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Structural changes in commercial agriculture

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STRUCTURAL CHANGES IN COMMERCIAL AGRICULTURE
STRUCTURAL CHANGES IN COMMERCIAL AGRICULTURE

... Implications for Education, Research, and the Organization of Farm Related Markets and Services

Proceedings of a Conference held in Chicago, Ill., April 12-14, 1965

Sponsored by the
Center for Agricultural and Economic Development, Iowa State University

In Cooperation with the
National Agricultural Extension Center for Advanced Study, University of Wisconsin and the Farm Foundation, Chicago, Illinois
Committeemen talk over arrangements for conference which produced this volume. They are from left to right: James Hildreth, Gordon Ball, C.B. Baker, Joseph Ackerman, Sydney J. Staniforth and Earl O. Heady.

A general view of the Conference on Structural Changes in Commercial Agriculture held at the Conrad Hilton Hotel in Chicago.
The basic idea of the conference on Structural Changes in Commercial Agriculture was planted in the spring of 1964 by Earl O. Heady. He outlined for the North Central Farm Management Research Committee his concern about the kind and amount of response to both current and prospective structural changes in the commercial farm firm. Many changes represent adjustments to technological and other innovations originating in marketing, research, and educational agencies serving farmers.

One important question is whether or not these agencies have responded appropriately to the feedback that is now apparent. What are the future needs in education, research, merchandising, supplies of managerial services and finance? How will the needs be met? What are the consequences for the Cooperative Extension Service; the agricultural experiments stations; the research and educational agencies of the USDA; farm supply firms and industries; processors, handlers and retailers; and financing agencies?

The idea of a conference was nurtured by the Agricultural Adjustments Subcommittee. Four "foundation papers," designed to outline prospective structural changes for agriculture through 1980, were presented to the North Central Farm Management Research Committee in the fall of 1964. They were criticized, revised and then circulated to representatives of the educational, research, merchandising and financial agencies selected by the conference program committee. Representatives were asked to prepare statements on implications for organization, staffing and operation in their respective areas. Their papers and summaries of revised "foundation papers" were presented in a Conference on Structural Changes in Commercial Agriculture, April 12-14, 1965.

The result is this volume. The program committee hopes that it will be a useful product and one of sufficient quality so that with appropriate processing it can be used to establish guidelines for decisions on many of the vexing problems that now face agriculturally-related institutions.

The conference itself was a heartening experience. Interest in all topics was immediately apparent; questions were relevant and penetrating; and discussions were candid and extensive. We hope through this volume to reach an audience wider than could be reached firsthand.

In a venture such as this many persons and agencies share responsibility. Special thanks must be given to the Center for Agricultural and Economic Development for providing much of the financial support for the conference and this publication. Supplemental assistance was given by the National Agricultural Extension Center for Advanced Study. In addition to financial support,
intellectual assistance was provided by Sydney Staniforth, who served on the conference program committee. We express our thanks to the Farm Foundation. Its continued support of the work of the North Central Farm Management Research Committee made the whole undertaking feasible. In addition, Joseph Ackerman and R.J. Hildreth served as members of the program committee and were invaluable in making local arrangements. The skills of Edwin O. Haroldsen, Editor, Center for Agricultural and Economic Development, were relied upon heavily in developing the format of the program and in assembling and editing the papers. To him and to others on the Center staff we express our gratitude.

Finally, to conferees we express our regret that it was impossible to include in the proceedings many of the ideas generated in the numerous discussions. We hope these ideas will be retained and communicated in decision-making councils that affect our agricultural sector.

The Program Committee

C.B. Baker, Chairman
Joseph Ackerman
A. Gordon Ball
Earl O. Heady
R.J. Hildreth
Sydney Staniforth
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SUMMARY

by Joseph Ackerman*

Agriculture evolved slowly through the ages. Even during the 30 years from 1910 to 1940 changes were comparatively slow and people were unprepared for the revolutionary changes that followed. The rapid changes we have experienced during the past 10 or 15 years caught us unprepared and left us somewhat bewildered, disorganized, and always trailing a little behind the times. The position of those who planned the conference on which this volume is based was that if we can look ahead to changes that will occur both in the farm structure and managerial situation, we can get organized now and devise ways of making our research and educational work far more effective in the future than in the past in meeting the needs of farm people.

The major events that have determined and will determine the pattern of the farm firm during the next 30 years probably have already occurred. The task of the conference on structural changes in commercial agriculture was to seek out pertinent situations and trends and with some insight synthesize them into what might be a reasonable prediction to be used as a guide in formulating future policies and programs.

The foundation papers, which appear as the first four chapters of this volume, discuss what is new in agriculture and what conditions are likely to be in 1980. Then questions are raised as to what the implications are for the people. We need to be concerned with the fundamental changes and how to guide them to serve the best interests of all. These changes, if wisely directed, will bring a higher level of living to farm people and others. Unwisely directed, they can bring hardship and frustration to many.

The four foundation papers make it quite obvious that we will need to restructure our educational efforts and facilities in order to keep pace with the increasing demands of farm people themselves. Farmers of today are more sophisticated than those of the past. The level of their management ability is constantly rising. They are becoming increasingly aware of the need for modernizing their programs to cope with rising costs and to meet growing competition. They know that programs and procedures that were adequate yesterday are likely to be obsolete tomorrow. They will want information required for making more complex decisions as technology continues to advance. They will want to take advantage of research findings as soon as they become available. They will seek additional services to help them solve technical problems and their credit and capital problems. People with vision, imagination, and determination will be needed in order to provide the necessary information and services.

*Managing Director, Farm Foundation.
Farm numbers are going to continue to decline. The average size of the farm will continue to increase. Capital requirements will probably increase at a faster rate than size of the farm. Many other dynamic changes are going to occur which will call for adjustments in organizations that serve farmers.

Some who attended the conference may have been disappointed in not finding more answers to the questions of implications. Yet the purpose of those who planned the conference was to try to determine where we are at the present time and where we are likely to be in 1980, then to raise questions in the minds of all of us concerning the implications. The value of this conference can be judged on the basis of whether we have set the stage for finding answers to the questions raised. I will try to point up some of the questions that ran through my mind as I sat in the planning sessions thinking of what should be covered by the conference papers, and also questions that were discussed in the papers presented.

**First let us consider the implications for education:**

- How do the technical and economic problems of commercial farmers change as their operations become larger and more specialized?
- How can extension meet the educational needs of these farmers?
- What level of training is needed for the county staff?
- Will the county continue to be the appropriate unit for serving farmers, or should extension shift to regional offices with highly trained specialists?
- Should extension education become more intensive and more formally structured rather than advisory in nature?
- What is extension's role with the nonfarm agricultural businesses?
- Will extension need to reach people beyond the confines of agriculture?
- Is extension concerned principally with problems internal to these businesses or with the way they serve farmers?
- Will farm services offered by nonfarm agricultural firms overlap or compete with extension efforts?
- Can nonfarm agricultural businesses be used as an arm of extension in farmer education?
- Can the needs of the agri-business group be met without serious problems of balance in research support and in extension's total program?
As we consider the implications for teaching programs in the colleges of agriculture some of the questions that need to be answered are:

For what kinds of positions are we training students?

What changes are required in our training program and our curriculum to equip our graduates to best fill these jobs?

Are our undergraduate programs too specialized in order to meet the needs of the modern commercial farmer?

Do we need more people with graduate degrees?

Should these degrees be research oriented?

Is it desirable to require five years of undergraduate work rather than four?

What types of retraining programs are needed to insure employment under changing conditions?

With respect to implications for our research program some of the questions that still remain to be answered are:

What changes are needed in either the kinds of research conducted or the machinery for administering research?

What proportion of the research resources should be devoted to the various sciences, and how should the research be related?

Should research be conducted in response to pressure?

Should we predetermine the relative pay-off of research activities in order to obtain funds?

Which research activities should be conducted by public agencies and which by private?

What kinds and portions of the research are needed now and will be needed in the future as a result of changes within farm firms?

Will electronic data processing and analysis of farm accounts increase, and to what extent will this information become available for direct use by practicing farmers?

Will such processing soon or ever reach the stage where with only a set of directions the farmer can feed in data from his farm and get answers for decision making?
Who should support research for this kind of objective?

What would be the effect of such a development on research and educational programs?

In the area of implications for organization of farm-related markets many questions were also raised:

Will technical assistance from firms supplying farm production inputs become increasingly important? Who will pay for this assistance and what is the prospective pay-off?

Will sales-related finance become increasingly important and what will be the effect on credit institutions?

How do the prospective changes differ between capital items and operating inputs? What forms will capital leasing take in the future?

What changes are in prospect for relations between manufacturing and sales firms in farm supply?

What are the prospects for further vertical integration between producing and marketing firms in the food industry?

What criteria are used to determine procurement practices of firms buying farm products? What are the effects?

What are the opportunities for farmers collectively to integrate forward into the food chain?

What changes are occurring in bargaining and uncertainty bearing, and how are these related to structural changes in the farm firm?

Will farm leasing become increasingly important on a full tenant basis? On a part-tenant basis?

What are the consequences for individual firms and institutions that finance farmers?

How will banks respond to needs of an agriculture increasingly sophisticated in its capital and managerial requirements?

What problems do vertical and horizontal integration create for inter-generation transfer of farm resources?
We are also faced with many unanswered questions about organization of farm-related services:

How will structural changes in the farm firm affect programs of farm organizations -- in the area of education, in the areas of farm supplies, marketing, and political action?

What are the consequences for farm organizations of increasing commodity orientation of individual farmers? Of declining population in rural areas?

What responsibilities will be assumed with respect to low-income farm families and low-income rural communities?

Will a variety of organizations develop, specialized by commodity orientation and income strata?

In what areas would such organizations compete?

In what areas would they complement each other?

How are services of farm organizations affected by the integration of farm-related firms?

What will be the role of professional farm managers in providing technical and financial management assistance for farm suppliers, marketing firms, manufacturers, and financial institutions?

What are the effects of off-farm migration on the quality and costs of community services in depopulating rural communities?

What are the effects on the quality and costs of such services in areas of urban expansion?

Are income transfers justified to reduce disparities in financial support of health, education, and other social overhead services in rural communities?

What changes are in prospect in the demand for social overhead services in rural communities as farms increase in size, specialization, and in capital requirements?

What educational changes are implied for school facilities in future rural communities?
We also face important questions concerning the implications for the organization and staffing of the colleges of agriculture and related educational and research services:

Should the present organization of our colleges of agriculture be replaced by a new, more responsive, wider and stronger system just as a multiple-lane interstate system is replacing the faithful but narrow highways which no longer suffice?

How restrictive is the departmental structure of our colleges and our system of degree offering?

Should any degree program or a college be eliminated or combined with others?

Are new programs needed in view of new technology?

How can the staff or its teaching capacity be expanded to meet the needs of the increasing enrollment in the immediate years ahead?

What should be the qualifications of new staff members?

Should all of the staff be located at the central university or scattered throughout the state?

Our colleges of agriculture have contributed much in making the United States different from other countries of the world. Through their research and educational activities they have helped supply the United States with abundant low-cost, high-quality food produced with an ever diminishing amount of labor. They have done a great deal to increase the material well-being of the citizens of the United States.

Agriculture is not going to stand still; it is going to continue to move forward perhaps at an accelerated pace. As we look ahead we can see that technological advances in the next decade will be some of the most far-reaching in our history. An exciting experience lies ahead for those who can contribute to the progress that flows from the technological development. The America that we enjoy today was built by men and women who had dreams and the will and initiative to fulfill those dreams. America will continue to grow in proportion to the capacity of her citizens to dream, imaginatively and constructively. With such dreams they will begin to find answers to many of the questions raised at the conference on structural changes in commercial agriculture.
Early in the revolution in scientific thought which began several centuries ago an idea arose that a natural law governs the infinite universe and that finite man had only to take steps to discover it.

It was a simplifying thesis, and therefore a comforting one. It was particularly attractive to social scientists, who other wise were hard put to apply rationality to the pulling and hauling which shapes human institutions.

Unhappily, that old confidence in a natural law which need only be perceived has dimmed. The natural law concept is now less acceptable in the physical sciences. It is almost in disrepute in the social sciences.

One consequence is to endow with mortality the organizational forms we live by. It is generally recognized that the ways we organize ourselves for both economic and social activity are always subject to change. Further, this admission of the transitory character of institutions is in contrast with the comparative timelessness of our values and goals.

The relevance of this introductory comment to a structural study of the farm firm is dual. First, the farm firm, like any human institution, is not carved in stone, assuredly to endure for all time. It is subject to change.

But the second derived meaning is the more profound and the harder to deal with analytically. An institution such as the farm firm did not arise purely out of happenstance. Nor is it the product of single-dimensional influences. Least of all is it the product of solely technological influences. It is also a reflection of deeply held socio-political aspirations and values. That is to say, as an institution of human society it also incorporates human values and goals. Therefore, any review of the setting for the institutional organization of agriculture must include cultural as well as technological considerations. It must be inclusive on either normative or positive grounds: educational leaders have an obligation to consider what "ought to be" as well as "what will be"; and any prediction of what will be could easily go astray unless society's capacity to express its non-economic goals is taken into consideration.

Definition of the Farm Firm

In the analysis that follows, the typical farm firm will be described in terms of the independent proprietorship commonly known as the family farm. This has been the prevailing unit everywhere except principally in plantation areas of the South and in parts of the Far West.

Definitionally, the farm firm will be regarded as a managerial unit in which labor and physical capital are applied to land in order to produce primary farm products. It basically produces non-differentiated (i.e., homogeneous) products. The typical farm firm combines laborer, supplier of capital goods, and manager in a single person.

In the majority of cases the farm operator is also owner. But not always. A sizable part of all land is owned by landlords. Question may be asked. Is a comparable part of managerial control thereby transferred off the farm, or outside agriculture? The answer seems to be that an appreciable share of management does reside off the farm, but to date little has moved out of agriculture. The majority of landlords are associated with farming, many being retired farmers or relatives of the operators. Ownership of land by town doctors and lawyers -- and even a few affluent economists--may be called absentee landlord control. However, the weighty issue in land holding and managerial control concerns how much ownership rests with nonfarm commercial investors who hold large acreages and formally manage their holdings. Thus far, commercial landholding of that kind is of secondary importance.

Moreover, modern technology probably transfers some of the seat of managerial power to the holder of physical capital, and away from the holder of land.

In other words, the farm firm generally combines the four factors of production in a single person.

\footnote{Elsewhere I have treated the traditional structure of agriculture in the following terms: "... (it) may be described variously, depending on whether one's interest is in institutions of the land, relations with the market, or other features. Probably the following is a nearly complete list of attributes of the structure:}

"(1) Land is privately owned and cultivated.
"(2) Much of the land is owned by persons within agriculture, rather than by a nonfarm propertied class.
"(3) The individual proprietor is manager and laborer and provides most or all his operating capital; he may also own his land.
"(4) Consistent with (3), the individual proprietorship is comparatively small.
"(5) The farm buys its supplies and sells its products in market exchange."

Sovereignty is internal in another sense. It is that the managerial function is performed primarily according to market data. This is implicit in calling the farm firm an independent managerial unit— or, perhaps, even in calling it a "firm." Traditionally, the farm has obtained its supplies in market purchase and has disposed of its product in market sale. Further, more recent and more sophisticated theory has recognized some further characteristics. The farm firm is usually in the position of a "price taker." For the supplies it buys it pays "made" prices. Moreover, in the past those prices have been uniform to all buyers; to the farm they have described a perfectly horizontal supply curve. For the products it sells the farmer also lacks the capacity to establish reservation ("administered") prices except insofar as that is done for him by government programs of price support or in some cases by cooperative bargaining.

These characteristics are full of implications. For example, the farm firm makes its production decisions internally, yet some of the paying price data may be unknown when those decisions are made, while most of the prices to be received are absolutely unknown. Further complicating the situation is the fact that for many farm products the production interval is long. A recognition of this perpetual chancery bears on the nature of management in agriculture and on the policy issue of instability (e.g., cyclicality) in agriculture. Does the farmer make habitual errors of anticipation of prices to be received? If so, there are management consequences. Therein is explained economists' interest in new techniques of supply analysis such as Marc Nerlove's distributed lags. Therein is credence found for such policy proposals as D. Gale Johnson's forward pricing.

Origins of the Traditional Farm Firm

It may be helpful to consider how the traditional structure of the farm firm came into being.

That firm has two origins. One is economic, the other socio-political.

Economically, the detached farmstead has advantages because farming is space-consuming. Machinery is heavy and slow. Also, farm products are bulky and many are perishable, and there is good economic reason to reduce their bulk and make them more storable and transportable right on the farm. This extends to feeding feedstuffs to livestock.

This does not explain why each farmstead is also a managerial entity, and each farmer a person of two or more economic roles. Here the biological nature of farming, the non-simultaneity of processes John Brewster notes, and similar factors have militated in favor of managerial independence. The composite-role farmer can certainly manipulate the production processes without costly bureaucratic overhead.
Historical events helped the farmer to gain and hold independent firm status. In the New World land was cheap, but much took some clearing. John Locke said that as much land as a man could clear, that much should he have. For centuries tillers of the soil had yearned for land of their own to till. On occasion they did more than yearn; they revolted for it. Their incentive was not only economic: Ownership of land was the badge of status -- social status and political status.

So with land so plentiful it became easy to indulge husbandmen in their wish. In the U.S. it eventually became national land policy to do so. First the policy was to help them to get land. For a century the policy has also been to help them to hold it.

But society does not answer all petitions affirmatively. Why did it so answer farmers? In the broader sense, why did our nation adopt, and, particularly, retain, so precedent-breaking an institution as individual freeholding of land? (In feudalism land was not owned; it was enfeoffed.) If the plowman wanted to own his land, why did society choose to let him do so? Why was land made a virtual commodity, to be bought and sold? Again, its early abundance was the original explanation. In my judgment there are two current reasons. One is that the performance record of our agriculture has been extremely good. The second is that our system of landholding has been one of small land holding. It is doubtful that society would long tolerate private oligopoly in land.

**Forces for Change**

Evidence is abundant that there are forces which press for change in the organization of the farm firm. They may even press toward elimination of the traditional farm as the central unit of agriculture.

It is worth a self-reminder that the firm, however identified, need not be the unit of scholarly inquiry and of applied "farm" management. P.J.D. Wiles makes clear in his good book *Price, Cost and Output*, that "... before 1870 ... there was ... no 'theory of the firm' as a separate branch of economics. Supply and demand in large markets, currency and credit, public finance, international trade and the elements of welfare economics were studied, but not the production function nor the pricing policy of the entrepreneur." Moreover, "practically without exception" economists then "held the full cost doctrine." ²

Before we attribute too much wisdom to Mr. Wiles' sententious statement we would do well to remember that before 1870 many other analytical tools of today were nonexistent. There was no theory of imperfect competition. Although the Austrian school was beginning to be influential it had

not yet gained wide recognition. William Stanley Jevons did not publish his Theory of Political Economy until 1871, and Menger's Grundsätze came out in the same year. Obviously, Marshall's blend of cost-of-production theories of value with marginal utility, in which he employed the idea of the typical firm, was not to appear on the scene until later.

Moreover, in the second edition to his book Wiles writes, "We need words and a schema that enable us to set the classical owner-managed enterprise among the various other kinds of enterprise: the peasant farm, the modern corporation, the producer's cooperative in Yugoslavia or else where, the 'establishment' in a Soviet-type command economy."  

Wiles adds that the firm as a corporate structure to combine factors of production embraces not only enterprise, the managerial factor, but "sovereignty, the right to give ultimate orders to the firm, beyond which there is no appeal;" and "equity, the right to receive the net profit." He explains further that "sovereignty and equity are not factors of production but rights."  

Sovereignty implies the capacity to decide what is to be maximized. Wiles says a "sovereign" might want to run this firm at a loss in order to pay high prices to one of its suppliers, in which he was still more deeply interested."

Forces pressing for change in the nature of the farm firm and therefore in the structural organization of agriculture may be classified broadly into those of the technology of production and those of markets, in the most comprehensive sense of each term.

Technology of Production.

The concept of technology of production may be subdivided into techniques as such, and into the kinds of resources employed.

That techniques are becoming more complex and more scientific is common knowledge. The point needs little elaboration. "A successful farmer is expected to know the chemistry of nitrogen applications, the physics of hay handling, the engineering of a balky tractor motor, the economics of selling hogs on the best market, the finance of long-versus short-term credit, and the laws of when to discontinue stilbestrol implants in the ears of steers." 

The advance in technology is a signal achievement, deserving eulogy. There is a dramatic contrast between "the skilled and competent family farmer of today...(and) his peasant forbear of only a few centuries ago.

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3Ibid., p. x.  
4Ibid.  
5Ibid., p. xiii.  
That advance in skills and status is among the most dramatic and heartening
the world has ever seen. To large extent it can be credited to education,
and it stands as a flaming tribute to the powers of education...

"But even so, let us guard against over-rating our attainments, or
misreading their meaning. Our generation has wrought wondrous things
in agriculture, but so did our fathers, and so did their fathers. It is
questionable whether the cotton picker is a more clever or more revolu-
tionary piece of machinery than was the cotton gin in its day. And neither
ranks alongside that most marvelous of all mechanical inventions in agricul-
ture, the metal moldboard plow, which presents a mathematical surface
that baffles the wizards of mathematics. It replaced crude tools for
scratching the soil that had existed since the dawn of time."7

The proliferation of new knowledge in agriculture has several conse-
quences. As one, it accounts in part for a trend toward more specialization
in farm production. As a second, it puts emphasis on more effective
educational programs for agriculture.

More than that, it raises question as to whether the individual farmer
can master the manifold knowledge and multiple skills modern technology
demands. Will modern technology doom the independent farmer and firm?
Theodore W. Schultz denies that it will. He avers the opposite. He
says, "as farmers adopt and learn how to use modern agricultural factors
an increasingly larger part of all farming is taken over by owner-operators."8
On the other hand, many observers suggest that complex technology
militates toward multi-farm units that make specialization of duties
possible.

But technology in the sense of "how to do it" is only half the story.
Most new technology has been applied in connection with bringing new re-
sources to agriculture -- or vastly expanding the use of some that pre-
viously were neglected. This is the economics of employing a great many
more capital inputs in farm production.

Thereby has agricultural productivity been enhanced. This result
alone has some meaning to farm management, and more to farm policy.

But an associated feature of that productivity is packed with signifi-
cance to farm management. It is the fact that it is a controllable produc-
tivity. The annual output of an individual farm (and of all agriculture) is

7Harold F. Breimyer, "Relations between Agricultural Policy and Freedom,"
Paper delivered at joint sessions of Marketing and Agricultural Economics-
Rural Sociology Sections of the Association of Southern Agricultural Workers,
Atlanta, Georgia, February 3, 1964.
8Theodore W. Schultz, Transforming Traditional Agriculture, Yale University
subject to governing control in a way and to a degree that was not true in an earlier, more agrarian age. Control is exercised primarily through the quantity of variable capital inputs employed. In this way the managerial task is made much more complex than it was when a manager's annual decisions concerned principally how to apportion a nearly fixed quantity of resources among alternate uses. Now the manager must decide also how many total resources (inputs) to procure and utilize each year.

It is in this respect that the uncertainty as to prices to be received becomes a serious impediment to good management. Moreover, if farmers as a group tend to make patterned errors in anticipating future prices, chronic instability in agriculture is likely to result.

Another way of viewing the managerial perils of a more technological and more commercial agriculture is to take note of how much annual cash production expenditures have increased and how large a part they are of gross cash receipts (75 percent in 1963). Today's agriculture is truly commercial. In a classical vocabulary, it can be said to be rationalized.

Linked therewith are issues of how to obtain adequate capital funds of the preferred kind, particularly equity capital. Also arising in that connection are means to temper the element of risk in farming.

Changes in Markets

However much methods of production have changed, it is possible that developments in farm markets have been even more momentous.

First of all, marketing has become ever more divorced from production. Producers of farm products generally do not now perform many marketing services themselves. Marketing has become a huge activity and a specialized one. It is conducted largely according to the rules of the nonfarm business world.

Marketing has become more influential. It has forced production to become more market oriented. It has even reduced it to a subsidiary role.

Market considerations find a greater place for several reasons: its growth in magnitude, the transition to more direct trading; impatience of market firms with so variable and unpredictable a market supply of products as typically comes from agriculture; the trend toward mass handling and mass distribution, which requires uniform, standard quality of products; and consumers' growing discrimination as to quality.

The resulting pressure for a more orderly supply of farm products of specified quality is known as the drive toward specification production. It prevails throughout agriculture.
It could be viewed, to be sure, as a managerial problem in production as such. It does indeed involve problems of how the biologic processes of agriculture can be reduced, managerially, to the neat order the marketing system wants.

But management in production responds only to stimuli. The stimulus, the incentive, has traditionally been expressed via the market pricing route. Increasingly it is being transmitted by more direct methods of the several kinds lumped under the broad term, "vertical integration." Integration will be named later as one of the alternate forms of organization of U.S. agriculture. Let it be recognized here that the managerial function and in fact the definition of the farm firm itself are affected by the manner in which the drive for specification in production is expressed. Wherever integration is complete, the idea of a farm firm no longer has meaning. Moreover, although integration once again combines production and marketing in a single entity, in the early version management rested primarily at the farm level but nowadays it usually is at the marketing level.

The search for more order and regularity in the marketing of farm products may be of primary importance to the marketing sector, but its secondary significance to the economics of the firm in production is awesome.

As a quick side comment, by no means all the interest in vertical integration arises in the search for tighter specification of quality (and timing, etc.). It has a source also in the greater concentration of size and power in parts of the marketing system. Earl Crouse of the Doane Agricultural Service declares that changes in retailing are the biggest motivating factor. Control over channels of supply (or distribution) is an instrument of market power.

Partly because many market firms have become larger, we have seen some departure from the established principle that farmers buy and sell on a "perfect" market insofar as price discounts (or premiums) for quantity are concerned. Large farmers can sometimes buy supplies at discounted prices for large quantity. They may also get higher prices for what they sell if they deliver a particularly large volume. The latter opportunity is confined chiefly to giant farms in specialty products, although it extends to some livestock products. Wherever these conditions prevail, the simplifying assumption of horizontal price curves for supplies bought and product sold is no longer applicable.

The nature of the structure of the market cannot be passed without a comment on the market for the important factor of land. Its price soars. There is no need here to expound reasons; they doubtless extend from the marginal worth of added land to accommodate overinvestment in machinery, to favorable tax laws for the capital-gains-wealthy, to the enticement of speculative investment. Whatever the reasons, land prices are high, and the consequences bear on the economics of the farm firm. A question is raised
as to how land costs are to be funded--also the question of whether an influx of nonfarm capital will compromise the operator's managerial role, perhaps eventually transferring management out of agriculture. All this is true despite the fact that farm operator-owners have a stout defense in their willingness to forego some imputed return to investment in order to be able to own land.

What of the Future?

The above review of how we got where we are, the nature and meaning of our present system, and the changing structural influences, are prologue to speculation as to where we may go next.

A convenient and meaningful distinction to be made is that between horizontal and vertical changes in the organization of the firm.

Horizontal Combination

Horizontal changes in turn are those of cooperation of various kinds, each with its unique significance both economically and socially-politically; and those of combining present farms into multi-farm corporate structure. The latter would be corporate in both formal organization and in administration. It would have all the trappings of specialization of jobs, a layer-cake executive hierarchy, a public relations officer, and a "public service advertising" budget. It would also be built largely on non-farm finance capital. In fact, a heavy introduction of non-farm finance capital would likely lead to such an organizational structure, if only by force of habit. A few existing farmers would become executives and more would be supervisors, but the majority would be laborers. Public services to such an agriculture would change materially. Research and education, for example, would be confined largely to work of basic and technical nature.

There are now some super-farms, as King Ranch and some specialty producers. More prevalent are large units in broiler and egg production and in cattle feeding.

Cooperation includes not only the familiar farmer cooperative associations but cooperative bargaining associations, such "self-help" techniques as marketing agreements and orders (state or federal), and direct government programs of types ranging from Section 32 surplus-removal to price supports that set floor prices. All these affect the managerial function in farm production, in some way and to some degree.

Vertical Integration

The other possible direction is toward vertical integration. By definition this involves a reconstitution of management. In principle, sovereignty could be shifted almost anywhere; that of the farm firm could be increased greatly if the farm were to take over marketing. In reality almost
all integration to date has transferred sovereignty off the farm. The only likely possibility of retaining it in agriculture is via cooperative arrange­ments. These too are being discussed in some circles.

Vertical integration introduces more complicated changes in the structure of the farm firm than does horizontal combination. If integration is achieved by the non-farm integrator’s acquiring ownership of farms, sovereignty will be transferred out of agriculture and the status of farmers will change much as in corporate super-farms. If integration is by contract instead of common ownership, the status of the farmer and his distributive share will depend on the terms of contracts and the elbow room each farmer enjoys in contracting. If contractual integration proceeds far, however, much sovereignty will be lost and the farmer’s distributive share will be reduced except insofar as it is sustained by group action.

Analytically, in an integrated agriculture many present techniques of farm management analysis would be rendered inapplicable. Their replacement would be the economics of imperfect competition in its infinite complexity.

The call for public services in an integrated structure would likely be even less than in a horizontally combined one. On the other hand, more of some kinds might be given without call. For there would be a need for surveillance and adjudication, for protection of the interests of erstwhile farmers. It is harder to protect political and social (i.e., "democratic") values in vertical combines than in a market economy.

Epilogue

The brief review of horizontal combination and vertical integration is offered as limiting cases. In the more diverse agricultural economy of the future there will be actual instances of each -- there are a number now. But there will be myriad mixed and half-way situations too. Also more cooperatives and bargaining associations as defensive measures. And quite possibly a new direction in farm policy that will extend a helping hand from government. The least to be said is that the single traditional model of a farm firm will no longer be as nearly universal as in the past. Various other models will command study and adoption. One of the complicating features of the emerging market structure as it affects the economics of the firm in agriculture is that it makes for more variation, more diversity.

Production economics thereupon becomes more difficult, farm management more comprehensive and complex, and the farm policy implications more profound but also more baffling.
ECONOMIC GROWTH OF THE FARM FIRM
AND PROJECTED CHANGES IN FARMING

by Earl O. Heady* and Gordon Ball**

The adjustment process of American farming is gradual and no sudden and complete transformation or revolution is in sight. Nevertheless, very significant changes in the farming structure are taking place within each decade, and in the future there will be even more rapid changes than in the past. While the changes of an individual year will not in themselves require a large adaptation of the services and markets serving agriculture, those of a decade will; those of two decades will dictate it. Already we find a strata of the most advanced commercial farmers whose managerial abilities, scale of operations, and general intellectual abilities and orientation require an advancement in research and educational programs and even in the services provided by the market sector.

Now is the time, looking ahead to the next decade and the changes it will bring in both farm structure and managerial personnel, to begin reshaping educational and research organizations to meet the needs and demands that will rapidly evolve during the next 10 years. The pressure is now on among advanced commercial farmers, and if reorganization and direction of public research and education are neglected, or even delayed, permanent damage in financing and opportunity is in prospect. We believe that (a) sufficient foresight still is lacking in respect to these prospective changes and needs in research and education; (b) the changes will be sooner, larger, and more important then yet realized by too many directors of major research and educational organizations for agriculture, and (c) using a worn but highly appropriate phrase, the time is later than most people realize.

The major task given us, however, is not to outline the structure and re-direction of research and education needed to service our commercial agriculture of the future, nor even to point out all the implications of the changes bringing about these needs. Rather it is to review the prospective changes themselves and their effect on the economic growth of the farm firm. We now turn to do so, but we do wish to make frequent reference to the implications of the projections and changes posed.

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**Professor of economics, Iowa State University.
The exodus of labor from farming during the past 15 years has left the farm population heavily weighted toward older operators. In 1959 the average age of farm operators for the U.S. was 50.5 years as compared to 49.6 years in 1954 and 48.3 years in 1950. Farm operators in the South had the highest average age, 51.5 years in 1959. For the U.S., the proportion of farm operators in the age group 65 years or more, increased from 16.6 percent in 1954 to 16.8 percent in 1959. During the same period the proportion of the farm operators under 35 years of age decreased from 15.1 to 12.7 percent. One important reason is that fewer young people are now moving into farming through the tenant system. In the same year though, 1959, 31 percent of the farm operators were over 55 years old and two of every three farm operators were 45 years or older.¹ In many localities and for some entire states the percentage was much higher. This age distribution will result in the retirement of a large proportion of existing farm operators in the next ten years and two-thirds of them will have reached their 65 birthdays within 20 years. Because of the "openings" created from this source, and because land supply to other operators will be increased accordingly, changes at the end of the next decade will be mammoth as compared to those at the end of the last decade. The entering managers who take over the land and assets of those who retire or die, as well as existing managers who acquire the land and other assets that then enter the market, will be quite a different managerial class than those they replace. They are unlikely to select agriculture as an occupation unless the financial rewards for their labor and management are several times that of the operators they replace. Their level of education and ability to seek out new knowledge will far exceed that of the farmers they replace. The managerial aids they will require and the technical knowledge they will seek routinely will represent a mix highly unsimilar and much more potent than that of the past. The proportion of managerial and technical knowledge these operators will want or require from the public and private sectors will likewise be very different.

¹U.S. Census of Agriculture, 1960.
Agriculture in less developed economies rests largely on labor and land, and has only minor dependence on capital. In the least developed nations of the world, 90 percent of the resource inputs are frequently composed of labor and land and only 10 percent of capital (with all inputs used converted to a money basis of market factor prices). Similarly in the United States, labor and land were the major inputs a century back when public research and educational services were initiated. Labor and land represented nearly 85 percent of all inputs (with all inputs converted to dollars on the basis of factor prices) as late as 1910 when agricultural research was only becoming well organized and the cooperative agricultural extension services were on the verge of creation. But with economic development, the trend is from a relatively large supply and low prices of labor and a small supply and high price of capital to the reversed relationship between these two resources. Farm managers respond accordingly and by 1960 capital, apart from land, represented nearly two-thirds of all farm inputs. Our projections suggest that by 1980, capital may represent as much as 80 percent of all inputs.

This shift in the input mix certainly brings a different emphasis on developing and communicating knowledge by private industry. At low levels of development, when the main inputs are land and labor, private firms have little opportunity to produce and merchandise these resources. However, as farming comes to rest mainly on capital, industry not only has a broad commercial opportunity to produce and distribute the materials so represented but it also has a great stake in developing and extending knowledge so that these inputs can be retailed. The results are evident, for example, in farm machinery and even in poultry breeding where the significant research is conducted by industry. The same developments are occurring in basic and applied research for plant breeding, the large innovations in animal nutrition, fertilizers, insecticides and other technical fields where the research results give rise to materials which can be packaged and retailed.

In the early years of agricultural college research and education, public research on technology was dominant because such technology rested on land and labor inputs which industry could not produce and sell. Research also was conducted on capital items, but these items were largely farm produced such as seeds, horses, legume rotations to produce fertility, etc. Now, however, public services may need to think about and concentrate on those fields of knowledge not so closely related to merchantable capital inputs, for industry can produce such inputs and simultaneously provide the technical knowledge, that goes with these inputs. Public institutions may provide knowledge in managerial processes and services, social sciences and economic predictions, basic principles of the physical and biological sciences, problems in land use and conservation and other concerns where industry does not produce a material product to merchandise aided by its own research. These shifts are significant and we do not recommend that the public abandon all applied research in physical and biological fields which relate to physical capital items. It is, however, important to note that the budgets of private firms for research.

2Since the figures cited are percentages, the total inputs need not be converted to a common value of the dollar.
development, and communication have grown tremendously. Considering all means of communication, the budgets of the private sector for this purpose likely exceed those of the extension services, especially for particular technical practices. Thus questions arise regarding public sector research and education; considering the presence of private industry and its contribution to farm knowledge and development, what are the areas of highest payoff for activities of the public sector? What are the priority areas of research which do not invite private investment but which are most essential in serving the next generation of commercial agriculture?

The Managerial Nature and Requirements of Farming

Increased capitalization of agriculture results in cost economies which can be realized only by farmers who operate on a sufficient scale. This force is reflected in the size trend indicated in Table 2.1; acres per farm increased by 113 percent in the 20 years 1940-60 while farm numbers declined by 38 percent. Serving in complementary fashion with larger farms and a greater capitalization of agriculture are managerial requirements to manage larger investments. Also, the increased commercialization, higher educational level of this generation, and the extended surplus capacity of current and prospective farming all give rise to a much higher degree of competition and a need for larger management skills. In another half generation, farms should be, and most will be, operated by managers who will have the equivalent of a college education. These operators will readily track down the basic technical information for production and will reap their larger gains from their ability to serve in the managerial capacity.

Table 2.1  Number and size of farms for selected years. U.S.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of farms (000)</th>
<th>Acres per farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920</td>
<td>6,448</td>
<td>137</td>
</tr>
<tr>
<td>1930</td>
<td>6,289</td>
<td>157</td>
</tr>
<tr>
<td>1940</td>
<td>6,096</td>
<td>174</td>
</tr>
<tr>
<td>1950</td>
<td>5,382</td>
<td>215</td>
</tr>
<tr>
<td>1960</td>
<td>3,704</td>
<td>371</td>
</tr>
</tbody>
</table>

Perhaps the greatest implication of growth in managerial abilities of farmers will be need for restructuring our educational facilities. An example of such restructuring already exists in the most highly commercialized farming counties of states such as California. The managerially-capable farmer will not want to seek knowledge from a generalist who knows little more than himself on highly technical matters. He will want to converse with a person at a higher scientific level. Hence the question: Will the equivalent of today's county agent be replaced by a specialist at a level of training of a Ph.D? Will county extension offices need to be replaced by regional extension offices large enough, while of reduced number per state, so that a group of specialists can be financed.

Somewhat similar questions can be raised about the managerial aids available and needed by farmers. Will they be provided through the extension services or through commercial channels? Can the farm and home planning machinery now in existence be upgraded sufficiently to meet these needs?

By 1980, we can obviously project retirement of all farmers now at middle age or above. The operators who replace them will be more skilled and efficient in the managerial process. In 20 years we expect farm operators to turn heavily to highly sophisticated managerial aids. By that time, we expect that programming, or some replacement for it, will be a common managerial aid used by operators in their farm planning. They also may employ other planning strategies which seem rather remote today. Farmers, in general, will not be big enough to own large-scale computers, but will command some understanding of the procedure and will hire the services of machines, through management or business consulting firms. It is reasonable to expect that such a farmer might use mathematical programming for deriving a basic long-run plan for his farm, an annual plan, and a revised plan for each major change in price or other variables.

If our agricultural educational facilities keep apace with economic development, we should expect the 1980 farm manager to be highly knowledgeable in the basic scientific aspects of farming. With competition maintained and a growing scientific and managerial knowledge of operators, farmers will be less willing to wait until information filters out to them through the conventional machinery of county extension agents, agricultural college publications, etc. A large number of farmers -- perhaps even the majority-- will want to get research findings directly from the experimental plot or laboratory rather than to wait for the conventional "filtering out" process and avoid the situation where other farmers obtain the knowledge first. In this context, we expect a great reshuffling and greatly reduced time lag in the number of farmers falling in the "innovator or first adopter" and the "imitator or follower" groups.
Farm Numbers and Sizes

There will be many fewer farms to be serviced by research and education in another two decades. Even if the rate of decline since 1920 prevailed, the number of farms would be down around two million in 20 years. It can be expected, apart from nominal farms, that the number of units will decline even more rapidly in the period ahead because of (a) the high proportion of older persons in the farm operator population, (b) wider spread knowledge of economic change and alternative employment opportunities by farm youth and (c) increased capital requirements for a competitive farm unit. Other predictions indicate an expected number of farms by 1980 of 1.5 million, but as few as 1.1 million of these farms could easily produce the nation's food in surplus quantity and without liquidation of the family farm structure of the nation.³ In terms of potential alone, the number of farms could decline readily to 800,000 (although a conservative time series prediction would suggest only something less than 2 million farms by 1980, including part-time and subsistence units).⁴ At least 50 percent of our farms at the present time must be regarded as inefficient units in both the physical and economic sense, and they produce only about 10 percent of agricultural production. Conceivably the largest reduction in farm numbers and conversely the greatest increases in farm size will be found among this group. The heaviest concentration of these farms is in the southern states and mountain regions of the country. We expect that within 15 years the percent of this group of inefficient farms will be reduced from 50 percent of the national total to 10 percent or less.

Capital for Farms and Industry

As agriculture comes to rest more on capital and less on labor and land inputs, the relative advantage of different farming regions will shift. Land of various qualities will be relatively less important in determining regions of comparative advantage, and location and population centers will grow in importance in this respect. The data of Table 5.2 show trends in support of that contention and supply information on the changes in capital requirements on farms between 1940 and 1963. The increases in total use of capital on all types of farms during the past 24 years have been tremendous, varying from 438 percent in the central northeast to 651 percent in the Black Prairie cotton farms. The areas with the greatest total capital investment are the High Plains.

⁴Also see R.F. Daly, "Agriculture in the Years Ahead," U.S. Department of Agriculture, mimeographed, February, 1964. He predicts 2,083,000 farms for 1980 but he also states (page 11) that 625,000 farms could produce the 1980 output with 2 million workers. The potential consolidation of farms and reduction in work force for agriculture is extremely great. Hence, the projections we cite, and those from Daly, may prove to be extremely conservative. It is for this reason that we prefer the low level of projected inputs indicated in Table 2.5 and the greater amount of change suggested elsewhere in the text.
Table 2.2 Value of capital per farm, specified types of commercial family-operated farms, 1940 and 1963.

<table>
<thead>
<tr>
<th>Type of Farm</th>
<th>Average Value</th>
<th>1963 as a percent of 1940</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1940a</td>
<td>1963b</td>
</tr>
<tr>
<td></td>
<td>(Dollars)</td>
<td>(Percent)</td>
</tr>
<tr>
<td>Dairy farms, Central Northeast:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total farm capital, January 1</td>
<td>9,900</td>
<td>43,400</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>5,300</td>
<td>23,400</td>
</tr>
<tr>
<td>Livestock and equipment</td>
<td>3,600</td>
<td>7,900</td>
</tr>
<tr>
<td>Hog-beef fattening farms, Corn Belt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total farm capital, January 1</td>
<td>20,640</td>
<td>98,920</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>14,220</td>
<td>66,070</td>
</tr>
<tr>
<td>Livestock and equipment</td>
<td>4,620</td>
<td>8,830</td>
</tr>
<tr>
<td>Cash-grain, Corn Belt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total farm capital, January 1</td>
<td>29,730</td>
<td>137,020</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>26,250</td>
<td>124,560</td>
</tr>
<tr>
<td>Livestock and equipment</td>
<td>2,850</td>
<td>8,000</td>
</tr>
<tr>
<td>Cotton farms, Black Prairie:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total farm capital, January 1</td>
<td>8,810</td>
<td>57,330</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>7,240</td>
<td>47,890</td>
</tr>
<tr>
<td>Livestock and equipment</td>
<td>1,320</td>
<td>6,490</td>
</tr>
<tr>
<td>Cotton farms (irrigated, High Plains, Texas):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total farm capital, January 1</td>
<td>24,120</td>
<td>139,450</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>18,300</td>
<td>121,330</td>
</tr>
<tr>
<td>Livestock and equipment</td>
<td>4,900</td>
<td>16,890</td>
</tr>
<tr>
<td>Cotton farms, Southern Piedmont:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total farm capital, January 1</td>
<td>4,790</td>
<td>30,750</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>3,670</td>
<td>27,040</td>
</tr>
<tr>
<td>Livestock and equipment</td>
<td>1,080</td>
<td>2,140</td>
</tr>
<tr>
<td>Tobacco-cotton farms, North Carolina:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total farm capital, January 1</td>
<td>10,420</td>
<td>57,540</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>7,230</td>
<td>40,400</td>
</tr>
<tr>
<td>Livestock and equipment</td>
<td>2,710</td>
<td>10,820</td>
</tr>
<tr>
<td>Wheat-small grain-livestock farms, Northern Plains:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total farm capital, January 1</td>
<td>34,590</td>
<td>202,110</td>
</tr>
<tr>
<td>Land and buildings</td>
<td>29,060</td>
<td>175,200</td>
</tr>
<tr>
<td>Livestock and equipment</td>
<td>4,640</td>
<td>22,880</td>
</tr>
</tbody>
</table>

b Source: Farm Costs and Returns, ERS, USDA, Agricultural Information Bulletin No. 230, (Revised June 1964) and(revised October 1962).
of Texas farms and the Washington-Idaho wheat-pea area, where the average capital values were already $139,450 and $202,110, respectively, in 1963. In all areas and for all types of farms, land and buildings accounted for a larger percentage increase between 1940 and 1963 than did livestock and equipment.

Growth in capital requirements and demand will have most significance for the individual farm. The growth in the amount of capital used by the individual farm has been much more than for the agricultural industry. This will continue to be true since farms are being consolidated and dwindling in number at the same time that capital is being substituted for labor and the general biological technology of agriculture rests more and more on capital from off-farm sources. The proportion of inputs that are unpaid (according to the Economic Research Service terminology) declined from 60 percent in 1910 to around 25 percent in 1963. Increased demand for inputs furnished outside the farm and household is expected to continue as structural change in agriculture progresses further. An important element in decline of the proportion of nonpurchased inputs is the diminution in farm numbers and the agricultural labor force. Small farms depend relatively more on labor and less on capital than do large farms. Since the major reduction in farm numbers is among farms with a small volume of output and inadequate income, the amount of unpaid or low paid labor inputs will decline further. Labor released from small units combined with other undersized units, or even with more adequate ones, largely is replaced by machinery and other purchased mechanical inputs. While less apparent, labor also is replaced by biological capital such as fertilizer, improved seeds and livestock, pesticides, and ration additives which increase output per acre or animal against a relatively fixed labor input per producing unit. Consequently, a given amount of food can be produced with less labor as more of these biological capital items are used. These capital items come largely from purchased sources and have an explicit price. Continued technical improvement through these capital materials also causes the proportion of unpaid inputs to decline. The same shift and substitution also takes place between these biological capital materials and land. The new technologies increase yield per acre, so that a given output can be obtained from fewer acres. If consumer demand grows at a slower rate than the increase in farm productivity encouraged by these inputs, fewer acres of land are needed for crop production. With surplus land shifted to less intensive uses, the capital innovations mentioned above substitute for it. The proportion of total inputs from purchased sources increases accordingly.

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5USDA Statistical Bulletin No. 233, revised. (Data based on 1935-39 price weights.)
6Daly, op. cit. predicts a 13 percent increase between 1962 and 1980 in farms with sales $10,000 and over and a decline of 60 percent in farms with sales under $10,000. He also predicts a decline of 49 percent in part-time and part-retirement farms.
The greater proportion of purchased inputs also increases the risks facing the farm manager. As Table 2.3 shows, the investment required to generate a dollar of income and the proportion of farm income required to cover cash expenditures has grown tremendously in the last 20 years. A bad year or break in prices may thus provide a much greater threat of loss and bankruptcy than two decades back. Are there planning strategies, in the realm of decision or other theories, which can be developed and retailed to farmers to meet these growing contingencies? Is there need to structure research in technical fields and the recommendations stemming from it, to provide data in the form that will mesh with alternative decision models and that is also designed to meet the greater risks posed by a highly commercialized and capitalized agriculture?

With the more rapid increase in inputs and capital investments for the individual farm than for the industry (Table 2.4) the problem of financing will differ similarly between the two. Between 1940 and 1963, the total value (current dollars) of physical assets for U.S. agriculture increased only 300 percent, as compared to nearly 700 percent for the national average of farms. Even then, the national average obscured the mammoth growth in capital usage and requirements by the large number of farms that are shifting to the highly commercialized category. An investment of $200,000 per farm, an amount

Table 2.3 Production assets, net farm income and ratio of assets to net income in the U.S. for selected years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Production assets (mil. $)</th>
<th>Net farm income (mil. $)</th>
<th>Assets per dollar of net income</th>
<th>Cash expenditures as a percent of cash farm income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1944</td>
<td>61,933</td>
<td>13,080</td>
<td>4.73</td>
<td>50.8</td>
</tr>
<tr>
<td>1949</td>
<td>98,043</td>
<td>14,276</td>
<td>6.87</td>
<td>66.2</td>
</tr>
<tr>
<td>1954</td>
<td>121,842</td>
<td>14,223</td>
<td>8.26</td>
<td>68.5</td>
</tr>
<tr>
<td>1959</td>
<td>154,767</td>
<td>13,407</td>
<td>11.54</td>
<td>75.3</td>
</tr>
<tr>
<td>1963</td>
<td>176,739</td>
<td>12,500</td>
<td>14.13</td>
<td>79.1</td>
</tr>
</tbody>
</table>

a Data for all years before 1963 are from USDA Outlook Charts. Data for 1963 were compiled from USDA Farm Income Supplement for 1964 and from USDA Outlook Charts for 1963.
Table 2.4 Indices of specified inputs per farm and for U.S. agriculture for two specified periods.

<table>
<thead>
<tr>
<th></th>
<th>U.S. Agricultural industry</th>
<th>Per farm of U.S. agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>100</td>
<td>104</td>
</tr>
<tr>
<td>Aggregate inputs</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>Farm real estate</td>
<td>100</td>
<td>112</td>
</tr>
<tr>
<td>Machinery and equipment</td>
<td>100</td>
<td>274</td>
</tr>
<tr>
<td>Fertilizer and lime</td>
<td>100</td>
<td>536</td>
</tr>
<tr>
<td>Feed and livestock</td>
<td>100</td>
<td>381</td>
</tr>
<tr>
<td>Paid inputs</td>
<td>100</td>
<td>167</td>
</tr>
</tbody>
</table>


now characterizing the innovators most closely described as "extension followers" over the past two decades, will define the "lower bounds" for a third or more of commercial farms by 1985. The growth in investment poses many interesting problems and questions: Will capital be best supplied to farmers as credit, or in the form of rental machinery and equipment? Because of the complexity and inter-action of the various capital items representing our developing farm technology, what structure can be best assumed by credit users and the firms and organizations that provide it?

Projected Structure of U.S. Agriculture

We now summarize some projections of U.S. agricultural structure for 1980. This point in time is only 15 years away and should serve as a goal towards which reorganization of research, educational and market services is oriented. Since many of the predictions are based on time series regression estimates, they may be highly conservative and somewhat greater change can be expected.\(^\text{7}\) They thus serve as a "minimum restraint" behind changes in public and market institutions directed towards servicing agriculture.

Total Input Projections

The level of inputs for agriculture in 1980 will depend on (a) the magnitude of farm output and (b) rates of growth in the productivity of farm inputs. In respect to magnitude of output for 1980, we make two estimates: an upper estimate with 1980 output 48 percent greater than 1960 and a lower estimate

\(^7\)An important number of the figures are based on Heady and Tweeten, ibid, pages 480-497.
with 1980 output 35 percent greater than 1960. Of the two levels of projected output, the upper one is more realistic and compares favorably with Daly's estimate for 1980. It supposes a national population of 260 million. The projected amount of total inputs for 1980 is between 27.5 and 25 billion dollars for the higher and lower levels of output respectively (Table 2.5). Total inputs are based on a predicted growth of the output-input ratio amounting to 1.7 percent per year. The growth in the output-input ratio is predicted as a further growth in the quality and productivity of inputs as generated by new knowledge. It is, perhaps, a conservative prediction since the output-input ratio grew by 2.4 percent annually between 1952-53 and 1962-63. Hence, the total amount of inputs now used in agriculture may be sufficient to meet output for domestic and foreign demand in 1980. (An extremely large and unexpected growth in foreign demand could increase both input and output requirements.)

For farm output projections to be realized with only a small increase in total inputs, major changes must, however, continue to occur in individual farm inputs, in farming specialization, in management, in institutions, and especially within the aggregate input category of agriculture. These latter changes generally will represent continued substitution of the more productive for the less productive inputs. Continued increased use of the more productive resources and their substitution for labor and some forms of capital are indicated in the 1980 projections which follow for durable capital, operating capital inputs, and various components of these resource categories.

Farm labor projections

Projections for 1960 to 1980 indicate that hired labor will decline at least by 30 to 35 percent and family labor by between 45 to 55 percent. The projections are for the total farm labor force to decline by 44 percent or from 7.1 million in 1960 to 4 million in 1980. Over 3.1 million workers will need to find jobs in other industries because of the net excess of births over deaths.

In alternative procedure, we estimated the number of workers required in 1980 to be 3.6 million, a 49 percent decline from 1960. The result is based on the assumption of annual increase in output and output per man-hour of 1.8 and 5 percent, respectively and perhaps is most realistic.

The minimum decline included, projected to 1980, would result in a farm population of only 9 million compared to a farm population of 14,313,000 in 1962. The percentage of the population on farms dropped from 23 in 1940 to

---

8R.F. Daly, op. cit. His estimates, corrected for time period, would show a growth in output of 43 percent between 1960 and 1980.
9Daly, op. cit.
10Source: Farm Population, Bureau of Census, Series ERS (P-27), March 1963.
9 in 1960 and to 7.7 in 1962. On the basis of our projections, less than 4 percent of the U.S. population will live on farms in 1980.

**Investments and assets**

With attainment in 1980 of the lower levels of projected output, the three main categories of farm production capital -- real estate, livestock, and machinery -- are expected to grow only 4, 16 and 13 percent respectively, considerably below past growth rate and the projected future output level (Table 2.5). However, in replacements due to technology, the amount of new capital items representing changed technology will be considerable.

The projected 1980 stock of real estate (land and buildings), of 74 billion 1947-49 dollars, is based on crop output requirements which are 34 percent greater than in 1960. A projected increase in yield per acre compensates for the larger requirements, while 4 percent fewer cropland acres and physical land resources are expected to be needed. An estimated 30 percent rise in irrigation, building, and other land improvements, however, is predicted to offset the reduced land requirements and increase the total physical volume of real estate assets.

A projected 16 percent increase in livestock assets is based on an anticipated 52 percent increase in livestock output between 1960 and 1980. Assets need not grow as rapidly as output because livestock production per breeding unit is predicted to be slightly more than 30 percent greater in 1980 than in 1960.

The increase in machinery stock is predicted to be less in the two decades following 1960 than in the single decade preceding 1960. The 1980 estimate, 11.5 billion 1947-49 dollars, is 13 percent greater than in 1960 and implies an annual increase of less than 1 percent. The projection is based on recent trends in machinery stocks and suggests a "mature" agricultural economy in terms of machinery. A large proportion of future machinery sales are likely to fill replacement needs rather than to be used to expand the agricultural plant. A large amount of new machinery will continue to be purchased not only to replace worn-out machines, but also to substitute for machines which are inadequate for large holdings. Such substitutions will offer sizable opportunities for machinery to replace labor, despite the rather small increment in machinery assets.

**Operating Capital**

A large share of the rising productivity of agriculture over the next two decades will come from operating capital inputs because their productivity is much higher than that of the resources they replace. Operating inputs include fertilizer, lime, feed, seed, high protein concentrates, herbicides, insecticides, hybrid seeds, and such general items.

All operating inputs are projected to total 12 to 13 billion 1947-49 dollars by 1980, an increase of more than 40 percent over 1960. Purchases of ferti-
Table 2.5 Projected U.S. annual inputs in 1980: Productive operating and labor inputs, durable services, output-input ratios and total output (million 1947-49 dollars). a

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor (based on man-hour requirements)</td>
<td>13,631</td>
<td>6,866</td>
<td>3,600</td>
<td>3,000</td>
<td>-48</td>
</tr>
<tr>
<td>Real estate (services)</td>
<td>3,485</td>
<td>3,750</td>
<td>3,900</td>
<td>3,750</td>
<td>0</td>
</tr>
<tr>
<td>Fertilizer and lime</td>
<td>393</td>
<td>1,561</td>
<td>2,600</td>
<td>2,500</td>
<td>67</td>
</tr>
<tr>
<td>Power and machinery</td>
<td>2,305</td>
<td>5,558</td>
<td>6,800</td>
<td>6,300</td>
<td>22</td>
</tr>
<tr>
<td>Livestock and feed b</td>
<td>1,151</td>
<td>1,526</td>
<td>1,930</td>
<td>1,860</td>
<td>26</td>
</tr>
<tr>
<td>Aggregate nonfarm c</td>
<td>1,296</td>
<td>3,112</td>
<td>4,900</td>
<td>4,400</td>
<td>57</td>
</tr>
<tr>
<td>Taxes and interest on</td>
<td>1,088</td>
<td>1,611</td>
<td>2,400</td>
<td>2,190</td>
<td>49</td>
</tr>
<tr>
<td>operating inputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous inputs d</td>
<td>831</td>
<td>1,307</td>
<td>1,600</td>
<td>1,550</td>
<td>22</td>
</tr>
<tr>
<td>Total inputs</td>
<td>24,181</td>
<td>25,292</td>
<td>27,730</td>
<td>25,550</td>
<td>10</td>
</tr>
<tr>
<td>Output-input ratio</td>
<td>.94</td>
<td>1.40</td>
<td>1.9</td>
<td>1.9</td>
<td>35</td>
</tr>
<tr>
<td>Total output</td>
<td>22,825</td>
<td>35,454</td>
<td>52,000</td>
<td>48,000</td>
<td>47</td>
</tr>
</tbody>
</table>


bInterest and other costs for holding livestock and feed inventories.

cIncludes purchased feed, seed and livestock, but excluding interfarm sales.

dMiscellaneous inputs include dairy supplies, blacksmith repairs, hardware items, etc.
ilizer and lime in 1980 are conservatively projected to be 2.5 to 2.7 billion dollars in 1980, or 60 to 70 percent more than 1960, the increase being somewhat greater than the 40 percent increase estimated for all operating inputs. Less than two-fifths of all land in crops and pasture was fertilized in 1954, but it is predicted that nearly two-thirds of such land will be fertilized in 1980. The proportion of acres suitable for use of commercial nutrients will be augmented by extension of irrigation and by depletion of virgin soil resources.

**Size Distribution of Farms**

A projected doubling in acres per farm by 1980, as projected from our estimates, indicates considerable potential for reducing per unit costs of production in crop production. Opportunities will exist to further substitute machinery for labor as depreciated stocks of machines are replaced by new and larger machines adaptable to larger acreages. This substitution of larger machines for smaller ones need not appreciably increase the stock of machinery if the new equipment is introduced only at the rate necessary to replace worn out and obsolete equipment. But since larger machines permit one family to have a larger acreage and more output per laborer, machinery investment will continue to cause movement of labor from agriculture.

In terms of value of sales or product produced per farm, the 1959 figures were: 48 percent of farms with sales under $2,500, 33 percent with sales between $2,500 and $10,000, and 20 percent with sales over $10,000. Our 1980 estimates are: 24 percent or fewer with sales under $2,500, 30 percent with sales between $2,500 and $10,000 and nearly half with sales over $10,000. The relative proportion of farms over and under 100 acres will certainly be reversed by 1980. By 1980, three-fifths or more farms are predicted to be over 100 acres. (In 1959, roughly half the farms were over 100 acres.)

The real structure of commercial agriculture already is represented by farms with sales of $10,000 or more. In fact, by 1980, the major foundation of commercial farming will be represented by farms with sales of $20,000 and over. To suggest the over-all structure of these commercial farms for 1980, we include the statistics from Daly in Table 2.6. Even among these classes of farms, the number with sales between $10,000 to $19,000 is expected to decline.

One-fourth of all farms in the lowest sales category, less than $2,500, by 1980 does not imply a large low income problem. Most of these farmers in this group will be semi-retired, have off-farms work or have various other sources

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11 Daly, op. cit., predicts an increase of 76 percent in cropland acreage per farm and 80 percent in total acreage per farm.

12 Daly, op. cit., 36.0 percent with sales of less than $2,500 if part-time and part-retirement farms are included in the category to compare with our estimates. Of total farm distribution in 1980, he predicts 2.4 percent with sales of $50-2,499, 13.2 with sales of $2,500-$9,999, and 50.8 percent with sales of $10,000 and over and 36.8 percent as part-time and part-retirement farms.
Table 2.6 Number, distribution and resources of farms with sales of $10,000 and over. 1962 and projected for 1980.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$10,000 - $19,999</td>
<td>571</td>
<td>425</td>
<td>250</td>
<td>410</td>
<td>120</td>
<td>225</td>
</tr>
<tr>
<td>$20,000 - $39,999</td>
<td>220</td>
<td>220</td>
<td>325</td>
<td>325</td>
<td>610</td>
<td>755</td>
</tr>
<tr>
<td>$40,000+</td>
<td>77</td>
<td>75</td>
<td>135</td>
<td>132</td>
<td>304</td>
<td>325</td>
</tr>
</tbody>
</table>

| Number       | 27     | 23     | 41     | 32     | 144    | 97     |
| Cropland (acres) | 220    | 220    | 325    | 325    | 610    | 755    |
| Productive assets<sup>a</sup> | 77     | 75     | 135    | 132    | 304    | 325    |
| Labor input<sup>b</sup> | 27     | 23     | 41     | 32     | 144    | 97     |


<sup>a</sup> Thousands of dollars
<sup>b</sup> Hundreds of hours

of income. Hence, many of the 550,000 farmers in this group will have adequate incomes even with low receipts from farm sources. Few of them will be actual commercial farms, certainly not by 1980 standards. The trend for the majority of farm output to originate from fewer farms will continue. The one million farms predicted to sell more than $10,000 will be responsible for the extreme majority of U.S. farm production in 1980. In fact, three-fourths million farms could easily produce our entire food output in 1980. Large investment and managerial skills will be required for these large farms. Whether these requirements can be supplied within the farm family is yet to be determined and depends on the credit structure, managerial aids provided by the Extension Service, and the institutional structure existing in 1980. For example, we would expect that the county extension agent of 1980 would need to be much more highly trained and specialized than today if outside managerial facilities are not to be required. We project mainly a family farm structure for the future, with some trend towards large specialized units in some commodities. These specialized units will be highly mechanized, as will be family farms, with an increasing number of them using two or more men.
FINANCIAL REQUIREMENTS OF THE FARM FIRM

by C.B. Baker* and L.G. Tweeten**

Of the three principal areas of farm firm management -- production, marketing and financing -- the latter perhaps has been most often neglected in teaching, research and extension. Yet financial management increasingly is the key to successful development of a viable economic farm unit. This paper deals with the objectives of farm credit policy, current and prospective capital needs, trends in institutions and credit practices to meet these requirements, and problems of individual farmers in financial management.

**Selected Objectives of Farm Credit Policy**

The direct, micro goals of farm credit agencies include flexibility and adaptability in lending practices to meet changing technical and economic conditions. Credit institutions should provide a stable and dependable source of loans for farmers with "legitimate" needs at terms consistent with risks involved and costs associated with administration, alternative returns on money, and "wholesale" money market discount rates.

Macro objectives are closely tied to national fiscal and monetary policies and emphasize stability in income and employment and support for economic growth. However, they also affect organizational efficiency and the distribution of farm income and assets as well. Shelby\(^1\) has suggested that use of general monetary powers of the Federal Reserve System may tend to reduce the size of the commercial banking system relative to non-monetary financial intermediaries. The distributional macro objectives will be discussed in more detail subsequently.

**Farm Capital Structure**

**Agriculture in Aggregate**

During World War II financial assets on farms increased faster than did physical assets. Real estate debt decreased while non-real estate debt remained essentially constant. In the post-war period non-real estate assets increased dramatically as capital deficits were replaced and capital-using technologies innovated. Since 1950 the value of real estate assets has increased more rapidly than non-real estate assets.

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*Professor of Agricultural Economics, University of Illinois.
**Associate Professor of Agricultural Economics, Oklahoma State University.
1 Minimum resources requirements were computed for several soil situations in the panhandle in addition to the sandy situation indicated. In several instances, there remained no margin for labor after paying current land, operating, hired labor, and capital costs. Hence, for these situations, no amount of resources could meet the prescribed operator labor income target.
Real estate debt, too, has increased relative to non-real estate debt since 1955. The net result has been a reduction in liquidity for U.S. farmers, in the aggregate, since the close of World War II (see Table 3.1).

The equity of farmers has been reduced gradually from 91 percent in 1950 to 86 percent in 1963, still high by nonfarm industry standards in terms of percentage. The equity percentage is partially determined by the age distribution of farmers. Because high equities tend to occur among older age groups, a change in age distribution through (say) accelerated retirement could decrease the equity percentage with no change in farm prices or incomes.

Stability in the real estate share of the value of all farm assets arises from increases in land prices because of competition from beginning and consolidating farmers, capitalization of commodity program benefits, suburban growth of cities, and other factors. The tendency for the real estate share of farm debt to rise after 1950 again reflects the upward land price trend since 1950.

The sharply declining farm population makes the increase in assets per farm and per worker more spectacular than the aggregate increase in assets for agriculture. Average assets per worker rose from $4,800 in 1940 to $33,200 in 1963. The average farm had $23,300 in capital assets in 1950; 13 years later the total was $60,600. Debt per farm and per worker also rose. Average debt per farm was $1,600 in 1940; $8,500 in 1963.

Inflation has been especially significant for land and machinery assets. Farm real estate assets (excluding the farm dwelling) increased less than 25 percent between 1940 and 1960 when valued in constant 1947-49 dollars (Table 3.2). The physical volume of productive real estate may grow only 4 percent by 1980 according to the projection in Table 3.2. Growth of other assets also is not sizable when projected in constant dollars. Assets per unit and per worker, however, are expected to double in constant dollar terms, between 1960 and 1980.

**Capital Used on Selected Types of Farms**

Table 3.3 shows actual and projected capital use for eight commercial farms representing a wide range of enterprises and geographic locations. Total capital in 1963 ranges from $302,180 for a general cotton farm in California to $29,940 for a tobacco-cotton farm in the North Carolina coastal plain, clustering at between $98,000 and $137,000 for four of the farm types. Capital per acre is especially high on the 10-acre New Jersey poultry farm, and low on the cattle ranch and the Kansas wheat farm. Capital per man is greatest on the Corn Belt cash grain farm and on the Kansas wheat farm.
### Table 3.1: Asset, Debt and Equity in United States Agriculture, January 1, Current Dollars$^a$

<table>
<thead>
<tr>
<th>Item</th>
<th>1940</th>
<th>1950</th>
<th>1960</th>
<th>1963</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Total</td>
<td>Per Farm</td>
<td>Per Total</td>
<td>Per Farm</td>
</tr>
<tr>
<td></td>
<td>($bil.)</td>
<td>($1000)</td>
<td>($bil.)</td>
<td>($1000)</td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Estate</td>
<td>33.6</td>
<td>5.3</td>
<td>3.1</td>
<td>75.3</td>
</tr>
<tr>
<td>Other Physical</td>
<td>15.1</td>
<td>2.4</td>
<td>1.4</td>
<td>40.4</td>
</tr>
<tr>
<td>Financial</td>
<td>4.2</td>
<td>0.7</td>
<td>0.4</td>
<td>15.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>52.9</td>
<td>8.4</td>
<td>4.8</td>
<td>131.6</td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Estate Debt</td>
<td>6.6</td>
<td>1.0</td>
<td>0.6</td>
<td>5.6</td>
</tr>
<tr>
<td>Non-Real Estate Debt</td>
<td>3.4</td>
<td>0.5</td>
<td>0.3</td>
<td>6.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10.0</td>
<td>1.6</td>
<td>0.9</td>
<td>12.5</td>
</tr>
<tr>
<td><strong>Proprietor's Equities</strong></td>
<td>42.9</td>
<td>6.8</td>
<td>3.9</td>
<td>119.1</td>
</tr>
<tr>
<td><strong>Percent Equity(%)</strong></td>
<td>81</td>
<td>91</td>
<td>88</td>
<td>86</td>
</tr>
</tbody>
</table>

Table 3.2: Projected U.S. Stocks of Productive Farm Assets to January 1, 1980 (Billion 1947-49 Dollars)\textsuperscript{a}

<table>
<thead>
<tr>
<th>Asset</th>
<th>Actual 1940</th>
<th>Actual 1950</th>
<th>Actual 1960</th>
<th>Projected 1980</th>
<th>Percent Increase (1960-80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Estate\textsuperscript{b}</td>
<td>58.2</td>
<td>63.4</td>
<td>71.1</td>
<td>74.0</td>
<td>4</td>
</tr>
<tr>
<td>Livestock</td>
<td>12.9</td>
<td>13.1</td>
<td>14.8</td>
<td>17.2</td>
<td>16</td>
</tr>
<tr>
<td>Machinery\textsuperscript{c}</td>
<td>4.1</td>
<td>8.6</td>
<td>10.2</td>
<td>11.5</td>
<td>13</td>
</tr>
<tr>
<td>Other</td>
<td>8.1</td>
<td>10.8</td>
<td>11.9</td>
<td>14.4</td>
<td>23</td>
</tr>
<tr>
<td>Total of Above</td>
<td>83.3</td>
<td>95.9</td>
<td>107.8</td>
<td>117.1</td>
<td>9</td>
</tr>
</tbody>
</table>


\textsuperscript{b}Does not include the farm dwelling.

\textsuperscript{c}Excludes 60 percent of automobile value.
Table 3.3  Actual Capital Investment for 1930, 1950, and 1963, and Projected Capital to 1980 by Selected Types of Commercial Farms<sup>a</sup>

<table>
<thead>
<tr>
<th>Item</th>
<th>Actual 1930</th>
<th>1950</th>
<th>1963</th>
<th>Projected&lt;sup&gt;b&lt;/sup&gt; 1980 (Current Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dairy Farm, Central Northeast</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>6,300</td>
<td>11,500</td>
<td>23,400</td>
<td>38,962</td>
</tr>
<tr>
<td>Other Capital&lt;sup&gt;d&lt;/sup&gt;</td>
<td>4,900</td>
<td>12,300</td>
<td>20,000</td>
<td>30,069</td>
</tr>
<tr>
<td>Total Capital</td>
<td>11,200</td>
<td>23,800</td>
<td>43,400</td>
<td>69,031</td>
</tr>
<tr>
<td>Capital per man year&lt;sup&gt;f&lt;/sup&gt;</td>
<td>6,120</td>
<td>14,167</td>
<td>28,366</td>
<td>46,021</td>
</tr>
<tr>
<td>Capital per acre&lt;sup&gt;f&lt;/sup&gt;</td>
<td>170</td>
<td>191</td>
<td>239</td>
<td>302</td>
</tr>
<tr>
<td><strong>Hog-Beef Fattening, Corn Belt</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>23,280</td>
<td>33,560</td>
<td>66,070</td>
<td>108,583</td>
</tr>
<tr>
<td>Other Capital</td>
<td>8,300</td>
<td>20,680</td>
<td>32,850</td>
<td>48,765</td>
</tr>
<tr>
<td>Total Capital</td>
<td>31,580</td>
<td>54,240</td>
<td>98,920</td>
<td>157,348</td>
</tr>
<tr>
<td>Capital per man year&lt;sup&gt;f&lt;/sup&gt;</td>
<td>19,374</td>
<td>37,930</td>
<td>64,653</td>
<td>104,899</td>
</tr>
<tr>
<td>Capital per acre&lt;sup&gt;f&lt;/sup&gt;</td>
<td>180</td>
<td>280</td>
<td>428</td>
<td>564</td>
</tr>
<tr>
<td><strong>Cash Grain, Corn Belt</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>30,400</td>
<td>52,630</td>
<td>124,560</td>
<td>218,623</td>
</tr>
<tr>
<td>Other capital</td>
<td>3,940</td>
<td>9,780</td>
<td>12,460</td>
<td>15,965</td>
</tr>
<tr>
<td>Total Capital</td>
<td>34,340</td>
<td>62,410</td>
<td>137,020</td>
<td>234,588</td>
</tr>
<tr>
<td>Capital per man year&lt;sup&gt;f&lt;/sup&gt;</td>
<td>22,920</td>
<td>56,736</td>
<td>123,461</td>
<td>213,262</td>
</tr>
<tr>
<td>Capital per acre&lt;sup&gt;f&lt;/sup&gt;</td>
<td>169</td>
<td>280</td>
<td>471</td>
<td>626</td>
</tr>
<tr>
<td><strong>Poultry Farm Producing Eggs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Jersey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>g</td>
<td>24,730</td>
<td>34,500</td>
<td>47,276</td>
</tr>
<tr>
<td>Other capital</td>
<td>g</td>
<td>8,590</td>
<td>9,580</td>
<td>10,875</td>
</tr>
<tr>
<td>Total Capital</td>
<td>g</td>
<td>33,320</td>
<td>44,080</td>
<td>58,154</td>
</tr>
<tr>
<td>Capital per man year&lt;sup&gt;f&lt;/sup&gt;</td>
<td>g</td>
<td>15,867</td>
<td>26,083</td>
<td>38,767</td>
</tr>
<tr>
<td>Capital per acre&lt;sup&gt;f&lt;/sup&gt;</td>
<td>g</td>
<td>3,332</td>
<td>4,408</td>
<td>5,815</td>
</tr>
<tr>
<td><strong>Tobacco-Cotton North Carolina</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Coastal Plain</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>g</td>
<td>14,000</td>
<td>24,340</td>
<td>37,682</td>
</tr>
<tr>
<td>Other capital</td>
<td>g</td>
<td>3,370</td>
<td>5,600</td>
<td>8,516</td>
</tr>
<tr>
<td>Total Capital</td>
<td>g</td>
<td>17,370</td>
<td>29,940</td>
<td>46,387</td>
</tr>
<tr>
<td>Capital per man year&lt;sup&gt;f&lt;/sup&gt;</td>
<td>g</td>
<td>7,519</td>
<td>13,366</td>
<td>20,616</td>
</tr>
<tr>
<td>Capital per acre&lt;sup&gt;f&lt;/sup&gt;</td>
<td>g</td>
<td>174</td>
<td>288</td>
<td>429</td>
</tr>
<tr>
<td><strong>Medium Scale General Cotton</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Farm California</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>g</td>
<td>120,080</td>
<td>255,550</td>
<td>432,704</td>
</tr>
<tr>
<td>Other capital</td>
<td>g</td>
<td>30,970</td>
<td>46,630</td>
<td>67,109</td>
</tr>
<tr>
<td>Total Capital</td>
<td>g</td>
<td>151,050</td>
<td>302,180</td>
<td>499,813</td>
</tr>
<tr>
<td>Capital per man year&lt;sup&gt;f&lt;/sup&gt;</td>
<td>g</td>
<td>34,644</td>
<td>93,845</td>
<td>153,789</td>
</tr>
<tr>
<td>Capital per acre&lt;sup&gt;f&lt;/sup&gt;</td>
<td>g</td>
<td>521</td>
<td>866</td>
<td>1,173</td>
</tr>
</tbody>
</table>
Table 3.3 (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Actual</th>
<th>Projected&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1930 1950 1963</td>
<td>1980</td>
</tr>
<tr>
<td><strong>Winter Wheat Farm, Kansas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>23,420 45,560 88,290</td>
<td>144,168</td>
</tr>
<tr>
<td>Other Capital</td>
<td>4,730 12,440 22,030</td>
<td>34,570</td>
</tr>
<tr>
<td>Total Capital</td>
<td>28,150 58,000 110,320</td>
<td>178,738</td>
</tr>
<tr>
<td>Capital per man year</td>
<td>22,341 61,702 114,917</td>
<td>178,738</td>
</tr>
<tr>
<td>Capital per acre</td>
<td>50 87 136</td>
<td>180</td>
</tr>
<tr>
<td><strong>Cattle Ranch, Intermountain Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and buildings</td>
<td>15,510 26,550 39,780</td>
<td>57,081</td>
</tr>
<tr>
<td>Other Capital</td>
<td>17,900 43,530 55,770</td>
<td>71,776</td>
</tr>
<tr>
<td>Total Capital</td>
<td>33,410 70,080 95,550</td>
<td>128,857</td>
</tr>
<tr>
<td>Capital per man year</td>
<td>18,876 45,804 55,877</td>
<td>75,788</td>
</tr>
<tr>
<td>Capital per acre</td>
<td>.27 42 54</td>
<td>68</td>
</tr>
</tbody>
</table>

<sup>b</sup>Projections are simple linear extensions of the 1950-63 trends in capital to 1980.
<sup>c</sup>Includes operator dwelling, service buildings, other improvements and land.
<sup>d</sup>Includes machinery, equipment, livestock, and crops.
<sup>e</sup>A man year is total annual hours of operator, family and hired labor, divided by 3000.
<sup>f</sup>Acres include all land in the farm. Capital per man year and per acre includes all real estate and other capital.
<sup>g</sup>Not available.
All farms have experienced a major growth in capital between 1930 and 1963 by the measures used in Table 3.3. The projections to 1980 are simple linear extensions of the 1950-63 trend in capital. The estimates are in current dollars; hence they include the same inflationary trend as existed between 1950 and 1963. The 1980 projections would be considerably lower in 1963, constant-dollar, real, or "physical" terms.

Labor Returns and Financial Structure, by Economic Class of Farm

Table 3.4 suggests that approximately $116,000 invested in productive assets is required to produce a farm labor return of $5,000 on the average. Only Class I and II farms provided a labor return of as much as $5,000. Only 10 percent of farms are in Class I and II. A major challenge facing credit institutions and farm management advisors is how to structure credit and counsel to move a larger proportion of operators into these farm classes.

It is safe to infer from Table 3.3 that the requirement varies widely among types of farms. Over all commercial farm classes, however, debt is strikingly consistent as a percent of assets, ranging from 15 to 17 percent. Debt as a percent of annual receipts was higher on smaller farms and tended to decrease with age in 1960 (Table 3.5). How young farmers, especially on large farms, have maintained such a favorable financial position needs additional study. The increase in the ratio of debt to farm receipts for younger farmers is much more apparent on small than on large farms. Young farmers on small farms appear to be in the most precarious financial position. Inclusion of off-farm income might give a very different impression. More information is needed too on relation of success to inheritance within critical beginning years for young farmers.

Minimum Resource Requirements for Individual Farm

Estimates of minimum capital resources required for a specified level of earnings are available for a number of farm types in various geographic areas and for several specified levels of operator earnings (Table 3.6). For a $5,000 return to operator (and family) labor and management in Oklahoma, minimum resources needed are very large in some instances (Table 3.7). The Oklahoma panhandle is a high risk, low rainfall area. At present prices for wheat and grain sorghum and for production inputs, margins per acre to pay operator labor are small. The result for the eastern sandy resource situation is a requirement of 5,379 acres and $498,096 total capital to return the operator $5,000 for labor and management.

For an operator return of $5,000 in four resource situations in southwestern Oklahoma, the capital required averages $193,506. Land requirements range from 588 acres to 1,652 acres per farm. With minimum possible adjustments to achieve the prescribed $5,000 labor return, farm numbers

Table 3.4: Estimated Average Income per Farm Family Worker and other Data by Economic Class of Farm, U.S., 1960

<table>
<thead>
<tr>
<th>Item</th>
<th>Economic Class of Commercial Farm</th>
<th>Noncommercial Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>Sales (Dollars)</td>
<td>40,000</td>
<td>20,000</td>
</tr>
<tr>
<td>and over (Dollars)</td>
<td>19,999</td>
<td>9,999</td>
</tr>
<tr>
<td>Average Labor income per family worker</td>
<td>14,487</td>
<td>6,977</td>
</tr>
<tr>
<td>Productive assets per farm</td>
<td>301,981</td>
<td>115,947</td>
</tr>
<tr>
<td>Debt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Estate</td>
<td>26,451</td>
<td>10,007</td>
</tr>
<tr>
<td>Other Debt</td>
<td>22,273</td>
<td>7,737</td>
</tr>
<tr>
<td>Total</td>
<td>48,814</td>
<td>17,744</td>
</tr>
<tr>
<td>Debt percent of assets (%)</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Average size (acres)</td>
<td>2,491</td>
<td>838</td>
</tr>
<tr>
<td>Percent of farm operators in class (%)</td>
<td>3.2</td>
<td>7.0</td>
</tr>
</tbody>
</table>

\(^{a}\)Luther Tweeten and Carl Olson, *Efficiency: The Aggregate Result of Managerial Actions*, Current Farm Economics Oklahoma State University, Stillwater, September 1964, and Luther Tweeten, "The Income Structure of Farms by Economic Class" (Mimeo), Department of Agricultural Economics, Oklahoma State University, Stillwater, 1964.
Table 3.5: Average Ratios of Debt to Income, Indebted Operators, by Age Groups, 1960a

<table>
<thead>
<tr>
<th>Item</th>
<th>Economic Class of Farm</th>
<th>Average of all classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt ratio to value of</td>
<td>I and II</td>
<td>III and IV</td>
</tr>
<tr>
<td>farm products sold less cash rent paid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age: Under 35</td>
<td>61</td>
<td>119</td>
</tr>
<tr>
<td>35-54</td>
<td>64</td>
<td>102</td>
</tr>
<tr>
<td>55 and over</td>
<td>59</td>
<td>91</td>
</tr>
<tr>
<td>Debt ratio to net cash</td>
<td></td>
<td></td>
</tr>
<tr>
<td>farm income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age: Under 35</td>
<td>280</td>
<td>343</td>
</tr>
<tr>
<td>35-54</td>
<td>335</td>
<td>313</td>
</tr>
<tr>
<td>55 and over</td>
<td>292</td>
<td>272</td>
</tr>
</tbody>
</table>

Table 3.6: Minimum Investment Needed for $4,500 Operator Earnings

<table>
<thead>
<tr>
<th>Item</th>
<th>Real Estate</th>
<th>Machinery, Equipment and livestock</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple orchard, Central Washington</td>
<td>80,800</td>
<td>13,100</td>
<td>93,900</td>
</tr>
<tr>
<td>Wheat farm, Eastern Washington</td>
<td>62,860</td>
<td>9,940</td>
<td>72,800</td>
</tr>
<tr>
<td>Cattle ranch, Northern Nevada</td>
<td>58,100</td>
<td>48,900</td>
<td>107,000</td>
</tr>
<tr>
<td>Hog-beef farm, Southern Iowa</td>
<td>53,840</td>
<td>16,860</td>
<td>70,700</td>
</tr>
<tr>
<td>Dairy farm, Central Utah</td>
<td>47,180</td>
<td>23,420</td>
<td>70,600</td>
</tr>
<tr>
<td>Cotton farm, Mississippi Delta</td>
<td>42,100</td>
<td>18,900</td>
<td>61,000</td>
</tr>
<tr>
<td>Dairy farm, Southeastern Pennsylvania</td>
<td>27,860</td>
<td>21,740</td>
<td>49,600</td>
</tr>
<tr>
<td>Cash grain farm, E.Central Illinoisb</td>
<td>102,260</td>
<td>20,860</td>
<td>123,120</td>
</tr>
<tr>
<td>Hog-corn farms, W.Central Illinoisb</td>
<td>67,990</td>
<td>28,810</td>
<td>96,800</td>
</tr>
</tbody>
</table>


Table 3.7: Minimum Land and Capital Needed for a $5,000 Operator Earnings in Oklahoma\textsuperscript{a}

<table>
<thead>
<tr>
<th>Item</th>
<th>Land (Acres)</th>
<th>Real Estate (Dollars)</th>
<th>Other Capital (Dollars)</th>
<th>Total Capital (Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oklahoma Panhandle\textsuperscript{b} (Eastern sandy resource situation)</td>
<td>5,379</td>
<td>408,804</td>
<td>89,292</td>
<td>498,096</td>
</tr>
<tr>
<td>Southwester Oklahoma\textsuperscript{c} (Weighted average of 4 resource situations)</td>
<td>588–1,652</td>
<td>151,667</td>
<td>41,839</td>
<td>193,506</td>
</tr>
<tr>
<td>Bottomland Soils\textsuperscript{d} (South Central and East Central areas)</td>
<td>209</td>
<td>67,925</td>
<td>18,195</td>
<td>86,120</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Based on current land prices and allotment conditions.


\textsuperscript{d}L.G. Tweeten and A.W. Reichardt, \textit{Profitable Plans for Farms in the Major Bottom lands of South Central and East Central Oklahoma}. Oklahoma Agricultural Experiment Station, Bulletin (forthcoming) Stillwater.
in southwestern Oklahoma would decrease to about one-third of the 9,300 farms in the area in 1963. Higher off-farm income, competition for resources, and other inducements will reduce the farm number toward the target established by the minimum income criterion.

Productive bottomland soils in Oklahoma reduce the land and capital requirements to attain the income target. These bottomlands lie in a 35-40 inch average rainfall belt and produce yields considerably higher than those in other Oklahoma areas. The optimum organization for bottomlands includes a somewhat specialized hog enterprise not found on many farms in the bottomland resource situation. If hogs are excluded and the organization confined to cash crops and cattle more commonly found, the land and capital requirements to reach the income target are greatly increased.

It is of interest to compare minimum with actual investments at specified levels of earnings. In East Central Illinois, $118,220 actually invested in the typical cash grain farm yielded operator earnings of $2,400 in 1961. In contrast a minimum of $82,970 is required at long-run prices and cost rates to yield operator earnings of $2,500. The "excess" was all in land. In fact, the minimum investment indicates nearly $3,000 more in non-land assets than was actually found on the typical cash grain farm in East Central Illinois as of January 1, 1962. This is an area in which more than 70 percent of the farms are tenant operated. Findings of "less than optimum" investment in non-land resources agree with results from other studies in this area.

The typical hog-beef fattening farm in western Illinois yielded operator earnings of $4,670 in 1961. Its investment, as of January 1, 1962, might, therefore, be compared with the minimum required to yield operator earnings of $4,500. The actual investment was $94,570, compared with an estimated minimum requirement of $96,800. The investment in land was $3,750 less than optimum, while investment in non-land assets was $1,520 more. These results also accord well with other findings suggesting that livestock farms differ less from optimum on the whole than do cash grain farms. The two Illinois areas thus represented are quite similar in soil conditions. In the livestock area, however, less than 30 percent of the farms are tenant operated. The closer approximation to optimum on the livestock farm may be related to more favorable credit restraints on livestock than on cash grain farms.

Implications for Financing Needs

The current over-capacity in agriculture,\textsuperscript{7} immobility of labor and, perhaps to a lesser degree, land resources,\textsuperscript{8} and high equity (Tables 3.1 and 3.4) point to plentiful aggregate credit reserves to meet the needs of agriculture to 1980. The potential ability of cooperative and private credit sources to extend funds is large. Tootell stated in 1960 that the Federal Land Banks, Banks for Cooperatives, and Production Credit Associations could double their loan volume if necessary.\textsuperscript{9} Increases in capital needs appear modest (Table 3.2) except possibly for operating inputs. Ties to the national money markets for loanable funds give greater volume for the farm credit structure. Close liaison with the U.S. Treasury for funds in national emergencies prevents gross instability. Country banks also are connected to larger money suppliers through branch and corresponding banking. Increased mobility of commercial farmers, who can travel to large city banks if necessary, also insures adequate loan potential. The fact that the growing nonfarm sector has an increasing share of the nation's wealth and capital reserves means that agriculture can draw more heavily from nonfarm money markets. Further, the impact of a sudden unfavorable change in agriculture's economic health will not, in contrast to the past, cause a national financial crisis.

A major effort to expand the aggregate volume of credit to agriculture by subsidies and liberalized credit terms might well generate a major conflict arising from the dual goals of efficiency and equity (equality) in an "ideal" credit structure. Farm income could be depressed in at least two ways: (1) by increasing aggregate farm output, benefitting initial users with productive capital opportunities but depressing incomes to agriculture in aggregate, and (2) by dissipating initial benefits through inflated land values. Any credit policy to slow the trend in land prices would also need to consider the impact on the beginning farmer. Higher land prices hurt him by requiring greater interest and principal payments. But policies to restrain land prices through more tightly controlled lending could put him at a relative disadvantage in relation to established farmers who depend less on borrowed funds for land purchases. Of course, in some instances, barriers to land purchase might also encourage the younger generation to make needed labor adjustments to favorable off-farm opportunities.


A basic capital problem in U.S. agriculture is to improve the distribution and mobility of capital among alternatives within agriculture. Distribution problems arise (a) within the farm firm, (b) among farmers within regions, e.g., for large efficient established farmers versus low income and beginning farmers, and (c) among general uses and geographic areas. Problems of allocation over the farm firm life cycle are discussed in a later section.

Allocation of Capital within the Farm Firm

Better financial coordination might improve allocation of capital within the firm. Efficiency and equitability would be served by making loans less available for real estate (to restrain relative increases in land prices) and relatively more available for operating inputs such as fertilizer, feeds, and pesticides. Credit restraints on operating inputs may have been partially prompted by the fact that they are used up in the production process, with no tangible assets remaining for loan security. Greater realization of the potential returns from operating inputs, additional finance from input dealers, contract production, and vertical integration will increase funds for such uses.

A greater loan volume per farm will permit greater supervision and possible coordination with commercial or cooperative record-keeping agencies that keep abreast of financial health and opportunities for expanded investment. There may be a trend to credit "supermarkets." A supermarket structure would provide a favorable environment for coordinating long and short-term credit. Long-term credit at lower rates for a continuing series of short-term farm capital needs would not be restricted to real estate financing. Private local banks, working on a branch of correspondent basis with larger banks tied to city money markets and with life insurance companies (for long-term loans), already are able to provide a sizable volume of loans to individual borrowers. Similar cooperation in long and short-term loans is possible between the Production Credit and Federal Land Bank Associations. Careful coordination of management and credit also is useful in appraising where perpetual debt and open-end mortgages might be best used. With perpetual debt, the farmer would not be required to repay the entire mortgage during the life cycle of the farm firm and hence would avoid some of the large principal payments. The future owner in some instances would merely continue the mortgage as is often done now with home purchases in urban areas. Such a system would require careful attention in investment decisions on capital structures specialized in use and tied to land. 10

Allocation Among Farms Within Regions

Approximately 95 percent of farm loans are made to commercial farmers. This allocation is expected to continue and is consistent with economic efficiency criteria but can conflict with welfare goals. What of the small farmer trapped in agriculture by skills with little value outside of farming, or the farm youth with large management capabilities but not enough equity from parents or other sources to form a viable economic unit? The Farmers Home Administration (FHA) can continue to perform an essential role in working with these people. The FHA will not be performing a useful function if it simply allows farmers to hold on to a marginal unit predestined to a subsistence income. Rather, the FHA might more intensively direct credit to help farmers obtain an economic size unit, which means consolidation and migration to alternative employments for some farmers. The perspective of the FHA might be broadened to include more financing to train farmers for nonfarm jobs, and to help them relocated at distant points if jobs are not available in the vicinity.

Allocation to Overhead Investments

The farm firm requires "overhead" investments as well as on-farm investments. These include capital allocations to local government, education, electricity, drainage, local area development, soil conservation, watershed protection, and research as possible alternatives. The welfare of farmers and non-farmers alike depends on the efficient allocation of capital among these uses as well as among uses on the farm itself. The allocative means are different as are the terms in which to compare payoffs. Hence many of these uses are outside the traditional sphere of the farm capital structure described earlier.

Research on potential returns from investment in these alternatives is fragmentary. In two of the above areas -- education and research -- returns on capital appear to be higher than on most farm enterprises, and further capital allocation to these uses seems justified. Education performs at least two important functions: (1) it raises the managerial ability of the farmer, allowing him to realize a greater return on capital invested in farming enterprises, and (2) it increases the working skills and adaptability of human resources to a wide range of employment, thereby increasing the mobility of labor. In both these ways, education can perform an important role in raising farm earnings relative to nonfarm earnings, particularly in low income areas such as found in the South. Many of the foregoing capital and credit allocation problems among enterprises, farms and regions will become amenable to solution only with additional investment.

Financial Strategies

Reder has defined a firm as a collection of assets with an aggregate value that exceeds the sum of each asset taken separately. It follows from this definition that firm growth consists of an increase in the value of this collection. Growth can result from either passive or active managerial policy. Even with a passive managerial policy, capital gains can generate growth in size of the firm.

We commonly associate growth, however, with an active managerial policy. In her penetrating analysis, Penrose has argued that in the corporate firm growth is explained by the accumulation of resources, especially managerial resources, in excess of requirements for current output. Such accumulation may or may not be related to market phenomena. We suggest that the Penrose hypothesis is no less plausible in single proprietor firms. In the corporate firm, managerial capacity may take the form of a management team developed from hiring new personnel, from merger with other firms, or from promotion within the firm of personnel who exhibit recognizable management capacity. In the single proprietor firm, managerial capacity may accumulate in less explicit but equally effective form in the individual himself.

Several financial strategies are available to the farmer assembling a capital aggregate consistent with his managerial skills. They include leasing of real property and, especially recently, capital assets; borrowing on open account, promissory note with or without specific pledge of real or personal property, or conditional sales contract (again, for either real or personal property); contractual arrangements associated with vertical coordination; or incorporation of the farm firm. When financing terms are taken into account, these various financial alternatives are far from neutral in their effects on marginal value product. Scale effects need also to be considered. The size of the aggregate that can be acquired varies by choice of financing strategy. As will be seen below, the size of the farmer's credit reserve also is affected.

Leasing

Farm leasing has long been viewed as a rung on the tenure ladder, a stage in the progression of the successful farmer from a hired worker to a debt-free owner. To an increasing degree, however, farmers are leasing, on a permanent basis, part of the land needed to make an economic farming

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unit. Indeed, there appear to be substantial economic reasons for projecting increased part-tenancy. The farmer growing in managerial skills can thus finance expansions to exploit production scale economies. Part tenancy also provides the means for later "retreat" associated with a decline in the labor and management capacity of the farm operator. In fact, part-tenancy may well be an important means of maintaining viability of the single proprietor firm in agriculture. It may also contribute, along with part-time farming, to a reduction in barriers between the farm and non-farm economies. The modern successful farm operator no more confines his investments to farming in general or to farm land in particular than he does his labor. We predict that investment alternatives of farmers in the future will broaden still further for an increasing percentage of commercial farm operators.

Heretofore limited mainly to farm land (and associated buildings), a considerable interest has been generated recently in leasing various capital items: machinery and equipment items, certain kinds of materials-handling and storing facilities, and even livestock. Morris and Schaffner et al. have shown that the choice of buying vs. leasing depends on the return from investments attainable with funds freed by leasing as opposed to buying. Also relevant are costs of borrowing, terms of the lease, availability of investment tax credits, etc. That capital leasing is an important alternative is attested to by the rapid growth of contractual arrangements. The explanation of such growth, despite higher cost of leasing relative to owning in many situations, may be found in the value of credit reserve thus left unused by the farmer dependent on external finance for expansion.

Borrowing and Credit Reserves Management

Among resources valuable to the farmer is his "credit": his ability to borrow. Though not listed in a conventional balance sheet as an asset, credit provides a reserve that can be drawn upon much like cash. Unused, it provides a degree of liquidity that enables the farmer to undertake uncertain ventures unacceptable to the indebted individual. Growth in unused credit, therefore, reflects financial growth in an important sense. Moreover, it can be used to generate economic growth as well.

A credit reserve is subject to growth or decline through financial as well as production decisions. A resource allocation that raises income clearly increases credit, other things being equal. But credit also grows

16 W. H. M. Morris, An Economic Appraisal of Agricultural Leases, paper presented to 1964 Bunkers' Clinic, Purdue University, March 18 and 19, 1964.
18 Credit Research Foundation, A Bibliographical Listing of Equipment Leasing, National Association of Credit Management, 44 East 23rd Street, New York City 16.
through increased liquidity in the asset structure, conserving credit for use in loans relatively attractive to lenders and so allocating credit use that lender-favored assets are financed before less-favored assets. Despite common statements to the contrary, there is significant evidence to suggest that, at least in the short-run, the farmer can increase total credit available by splitting it among primary and secondary lenders. We hasten to add that he may also increase financial management problems. And failure to handle these problems leads quickly to decreased total credit. But many farmers have found total credit expanded by using machinery and feed dealers in place of or as well as the bank or Production Credit Association. The continuing importance of dealer loans is difficult to explain on the basis of the terms of the loan. However, there may be an explanation in the payoff to the dealer from merchandising that allows him a margin to assume some risk unacceptable to commercial lenders.

In recent years the conditional sales contract has come into increasing use. Long important in financing non-land assets, it now has become the most important single type of financing in the case of real property. It frequently is more costly than a conventional farm mortgage loan. Also, it leaves the borrower far more vulnerable, since many legal protections available to the farm mortgagor are not available to the installment loan contract borrower. What then accounts for its increased use? The most obvious answer is that it reduces the minimum down payment to a small amount. Thus either a large land base can be financed out of given capital or capital is left with which to finance non-land resources. The latter point may be especially important in the case of operating inputs. Loans to finance operating expenses and non-durable items generally are heavy users of credit reserves.

Vertical Coordination

Processors of farm products and supplies of farm inputs not only lend to farmers in sales-related activities but also invest directly in the farm sector. The consequence is to radically alter the structure of the farm firm. Particularly in the case of processors, investments tend to relate specifically to individual enterprises -- e.g., a specialty crop or a livestock enterprise. Also the investments typically are accompanied by managerial services (e.g., vegetable crops). In extreme cases (e.g., broilers) the whole structure of the farm firm is altered and bears little resemblance to the individual proprietor farm firm that existed prior to the structural change.

22 Irwin and Baker, op.cit., Advantages also are generated for the lender, in the case of a farmer who is willing to accept a down payment small enough to permit him to distribute capital gains on his property over several years.
Capital thus applied to agriculture originates not only in the corporate or cooperative resources of the integrator but also from diversions made by such organizations from their credit. Since the non-farm firm typically is much larger in resources and in capital acquisitions capacity, it is relatively easy for the farm firm to be dominated in the structural change. Increased use of inputs that originate from off-farm sources, including services, provide easier financial access than heretofore for such farm-related firms. The incentive for supply firms is provided in the form of development of outlets for products and services for processing firms in the development of a supply of farm products controlled as to timing, quality, and to a degree, quantity. Investment from non-farm sources is promoted by a lag in farmers' response to changes in market or technical opportunities, by lenders' failure to respond to lending opportunities, by the presence of a large supply of under-employed labor; or by joint combinations of such factors as these.

Farm Incorporation

The outstanding financial advantage of the corporate firm is in its chartered privilege to acquire capital through the sale of stock with limited liability for stockholders. Additional advantages for farm families are flexibility in estate planning and, in certain instances, reduction in the tax on inheritance and income. Also, in contrast with vertical coordination incorporation may often be a means of preserving the essential family structure of the farm firm.

In the proprietor firm, aside from a share lessee, profits remain with the operator, as do losses. Returns to a lender are limited to a dollar-fixed sum that depends only on the interest rate. Thus it can matter but little to the lender whether a financed venture is expected to yield a 5 or 50 percent return. Indeed it is difficult to see how a commercial lender can be expected to make loans in which any appreciable predictable risk in principal payment is involved -- at least at interest rates common on farm loans (say anything under 10 percent in actual per annum terms).

Incorporation may provide a convenient means for heirs migrating from the family farm to retain an investment in the farm and at least a potential voice in control of the farm business. The operator who remains escapes the sudden burden of financing the whole of an economic size farm organization. As he develops financially, he may be able to buy, at a more modest pace, an increasing share of the business he operates. But he is at no time forced to "revolutionize" his financial organization to preserve access to the farm and the base thus afforded for growth and development. Given these advantages, we suggest the incorporation on a "family" basis may well increase in future years. Such a trend has much to recommend it.

One factor that may retard the development is the borrowing capacity generated by a family incorporated farm firm. Limited liability has accounted for vast capital accumulations outside agriculture, through sale of stock. The market for farm-based stock is not likely to generate anything comparable in magnitude. Meanwhile the farm operator may find less credit available per dollar of corporate equity than previously was available per dollar of equity in the single proprietor firm. Paxton reports that in Michigan, in the case of family-incorporated farm organizations, Federal Land Banks and Production Credit Associations request personal signatures on loan documents in addition to corporate evidence of obligations. Loan guarantees might be justified for a limited period to finance the organization of an incorporated farm under certain conditions. Such conditions would be analogous to those in which FHA loans are made to farmers. Indeed the FHA might well be the appropriate agency to entrust with such a program. In addition to the supervisor-client relation so successfully used in its present program, FHA could assist and instruct all parties to the incorporation relative to the requirements, opportunities, and peculiarities of the corporate form of business enterprise. Such help would be far from negligible in the case of such families as might “qualify” for incorporation financing.

The Life Cycle Problems

The single proprietor firm is peculiarly subject to factors associated with the biologic cycle of the operator and family. Through the typical productive life span, the farmer commences with a labor surplus, deficit in management and capital, and progresses through a period of such growth as can be financed from income or credit use. He reaches, in late life, a period (if successful) when, after reaching his maximum in managerial skills and capital access, he looks forward to retirement with or without an heir for the farm organization he has generated. With an heir, he must begin considering the operational characteristics of the farm organization for the next generation. Without an heir, he must consider the marketability of the organization or, meanwhile its properties as a source of rental income in his retirement.

Stagewise Financing Problems

Both borrower and lender face a changing array of problems through such a cycle. An early problem for the borrower is to identify managerial aptitudes and market opportunities and to gain access to capital at a rate commensurate with his ability to grow in managerial skills. The lender’s problem at this stage is to identify the young farmer capable of meeting these demands successfully. In a period of accelerating change in technology and markets, it is increasingly difficult to base projections on the farm itself. Success is becoming less land and more management related.

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Problems no less urgent occur in the middle period. Having established a going organization, the farmer now faces alternatives in the rate of growth, if not directions as well. Opportunities change and the learning process cannot be expected to proceed without altering goals and skills. He also must choose among alternatives in financing growth. Relying on growth from current income, he risks letting managerial skills go under-used. If they are substantial, or are the type with high payoff, it becomes feasible for him to lease or to use credit or other financial strategies. Opportunity costs become important. He must develop an acute sense of timing — for seasonal problems in finance and for life cycle problems of which, in this stage, he finds himself increasingly aware. The lender's problem again is one of identification. For the over-cautious farmer, encouragement may be needed; for the plunger, a defensive role is required.

Some of the more urgent and difficult problem arise in pre-retirement years. In this period even the moderately successful farmer may have attained an equity and credit position that allows him access to more capital than he can use profitably with his managerial and labor resources. Because of declining labor resources, he is all the more tempted to mechanize, even at a considerable outlay, to reduce labor requirements, and perhaps avoid the problems of managing hired labor. Often, however, such an organizational move can be treacherous. To exploit economies generated by mechanization means an increase in livestock (in case of materials-handling investments) or cropland. If in livestock, the organization is usually made more specialized than before and hence more difficult to sell, should the occasion to do so arise. Equally important, should the farmer have an heir, the heavily mechanized, specialized organization may not be appropriate for a young manager, who has a surplus in labor but a deficit in management and/or capital.

The lender is unlikely to suffer loss from the moderately successful farmer we have characterized. He has a pressing problem however, in the case of the less successful farmer who has emerged from the "growth period" without substantial growth and without appreciable financial progress. Faced with no particular past deterioration in the recorded quality of loan, it is easy for the lender to continue until the loan does become undesirable because of the operator's age and income requirements. At the other end of the scale, the lender may have plungers who continue financing operations in post-retirement years that would have been questionable even in early years of growth periods.

Problem of Liquidity Over the Farm Firm Life Cycle

In the early postwar period we have seen that U.S. farmers were in a highly favorable financial position. In recent years, returns to real estate have been low, but for many farmers with a high equity in land this posed no problem. Rising land values and high land equity permitted returns to equity in real estate to be imputed essentially to labor and used to pay household
expenses. Problems created were those of liquidity. Lower commodity prices, high operating costs, and inflated land prices left farm owners with a satisfactory net worth but low annual income. Assets have tended to be tied to land while liquid assets were exhausted to pay household and production expenses. For many, the principal problem becomes one of holding out long enough to sell the farm and retire on capital accumulated in land. Increases in farm mortgage debt as a percentage of total farm debt suggest that in recent years farmers may be using real estate credit for operating capital partially to alleviate such a condition. A major future difficulty may arise if farm profit margins become narrower and if capital gains, that have provided retirement income and made almost any loan policy look good, are not forthcoming in the future.

Capital requirements were found to differ by region and farm type. Many estimates reach as high as $100–$200 thousand and more. Under traditional goals of full equity at the end of the farm life cycle, how is the beginning farmer to acquire this size unit? At a 5 percent rate of return or accumulation, a $28,409 initial investment is required to accrue a $200,000 investment in a firm life cycle of 40 years. Viewed in another manner, a 25 percent initial equity might be considered a minimum for title on a $100,000 investment. This large entry requirement is a formidable barrier to entry and is consistent with the policy goal of labor adjustments out of agriculture. But this barrier also can be a disadvantage by encouraging purchase of an undersized inadequate unit and discouraging entry of able farm youth who are qualified managers but lack capital.

General Recommendations and Conclusions

Adaptability of financial intermediaries serving farmers to the credit goals indicated earlier is impressive. Since World War II, PCA's and commercial banks have established effective programs in intermediate term loans. Considerable experimenting continues and is wholly understandable in view of complexities involved in nonreal estate loans that extend beyond a single cycle of production. Financing beginning farmers is a perennial problem in a sector with so high initial capital requirements. However, the array of leasing arrangements, the flexibility of judgment of local lenders, and the formal programs of FHA combine into a program that seems reasonably effective in financing new farming entrants. In a recent conversation, an Illinois FHA representative complained that he was being asked too infrequently, in terms of his own satisfactions, for financial assistance in getting established. Instead, he was substantially employed in financing purchases of "headquarters units" for tenants operating farms of several hundred Corn Belt acres (but not larger than "family size.")

Farm mortgage lenders can nearly tailor a farm mortgage loan to the repayment capacity of a qualified borrower. A considerable fraction of the loan often can be left unamortized. Earnings from off-farm sources, an increasingly important part of the income of many farm families, are often taken
into account in appraising the applicant for farm mortgage as well as non-real estate loans. All these are welcome adaptations and realistic responses to changes in the environment of the farm firm.

Despite these favorable adaptations, credit use is not well distributed among farmers, lender-decisions for credit-dependent farmers can lead to non-optimum organizations, and serious inter-generation problems persist. Lender preferences for asset-generating and self-liquidating loans need not accord with optimizing allocations implied by marginal analysis. For the farmer, two alternatives are open. The first is to so use his credit resource as to minimize credit use for those purposes in relative disfavor of lenders and otherwise generate such growth in his credit as seems feasible. The second alternative is to use merchants and dealers in a split line of credit. That this alternative is frequently adopted is attested to by current evidence. Thus the machinery dealer is increasing his share in machinery loans (often nonself-liquidating). So also are feed and fertilizer dealers where the loans are non-asset generating. At best, however, borrower is left with a complex financial organization to manage.

Life cycle financing problems, as outlined above, are aggravated by inter-generation transfers associated with single proprietor firms. Economies of size reduce new farming opportunities already too few to retain in farming more than a fraction of the youth raised on farms. Those leaving agriculture drain capital from agriculture and often create, by inheritance, a serious financing problem for those remaining in agriculture. The new farming entrant is required to finance the purchase of a farm organization, perhaps inheriting only a small fraction of the capital required. With increasing size and sophistication of the farm organization, he may also lack the managerial skills required for successful continuation of the developed organization.

We expect the use of merchant and dealer loans to continue. The machinery and equipment dealer have several substantial advantages in competition with the primary lenders. With a stake in merchandising returns, the dealer can afford, if necessary, to finance more liberally than can the primary lender with his dollar-fixed interest returns. Moreover, the dealer is necessarily better equipped to judge payoff from new and sophisticated equipment. Unfortunately, he also is biased in the transaction. Thus the farmer is faced with a judgment problem that is different from the one he faces when he borrows from a relatively neutral primary lender. Finally, successful credit policies require policies and personnel not always found in sales organizations.

A large percentage of the nation's 14,000 commercial banks are located in rural areas, most organized at the outset more or less specifically to finance farmers. Banks in such areas suffered a 50 percent attrition during the depressions of the 1920's and 1930's, a factor that to this day conditions lending practices in a large number of surviving country banks. More important, however, is the fact that a large number of country banks are capitalized at a level too low to permit them to finance a substantial fraction of
commercial farm applicants. Finding it unprofitable, unpleasant, or simply "out of character" to use a city correspondent for the overline, the banker watches the most profitable farm borrower shift to the PCA or split his line of credit with one or more merchants in the community.

Clearly this is an undesirable situation. One alternative is to expand branch banking. For the foreseeable future, however, this will be an unacceptable solution in a large number of unit-banking states. An alternative to this is an educational campaign on the use of correspondent banking facilities. A considerable effort along this line already is in progress. Another alternative is the development of legislation in which inter-bank compacts might be developed. Under such an arrangement a single bank would be responsible entirely for any given loan, but would be able to add to its reserves some fraction of the combined reserves of all banks in a given compact. Banks might be grouped along geographic lines, in interests of similarity in environment, and outlook of bankers. Together, such a grouping of banks might eventually gain additional benefits: perhaps some specialization in lending and joint hiring of personnel.

Banks perform many roles unique among lenders. Responsible for introducing currency into the economy, their demand deposits comprise the vast bulk of the nation's effective money supply. They are instruments of monetary and (aggregative) credit policy. Such policy is implemented principally through open-market operations and reserve requirements. Non-bank lenders are only indirectly affected by these measures and are benefitted, at first, from a policy of tightening the supply of money and credit. To the extent, therefore, that non-bank lenders grow relative to banks in lending, the effectiveness of banks as policy instruments may be somewhat modified.

From the banker's point of view, a relative decline in direct financing need not be an unsettling prospect. The bank will become less a retailer and more a wholesaler of loan funds. How seriously this will impair the instrumental character of the banking system is difficult to judge. Our estimate is that the effect will be slight. A contraction policy that affects banks will be transmitted quickly throughout the whole of financial and commercial sectors.

It seems likely that PCA's will expand as a "complete-line" lender, with budgeting facilities and a "neutral" source of financial advice. It is important, however, to keep their possibilities in proper perspective. They possess no magic in obtaining loan funds cheaply for farmers in periods

26 A common loan limit is 10 percent of paid-in capital and surplus for the non-livestock.
of monetary and credit contraction. Nor can they be expected, with their member-wise responsibilities, to loan on other than self-preservation criteria. They are, however, chartered to deal with farmers and can entertain no other investment alternatives for the use of funds available to them.

We would encourage continuation of the trend to closer cooperation of PCA's and FLBA's. As a matter of fact, it might be defensible to accelerate the merger of the two lending institutions, at the local lending level under single management. In the future, a similar move might be useful at the district level of the PCA. Economics from size and greater efficiency in use of reserves might be considered as well as the possibility of better serving the needs of individual farmers.
MANAGERIAL REQUIREMENTS OF
FARM FIRMS, 1980
by James Nielson*

The Role of Management

Farm firms operate in a dynamic environment in which any of the variables which affect farming operations may change at any time. Change—along with values, beliefs and limitations on man's perceptual abilities—leads to imperfect knowledge and imperfect foresight. Lack of perfect knowledge and foresight leads to uncertainty. Thus, the crucial role of management is to formulate expectations regarding the future, to devise strategies for dealing with uncertainty, to decide upon and take action designed to fulfill goals of the firm, and when necessary to adjust the goals themselves.

More specifically, management consists of performing these functions or processes: (1) formulating the goals of the firm, (2) recognizing problems and opportunities, (3) obtaining information and analyzing alternatives, (4) making decisions, and (5) taking action, accepting responsibility, and evaluating the outcome.

Objectives

The purpose of this paper is to discuss changes in the demand for and supply of managerial services in farm firms during the next 15 years.

First, I shall outline recent and prospective changes in agriculture, with emphasis on changes that have an impact on managerial requirements and on the supply of managerial services. Because of the wide variations which are likely to be relevant in our analysis, I do not consider it fruitful to attempt to predict what the "average" or "typical" farm will look like in 1980. I intend only to indicate the possible range which may exist in important variables affecting the demand and supply of management. Thus, if I suggest that there will be a number of very large farms by 1980, I mean only that there will be enough of them to merit some of our attention; I will not be implying that all farms or the typical farm will be very large.

Then I shall consider the demand for managerial services. The major factors which influence the managerial requirements of farm firms are (1) economic environment, (2) input mix, (3) degree of specialization, (4) size of business, and (5) form of ownership and control.

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in individuals in the farm unit, and (3) hiring outside consultants and other managerial services.

I shall conclude with a brief section on what I consider the challenge of management.

**Changes in Farming**

**Changes in Economic Environment**

During the next 15 years there will likely be steady and sustained growth in the U. S. economy, with government action designed to avoid major ups and downs in the business cycle.

Even though population and per capita income levels will be increasing, output of a number of farm products will exceed effective demand, and farm prices will be under continued pressure. With the moderate inflationary trend which is expected, prices of inputs purchased by farmers will increase. Some farm groups will press for higher farm price supports and other programs to aid farmers; these programs will be increasingly difficult to obtain because of the diminishing political influence of farmers.

In the past decade competition has led to the rapid adoption of new technology on farms. Much of the new technology has been in the form of inputs purchased off the farm. Many of these inputs require large investments, and farmers have expanded operations in order to spread overhead costs and attain lower costs per unit of output. At the same time, expanded output has kept ahead of the demand for farm products, resulting in depressed prices, the price-cost squeeze, and the necessity for many farms to operate on narrow margins. This cycle seems almost sure to continue during the next 15 years, barring a major war or other occurrence.

**Changes in Inupt Mix**

One of the most dramatic changes in American agriculture has been the shift toward greater use of capital relative to land and labor. The shift toward substituting capital for labor, and to lesser extent land, was particularly rapid during the 40's and 50's. Increased capital came mainly in the form of inputs purchased from off the farm, such as mechanical power, equipment, feed, fertilizer, and insecticides. The shifts came about partly because of the rapid development of machine technology, partly because of the high prices of land relative to the prices of other farm inputs, and partly because of difficulties farmers experienced in getting the quality of labor they desired. The shifts were hastened by the research and educational work of the USDA and the land-grant colleges.

By 1980 it seems certain that in considering management we shall have to take account of further changes in the input mix on farms.

With continuing inflation and the demand for land for urban development, land prices and real estate taxes will probably continue to rise.
Most certainly the quantity of inputs purchased from off the farm will increase further. Many farmers will find it profitable to adopt the new inputs that result from technological research and innovation. Not only will there be an increased range of inputs available to farmers, there will also be many improvements in the qualities of inputs that are presently available.

By 1980 it is highly probable that a federal minimum wage, and perhaps also federal regulations on housing and working conditions, will apply to hired farm labor. These federal regulations, plus the increasing mobility of labor, will result in significant increases in costs for farmers using substantial amounts of hired labor. Higher labor costs suggest the consideration of further mechanization on some farms.

I suspect that by 1980, many farming operations that are now done by hand will either be eliminated or mechanized, and many that are now mechanized will be automated. In the fall of 1964, the head of the production planning division of the International Harvester Company made the flat declaration that every farming operation conceivable could be mechanized -- at a cost. He went on to express the conviction that farmers will pay the necessary price for machines that will relieve them of the drudgery of performing the most repetitive farming operations -- tasks that are repeated day after day over a prolonged period of time. He also pointed out that much new technology in machinery design does not replace the old but instead is added to it, thus increasing the number of machines and the machinery investments on farms.

Thus, I expect further declines, relatively, in the importance of the land and labor inputs in farming, and increased use of purchased capital per farm, per acre, and per farm worker. Our analysis of managerial requirements, however, will need to consider the wide variation in the proportions in which inputs are combined on farms.

Changes in Degree of Specialization

In general there has been a trend toward increased enterprise specialization on farms, and I expect this trend to continue. On farms with limited resources, advantages to be gained from adopting new technology can be gained only by specializing in order to attain adequate scale. Other factors which may lead toward greater specialization are (1) opportunities for concentrating efforts and skills on production of one or a few products, (2) buying and selling advantages that may result from increased volume of a commodity, and (3), under some circumstances, greater efficiency in the use of labor and management. On the other hand, the move toward more specialization will be limited by the need and desire of some farmers to remain flexible in order to cope with uncertainty, and by the possibilities of utilizing some resources more effectively in a diversified rather than in a specialized organization. In some farming operations diversification may
may move in the direction of taking on more processes, especially to utilize resources during the winter months.

During the next 15 years we shall need to give attention to the managerial requirements of farm units with fairly wide product diversification: those that are specialized on one product, but carry it forward through a number of stages in processing; and those who specialize down to one stage on one product (producing feeder pigs, raising dairy heifers, finishing cattle).

Changes in Size of Business

For some time there has been a steady increase in the average size of farms, whether measured in terms of acres, capital investment, or volume of output per farm.

During the 20 year period 1939 to 1959 the total number of commercial farms declined from 4.1 to 2.4 million according to the U.S. Census. The decrease in the total number of commercial farms was mainly accounted for by the disappearance of small marginal units with less than $2,500 worth of sales.

Nikolitch's study of census data indicated that the number of farms with total value of sales of $10,000 to $40,000 increased from 284,000 to 693,000 from 1939 to 1959; the number with sales of $40,000 to $100,000 increased from 24,000 to 82,000; the number with sales of $100,000 or more increased from 5,000 to 20,000.1 By 1959 there were about 800 farms with one-half million to 1 million dollars of sales, and 400 farms with 1 million dollars or more of sales.

While there were increases in the number of larger farms in all farm types, the greatest increase in the number of larger farms was in livestock farms, followed by cotton, poultry, dairy, and fruit and nut farms, with the least increase on tobacco farms.

Even though the average size of farms and the number of larger farms has been increasing, Nikolitch's study showed essentially no change in the proportion of farms using more than 1.5 man-years of hired labor.

1Radjoe Nikolitch, Our 100,000 Biggest Farms. Their Relative Position in American Agriculture, Economic Research Service, USDA, Agr. Econ. Rept. No. 49, February 1964. Nikolitch measured value of sales for all years in terms of 1959 prices received by farmers, and adjusted all data to the 1959 census definition of a farm.
A continued decrease in the number of farms through farm consolidation, an increase in the average size of farms, and an increase in the number of larger farms are expected during the next 15 years. The extent of change will depend on a number of factors. Some agricultural economists believe that institutional factors will limit the growth of larger farm units. It is true that the size of farm units has been strongly influenced by national policies and programs in the past, and this will probably continue to be true to some extent in the future. The institutional restraints relate primarily to ownership and the use of land, and these restraints are likely to decline in importance in the period ahead. Federal government policies -- such as those which had strong influence on land settlement and land use in the past -- will have decreasing relevance as a determinant of farm size. Also, land is becoming less of a limiting factor in expanding the size of business because it is increasingly replaced by purchased nonfarm inputs and technical know-how. Land tenure and transfer laws, as well as difficulty in finding farmland available for purchase, will limit farm expansion in some states. Thus, growth patterns may vary considerably from state to state.

There are few effective institutional restraints on the acquisition of non-land inputs needed in farming. Financing has served as a limiting factor in the past, and will certainly continue to be for some farms in the future. At the same time, some farm managers will be able to obtain sufficient financing to carry out substantial expansions in farm size.

Probably the most important factors that will influence the growth in size of farm units are those that relate to economies and diseconomies of scale. The disappearance of many smaller farm units is generally attributed to economies in the use of technology and equipment which require large capital investments. Many of these investments cannot be justified on small farms; per unit cost advantages can be realized only by expanding output. Also, an increase in the scale of operations may lead to efficiencies in the use of labor, and to buying and selling advantages.

Beyond a certain point, some agricultural economists believe that further growth in the size of firms is discouraged by the appearance of diseconomies. Diseconomies of scale are generally attributed to management as the limiting factor -- the inability of management to coordinate and control a large organization, and to supervise workers -- some of which may be at a considerable distance from headquarters. Other diseconomies which are suggested are increased costs and difficulties of obtaining the amount and quality of inputs needed, and finding markets for certain kinds of outputs.

Economies of scale studies frequently have shown that smaller units can achieve substantial reductions in unit costs by expanding, but that after an efficient size is reached there are no strong economic incentives for further expansion. At the same time a number of studies have indicated that unit costs are approximately constant over a wide range. This evidence seems to indicate that the average cost curve remains flat, or at worst
rises only gradually, with considerable increases in farm size. This may indicate that over a wide range of farm sizes neither important economies nor diseconomies apply—or more likely, that such economies and diseconomies as exist pretty well balance each other. Where either of these conditions exist larger farms will have higher net incomes simply because of the larger volume of business.

With roughly constant average per unit costs, or even with slightly increasing costs, some more talented and adventuresome managers explore the possibilities of very large farm operations. In some cases, the farm manager decides upon the size and organization of a sub-unit which is efficient, and then tests his ability to control additional sub-units of this same size and organization. After successful large scale units are established, other farmers try units of similar scale. Once the pattern of large scale farm units is established, the pattern tends to be repeated within the region where it starts, and to spread to other regions.

Economies of large scale production appear to have developed to a greater extent in livestock and poultry production than in crop production. Examples are broiler producers who turn out hundreds of thousands of broilers, cattle feeders who handle 50,000 or more head of cattle, dairy herds of several thousand cows, and operating units with as many as a million laying hens. Many of these operations are carried on with very small acreages of land, and many are large integrated units that cannot be classified as family farms. Of the very large units that have been established, a number have gone broke, some are moderately profitable, and some are highly successful and persist.

In the next 15 years there will certainly be an increase in the average size of farms, perhaps a doubling. There will particularly be a decrease in the number of smaller farm units, although some of them will not doubt persist. There is no doubt in my mind that the great majority of farms will be family farms, although the family farms will increase in size. While many of them will be approximately one-man farms, there will likely be an increase in two-man and possible three-man farms, especially on livestock farms where chores and other operations must be performed every day. I tend to believe that there will be a faster increase in the number of larger units than some of the other participants in the conference. It is not essential for us to agree on this, however. My point is that in considering managerial requirements we shall need to take account of the very wide range in farm sizes which will exist.

Changes in the Form of Ownership and Control

Given the increasing technical and economic complexity of farm management, some agricultural leaders raise the question whether the individual general-purpose farmer -- asset owner, risk bearer, manager, supervisor and
laborer -- is capable of handling the multiplicity of functions which must be handled in a successful farm business in the years ahead. The large capital investments required for entry into farming and the difficulties of refinancing with each new generation of farmers also raise questions about the persistence of the present system of ownership and control.

Ownership of Assets. The changes which have occurred in farming so far have not appreciably changed the tenure of land ownership in the U.S. However, one of the results of structural changes now occurring in agriculture likely will be decreased emphasis on full farm ownership. Where farmland is available at existing or prospective rental rates, a number of farm managers will find that their best alternative may be to rent the land and to allocate most of their capital to the purchase of machinery and current inputs. We may also see an increase in farmer leasing of equipment and other capital items. In addition, as newer generations of farmers are willing to use more borrowed funds and as financing becomes more readily available through various lending agencies, there will be greater use of credit in accumulating farm resources.

Partnerships. There will likely be an increase in farm partnerships, particularly family partnerships, as a means of getting together sufficient capital for an economic unit. This may be the only way that some farm youths can obtain a start in farming.

Incorporation of the Farm Business. Many agricultural writers have referred to the increase in corporation farming and to the expected, and sometimes feared, increase in prospect. Data available for a few scattered states show rather dramatic percentage increases in the number of incorporated farms, but indicate that they are a very small fraction of the total numbers of farms. Incorporation has occurred most frequently on larger farms, and particularly on large fruit and vegetable farms and certain kinds of livestock operations. In 1954, 5.0 percent of the farmland in the U.S. was in corporation farms, ranging from 1.1 percent in the East North Central region to 11.5 percent in the Pacific region.2

The greatest interest in incorporation relates to the process of capital accumulation, the family farm cycle, and farm transfer. In some cases, incorporation may result in savings on income or estate taxes. Expansion of corporation farming is limited by statutes in some states.

Taking all factors into consideration, I expect some increase in the number of corporation farms during the next 15 years. In most cases the choice will be between forming a partnership and incorporating. Incorporation, to the extent it occurs, will be concentrated in larger farming units. While some of the incorporated farms will not be family farms, many of them

will be. Because of the possibilities for continuity and orderly transfer, more and more farm families may come to look on incorporation as a means of preserving the family farm. While some farm corporations will be able to tap equity sources outside agriculture, much of the equity capital for incorporated farms will probably come from family members associated directly with the farm and from other family members who have migrated to the city.

Vertical Integration. There has been some increase in contract farming and vertical integration, particularly in the production of broilers, processing vegetables and other specialty crops, sugar beets, seed crops, and fluid milk. There is some tendency toward increased cattle feeding on a contract or custom feeding basis. The main reasons for the increase in vertical integration has been to finance heavy investments in specialized equipment and to offset some kinds of uncertainty that accompany increased specialization. We may see some further expansion in vertical integration and contract farming.

Increased Similarities between Farm and Nonfarm Businesses. There are some tendencies for farm businesses to become more like nonfarm businesses. As land becomes a relatively less important input in farming, and as farms become more specialized, increase in volume, use more inputs purchased off the farm, and adopt more advanced technology, they become more like nonfarm industrial firms. This is already true of many large livestock operations.

As farm units become larger and more highly commercialized, we observe greater separation between the firm and the household, and I think this trend will continue. Within the farm family there will be greater separation of production and consumption decisions. Taking into account household demands and goals of the farm wife and other family members will be less relevant in formulating the firm goals. Farm wives will have less voice, by mutual agreement, in such things as complex investment decisions that run into the hundreds of thousands of dollars. Farm wives will play essentially the same role in helping or hurting the business -- through their interest, encouragement, tolerance of late hours, or the opposite -- as wives of urban businessmen.

Thus, I do not believe managing a farm business in 1980 will be much different from managing any other business of similar size. At the same time, there will be increasing similarities between the managers of farm and nonfarm firms. More and more the distinction between rural and urban is disappearing in the U.S. In many but not all sections of the country, farm children attend the same schools as urban, and farm families shop, go to church, and use recreational and social facilities the same or similar to those of urban people. This situation influences their values, attitudes, and to some extent interests -- factors which have an influence on how the

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person carriers out the processes of management.

**Demand for Managerial Services**

**Impact of Economic Environment on Managerial Requirements**

During the next 15 years there surely will be many changes in economic factors and government farm programs which will call for response on the part of farm managers. More particularly, the narrow profit margins which are expected to prevail indicate increased demand for managerial services to keep up-to-date on outlook and other information, to decide upon the appropriate action to take in response to changes in the economic situation, and to carry out the action successfully.

**Impact of Input Mix on Managerial Requirements**

When family labor and land were the principal inputs in farming, the manager's chief problems were selecting enterprises and practices that would provide the best return to these resources. The increased availability of nonfarm inputs greatly widens the relevant decision-making horizon with which the farm manager must deal. New discoveries increase the number of kinds of inputs or techniques the manager must consider. In addition, within the constraints of his ability to finance their purchase, the individual farmer has an essentially limitless quantity of nonfarm inputs available for his consideration. In the present and near future, increased financing with more realistic repayment terms may be available to qualified farm borrowers. At the same time, more farmers will probably be willing to use more credit to finance purchase of inputs. Because of the availability of both nonfarm inputs and financing, many farmers will be in position to consider a very wide range in both variety and quantity of inputs to be purchased.

Farm managers in the future, then, will be called upon to make a large number of decisions regarding resource acquisition and use. Examples are: (1) what resources to acquire, including both kinds and qualities of inputs, (2) how much of the resources to use, (3) where to acquire the inputs, and (4) how to gain control of the resources. Many of these decisions are interdependent and need to be made jointly. In addition, once it has been determined that investments in a new asset or technique would be profitable, there are further questions of timing of the purchase, deciding how to fit old and new technology and equipment together into a system, and how to modify the system for different scales of operation.

Farmers in some areas will find that rapid increases in the price of land because of urbanization will require the use of managerial resources to decide when to sell land and move to another farming area, or whether to sell land and move out of agriculture.
During the next 15 years farmers who need hired labor in their farming operations must pay wages and offer other benefits which are more competitive with nonfarm labor. The increase in labor costs will call for managerial services to analyze the profitability of further investments in labor saving machinery and methods. Some may be forced to reorganize their farm businesses to do away with seasonal labor peaks and to employ labor year-round; among other things, this may require training workers to do a number of different jobs. On the other hand, adoption of new technology often reduces the number of laborers required, thereby reducing managerial requirements connected with recruiting, training, and supervising labor.

Thus, between now and 1980 there will be a substantial increase in the need for managerial services to carry out learning processes to obtain relevant facts about the new discoveries and analytical processes to determine the extent to which the new alternatives should be adopted. New technology frequently calls for changes in proportions of inputs -- substitutions needing to take place between two or more inputs because of changes in the relative prices; an important function of management is to decide what substitutions are optimum. With the narrow profit margins that seem in prospect, the value of refined analysis is increased.

Greater managerial skill will also be required to successfully manage farming operations which increase in complexity because of the use of new kinds of inputs, very large and expensive equipment, and complicated techniques.

In addition, increased managerial resources may be required to deal with increased risk and uncertainty resulting from the greater proportion of purchased factors in the input mix. There have been substantial increases in the investment required to generate a dollar of net farm income and in the proportion of farm income required to cover cash operating expenses. These conditions make the farm operator more vulnerable to a crop failure, outbreak of disease, or sharp decline in prices received. On the other hand there are a number of changes in inputs and techniques that have the effect of reducing the uncertainty faced by farm managers -- for example, improved varieties, use of irrigation water, methods of insect and disease control, environmental control, and uniformity in quality of inputs purchased.

Managers who are first to innovate receive a high payoff for innovations that are successful. However high costs and high risk are associated with innovation -- particularly in trying out a series of interrelated farming adjustments which may involve substantial investment and the probability of considerable financial loss if the idea does not turn out as expected. During the next 15 years I would expect the farm managers who are most venturesome in trying new combinations of factors of production and new production and marketing techniques to fall into classes roughly as follows: (1) those who innovate successfully most of the time -- they will profit from their success and other managers will learn from them, although farmers who discover new things will increasingly take action to slow down the speed
at which this happens in order to retain competitive advantage; (2) those who try out so many things that do not work that their losses will be high, and many of them will eventually be forced from the game; and (3) various gradations in between.

On the average, the most successful managers may be those in what may be referred to as the early imitative group. Managers in this category may leave the production of new farming ideas to the agricultural colleges, the USDA, firms which supply inputs to agriculture, and the innovating farmers. They may have the managerial ability to seek out and obtain information on new developments early, sort them rather quickly, and decide which they should adopt. They will thus forego the cost and risk involved in developing new ideas, and will profit through application of more perfected inputs or methods. Firms that are too slow in adopting new techniques will find the production increases resulting from the actions of earlier adopters will make their profits smaller than previously, and many will likely be driven out of farming. The faster a new idea is adopted by farmers, the quicker the pressure will develop on the late adopters to accept the idea, or to suffer the consequences.

Taking all factors into consideration, I conclude that production of new technology and possibilities or necessity of making changes in the input mix will cause substantial increases in managerial requirements -- both in terms of total requirements per farm firm and as a proportion of total resource used.

Impact of Specialization on Managerial Requirements

Managerial requirements for gathering and analyzing information, making decisions, and taking action vary more or less directly with the number of enterprises and processes included in the farm organization. That is, fewer managerial resources are required to keep up-to-date on one enterprise than on several. Where a farm handles more products or processes rather than fewer, the increase in managerial services needed to keep up-to-date will depend a great deal on how similar the products and processes are to each other; taking advantage of supplementary relationships and attaining year-round use of resources usually require substantial differences.

On the other hand, higher level of management may be required on very highly specialized farms to overcome problems which accompany the increased specialization -- such as failure to take advantage of supplementary relationships and problems of timing in farming operations. Yields and quality may drop if planting and harvesting operations cannot be completed at the right time, and higher costs and supervisory needs may be involved in handling peak labor requirements.

Improved technology -- such as use of different varieties which can be planted and which mature at different dates, new techniques for controlling insects and diseases, use of irrigation water, and adoption of
certain other practices -- tends to reduce some of the risks and uncertainties involved in specialization. Others can be handled by buying insurance and by various kinds of contracting and cooperation. But there are other kinds of risks and uncertainties that will increase with specialization -- uncertainties resulting from changes in yields, uncontrollable outbreaks of disease, price changes, and technical changes which may have different impacts on the various enterprises and processes in the farm plan. The stability of farm income resulting from possibilities for "averaging out" returns from several enterprises may not be possible in certain kinds of specialized operations. This lack of a stable farm income results in an increased demand for managerial services -- that is, services to carry out learning and analytical processes designed to insure optimum efficiency and services to avoid costly losses on the enterprises or processes chosen.

In the size ranges that will be most typical by 1980, I believe that managerial requirements per enterprise will be higher on specialized operations, but that total managerial requirements per farm will be lower on specialized farms than on diversified farms of similar size.

Impact of Size of Business on Managerial Requirements

The payoff from more accurate estimation of economic optima increases as the size of business increases. This fact emphasizes the importance of problem recognition, information gathering, analysis, and use of appropriate choice criteria.

First, in considering large investments in expanding the farm unit, careful and detailed analysis will be necessary to see if the outlay can be justified and can be paid off in a reasonable period of time. The consequence of error is obvious. Second, with large scale operations, the gains which can be realized from more accurate estimates of economically optimum rates of inputs (such as feed, fertilizer, and fuel) will be substantial. While missing the optimum rate of input frequently doesn't make too much difference dollar wise on a smaller unit, it can mean thousands of dollars on a large unit. The same applies to analyses designed to provide estimates of the least-cost mix of inputs. The effect of what we are saying at the moment is that the value of additional information to the firm has increased, making it worthwhile to spend more time and money carrying out managerial processes.

Successfully carrying out the managerial functions discussed in the following paragraphs will become increasingly important as the size of the farm business increases.

Record Keeping and Analysis. Managers of larger farm units will certainly find it necessary to keep more complete and accurate farm records, and to analyze and use this information in making decisions. As farms become larger, and perhaps also as they become more specialized and more mechanized, experiences and observations on the farm unit itself may become increasingly important sources of information. Managers of larger
farms may find it feasible, and in some cases essential, to do the systematic testing to find the inputs and techniques that are best adapted to their setup. In doing so, they will often ask help from or cooperate with personnel from agricultural colleges, machinery manufacturers, feed manufacturers, and fertilizer companies. A number of large farms are already doing a good deal of such testing. One large farm I visited in California last summer, for example, has carried out well designed experimenting and record keeping to determine the optimum number of times to recap truck tires on its operation, and the optimum gear in which to operate tractors under various soil and crop conditions. By cooperating with input suppliers, managers of such units help to communicate the needs of larger scale farms -- such as the need for more durability to be built into machines to be used in large scale farming.

Capital Acquisition and Financial Management. The large amount of capital needed to finance investments and to purchase current inputs on larger farms suggests the importance of capital acquisition and financial management functions, including management of cash, credit, credit reserves, and insurance. Part of the job will be to make and carry out decisions regarding how to gain control of the inputs needed. Many farm firms will need to use large amounts of borrowed funds during the next 15 years. This will call for management to plan, make decisions, and carry out negotiations regarding source of funds, terms of the loan, and repayment plans. Deciding on the optimum amount of borrowed money to use and timing of both borrowing and repaying will be important.

Operators of large units must get used to living with large capital investments and frequently with large amounts of debt. Such responsibilities weigh heavily on some managers, but are taken in stride by others. To the extent that possibilities of loss of large amounts of assets exist, large firms require more intensive use of managerial services in gathering and analyzing information and making and carrying out decisions designed either to reduce or deal with risk and uncertainty.

Buying and Selling. With the narrow profit margins per unit that are in prospect, buying and selling will become increasingly important functions of management during the next 15 years. Particularly on farms with a large volume of output, the manager will be able to afford to spend more time and money gathering information on sources, prices, and qualities of inputs, and on outlets, prices, and reliabilities of buyers of his products. Dealing with buyers and sellers so as to attain the greatest advantage possible will have significant payoff. While the manager may be able to get only a very small additional margin for what he sells, this may be of real significance for large volume producers where a small change in the net price can have a rather sizable effect on net income. Likewise on the buying side, large farm operators can frequently gain some advantages through skillful bargaining with suppliers.
Studying outlook information and timing seasonal transactions will have high payoff in buying some inputs and selling some outputs.

By 1980, farmers will be dealing with marketing firms of much larger size than at present. There will be an increasing emphasis on direct buying from farmers by processing and even retailing firms, and the trend toward bypassing of such central marketing facilities as stockyards and commodity exchanges will probably continue. As direct buying increases, price quotations of the type now generated by central markets will either disappear or become highly unreliable. Managers of large farm units particularly may find that there is high payoff in organizing their production and marketing to meet buyer specifications with respect to grade and timing of delivery; this will be particularly important in the case of products where quality and perishability are problems.

Selection and Training of Workers. On larger farms which employ significant numbers of hired laborers, selection and recruiting of workers will be important functions. Perhaps an even more important personnel function will be training of workers. While the selection of workers is important, I suspect that farmers frequently devote too much time trying to find exactly the right man. It is typical for farm operators to insist that hired men have considerable experience. They might solve their personnel problems more easily by hiring young men with a high school education and preference for farm work, and then providing the necessary training. Well-trained workers are more productive, can accept more responsibility, and require less supervision.

Last summer in California I visited farms with up to 300 year-round employees. While some day-to-day instruction no doubt took place, in no case did I find a farm with any very well thought out training program. When asked why, the managers most often said that if they provided good training for their men, someone else would hear about it and hire them away -- a not very valid reason in my estimation. It appears to me that in the past, few farm units have had enough employees to motivate management to give much attention to training, and we simply have a lag in attending to this important personnel matter.

Working with People. On large farm units employing a number of workers, certain managerial skills will be necessary that are not as crucial on smaller farms. Skill in dealing with people or handling interpersonal relations is one of these. The success of the total operation will depend partly upon the manager's ability to carry on successful relations on a continuing basis with employees, suppliers, buyers, and others.

In working with people, one of the skills that managers of large firms must develop is using authority. Because of their values and background, many farmers are reluctant to exercise authority. Being independent and not liking to be told what to do themselves, they are hesitant to tell others what to do. Proper exercise of authority includes delegating authority to subordinates. Some managers will not delegate sufficient
authority, try to do too much themselves, and thus have too little time and energy for the larger, integrative functions of management. When the top executive tries to retain too many tasks for himself and spreads himself too thin, things break down internally; this has been noted in both non-farm and farm firms.

Having recruited personnel with some potential and developed this potential through investments in training, management has the continuing responsibility for providing an organization and atmosphere that will permit all of the individuals in the firm to grow and further develop their capabilities. "The feeling of being part of a team, of being part of a joint effort, of having a common goal provides powerful motivations at work. The way in which the worker sees himself and his job holds the key to motivational forces that are probably far stronger in practice than those controlled by pay alone." 4

Communicating. Managerial processes in larger firms will call for more attention to the communication function. The larger organization will be made up primarily of a group of specialists who are interdependent on one another's skills and processes in making the whole unit function effectively. The problem is to figure out what information is needed at what points in the organization, and then to get it there as quickly and efficiently as possible. Among other things, this suggests the importance of a farm business center with an intercommunication system leading to key personnel who may be on farm equipment, in cars or trucks, in milking parlors or feed lots.

Staffing in Relation to Size of Business. On the one-man farm most of the operator's time is spent as a laborer, with some time devoted to handling business affairs or managing; there is little to be done in the way of supervision. As the unit expands to take in hired labor, say part-time help or a full-time man, the operator must spend less time in physical labor and more time supervising others.

As the size of the firm continues to grow, employing more workers and other resources, the manager must spend less and less time in physical labor and more time managing and supervising. After a certain point is reached, the farm operator will have to spend full time managing and supervising. Further increases in scale mean that the manager will not only have to spend full time managing; he will have to set up a chain of command and delegate many important responsibilities, including supervisory and managerial responsibilities, to others. The manager will find it necessary to "buy" certain kinds of managerial services by hiring highly trained, skilled specialists on a consulting, part-time or full-time basis.

As farms increase in size, various forms of organizational structures can occur, depending upon the phenomena that lead to growth with the firm. Scale increases which bring about roughly proportional increases in the use of all resources imply, among other things, increases in

the number of workers that will need to be supervised. In industry one
commonly observes the concept of the plant, with a manager or supervisor
directing it. In large scale farming one observes a parallel organization --
namely dividing the farm or ranch into units (a geographic area of the farm,
laying installation, feed lot) with a supervisor or manager in charge of
each unit and a top executive in charge of the entire operation. This type
of organization implies replication and can include varying degrees of de-
centralization of decision making.

A firm that is diversified may have an organization that calls for enter-
prise managers -- a crops man and a dairy man on a dairy farm, for ex-
ample. On very large units one finds a man in charge of each crop, and
the dairy business may be broken down to one person in charge of the
milking herd and another in charge of raising the replacement heifers.

Some large farms are organized around full-time or part-time functional
specialists such as agronomists, nutritionists, entomologists, accountants,
and equipment and irrigation managers. With large scale and close margins
in the next 15 years, there may be increased need for the services of farm
management specialists on a full-time or consulting basis to help estimate
various kinds of economic optima. The kind of managerial hierarchy formed
depends largely on the size and kind of unit, and to some extent on the
preferences of the organization builder. On the largest farm units the
various kinds of breakdowns are sometimes combined -- that is, they have
division of responsibility by enterprise, by functional specialty, and by
units. Examples of the organizations on two actual farm units are given in the
the following paragraphs.

A 14-man dairy operation with 600 cows (500 milking at any one time)
is operated by the following: the manager who is the owner of the operation,
a herdsman, assistant herdsman, a feed foreman with two helpers, one
wash-up man, and seven milkers.

A large beef feeding operation, employing 30 men, and feeding out around
35,000 head of cattle a year is staffed as follows: the owner who is in-
volved in the most important management decisions but who divides his time
between the feeding operation and other interests; a full-time hired manager;
nine cowboys working under the cowboy superintendent; five feeders work-
ing under the feeding superintendent; a four-man mill crew working under the
mill superintendent; a three-man maintenance crew working under the mainte-
nance superintendent; a man with two helpers who clean the lots; and a
full-time accountant. In addition, a free lance nutritionist and a veterinarian
are retained on a part-time basis.

Large farms with multiple person managerial staffs attain the advantages
that can be obtained through specialization and division of labor, as well
as the frictions and need for integration that apply to all large scale
organizations.
Managerial Requirements as Related to Size of Business. Some managers will have or will be able to develop the ability to perform the managerial functions necessary to be successful with a large farming operation. Others will not be able to handle all of these functions effectively, particularly the control and integrative functions which are especially crucial in large operations. In some cases there will be unused or underutilized managerial ability that may lead to farm expansion, or at least will be more nearly utilized after expansion. In other cases, expansion in the size of the business may lead or force the development of previously untouched capacity in the manager. When a farm reaches sufficient scale that it can afford a full-time manager, he will frequently have the time and ability to be successful in undertakings that are out of the question for the operator who is thinking in terms of himself and perhaps a hired man or two.

Demands for managerial services will increase as the size of business increases, and managerial requirements will certainly be significantly higher per farm on larger farms than on smaller ones. However, partly because there is an almost irreducible minimum of management required regardless of the size of the firm and partly because of efficiencies which can be gained in the use of managerial resources, management will decrease as a proportion of the total of all resources used as the size of the farm business increases. 5

Impact of Form of Ownership and Control on Managerial Requirements

Incorporation of a farm business is likely to call for small increases in the use of managerial resources. Separation of ownership and control may result in conflicts in goals and policies of managers versus owners which must be resolved. Also, some additional activities may be carried out in the firm because of the corporate structure -- multiple bookkeeping and accounting, corporation reports, attending to legal matters, and in larger farm corporations, information gathering and analysis designed primarily to convince a board that a certain action should be taken.

Under the usual arrangements in which vertical integration of farming operations occurs at the initiative of outside integrators, the integrator becomes a participant in a specific enterprise. The integrator often furnishes all or a part of the capital requirements and sometimes guarantees certain marketing conditions. Managerial resources in the form of direction of the organization and technical details of operation of the enterprise frequently accompany the integration (more often this managerial discretion is taken over by the insistence of the outside integrator than by demand on the part of the farm operator). In cases where technical and organizational know-how are provided by the integrator, managerial resources which must be provided within the farm firm are decreased.

Resources Needed to Carry out Managerial Processes

The managerial functions mentioned at the beginning of the paper are in reality closely interrelated parts of a whole process. There is, however, need for more emphasis on certain of the managerial processes in some situations, and need for more emphasis on other functions under other conditions. Shifts in emphasis which may be called for between now and 1980 are discussed briefly in the following paragraphs.

**Formulating Goals.** Clearly formulated goals, both long run and short run, will be especially important in the period ahead in quickly recognizing problems which need to be solved and in recognizing opportunities which, if pursued, will lead to goal attainment. The changes which must be faced by managers, and the narrow profit margins in prospect, will call for rather prompt adjustments in goals in response to changes in circumstances and success or failure in goal attainment. Some will likely need to give up the goal of farming as an occupation. An additional responsibility will confront the management of large scale farm firms with many employees operating at different levels in the hierarchy; namely, resolving competing individual goals and organizing and conducting the affairs of the firm in a manner which will provide meaningful opportunities for individuals within the firms to attain their personal goals.

**Recognizing and Defining Problems.** Recognizing problems and opportunities created by changes in the environment, changes within the firm, or arising because of unexpected outcomes is one of the important responsibilities of management. In the highly competitive period ahead managers who recognize problems or opportunities earliest -- and who can define problems in clear enough terms so that they can be solved -- will have an advantage over other managers. Doing so may depend largely on clearly formulated goals and on effective information gathering processes.

**Gathering and Analyzing Information.** Increases in specialization so that one enterprise cannot so easily bail out an unprofitable one, high rates of purchased inputs, and generally narrow margins emphasize the importance of information gathering and analysis for successful farm operation between now and 1980. Detailed records by enterprises and by inputs may be essential sources of information in making some management decisions. These records may also be increasingly useful in obtaining financing. Managers of some large farms already find it worthwhile to keep complete records of repairs and maintenance on each major piece of equipment on the farm.

The most effective managers in the period ahead will likely be those who work out and follow routine procedures for analyzing the repetitive types of problems they face in operating their farms, freeing managerial time and energy for important once-over decisions.
Making Decisions. One of the key functions of management is making decisions -- deciding on appropriate actions or reactions on the part of the firm. In order to be effective decision makers, managers of the future will need to give more attention than they have in the past to the development and use of effective decision processes and criteria or bases for choice when confronted with alternatives. One of the marks of successful managers operating under the economic conditions in prospect is decisiveness -- the willingness to go ahead and make a decision in the face of uncertainty without undue insistence on complete information and highest accuracy in prediction.

Taking Action, Accepting Responsibility, and Evaluating Outcome. Having analyzed alternatives and made decisions, it is the task of management to take the appropriate action, and to accept responsibility for the outcome. This is another stage at which many managers fall down; they make lots of plans, have good intentions, but never carry them out. The successful farm managers of the future are those who can maintain the drive to put their plans into action.

Also, better managers will do some systematic evaluating of the outcome of their decisions and actions, and provide feedback for correcting errors before they get too far out of hand. Under dynamic conditions, effective managers can and do substitute feedback for some information gathering and analysis which might precede decisions; that is, rather than trying to reach exactly the right decision ahead of time, they decide to try something and assume that corrections and adjustments will have to be made on the basis of insights provided by experience. Farm records from mail-in account projects, studied on a quarterly or even monthly basis, may be an effective source of feedback information for use in controlling the business.

Summing up the Demands for Managerial Services

The changes in managerial requirements of individual farm firms which will occur in the next 15 years will vary widely, depending upon the changes in input mix, degree of specialization, size of business, and form of ownership or control. In general, however, our analysis of managerial requirements per farm indicates the following: (1) substantial increases in size of business will cause substantial increase in total managerial services required, (2) substantial changes in input mix and adoption of new technology will result in substantial increases in use of managerial resources, (3) a shift to more complicated forms of business organization and control will call for slightly increased managerial services, and (4) increases in the degree of specialization will result in moderate decreases in managerial requirements.

In addition to these important factors internal to the firm, external factors which farm firms must face during the next 15 years are almost sure to increase the need for management. In some of our managerial research in Michigan we asked farmers what had happened to their ability to manage during the previous five years. Quite a number responded by saying
that they thought their ability had improved, but that changes in farming had increased the complexity of management. Typical responses were "Decisions are getting harder due to economic conditions, cost-price squeeze, etc." and "It's a lot harder to make decisions today. Sure I've learned a lot but I'm up against tougher situation and the decisions we have to make are more difficult."

With the anticipated narrower profit margins per unit, success in farming will depend to a high degree on sophisticated management of large capital investments and high current inputs, and on the application of complex techniques of production. These will make high demands on managerial services.

The complexity of management appears to increase with each turn of the cycle, and the various factors influencing managerial requirements interact with each other. For example, the competitive situation forces farmers to adopt new technology; in order to make the new technology pay off they frequently find it necessary to increase their scale of operations; in order to attain sufficient scale in enterprises many are forced to specialize; specialization frequently calls for use of more purchased inputs and increases uncertainty. The net effect is the increased need for management.

Taking all factors into consideration, I believe that changes in factors internal to the firm and those external to the firm all combined will result in substantial increases in managerial requirements per farm firm in the next 15 years. One cannot help but feel somewhat inadequate in having to use terms like "substantial" in referring to managerial needs. The main part of the difficulty is our inability, in the present state of managerial knowledge, to identify both quantity and quality of the factor.

To be more specific, I believe that on the average there will need to be a substantial increase -- perhaps a doubling -- in the number of hours devoted to carrying out managerial processes per farm per year. In addition, management will need assistance from various aids such as accounting systems, and computers. Not only that, but the quality or sophistication -- the effectiveness of each hour spent in managerial activity -- must improve. Managers of farms in the future will need the level of intelligence, amount of training, and degree of managerial skill possessed by managers in middle management positions in medium sized nonfarm firms. Managers of medium sized farms or larger will need at least the equivalent of a bachelor's degree in addition to managerial skills which are developed through experience.

If it's difficult to make meaningful quantitative statements about the managerial requirements of individual firms, it is even more so to make projections for the entire farm economy. Even if we had acceptable measures of management, such projections would require estimates of the number of all sizes and types of farms for all regions of the country. In general terms, however, I would conclude that the total managerial requirements in farming would decrease significantly in terms of the total number of man-hours needed to carry out managerial functions. An almost irreducible amount of management is needed to run any farm unit. The projected decreases in the number of farm units should result in total decreases in managerial requirements, even though requirements per unit increase. Fewer managers will be needed on farms, but as implied by previous comments, they will need to be more competent ones.
Supply of Managerial Services

The supply of managerial resources on farms is increased through individuals entering farm managerial positions and through development of their managerial capacities. The supply is decreased by deaths, migration off the farm, and through decreases in abilities to manage.

There has been some research on farm-nonfarm migration, but we really know very little about the supply functions for farm managers of different competencies. Even though there is sometimes lack of information on the part of farm people, and other imperfections in the labor market, the principle of comparative advantage would apply at least to a certain extent. Within the limits of personal preferences and knowledge of alternatives, we would expect many people to move to positions that would provide the greatest rewards for their services (and other productive assets if they have them).

What quality of managers will the new entrants to agriculture be? Our discussion of managerial requirements suggests that a very high level of management is needed to successfully operate farms of the future. There is, however, a question of whether farm incomes relative to nonfarm incomes will be sufficiently high to attract farm youth with the greatest managerial potential.

It may be that the majority of farm managers of the future, especially on small to medium sized farms, will be of rather middling managerial competence. The talent that has potential for handling a sizable and complex farming operation successfully is somewhat scarce and is well paid outside agriculture. Because of the higher rewards they may receive, farm youth with greatest managerial potential may migrate off the farm to work in professional or managerial positions.

At the same time, those with the least potential for being successful as farm managers may also earn higher incomes in laboring jobs off the farm. They may migrate because they see where their comparative advantage lies, because they cannot control the necessary resources to start farming, or because they start and are so unsuccessful that they are forced out.

Developing the Managerial Potential of Farm Operators

Because of the increase in average age of farm operators, and also the possible greater ease of retirement for some farmers during the next 15 years, more new operators will be entering farming in the period ahead. Even though many may not be those with greatest management potential, they will be younger and therefore possibly more aggressive. Since the average number of years of schooling completed is increasing, they are almost sure to have higher levels of formal education than those retiring from farming. In the future, there will be essentially no people involved in managerial jobs on farms that have less than a high school education. In parts of the country many farm managers have had college short courses or have attained a B.S. degree, some have M.S. degrees, and a limited number on large scale farms have Ph.D. degrees.
The trend toward higher levels of formal education will probably continue, and this education can help increase potential managerial performance. Our consideration of managerial requirements suggests that several kinds of emphasis in the education of prospective managers are relevant:

1. The pervasiveness of technological, economic, and institutional change makes managerial ability of crucial importance in living with and dealing with change effectively. This suggests that managerial training should accomplish these important objectives. It should provide a conceptual background for recognizing and formulating problems. It should build an intellectual curiosity that leads to a continuous desire to learn. It should encourage flexibility, adaptability, and imaginative response to change whenever it occurs.

2. The need for managers to deal with normative concepts suggest the possible usefulness of training in philosophic value theory.

3. The information gathering functions of managers suggest the relevance of teaching improved learning processes, providing an appreciation of the values and costs of learning, and the effective use of machines and other aids in processing information.

4. The analysis function suggests the importance of teaching principles and concepts (in the various technical fields in and related to agriculture, economics, logic, mathematics and statistics) which may be helpful in carrying out analytical processes. This part of the training should take account of the now established use of deductive reasoning processes on the part of farm managers.

5. Because the decision-making function is crucial, training in decision theory should be helpful in teaching prospective managers how to effectively formulate and use decision processes and choice criteria.

6. The importance and the trickiness of communication suggest the need for the developing verbal facility on the part of managers.

7. The need for effective interpersonal relationships in management suggests the advisability of training in psychology, sociology, and organization theory.

In many respects, the problems of the generation and accumulation of managerial resources are similar to those of capital formation. Once an individual has entered a managerial position, he can continue to learn and to improve his managerial ability. Observation of one's own managerial processes and the outcome of one's actions may contribute to a better system for carrying out managerial processes in the future if the manager works at making the experience pay off.

**Hired Managerial Staff**

Beyond a certain point in the growth of farm firms, one individual will not be able to develop all of the skills and abilities that are needed. As previously indicated, such farms will find it feasible to hire specialists to perform various managerial functions.

**Off-Farm Sources of Managerial Services**

There is increasing evidence that farmers able and willing to pay substantial amounts for managerial services. What dairy farmers pay for DHIA services are one example. A number of farmers pay $500 or more to have their soil tested and fertilizer inputs specified. Fruit farmers pay that and more for prescriptions
on spraying. Many farmers pay for accounting and tax services. In 1964, 1,163
farmers paid an average of $107 each to participate in Michigan's mail-in account­ing project. Off-farm sources of managerial services which are presently avail­able or in prospect are discussed below.

Part-time Consultants. Farmers who cannot afford to hire specialists on
a full-time basis can obtain services from them on a part-time or consulting
basis. Examples of specialist services which may be secured in this way are
those of veterinarians, nutritionists, accountants, lawyers, and soil technicians.
Professional farm management specialists are available on a consulting basis, and
their use by larger farms will probably increase. Other types of specialists
are implied in the paragraphs which follow.

Lending Agencies. In the future, lending agencies may provide substantial
amounts of technical information and managerial advice -- in fact they may insist
that their advice be followed if they are to provide substantial amounts of capital
to the farm. FHA men, for example, visit some farms 12 to 15 times a year. Com­
mercial banks and insurance companies that make large agricultural loans frequently
have agriculturally trained staffs to assist and advise farm managers. Farms with
low equities particularly may have to borrow from sources that demand the right
to participate in major management decisions and supervise operations.

Integrators. On some enterprises and under certain financial and
management circumstances (for example, where capital and technical know-how
are inadequate), managers may enter into integrative arrangements under which
the outside firm provides some managerial services.

Cooperatives, Trade or Bargaining Associations. In industry, trade
associations provide technical and market information for firms too small to do it
for themselves and help firms restrict production and allocate marketing. In the
future, cooperatives, trade or commodity associations may provide more of such
services to farmers.

Computing Services. Simon is convinced that in the near future nearly
all routine decision making now performed by "middle management" will be taken
over by machines which will carry out the necessary processes faster, better and
more economically than humans. He believes that executives will retain some
relative advantage in solving unique problems, but that by some time in the 1970's
machines will be able to solve at least the range of problems that people now can.6
I have substantial reservations about the ability of machines to solve important
management problems which arise because something completely new has occurred
and for which there is no precedent. In any case, I believe that during the next
15 years the most significant, and to me the most interesting, managerial process
will take place in the human mind. Machines will be helpful in assisting with cer­
tain managerial processes, however.

6Herbert A. Simon, "The Corporation: Will it be Managed by Machines?"
in Management and Corporations 1985, edited by Melvin Anshen and George L.
To the extent that automation of managerial processes will be technically possible in nonfarm industrial firms, it will be possible to a similar extent in farm firms. The expansion in the use of machines will depend on their ability to lower the cost of carrying out managerial processes such as information storage, retrieval, processing, and analysis. Electronic computers of course are already in use in summarizing farm records, to some extent in analyzing farm businesses, and in programming optimum feed and fertilizer mixes.

In very large farm firms, purchase of computing equipment may be feasible. Most farm managers, however, will find it more economical to use computing services available from commercial companies or agricultural colleges. These services could be used for farm analysis and for estimating optimum farm plans. The farmer could send in his resource situation, the kinds of alternatives he would be willing to consider, estimates of production and yield possibilities, and other information. The computations of expected outcomes under various alternatives could then be computed and sent back to the farmer. It may be that more farmers will avail themselves of these services in the future, and the most successful managers may be those who are most skillful in adapting the results to their operations.

**Input Suppliers.** As nonfarm firms find increasing markets for their products as inputs of farm firms they have increasing incentive to test the performance of their products under farm conditions and to communicate this information to farmers. This technological information, as well as other information, counsel, and services provided by suppliers, is a form of managerial service that will be available to farmers. Also, beyond a certain point in the complexity of machines, the manager may increasingly look to the manufacturers or outside service men to keep the machines maintained and operating properly.

**Public Agencies.** Public agencies such as the agricultural colleges and the USDA will likely continue to serve as important sources of technological information through their programs of basic and applied research and experimentation. Farm management workers can provide analyses of the impacts of new technology, resource combinations, enterprise combinations, scale, vertical integration, and government programs. Outlook information and analyses will also be an important service to farmers.

Extension workers, in addition to providing information to farmers, can provide motivation, assist in goal formulation, suggest alternatives for consideration, and help managers see the consequences of errors. In addition, they can assist farm operators in improving their managerial ability through individual consultation, group meetings, and particularly through the kinds of sequential management training schools now being conducted by farm management specialists in several states.

**Summing up the Supply of Management.** Within limits, I suspect that there is a fairly wide range of persons who have the potential ability -- with training and experience -- to serve effectively in managerial positions on farms. I believe that a sufficient
number of persons with adequate potential will remain in or be attracted into farming in the decade and a half ahead.

Thus, with the off-farm managerial services that will be available and the possibilities for developing the managerial potential of present and prospective managers, I believe the supply of managerial resources available to farm firms during the next 15 years will be adequate to meet the needs.

The Challenge of Management

During the next 15 years we need a managerial revolution in agriculture to match the technological revolution of the past 15 years. Some students of management of nonfarm industrial firms believe that changes in techniques of management have done more to revolutionize American industry during the last 15 years than engineering changes. I do not believe this has been the case in agriculture, but I believe that such changes are possible.

I have great confidence in the improvability of the human resource, including improvement in man's behavior in his role as a manager. Improvements in managerial performance could lead to increases in efficiency of all resources used in agriculture, and to more satisfying lives for farm families.

Very briefly, some of the managerial research now needed is as follows:

1. We need to know more about the supply functions for various qualities of farm managerial talent. Effects of migration on the management supply should be included in such research.

2. It would be useful to know more about how operators of different sizes and types of farms divide their time among managing, supervising, laboring, and other activities.

3. Research is badly needed to develop techniques and instruments for measuring and predicting managerial performance. Some of such research is now underway in a North Central regional project and elsewhere, but more is needed.

4. All of us have observed farm businesses get badly out of balance because of rapid and drastic changes in size and organization. We ought to do more work on the change process -- how it occurs, how it can be fostered or speeded up where needed, and how educationalists can be of greatest service to individuals or groups who face the need for large and frequent change.

5. We could be of greater help to managers if we knew more about the forces related to motivation, and how to help managers get and stay motivated.
6. Probably most important of all, we need to do research that will lead to improved managerial processes which can be taught to managers. In order to do this effectively we need to learn more about human and other limitations on man's abilities to carry out management processes, even while acknowledging that man's abilities can continue to increase through time. Then we need to formulate and test hypotheses regarding improved processes — processes which hopefully may take account of individual differences in such things as age, experience, capabilities, and personality. Development and teaching of improved managerial processes would do much to help managers cope with the problems of management which will become more complex between now and 1980.
As I studied your conference agenda, I noticed that your committee very wisely planned for a division of labor. As I discuss the implications of economic changes for educators, my task is to show how these changes affect the farm family phase of the extension service program. Of course, this is only one phase of the program. Since different phases compete for resources while giving mutual support, it is hard to talk about only one phase of the program without some overlap. However, I shall try.

I also detect from the emphasis in your program that this conference is especially interested in the larger, more sophisticated farmers. I believe that this is a significant problem that deserves our time, and I will do my best to fit in with this objective. At the same time, I want to record that this is not the largest group of farmers, and that we could hold an equally challenging conference on meeting the educational needs of farmers who fall below your target group in size of operation and income. In Illinois we are concerned about meeting the needs of these smaller and less well capitalized farmers and we are designing programs specifically aimed at them.

As we consider extension's mission to reach commercial farmers, two questions come to mind:

1. What are some of the more significant needs of intelligent commercial farmers?
2. What is the situation today in which they seek information?

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**Significant Needs of Commercial Farmers**

Without trying to recount all of their needs, a few seem to be increasingly important.

1. Each individual farmer needs specialized knowledge tailored to his specific type of farming. This information might draw upon a wide range of subject matter, and get into such fine points as choosing the best alternative from among several good practices. There may also be problems of fitting technology into mutually supporting systems. Capital requirements and risk considerations also play an increasingly important role.

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* Director of the Cooperative Extension Service, University of Illinois.
2. Although commercial farmers have already exhibited considerable business competence, they increasingly need to have an excellent understanding of executive management and decision making principles and how to handle data and decision-making tools and techniques. These needs seem to have special implications for the extension service.

3. Commercial farmers need to understand the agricultural industry as a whole and the relation of the industry to the general economy. Especially must they understand what is going on in related industries, both in markets and services, and constantly assess the meaning of these developments in general economic terms and as they effect their industry.

4. They need data from the firm itself on which to base decisions. They need more cost accounting so they can use input-output data to make decisions. Lack of this data seriously hampers the whole decision making process. This area is poorly developed in the midwest.

5. They apparently need more study on the relevant ways to price and move products to the consumer. It seems that some of these farmers may not display Adam Smith buttons as prominently as they once did, and that they want to study and explore some adaptations of the present system to be sure it is the best one. I'm not saying that this group believes they do not have the best system, but younger men coming into the industry want to think it through again and try all relevant approaches that might improve it. This is a great educational challenge to extension.

6. These commercial farmers need to understand essentially all there is to know that affect their operation. They are willing to study nutrition, physiology, and reproduction in a basic as well as in an applied sense. These needs add increasingly higher levels to the Extension educational program and permit new methods to be used.

Relevant Changes in the Educational Climate

A few things stand out when we assess the climate in which extension will be carrying out its programs toward this group in the future.

1. The increasing capability of this group to learn through independent reading and study, and to apply this knowledge.

2. The increasing use by industry of an educational approach to sales and service and the associated increase in agriculturally trained personnel being employed. This will permit extension to reduce its efforts in certain fields and to move still further in its unique role.
3. The significant increase in government aid to education that Congress has passed or is considering and the associated growth in extension work by other institutions and other parts of the land-grant university that is likely to result. This is an exciting development that will permit the land-grant universities to develop more fully in other parts of their institutions the same concept as historically has been confined to agriculture and home economics.

4. The growth in number of educational institutions in the various states as they try to meet more diverse educational needs and more students. I refer not only to higher education centers, but to technical, vocational, and junior colleges as well. These developments give local people easy access to many types of information.

5. The changing character and location of research. It appears likely that experiment stations in the future will conduct less research of an immediate problem solving character. This has implications for extension in many ways. We will probably define as extension some types of work historically defined as research, and extension will have to search still more widely to discover reliable knowledge for its program.

These things show that extension is operating in a very dynamic situation, and that many forces are at work that have a bearing on its mission and the ways to perform it. This means that extension must continue to seek its unique role. As extension stopped culling chickens when others were able to do it, so it must continue its philosophy of helping others to develop the skills and techniques and services that modern farming needs today. While it must continue its interest in action, it should continually pull back toward its educational mission as others become capable of fulfilling the action roles that Extension perhaps found it necessary to pioneer.

The extension service is a unique United States invention, and it still brings many unique capabilities to its mission. I see them as:

1. Experience in the use of informal education methods which include techniques not simply to impart knowledge, but also to encourage its application.

2. A field staff in each county and a state staff at the university that is more highly educated than at any previous time in history.

3. Access to reservoirs of knowledge at the university and the U.S. Department of Agriculture.

4. Support from and liaison with agencies at the federal, state, and local levels. This places extension in a critical role with respect to working with counties in planning for community betterment.

5. A local program development process that maintains flexibility and gives priority to pressing local problems.

6. A reputation as a reliable and objective source of information.

7. A scope of concern that is broad enough to treat the farm as a unit plus
the relevant aspects of its setting. This fact is increasingly important as sources of information become more fragmented.

The Mission of Cooperative Extension as it Relates to Commercial Farmers

If these are reasonable assumptions about some outstanding commercial farmer needs and the climate in which we operate, and if this is a reasonable assessment of extension's unique capabilities to contribute, what then should extension be doing to meet the emerging needs? That is, can we be more definite about its mission? How does this unique "education for action" role find expression in the changing situation? I have expressed the philosophy that while extension is interested in changes and willing to provide some services to help bring them about, it should help other sources develop these services so that it can move on to other things. Extension's role with farmers relates directly to these unique organization and function factors. Ultimately, the unique role rests in, (1) its objective posture, (2) its coordinating capabilities, and, (3) its role as an adult education agency at the university level that conducts educational programs in depth over a wide range of subject matter.

A relevant question that relates to extension's mission with commercial farmers seems to be, "What do such farmers need to know to make their own decisions, as contrasted with what they should look to others for?" I have stated that commercial farmers are highly motivated to learn. The question is where their limited time for this function can be placed. We try to deal with this question in the program planning process. Obviously, it is a highly personal matter. For example, should a farmer try to know all he needs to know to select his own fertilization program, or should he in the future simply buy this service from a group of experts? Those who argue this point say that the human body is so complicated that the normal individual cannot know enough to administer its needs. Therefore, we must rely on experts for diagnosis and treatment.

Some argue that we are reaching this point in certain phases of commercial farming. Whether you accept this point of view or not, we must plan information to meet the various needs of farmers. What kinds of information enough commercial farmers what to know so that extension can afford to direct a program toward meeting their needs? Is the importance increasing of different types of decisions such as those relating to financing? Which types of information are least available from other sources?

An associated problem, as extension considers its mission, is what it is doing today that service industries can acceptably perform in the future. For example, Illinois recently stopped its regular soil lab supervising service on the basis that extension will work with any laboratory to maintain quality control, but that its educational interest begins after the test is made. We believe adequate soil testing facilities exist in our state. Farm accounting may be a likely candidate for similar treatment by many universities in the near future.
In order to discuss methods and organization and staff roles, I must make some assumptions about the extension mission in light of all these situations. I would like to suggest eight significant needs with which extension must continue to concern itself. All of these relate to the commercial farmer and the setting in which he lives and operates.

1. Commercial producers need a top job of education, including emphasis on buying and selling problems. Local extension councils are asking for more programs in grain and livestock marketing. The demand for technical production information is also increasing. Farm advisers in our state report more traffic in their offices than ever before.

2. Younger families, especially, need a strong program in management and decision making. This seems to be a unique role of extension.

3. Communities need a resource development program to help them work toward economic growth and civic improvement and to coordinate the services of various levels of government and other service organizations. This is important to commercial farmers.

4. People need expanded programs in public affairs to help them understand the economic and social climate in which they live and the issues which affect them. This must involve programs aimed at increasing economic literacy.

5. Families need a program in living that deals with their urgent concerns. Such a program will adapt family-living and home economies subject matter to the needs of families at various economic and social levels. Work in urban counties should be oriented to those important local problems that Cooperative Extension is capable of handling. For the wives of commercial farmers the program must go beyond the traditional programs in foods, clothing, etc.

6. Young people need continued strong emphasis on 4-H and other extension youth programs that emphasize both "learning by doing" projects and the development of skills and knowledge necessary to cope with modern problems in living and earning a living.

7. Farmers need an effective program with agriculture beyond the farm, including both the service and marketing industries. This is an important role both in reaching farmers through these groups and performing extension's continuing education mission.

8. Extension needs to represent the university in non-metropolitan communities to give them more access to the resources of the land-grant system.
Educational Methods

Earlier sections have given several clues to changes in program methods that are rapidly occurring in extension and seem unquestionably in the right direction. Several are significant.

1. Audience stratification. Cooperative extension can no longer work with farmers as a group on technical and business problems. Extension needs to sort out the more intelligent farmers and teach at their level. There must be more information at higher levels for them.

2. Intensity and depth of teaching. Farm operators today are willing to spend more time at learning if the information relates specifically to their needs and interests. This de-emphasizes recommendations and puts more emphasis on "why," so that farmers may be able to judge the relevancy of the information and the objectivity of the sources. This creates more formal extension programs with commercial farmers.

3. Packaging information to fit types of farming. This development is both possible and essential. Traditional subject matter-oriented programs are changing to client-oriented programs. Such changes require departmental information pre-packaging and coordination to fit the extension program. We foresee continued similar emphasis in future extension programs, especially those designed to reach the more commercialized farmers.

4. Increase in industry people providing technical service. One of the most dramatic developments in recent years has been the increase in numbers of industry people who are technically competent and whose job is to promote sales by providing technical service along with the product. Sometimes these people are not directly associated with sales, but the company tries to differentiate its product by offering this technical service. These men offer additional education to farmers and make it possible for extension to move continually toward more basic education. These people have added a significant dimension to extension's educational program. That is, cooperative extension now holds many types of educational programs for these representatives themselves, helping them to keep up-to-date on experiment station research and to continue their professional education. This seems to be in Extension's interest to do an effective job and perform most efficiently.

In Illinois we look upon these industry representatives as volunteer professors and welcome them as additional Extension workers. Commercial farmers in the state seem willing for us to work closely with them as long as we stay available as a point of reference. We have been surprised, because we assumed that the work of these many agricultural representatives would result in fewer calls at our offices for specific answers to questions. However, the opposite has occurred. More people are coming into the offices for such information than at any previous time. Apparently farmers look to extension as a place where they can reduce the confusion that at times results from many different sources of information.
5. New educational methods. Extension is able today to use new methods in carefully designed educational programs. One example includes new developments in the mass media. The Tele-lecture system makes it possible for us to tap people on the campus that we could never involve in our programs otherwise. We are able to use educational TV networks to add lectures to county programs as a substitute for personal appearances with appropriate follow-up on the part of the county staff. We have been experimenting in our state with developing learning kits as our approach to self-instruction in which the individual can have audio-visual aids and study materials in the kit which permit him to go as fast and as far as he wishes in independent learning. We are also experimenting with further use of direct mail with these new audiences.

Implications for Staff Roles and Structure

The County Office.

In the discussion of county extension office missions, a suggestion was made that the county office act as liaison between the community and the university. This will occur in varying degrees as the university determines. It would seem a reasonable prediction, however, that this role will increase as other schools and colleges of the land-grant university increase their educational efforts with partial support from federal funds. It seems unlikely that more than one system of field offices will be developed. It would appear to be a good bet that the cooperative extension field offices, or at least some of them, will need to assume this role of liaison between the university and the community in many states. Current trends seem to indicate this.

It also seems relevant, however, that it might not be necessary or wise to make a university center of each county office, because the more formal character of the university programs other than those of the Cooperative Extension Service may make it possible and even more efficient to perform this liaison role on a multi-county basis. Obviously, there would need to be more flexibility in staffing and there are implications for organizational structure. It is likely that these issues will need to be faced.

Staff Specialization in Multi-County Unit

This development, if it occurs, may tie in nicely with another trend that seems to be taking place within cooperative extension. I refer to the development of programs and staff specialization within a predetermined multi-county unit. I firmly believe that each county extension staff member should maintain a long suit in addition to his generalist's role. Added education is making this possible. Extension's program scope presently places stress on a single agent in a small county to keep on top of all relevant developments, to provide program leadership in the community, and to be knowledgeable enough for the specialized producers. New developments in community planning, including such areas as economic opportunity, where local community action is required before communities can participate adds to the stress. Agents also are
expected to perform many specialized roles in addition to teaching subject matter. Examples are organization and coordination of program and personnel, community development, and 4-H Club work.

It seems increasingly clear that cooperative extension is not going to be able to place in each county the size of staff to permit the specialization required to carry on a completely effective program. This all seems to forecast some sort of multi-county structure for the extension service. County offices would probably be maintained in such a multi-county structure, but staff specialization would be provided. In plan of work processes, the county units would first consider needs, and then multi-county programs would be developed where the job could be done more effectively on that basis. County personnel would carry specialized assignments and would take leadership in each major phase of the program throughout the multi-county area.

Some such model seems to fit in very well with the overall setting and needs today. Several similar experiments around the country seem to be working well. We will probably see this develop more rapidly as its potential becomes better understood. Various types of state and federal governmental program that require action on an area basis will hasten the development of this approach.

Since the field staff is by far the largest resource available to the extension service, it must be utilized to its potential. As more Extension field staff members complete their master's degrees, they become capable of teaching in their own right and will find their work most rewarding and their status enhanced by so doing.

State Extension Staff

State Extension staff members are also interested in this development. Since they generally have completed advanced educational programs, they are most interested in teaching at higher program levels. Too, as research becomes more basic, extension specialists need to be close to or a part of applied research. And, increasing work with industry places more demand on the specialist staff for continuing education that requires their participation. Increasing specialization at the local level makes state specialists more effective because they can then develop larger, more specialized programs.

Setting Priorities

We sometimes see questions raised in the press about extension's present capabilities to meet the needs of commercial farmers. In such a rapidly changing situation, the organization may lag in institutional adjustment, and secondly, the public may lag in recognizing the adjustment once it takes place. I suggest that we are experiencing the second lag at the present time, because I am convinced that extension was never stronger nor more respected by local people than it is today, including the more sophisticated phases of agriculture.
As the public becomes more diverse and the subject matter more complex, Extension must carefully develop programs with determined priorities, and this needs to continue as a fundamental extension principle. Extension directors, however, have to allocate resources because it has too many things to do and too few resources. It is clear that today we cannot give the public everything it wants. To try to do so would scatter the shots too widely and place too much strain on the organization. We must direct the extension program at significant needs of people. We need to limit our efforts so that we can do a quality job. The trend seems clear that cooperative extension will continue to be interested in action and the service needed to get action when such service is not available. But at the same time, extension will constantly seek to play its unique role as a part of an institution of higher education, and will make still greater use of formal teaching methods. The future seems to promise more specialization, more delineation of staff roles, more multi-county structures, more educational work with industry, a broader program scope, and many exciting developments in both program and audience.
I. Introduction

It is clear from the "base" papers and the program agenda that this paper should be directed to the role of university extension with business firms directly associated with agriculture, which in modern day agricultural college terminology are called agri-business. For the purpose of this paper such firms are defined as those supplying goods, and services to farmers for agricultural production and those firms involved in the many processes between the farmer and the consumer. Such firms represent a sizable share of the total economy. The value added by this industry is over $100 billion with the on-farm business firms adding only about $13 billion.

While this paper is directed primarily to such business firms, there is another dimension to non-agricultural extension with farm people that, from my point of view, must at least be mentioned. This refers to the educational needs of farm people which are unrelated to their vocation of farming. This point will be discussed briefly in the final section of this paper but the brevity with which it is handled should not be interpreted as an indication of its importance.

II. Extension Should Work With Non-Farm Agri-Business

There are at least three reasons why university extension has an obligation to work with agri-business.

A. Legal Mandate

The original Smith-Lever Act and all subsequent amendments have stressed that extension was to be concerned with subjects relating to agriculture and home economics with all the people -- not just farmers. There can be no denying that agri-business firms are related to agriculture. This concept was reinforced with the agricultural marketing act of 1946.

B. Operational Mandate

One of the primary and continuous responsibilities of the Cooperative Extension Service has been to disseminate new research findings of the experiment stations and of the USDA to farmers, businessmen, and consumers. In the current fiscal year, approximately $49 million is being spent by the USDA and by experiment stations for research primarily of concern to agri-business firms. In addition, billions are being spent by a number of fed-
eral agencies on research that has some bearing on the day to day operations of agri-business firms. This research is producing results which, if incorporated widely by industry, could change the present level of efficiency and gross product added to the economy.\(^1\) There is no question that the Cooperative Extension Service has a mandate to be active in dissemination of at least the research of the experiment stations and the USDA that is of use of agri-business.

C. **Assisting Farmers**

One of the missions of the Cooperative Extension Service has been to help farmers. This mission has been the main justification for appropriations and continues to be the primary stated mission of the majority of extension services and extension workers.\(^2\)

With this as an objective there are several reasons why extension has no alternative to working with agri-business. First, the entire process of production, processing, and distribution of food is a continuum which increasingly is highly interrelated. Vertical integration and contracting for marketing arrangements and for supplies and services intensify the continuum concept.

Inefficiency in any part of the non-farm agricultural continuum can defeat the purpose of extension work, either in terms of increased benefits to farmers or to consumers.

Second, much of the new technology must be made available to farmers via industry. New chemicals, semen for artificial insemination, and hybrid seed, to mention just a few examples, are purchased by farmers only through industrial production, promotion, and sales even though the basic technology might have been developed by a state experiment station or by the USDA. Extension, by working with industry on using new technology, can assure a more rapid availability and adoption of new technology.

Third, the performance and efficiency of the marketing system for farm products can vitally affect the future of the entire agricultural industry, particularly when non-farm produced substitutes are becoming increasingly available. Not only should the marketing system for farm products perform efficiently and reflect at least part of the benefits of efficiency to farmers and consumers, but also it must reflect consumer signals quickly and accurately. One of the major examples where the reflection of signals throughout the system has failed, to a large extent is the consumer demand for lean pork, and this undoubtedly is affecting the demand and hence production possibilities and income from the production of pork.

Many more reasons why extension has an obligation to work with non-farm agricultural business could be given. The above should suffice, however, to establish the point.

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\(^1\)One of the big national policy questions today is that of the desirability, of the need, and of the pinpointing of responsibility for disseminating research results from non-USDA-related projects.

\(^2\)I grant there are reasons to question the validity of this assumption by interpretation of the extension laws and particularly in terms of results, because of the inelasticity of demand for farm products which has caused much of the benefits of efficiency to accrue to consumers. In spite of all arguments to the contrary, I still accept a basic mission of extension being to help farmers and will argue that it has and that it continues to do so immensely. Let us by-pass this argument, however, and simply assume that a basic purpose is to help farmers.
III. The Need and Desire of Agri-Business for Extension Assistance

"Need" is a relative term. By virtue of several comparisons, however, there is a definite need on the part of agri-business firms for educational assistance. For several years the U.S. Department of Commerce has promoted a concept of industrial extension. Several series of Congressional hearings, plus considerable back-up material prepared by the U.S. Department of Commerce, have demonstrated conclusively that the civilian segment of the American economy is lagging behind several of our major competitors in domestic and world markets in the adoption of new technology; namely, West Germany and Japan. In these comparisons, agri-business firms have shown no better than an average rate of performance. The implications of this situation for our national economy are obvious.

Another measure of need is actual performance in relation to potential. A number of studies by our colleagues in other universities and in the USDA have shown that, on the average, agri-business firms are not performing as efficiently as they could. One of the possible implications of this is that neither farmers nor consumers are benefiting as much as they could.

The expressed desire of agri-business firms for extension assistance varies widely, and is in almost direct ratio to their exposure to extension programs which help the industry to solve some of its problems. There are examples in several states where extension has worked for many years with almost every firm in a particular agri-business industry. These firms are not only strong supporters of the entire extension effort, but would vigorously fight any extension administrator who tried to stop or curtail the program with the industry. It is also easy to find states in which a particular industry feels that the total economy would be better served if extension work was abolished. Invariably, when a firm or an entire industry is in trouble in a particular section of the country, it alternately begs extension for help and blames it for its present condition. Also, agri-business firms which have not had close exposure to extension tend to feel that extension should serve as a sales force for the their particular products, and if there should be a recommendation by extension which is interpreted as being detrimental to the firm's sales efforts, extension becomes the devil himself. Although this cannot be full documented, careful observation would indicate that the felt need on the part of agri-business and the actual use of agri-business of extension depends almost entirely on whether extension has directed, over a period of years, conscious efforts to assist that industry with its problems.

IV. Acceptance of Responsibility by Extension to Work with Agri-Business

In terms of policy, extension has unequivocally accepted the responsibility of serving agri-business firms. This was stated in the Scope Report\(^3\) and elaborated upon in "A Guide to Extension Programs of the Future."\(^4\)

The unanimous acceptance of this responsibility by all extension administrators came some 12 years after serious efforts were made by some directors to secure this stand. It was the passage of the Agricultural Market-


ing Act in 1946 and its subsequent interpretations by the USDA that caused the Extension Committee on Organization and Policy to establish a marketing sub-committee in 1946. This sub-committee soon recognized that much of the marketing work must be done with agri-business firms. This sub-committee made a number of reports to its parent committee, but it was not until the acceptance of the Scope Report in 1958 that the Federal Administrator of Extension was in a position to assert to the Secretary of Agriculture to the Congress, and to the country that extension has accepted the responsibility of working with agri-business firms. While the Agricultural Marketing Act limited its funds to providing educational programs with marketing firms, it brought an acceptance at the same time by extension administrators of the responsibility to work with those business firms providing supplies and services to farmers.

Since 1958 the marketing sub-committee and ECOP have reiterated several times the intention of extension to provide educational programs to agri-business firms. In 1965 it is safe to say that extension administrators and most extension workers accept this responsibility.

As would be expected, the actual initiation of significant educational programs with agri-business firms has lagged behind the acceptance of policy statements to this effect. There have been a number of reasons for this lag, the primary one being the shortage of resources. Since widespread acceptance of the responsibility to work with agri-business firms, extension has been able to add few new positions, and most of the additions have been for earmarked programs, such as the safe use of chemicals program approved by the last Congress. Most extension administrators feel they have never had sufficient resources to adequately serve farmers and most farm organizations have agreed. They maintain that a substantial program with new clientele will require additional funds. In spite of limited additional funds and inadequate staffing for traditional programs, there has been a significant increase in extension manpower devoted to working with agri-business. The increase in the last eight years is sharp and significant in absolute terms. This is indicated by statistics released in the past year by the Federal Extension Service which have been made available to all states. While there has been a significant increase in such activities, staffing is still low in relation to workload, in terms of the manpower required to do the job, and in relation to staffing for work with farmers. In view of the shifts which have occurred, in spite of restricted resources, one must conclude that extension has seriously tried to live up to the responsibility it accepted for working with agri-business firms.

The shift in resources which has occurred is even more significant in view of the environment in which most extension administrators operate. Until quite recently, most cooperative extension workers felt it was part of their responsibility to serve as guardians and promoters of farmers. They felt that in order to be effective with farmers they had to identify closely with their values. Perhaps even today, many farmers feel that business firms with which they deal are their mortal enemies. They feel that it is the business firms which cause their economic woes, and further, that the firms are deliberately
driving them to their knees. Extension workers tended to accept this same philosophy in the past. Many of the extension programs of the thirties, and in some instances, even later, were designed to help farmers make a minimum use of agri-business firms, examples being home mixing of feeds and fertilizers, and direct sales of products to consumers. It has been just as hard for extension leaders to bring about a change in this philosophy as that experienced by deans and department chairmen in getting faculty committees to change curricula, course content, and direction of research projects. While the attitude of some 15,000 cooperative extension workers is not uniform, the vast majority today accept agri-business for the role it plays, that it is legitimate in our economy, and that it contributes to the welfare of the farmer.

As would be expected, the transition from antagonism to actively assisting agri-business firms occurred by evolution.

It is logical that the first step was to work with industry to help farmers. A good example was the work with all phases of the fertilizer industry to get farmers to use adequate amounts of the right types of fertilizer. Since until recently, almost all farmers were using less than the optimum amount of fertilizer, extension and the industry could work happily together on this project with no thought of conflict of interest. This example could be duplicated in many other industries. To a considerable extent, the same situation applied to marketing firms. Extension workers cooperated with marketing firms in getting farmers to change practices which affected quality or seasonality of production. Again, there was often a complete harmony of interest.

The second stage of extension working with agri-business was and continues to be the efforts to help the business firms to solve their problems. Here extension is endeavoring to do with business exactly what it has endeavored to do with farmers. The business firms have problems relating to technology, economics, and management just as farmers do. The initial contacts with many business firms were in the area of simple technology, just as early extension workers worked with farmers on simple technology. Very quickly, however, extension workers moved into areas of economics and business management. 5

V. Some Pointers for Successful Extension Work with Agri-Business

There has been sufficient work in almost every state to indicate the way by which successful extension programs with agri-business can be mounted.

The most important point, by all odds, is using highly competent, specialized personnel. The most successful work with agri-business, in terms of results and acceptance, has been by highly trained state specialists. It is an exception when county staff members, with generalized training in agriculture, are able to effectively work with industry. It is not only a matter of professional competence, but also some remoteness from the local scene is important. Many business firms prefer not to have their serious problems known by a local person, who, in their mind, may have divided loyalties.

5 It is my opinion that the emphasis on technological assistance to business firms is being under emphasized.
Except in those instances in which the interest of farmers and agri-business firms are completely in harmony, the method of approach is important. The approach of asking a business firm to make a change to help farmers is successful only if such an approach is in the immediate and direct interest of the business firm. The approach which is invariably successful is that of helping the firm to solve its problems and to increase its net income.

The educational methods with agri-business firms, generally speaking, must be more sophisticated than those traditionally used with farmers, although this difference may be quickly disappearing as farmers become better trained and more sophisticated. More extensive use can be made of group methods and particularly those activities which provide training in depth, such as conferences, short courses, and non-credit courses. Written material, particularly when beamed to a specific audience, is more effective with agri-business than with farmers. The old "method and result" demonstration are extremely effective; but for the result demonstration to be effective it must be clearly understood by the business firms that this is the purpose, and this fact must be established in advance of the demonstration being conducted. There is not as much natural "filtering down" within industry as there is within the farming community.

While methods are somewhat different, there are two basic principles that extension learned in working with farmers that apply to work with agri-business firms; namely, using the problem solving approach and involving the people who must take action in program development.

Another principle which has been basic to work with farmers but which is even more basic to work with agri-business is staying with the information developed through research. Many county agents have been able to "fly by the seat of their pants" in advising farmers, and by so doing, have filled many voids in a satisfactory manner. Such an approach is quite dangerous in working with agri-business firms.

VI. Some Problems in Extension Work with Agri-Business

Some extension workers, after highly successful experiences in working through industry to influence farmers on matters such as using more fertilizer, have concluded that the way to do extension work with farmers is through industry. Extension must never sever its direct line of communication to farmers. It is desirable to reinforce the direct line, wherever possible, by working through industry. It is as likely, however, that it may not be in the interest of farmers to buy a particular product from a particular firm as it is in their interest to buy it. As farmers approach the optimum use of a particular input, the possibility of conflict between the interest of farmers and business becomes increasingly possible. Extension must thus maintain at all times a direct channel to farmers and to industry, and be in a position to advise each on their best interests, and at the same time, be in a position to advise against a possible course of action by either.
There is a possibility and even a probability that extension workers assisting industry will take the same attitude toward that industry that traditional agricultural agents have taken toward farmers; namely, that they can do no wrong. Recognizing that at any one time an extension service may have staff members who are primarily concerned with farmers, and others who are concerned primarily with industry, somebody in the organization must be in a position to continuously look at the total structure of the agricultural economy. Efficiencies and monopolistic tendencies must be identified, and alternatives for either farmers or industry to overcome these must be outlined. Extension is publicly supported, and in the final analysis, public interest must come first. It is perhaps too much to ask that one individual be concerned day in and day out with the interest of a particular group, and to some extent his effectiveness depending on being so identified, and at the same time to look at the over-all structure. This can be avoided for the service as a whole, however, by having some staff members who are free to look at a total situation and to let the chips fall where they may.

The extension administrators, seriously trying to serve farmers and agribusiness at the same time, must be prepared to deal with divergent views within the staff. I recall being chairman of a dairy committee some years ago, with the membership consisting of farm management specialists, economic marketing specialists, dairy production specialists, and dairy firm technology specialists. The divergence of views was astounding. Many hours were required of the administrator to bring views of the group together in planning for the future of the dairy industry.

VII. Non-Agricultural Extension Work with Farm and Rural Non-Farm People

The final paragraphs of this paper are totally unrelated to the preceding part. They do, however, inject a significant point of view. Many of the most significant educational needs of farm and rural non-farm people today are totally unrelated to the broad field of agriculture. Farm people have a major stake in the structure and efficiency of local government, particularly since most such units of government are financed solely through real estate taxes. They are concerned with formal educational opportunities for their children. They need to know how to be participating citizens in an effective manner. Within a generation, farmers in many states have become a small minority group, and they desperately need guidance on how a minority group can achieve its goals within a democratic society. The majority of young people on American farms will live and work in a society which is urban from both a physical and an attitudinal point of view. Increasingly, group action is required to achieve goals, and farmers with their tradition of rugged individualism are generally ill-equipped to organize for community action. Unfortunately, most of the rural areas of the country are cultural and artistic deserts.

One of the real tragedies has been the tendency to confine cooperative or agricultural extension to rural areas and general extension to on-campus and urban areas. Also, cooperative extension has generally been restricted to agricultural fields, while general extension has concentrated on non-
agricultural fields. There is no question that agriculture has a great contribution to make in urban areas. It is unfortunate that more consideration has not been given to the knowledge in colleges of agriculture in urban planning and urban community development activities. It is equally as tragic that non-agricultural subjects have not been made available to rural people. I am not trying to sell any particular organization, but it is imperative that the knowledge of the colleges of agriculture be made available to all people, and that the knowledge of other colleges, particularly in the arts and cultural areas, be made available to all people.

This final point could be discussed ad infinitum. I hope, however, these comments offered have made the point.
IMPLICATIONS FOR TEACHING PROGRAMS IN COLLEGES
OF AGRICULTURE OF STRUCTURAL CHANGES IN THE
ECONOMY OF THE COMMERCIAL FARM FIRM

by Carroll V. Hess*

Structural changes in the economy of the commercial farm firm have taken place simultaneously with structural changes in the off-farm segment of American agriculture. These structural changes must be viewed as complementary in nature. It would be difficult if not impossible to discuss the implications for teaching programs in colleges of agriculture of structural changes in the economy of commercial farm firms independent of the off-farm structural changes. Therefore, this discussion will also involve references to the off-farm segment of agriculture.

Structural Changes Influencing Educational Needs

The commercial farm operator has become a specialist in production and increasingly so as a commodity specialist. This development calls for improved and specialized knowledge of a technical and managerial nature. Also, as Breimeyer points out in his paper, more and more of today's farm management has moved off the farm, but not out of agriculture.\(^1\) It has shifted to absentee landlords residing nearby; to technical sales-service representatives of farm supply and commodity processing and distribution firms; to private and public credit agency representatives; to professional farm management counselling services; and not to be forgotten, publicly supported continuing education program specialists.

So, on one hand, the technical knowledge and the managerial requirements of the commercial farm operator may well have increased; but he has many managerial and technical assists available to him. The future competitive postition of individual farm operators might well depend as much upon his ability to screen and utilize the proper input mix of these technical and managerial assists as upon future farm price-cost relationships.

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\(^1\)Harold Breimyer, "The Farm Firm in the Structure of the Agriculture 'System'," pages 1-10 of this report.
Hence we observe in our modern day agriculture the development of a peculiar and strengthened interdependence between the commercial farm operator and the many off-farm related private firms and public educational agencies. The farmer of several decades ago was more "on his own." The complexity and dynamics of today's agriculture places a great many more persons on the farmer's team. This emerging environment calls for unique and different managerial and technical skills and competencies. Heady and Ball pointed out in their paper that tomorrow's farm operator will require a different mix and potency of managerial aids and technical knowledge. Also the proportion of this assistance that farm operators will require and request from publicly supported and private sources will differ. These changes have important implications for future educational emphasis for agricultural graduates returning to the farm or becoming part of the growing army of managerial and technical assistants.

Farm capital, apart from land, represents over two thirds of total farm inputs today. Some 1980 projections suggest that this proportion will increase to as much as 80 percent. This increased emphasis on capital places commercial supply firms in a position not only to merchandise and increased volume of capital inputs but makes them responsible for developing and distributing information materials. Thus, representatives of today's agriculturally related firms become more than mere salesmen of commodities or services. They become educators as well. Agricultural curricula must take note of this. Much of the newly introduced technology into farming today is of the labor-displacing, output-increasing type. The proper choice of kind and amount of technology often represents major capital commitments of an irreversible nature. The effects of various adopted technologies on the operator's managerial capacities are also important.

Several developments have important implications for teaching programs of colleges of agriculture. These include the combination of reduced farm numbers and the accompanying increased scale of operations and capital requirements; greater product specialization; greater specification production; growing importance of non-land capital inputs; strengthened market power of major farm supply, processing and distribution firms, and the vertical and horizontal integration effects on shifting or restructuring of the managerial function. The growth and proliferation of knowledge in agriculture combined with the changing managerial and technical needs of tomorrow's agriculture commit our colleges of agriculture to constant, critical reviews of their teaching programs. Our colleges of agriculture, because of their firm commitment to public service, must take the risk of leadership in developing appropriate teaching programs rather than sitting back comfortably and waiting until outside pressures force recognition of needs.


3Ibid., p. 13.
Implications for College of Agriculture Teaching Programs

The major purpose of this paper is to outline the breadth and content of educational programs which colleges of agriculture should be offering in response to changing educational needs associated with structural changes in commercial agriculture. Technician training, baccalaureate programs, and non-degree and degree post-baccalaureate professional improvement programs are discussed. Our agricultural colleges must understand their public commitment to serve the needs of a wealthy and affluent society characterized by changing tastes and preferences, advancing technology, increased reliance on capital goods, and a changing quantity and quality of natural and human resources. Combine with this an almost insatiable desire for more and more of the "good life," and you have some sense of the commitment that colleges of agriculture must feel to our society. Administrators and faculty, when considering educational needs in agriculture, must envision themselves in a broad economic development role. They must appreciate the important contribution that agriculture can make to the nation's economic development. For this reason, a premium must be placed on quality of agricultural training, and the emphasis must be such that agricultural graduates compete effectively in prospective employment markets.

Objectives of Collegiate Agricultural Teaching Programs

The first step in developing teaching programs is an assessment of the role of professional colleges in a university system. Essentially, their role is to provide an educational program that encompasses a general education in the natural and social sciences and the humanities as undergirding for curricula, courses, and teaching approaches oriented to a major field of professional agriculture. The development of major areas of professional agriculture. The development of major areas of professional specialization within agriculture should reflect a constant sensitivity to the changing educational requirements of the agricultural sector of our economy. College administrators and faculty must project the current trends in educational needs so that existing college programs will reflect the necessary wisdom and foresight. Otherwise, we are condoning a greater rate of educational obsolescence than can be afforded.

Since a curriculum or program is really a "plan of learning" it must incorporate courses and teaching methods which develop the student's understanding of relevant principles and concepts. A student must be able to formulate a generalization in his own words and be able to recognize illustrations of it and be able to use it in his own thinking and planning. A student must learn ways of carrying on inquiry and attacking problems. In any course, he should be expected to carry on intellectual activities characteristic of that discipline or field of science. Interdisciplinary or departmental senior seminars can contribute greatly to development of these traits and the ability to integrate the total educational exposure.
Effective agricultural curricula should provide opportunities for students to acquire abilities and understandings which are important and which cannot be effectively attained outside of college. The technical exposure can be reduced significantly if necessary, since this can be "picked up on the job" in many areas of employment. Also technical knowledge quickly becomes obsolete in this age of rapidly advancing technology. Principles and concepts are less likely to change. Therefore, greater emphasis should be placed on the principles and concepts upon which the student can build for the future self-education and future professional degrees. This kind of educational emphasis will not only reduce the obsolescence rate of a college education but will also prepare graduates for more efficient retraining through professional improvement programs.

All agricultural programs should encompass a general education in the natural and social sciences, humanities, and communications as a foundation for future professionalization in agricultural specialties. One should not be so concerned about training for the first job, or the subject matter that has immediate application. Instead, curricula should provide an educational exposure which will prepare the student with a life-long intellectual base. Too frequently the heavy emphasis on training for the first job is at the sacrifice of depth and breadth in other areas which are so essential to the student's general education and science foundation. The latter are essential to making agricultural graduates more competitive with graduates emphasizing business or liberal arts in their backgrounds. All courses should recognize the student's background in the basic sciences and mathematics and should be oriented toward some clear-cut educational objective. They should not only be interesting but challenging to the student. Too frequently, courses fail to recognize the improved educational base that students now receive in most high schools and, therefore, students are not challenged by many of the introductory courses.

The competitive labor market for professionals is growing more intense and at the same time is making greater demands on our graduates. In view of this, do our programs of study and our teaching methods instill in the student the inclination and motivation toward self discipline for continued study after graduation? As teachers we should scrutinize our courses and teaching approaches to insure that we are accomplishing this goal. We should ask ourselves, What are we trying to do to our students? How do we want them to be different as a result of taking our course?

Too frequently we hear faculty members remark that we should not stiffen up our curricular requirements or raise our grading standards or we may lose students. I think the question that needs to be asked is, What are the consequences if we do not? How many good students are we losing through nonchallenging, overlapping, obsolete, busy-work courses? How can we, without providing a foundation in mathematics and basic sciences, introduce the student to penetrating analyses in the applied professional courses offered at the upper division level? Professional courses with sufficient depth and breadth must be based upon a rigorous foundation in the fundamentals of the
disciplines involved. One way to insure this is to require a rather standard freshman core for all agricultural programs. This core could be modified slightly in the sophomore year to take cognizance of the slightly different fundamental requirements of different upper division professional areas of specialization. Professional programs should embody enough flexibility to permit structuring a graduate study preparatory program for those students so identified and so motivated.

Lest I be misunderstood, I am not arguing for necessarily raising college admission requirements. But, if our colleges of agriculture do not offer programs with sufficient depth and breadth of education as well as challenge, then our highly motivated, high ability, professionally-oriented student will either lose interest in college or transfer to another college or unit of the university where he will be challenged and stimulated. We can ill afford this in our colleges of agriculture. In the final analysis, the strength of a college depends upon the scholastic standards of its faculty and students.

Placement Patterns

A review of the placement patterns for baccalaureate degree agricultural graduates will provide insight into current and future educational needs. The results of a nation-wide study of over 3800 spring, 1964 baccalaureate graduates of colleges of agriculture showed that 57 percent were entering civilian employment, 29 percent were planning graduate or professional study and 14 percent were going into military service. If we assumed that the 14 percent going into military service, upon return to civilian life, would go into civilian employment or graduate or professional study in the same proportion as did their classmates, then we would find 67 percent going into civilian employment and 33 percent into graduate or professional study.

Of those entering civilian employment, an estimated 93 percent accepted positions related to their agricultural education. Of those planning graduate or professional study, 81 percent expected to enroll in their major agricultural fields.

The most popular occupation of those entering civilian employment was farm operation and farm management-related occupations (26 percent). Other major occupational categories, in order of frequency, were teaching, technical service and consulting, sales, extension work, and research and development. The results of a similar 1963 national study disclosed comparable placement patterns. 4


Farms and ranches were the largest single type of employer, followed by government and educational institutions. However, the several types of employers ordinarily designated as "business and industry," when combined become the largest category and represent one-third of the baccalaureate graduates.

The study revealed some rather interesting regional differences in placement patterns. Most important was the fact that 40 percent of the graduates of northeastern U.S. colleges planned graduate or professional study as compared to only 25 percent for the north central colleges. Percentages for the southern and western colleges were 27 and 28 percent, respectively. As expected, 96 of the graduates of the north central colleges who were entering civilian employment were going into agricultural employment, compared to 84 percent for the graduates of northeastern colleges. Comparable figures for the southern and western colleges were 90 and 96 percent, respectively.

These data represent replies from 47 of the 67 U.S. institutions offering instruction in agriculture and accounted for 83 percent of the total fall 1964 agricultural college enrollment. The replying institutions could not account for 16 percent of their graduates. One might suspect that a relatively high proportion of these graduates with "unknown" employment entered farming or non-farm businesses.

Information on agricultural baccalaureate graduates at the University of Minnesota entering civilian employment shows that more than 60 percent accept initial employment in some phase of business and industry; about 10 percent return to the farm; and the remaining 30 percent accept government employment in vocational agriculture, extension work, soil conservation service, college teaching, public credit, regulatory agencies, etc. By contrast, a decade ago, 60 to 70 percent of those entering civilian employment entered various federal, state and local government agencies. We anticipate the trend toward increased employment in business and industry to continue at Minnesota as more firms increase their employment of technical sales and service persons, management trainees, etc. The fact that technical and scientific position require more advanced study than previously explains the proportional reduction in placement of agricultural baccalaureate graduates in non-business oriented positions.

Supply-Demand Situation

An inventory of jobs available in 1963 to baccalaureate agriculture graduates for an 11 state north central area disclosed 3,152 positions.\(^6\) Sales and management in business and industry represented 32.9 percent of the number. Teaching vocational agriculture represented 10.5 percent, resource and community development and planning 12.1 percent, farming and herdsman positions 6.5 percent, county extension 5.3 percent, credit 4.7 percent, communications 5.5 percent, and other represented smaller percentages. The 3,152

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positions represent 2.2 jobs for each baccalaureate graduate that year when adjusted for those graduates planning to go into graduate study and for duplication of jobs in various states. Therefore, it will be necessary to draw upon graduates from the biological, physical, business, and commerce curriculums to meet these placement opportunities in agriculture.

Projected Demands

An estimate of future demand for bachelor degree agriculturists by the 12 North Central colleges in 1963, ranked agricultural industry, sales and management first, with agricultural education second, and agricultural extension and agricultural journalism much lower. This same study indicated the strongest demand for advanced degree graduates would most likely be in agricultural economics, with food science and bio-chemistry ranked next.

The above summaries of current placement patterns, projected demands, and expressions from industry people make two points amply clear:

(1) Our colleges of agriculture are failing to attract sufficient students to meet half the current demand in spite of the fact that these colleges are uniquely qualified to offer students an interdisciplinary approach to the application of the natural and social sciences to many of the agricultural science, business, and economic specializations.

(2) Demand will most likely increase as programs increasingly reflect sensitivity to proper educational emphasis and as revised programs are interpreted to agriculturally related businesses and public agencies.

Many agricultural industries are growing more conscious of their need for agricultural college-educated manpower. Some agricultural industries are projecting the number of college graduates on their payroll to double within 10 or 15 years. Competition among firms requires strengthening the training of their sales, technical, and management force. Also more and more firms are raising their standards to the level of a master's degree.

Dilemma of Student Enrollments and Manpower Needs

Why then hasn’t the market place, in the face of this strengthening demand for college trained agriculturists, attracted sufficient numbers of students to colleges of agriculture? I believe that there are a number of forces operating to explain this. First of all, the popular press version of farm surpluses, farm subsidies, Billy Sol Estes episodes, etc., has given agriculture a poor image. This is not improved by declining farm numbers, rising capital requirements, and declining operator incomes in many areas. All of these only serve to convince many high school seniors, particularly farm boys, to consider

\[7\text{Ibid.}, \text{p.} 2.\]
more favorably other occupational opportunities. Perhaps the most serious deterrent to increased enrollment is the general image that the main function of colleges of agriculture is to train students to become farmers. Little do they realize that less than one-fourth of present agricultural graduates return to the farm. This statistic is rather shocking to many farm parents and urban parents who are not aware of other promising professional areas open to agricultural graduates. Many agricultural college faculty members have not made any concerted effort to interest young men and women in going to college. Why? Are we ashamed to recruit? I do not believe we should be. In fact, I think we have a responsibility at least to make aspiring high school graduates aware of college of agriculture programs and career opportunities. It is shocking to realize that today only one of 10 vo-ag graduates enrolls in a college of agriculture.

But we should not think only of farm youths. Currently, over half of the students in colleges of agriculture in the United States are from non-farm homes. Many of our agricultural curricula prove very attractive to non-farm students. A few good examples are food sciences and technology, horticulture, agricultural and biological science, forestry, wildlife, conservation and resource and community development. In fact, many urban high schools with strong biological and physical science curricula will provide excellent foundations for most agricultural curricula. Farm experience is no longer a prerequisite to employment in many agricultural occupations.

Programs to Meet Changing Educational Needs

Baccalaureate Degree Programs

An important factor influencing agricultural enrollments is the image provided by our traditional production curricula, e.g., animal husbandry, dairy husbandry, agronomy, farm management, etc. These commodity-oriented curricula often give the erroneous impression that the programs are farm-oriented, lack a scientific base and are non-professional in nature. I think much could be gained by many colleges of agriculture if they would revise their traditional agricultural curricula along the lines of vocational or occupational areas. For example, after much soul searching at Minnesota, the College of Agriculture Curriculum Study Committee recommended and received faculty support, in principle, for five agricultural programs to replace our present 22 separate curricula and options. These programs are Agricultural Production and Industry, Agricultural Business Administration and Economics, Biological and Physical Sciences in Agriculture, Food Science and Industry, and Resource and Community Development.

The program titles themselves reflect a sensitivity to the need for developing programs to meet the growing needs of the business and food science areas, resource and community development, and graduate study preparation. It was considered important to give visibility to these areas.
Under the above proposal, a student would not be identified with a department until he had selected a specific area of specialization within one of the programs. He could delay this decision until the end of his sophomore year if he desired. In the meantime, the freshman and sophomore programs would emphasize a solid base in the supporting sciences (chemistry, biology, mathematics, physics, economics, accounting, etc.), and also meet many of the general education and college requirements in communications, humanities, and social sciences. Also, important to the student during these first two years is the opportunity to explore alternative career areas before committing himself to an area of professional specialization and assignment to a particular department.

A conscious effort was made in describing these five programs to insure an interdisciplinary approach in defining the objectives of each program and in outlining program requirements and recommended courses for various areas of specialization for each program. The latter step is now being taken by a faculty committee for each of the programs. It is hoped that these interdisciplinary program committees will develop programs more sensitive to agriculture's changing needs as suggested by the structural changes in agriculture.

The College of Agriculture Curriculum Committee at Minnesota is hopeful that departments will carefully scrutinize existing courses and examine the contribution of each course to revised program objectives. Some courses may be declared obsolete and dropped. Other courses may be collapsed and merged with closely related courses of other departments. In other instances, new courses will be necessary. The latter may be developed by single departments, or through the joint efforts of several departments or disciplines.

This is not to suggest that present departmental structure be modified; only that an interdepartmental or interdisciplinary approach be taken in formulating revised programs and courses. This is particularly true in the more applied subject matter areas which should emphasize the problem-solving approach. More serious consideration should be given in these areas to courses extending over several academic terms, with each course carrying more than the usual three credits. The "teacher team" approach is appropriate in these instances. Such deliberations may suggest some departmental realignments more effectively to attain new program and course objectives. Staff and administrators must be prepared to experiment with new teaching approaches and innovations. Individual instructors must continually search for improved instructional approaches adapted to their peculiar personality, temperament, and course objectives.

**Technician Training Programs**

If I may digress briefly, I think there is a need and a place for technician training in agriculture. But let us not place the technician-oriented student in the same courses with out collegiate, baccalaureate, professionally-
oriented students. The interests, motivation, and frequently the aptitude of these two groups are so different that intermingling in classes often creates serious incompatibilities. Instead, we should establish separate one or two-year terminal "technical certificate" or "associate degree" type programs, and if at all possible, offer separate courses for this program. If colleges of agriculture do not meet this need, then junior colleges will assume this responsibility. This development could be serious if the junior colleges lack the necessary laboratory facilities and qualified faculty. The other alternative is establishing separate vocational and technical institutes. I visualize this to be a desirable solution to meeting the technician needs in agriculture. Technicians, in support of scientists and engineers, can appreciably increase our total professional output.

Post Baccalaureate Programs

I seriously doubt if we can any longer consider the baccalaureate degree in most professional schools, particularly agricultural colleges, as purely a terminal degree. Instead, it must be increasingly thought of as a foundation for training practicing agricultural professionals, either through more advanced graduate study or five-year professional degrees in selected areas. This is already obvious in agricultural extension, vocational agriculture and those teaching vocational agriculture in junior colleges or vocational-technical schools, and natural resource management. The vast expansion in our fund of knowledge plus the growing complexity of problems require that a multitude of disciplines be brought to bear on most problems. This extends the period necessary properly to train our practicing professionals in agriculture. Thus graduate education is going to become a more important part of our agricultural college's function in the future.

One excellent example of this is the area of resource and community development. In addition to the fields of agricultural economics, agricultural engineering, soils, fishery and wildlife, and forestry, we must call on sociology, psychology, geography, and political science, to mention a few. Since the graduate from this resource and community development area will need to develop a specialty in order to be marketable upon graduation, if I may use that term, he will not be able to get the view of a multidisciplinarian in the usual time required for a baccalaureate degree. Most colleges of agriculture have faced up to this problem and are offering either a five-year professional baccalaureate degree or a master's program in these areas. Experience suggests that five-year professional programs offering only a baccalaureate degree lack sufficient appeal for most students, except where the field specifically recognizes it and rewards the graduates accordingly. In most cases where considerable work is required beyond the normal baccalaureate requirements and where this work is of graduate study quality, the student expects a master's degree. Colleges must face up to this reluctance toward five-year professional degrees. It is becoming obvious that colleges must either redesign their four year curriculum or fashion a genuine master's program in these areas.
The plan B (non-thesis, starred papers, and extra course credit) master's degree was introduced at many institutions as an expression of meeting the needs of practicing professionals without requiring conduct of research and writing a thesis.

This raises another important question. What about the baccalaureate graduate who has been "on the job" for 5, 10, 15, or more years and suddenly finds himself facing the prospect of either being satisfied with his present professional status and perhaps salary or pursue a professional improvement program of study? Pressures are mounting on our colleges of agriculture to develop professional improvement programs. Those expressing a need include county extension agents, vo-ag instructors, home economists, foresters, and professional workers in public educational, credit, and regulatory agencies as well as managerial, administrative, and technical personnel in agribusiness firms. The fields of elementary and secondary education, business, and engineering have long recognized the need for refresher-type courses and more recently for longer professional improvement programs.

There are essentially three groups of graduates who are in need of professional improvement:

1. The first group includes those who need only periodic refresher-type courses to become briefed on recent technological developments, up-to-date information, new operational techniques, etc. These might be served by short, intensive professional improvement courses in the form of workshops, clinics, conferences, seminars, etc.

2. The second group includes those who need slightly more educational exposure to gain more depth or breadth in selected areas of their undergraduate major or more breadth of a specific nature in a closely related field. For these students, the "special student" classification is often adequate to facilitate registering for regular courses. Usually the student is not pursuing another degree and the courses would not generally be recognized for graduate credit.

3. The third group includes those who need extensive retraining, either in their undergraduate major or a closely related field, or in a completely new area of study. Those who qualify
for admission to the graduate school might best enroll formally as candidates for advanced degrees. This could be done under the plan A master's, which is rather specific; the plan B master's, which is more flexible, or a special master's degree such as a master of agriculture, which could be a generalist-type degree. Those who cannot qualify for admission to the graduate school could enroll for professional improvement credits of some sort.

The special master's degree poses some difficult and knotty questions. Immediately the question arises, Isn't this a watered down master's degree? True, they are "professional" or "practitioner" degrees in contrast to the "academic" degree and usually have little or no component of original scholarly work such as research and thesis. Also, they correspond to the concept of training or instruction or sometimes, even indoctrination. Yet, very acceptable degrees of this type are being awarded regularly in a number of professional schools. Minnesota has a "master of agriculture" degree under consideration at the present time. I feel very strongly that we should pursue this effort more intently. I believe that such a degree is plausible even in an environment of research-oriented advanced degrees. Largely because of tradition many faculty members may find this position difficult to accept.

Typical of the comments concerning present master's programs by professionals seeking professional improvement are that the programs lack flexibility and are not broad enough --- or, the programs are too research-oriented. Pressures from past graduate, practicing professionals for postgraduate education to improve their competencies necessitate modifications in current educational programs. I think this need can be met without lowering standards. Other criteria must be developed to measure scholarship and mastery of a particular area. In many instances, different courses will be needed since the course objectives are different from those of academic degrees.

Those persons mentioned in groups two or three above who live within commuting distance of the university could easily enroll and attend classes either as regular daytime students or in the evening general extension-type programs. But many aspiring professionals live beyond a reasonable commuting distance. Also few out-state professional personnel employed on a 12 month basis can secure leaves for the purpose of professional improvement. Some arrangements must, therefore, be made to take the education to these professionals. Several alternatives exist. The university can either establish off-campus continuing education centers in the state or simply arrange to offer courses at certain locations at specified times. The student can enroll in these courses in the same manner as for on-campus courses. The course may or may not carry graduate credit. A policy of not rating these as graduate-level courses would be desirable where prerequisites were respected to prevent diluting graduate level courses with students lacking background. Teaching courses off-campus helps students obtain educational improvement, and if enrollment is large enough, according to the experience of a number of schools. Such courses can be offered very economically. Limited departmental resources at some institutions have restricted expansion of out-state courses below the desired offerings.
I sincerely believe that the university has a responsibility to serve the needs of the many qualified professional people who are in need of and are desirous of additional professional training. Consideration of these needs deserves high priority attention by college administrators. I would go so far as to recommend that limited appropriations be shifted from some resident instruction programs to support graduate professional improvement programs. Often the same course can be offered on-campus and out-state during the same school term. This practice makes for efficient use of course preparation time by faculty. This is currently being done at Minnesota.

Concluding Remarks

In conclusion, I would make several observations. Our administrators are becoming more sensitive to the need for developing professional improvement programs. On many campuses, faculty members are rediscovering the undergraduate. Some faculty members who once concentrated on basic research when it was fashionable are requesting opportunities to return to the undergraduate classroom. Many faculty members are becoming more concerned about what they teach and what is being taught in related courses. In other instances, administrators are beginning to ask their more matured and effective teachers to offer the introductory and lower division courses. Most colleges of agriculture have either just completed or are busily engaged in a critical review of their agricultural curricula, courses, and teaching methods. Also there is a renewed interest by many faculty members in occupational and academic advising of undergraduates.

These are healthy and most welcome signs in colleges of agriculture, particularly following an extended period of undergraduate neglect during the late forties and fifties, when there was a strong push for basic research and strengthened and expanded graduate programs. The dearth of graduate students in many areas made departments cognizant of the need to give greater attention to the quality of their undergraduate programs and to show greater concern for the undergraduate. Graduate programs simply ran out of qualified raw material. It was a choice between offering weaker advanced degrees, providing for the correction of considerable undergraduate deficiencies, or strengthening the undergraduate programs.

Some faculty are dedicating themselves to the cause of developing undergraduate academic programs attuned to progressive educational objectives, undergirded by a virile and effective academic and occupational advising system.
The secret to developing sound educational programs is to put the student first, the college and department traditions last. Let us set aside our professional jealousies, tear down the traditional college and departmental barriers, and jointly and objectively approach the task of developing teaching programs attuned to the age in which our graduates are going to devote their professional life. These programs must give the student the opportunity for effective learning and for developing his maximum capacity. They must provide a fundamental understanding of the basic physical, biological, and social sciences. They must give some of the broad educational experience offered by the university. And finally, they must provide the student with technical knowledge and principles required for a degree of specialization in some phase of agriculture. Society expects nothing short of this from those of us in a position to influence future educational programs of our colleges of agriculture.
IMPLICATIONS FOR EDUCATION: A DISCUSSION

Robert C. Clark*

Structural changes in commercial agriculture, which are deemed desirable, will be brought about most effectively through changing the interests, increasing the knowledge and skills of people associated with the farm firm. This conference group fully recognizes that education is the process by which such changes in people can most easily occur. It is the process that enables people voluntarily to make economical use of land, labor, capital, and management in a dynamic environment. The contributions of research and education are magnified as capital and management become increasingly important in bringing about changes in the farm firm.

Meeting the educational challenges facing farm and non-farm directed extension workers and resident teachers today, and in the years ahead, requires a high level of knowledge and skill. The explosion of knowledge is occurring at a rapid rate. Between 1750 and 1900 the world's knowledge doubled; it doubled again between 1900 and 1950, again between 1950 and 1960, and it is expected to double again by 1967. The proliferation of findings of research and published materials, about which professional people are expected to be able to interpret to others, places unusual demands on all of us engaged in the teaching profession.

A study of the excellent base papers 1 which have been prepared for this conference prompts me to emphasize five major implications for education. I am grateful to Director J. B. Claar and Professor Carroll V. Hess for sharing with me copies of their papers for review. The facts and viewpoints which they have presented to us are most challenging and, I am sure, will bring forth many questions and comments.

First, as I see it, the primary job of the extension worker and resident teacher of undergraduate and graduate students, and adults in a voluntary educational program, is to understand and interpret for his clientele the latest findings of research that have a bearing on solving the problems they face. This task is basically a two-fold function. First, an individual must master a body of subject matter. Second, he must develop the knowledge and skills of effective teaching. One without the other materially lessens the value of the educational process and the professional acceptance of the individual.

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1 Earl O. Heady and Gordon Ball, "Economic Growth of the Farm Firm and Projected Changes in Farming," beginning on page 11 of this report.
Harold F. Breimyer, "The Farm Firm in the Structure of the Agricultural System," beginning on page 1 of this report.
James Nielson, "Managerial Requirements of Farm Firms 1980," beginning on page 51 of this report.
Dr. Hess\textsuperscript{2} emphasized that point very effectively in discussing the importance of graduate study and in-service training as a means of keeping informed about the latest findings of research.

Many extension workers, and particularly those individuals in responsible leadership positions, are recognizing that graduate study and in-service training are important means of increasing the level of professional competency in subject-matter and teaching skills. In 1956, 15 percent of the total extension personnel held master's degrees and 2 percent held doctorate degrees. In 1962, 23 percent had earned a master's degree and 4 percent a doctorate degree. The number receiving advanced degrees has continued to increase each year. However, Extension will need to emphasize graduate study and in-service training more strongly in the future than in the past if the staff is to measure up professionally with the standards required of persons engaged in research and resident teaching.

Certainly the increased emphasis on professional competency will necessitate closer coordination of research, resident teaching, and extension than exists in many land-grant institutions at the present time. Such coordination should also bring about a closer working relationship between the theoreticians and the practitioners.

The second point that warrants further emphasis is in regard to a question raised by Heady and Ball;\textsuperscript{3} "Will the equivalent of today's county agent be replaced by a specialist at a level of training of a Ph.D.?" My judgment would be that two types of specialists with Ph.D. degrees will be required in the next 10 to 15 years. They will be so located as to serve a trade area, a commodity area, or multi-county unit rather than the traditional county as is usually the case at present.

This point was emphasized by Director Claar\textsuperscript{4} in his discussion of staff roles and structure in relation to the "development of multi-county programming and specialization of staff within a predetermined multi-county unit."

Increased specialization of the extension staff working most closely with the clientele will, in my opinion, be required in two major areas of work. One area will be technical subject matter related to problems of production, distribution, marketing, consumer buying, conservation of natural resources, business management, health, etc. Equally essential at the area or multi-county level will be persons highly trained as specialists in adult education and administration. Problems of staff organization and professional development, planning educational programs to draw on the total resources of the university, community organization resource developments, etc., will require a highly trained adult educator. The need for services of both types of specialists are more and more evident. There

\textsuperscript{2}Carroll V. Hess, "Implications for Teaching Programs in Colleges of Agriculture of Structural Changes in the Economy of the Commerical Farm Firm," beginning on page 95 of this report.

\textsuperscript{3}Heady and Ball, Op. Cit., p. 8.

\textsuperscript{4}J.B. Claar, "Farm Directed Extension," beginning on page 77 of this report.
is a definite trend toward increased professional competency through area staffing. Staff members so employed are either specialists or are expected to prepare themselves for specialized services. In my opinion this is a desirable trend.

If the land-grant institution desires to extend its resources to serve all the people of the state, e.g., the farm family, commercial agriculture, agri-business interests, persons engaged in the professions, and as laborers and civic leaders, certainly a more highly specialized staff working more closely with the clientele will be required. This point was emphasized by Dean Ratchford in his presentation.

Developing a better understanding and greater skill in using the process of logical reasoning is the third point that warrants emphasis. Such an understanding and skill is needed, to a greater degree than at present, by both the extension worker and the resident teacher. Professor Nielson refers to the functions or processes of management in his paper. Director Claar emphasizes the importance of management and decision making, particularly for younger families, and the need for reliable facts with which to reason. The researcher speaks of the scientific process as being synonymous with logical reasoning. If the professional staff person possesses this understanding and skill of logical decision making, it is assumed that he can and will teach his students to follow such a pattern of reasoning in solving their problems.

Developing a deeper respect for facts, what they are, how they are derived, and alternative uses to which they can be put are the tools we use in logical reasoning. Such thought processes require the ability to think for oneself as contrasted to simply executing the plans of others. It requires some active involvement of the teacher and extension agent in research projects in one's field of work rather than simply disseminating the findings and conclusions of others. It means more time and thought devoted to formulating objectives and goals and identifying and defining problems. It involves thinking through alternatives and reaching decisions based more on facts and carefully evaluated experiences and less emphasis on decisions that are politically expedient or personally advantageous.

Greater knowledge and skill in applying the process of logical reasoning in problem-solving can be developed through a solid foundation of graduate study and in-service training in technical subject-matter. Certainly we will agree that the research experience is invaluable in the development of logical thought processes. A study of the philosophy and principles of extension and adult education, principles of learning, methods of teaching, human relations, and administration can be equally valuable in helping the student examine facts and opinions from an analytical point of view. My argument is for greater emphasis on the theory and principles of our job as educator provided through formal study, with the "how we do it" emphasis being provided largely through in-service training. Dr. Hess emphasized this point repeatedly in referring to theory and principles as being basically important in a resident instruction program.
The fourth point is the value of more intensive training for the clientele. Director Claar emphasized this need at several points in his presentation. To stimulate interest and change attitudes of people is a difficult task. Assisting people in identifying and defining their problems on which information is desired is tedious and time consuming. Identifying relevant facts and ideas that relate to the solution of such problems is a task for the experts. The process of getting people to accept new ideas and methods of farming is a slow one.

The preceding papers emphasized the need for greater intensity and depth in our teaching, whether it be in the formal classroom or in the field. Enabling the students or the adult to judge the relevancy and objectivity of the sources of information being presented requires both an intensive and extensive approach to the subject. Needless to say, more time is required to develop such an understanding of relevant information than can be accomplished in one or two short meetings. More frequent and intensive training by extension is one effective means of diffusing research information to people who need it.

Specialists and agents who have seen fit to plan and conduct a series of meetings on a given subject or offer a fee course with credit have been enthusiastic about their experience. Such an intensive approach with a group definitely committed to the program helps in developing greater knowledge of the theory and principles as well as the "how" of the subject matter concerned. It is reasonable to expect that such an approach would make for more rapid adoption of new technology and the findings of research.

Extension, traditionally, has placed considerable emphasis on the process of involving people through committees, conferences, planning meetings, workshops, etc. In my opinion, more emphasis should be placed on the product of education, which is the subject matter concerned. Involvement of the individual is absolutely essential for effective learning. Too often we do not follow through with our greater responsibility of providing the knowledge with which people can think for themselves and solve their own problems. It is much easier to record and evaluate the process than it is to determine what people have learned and actually put to use as the result of extension's efforts.

The fifth and last point is giving the learners' interests and needs a high priority in planning educational programs. Professor Hess stated, "The secret to developing sound educational programs is to put the student first, the college and department traditions last." I would agree that the interests and needs of the resident students, as well as the adults are of major importance. However if the student is to extend his interests, expand his horizons, and add to his knowledge, he must be motivated to do so. Motivation and willingness to changes become increasingly important and difficult as a person becomes older.

How is such motivation brought about? It is usually accomplished by a well informed and highly motivated teacher, parent, or friend. A well organized curriculum of study also provides valuable support to the teacher. Department traditions and policies that are based on extensive experience and sound staff judgment, but are being constantly evaluated and changed as circumstances warrant, can and do support the students' interests.

I believe the learner is the objective of our educational system. The resident staff member and the extension worker should serve as the leader of thought, and guide in the program planning process and in problem solving if he is worthy of being called an educator. Professor Hess refers to this important role as one of educational leadership.
IMPLICATIONS FOR RESEARCH PROGRAMS OF
AGRICULTURAL EXPERIMENT STATIONS

by G. M Browning*

Information presented in the background papers emphasizes that major changes have already occurred in the economy of the commercial farm firm and that changes will continue to occur in the future, probably at an even more rapid rate than in the past.

My assignment is to consider the implication of past and future change in the commercial farm firm on research program of the agricultural experiment stations.

Need for Change

The agricultural experiment stations grew out of a recognition that farmers could not do their own research.

In the earlier years of a young and growing nation the urgent need was to produce food and fiber for the people.

The state stations and the U.S. Department of Agriculture responded to this need by directing most of the research effort to programs concerned with increasing agriculture's capacity to produce.

New technology, a product of research and development, has and will continue to play a vital role in the economic growth of our country.

It also has made possible a modern, efficient agriculture that stands as a tremendous resource to support hot or cold wars, to meet foreign policy needs, to assure continued economic growth, to supply our expanding population with more and better goods and services, and to keep us competitive in today's common markets and in tomorrow's free world markets.

New technology gives rise to complex economic and social problems because increased output is not immediately "digested" into the national economy.

Burdenome surpluses have been cited as evidence that we have too much research, too much technology, and too much efficiency.

Some say we should slow down or stop production research and limit the use of new technology. But how much is really enough?

Research can't be turned off and on like a water faucet.

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Many problems of safe, efficient use of our natural resources are yet unsolved and won't be solved unless we continue and expand production research.

Reversion to a "policy of inefficiency" will stagnate economic growth and create more economic and social problems than it will solve. To kill the "goose that laid the golden egg" is not the right answer.

But we do need to expand research to help rural and urban communities adjust to the complex economic and social problems that arise from cost-reducing and output-increasing production research.

We need more research to provide information that will help:

1. Facilitate the "digestion" of potential gains into general economic or industrial systems.

2. Lessen the short-run problems created by increased output.

3. Bring returns in agriculture to par with other industries.

4. Insure that gains from technology are realized quickly and fully by farm and city people.

5. Bring about a more efficient allocation of resources between the agricultural and non-agricultural sector of the economy.

6. Result in more efficient use of natural and human resources of agriculture in relation to demands for products.

7. Lead directly to policies or developments which improve the short-run income position of agriculture and restore long-run structural balance, in terms of resource returns, between agriculture and other industries.

8. Promote directly the improvement of marketing systems and the economic and social mechanisms through which farmers exchange products and resources.

9. Allow specification of more efficient or desired uses of natural or human resources of agriculture relative to the present demand for products and prospective needs of a progressive economy.

10. Result in increased demand for farm products through chemical, physical, biological, economic or other research which:

   a. Improves the quality, form or grade of agricultural products.
   b. Creates improved strains or kinds of products.
   c. Creates new industrial or other uses of existing products, or
   d. Expands outlets for existing or new agricultural products in foreign markets or through improved human nutrition and greater capital consumption in this country.
Obviously, this is not a complete list of all the needs. Assuming that these are significant problem, what is the total job that needs to be done? And what are the steps that should be taken to assure that the state stations and the Department of Agriculture, individually and collectively, develop programs commensurate with the needs.

As we focus the spotlight on the stations' program and consider the changes needed to best serve the people, we need to be conscious of the stations "public image" and the suggestions that are made to improve its usefulness.

Debate goes on as to whether the research programs of the state agricultural experiment stations are sensitive and respond adequately to current and future needs.

Are the stations really concerned and doing research that best serves the needs of the people?

Have we identified and obtained agreement on the most significant problems which should demand our efforts?

Are research resources being focused on areas of top priority?

Some say the research engine is "running wild" churning out technical progress faster than is needed or can be absorbed by the agricultural industry, the rural population, the nation, and the world.

Should less emphasis be placed on "production research" and more emphasis on research to develop new ways and means of adapting or adjusting rural America economically and socially to technological progress and economic development?

Should we be devoting more time to national and world affairs in which we find ourselves?

Others believe that America is fast using up its fund of knowledge on how to expand production, that we must redouble our efforts to prevent food shortages in 10 years, or to provide reserves and the potential to produce in the event of world crisis or prolonged drought.

These conflicting viewpoints are partly semantic, partly factual, and partly honest differences in evaluation.

Reconciliation of these differences and the development of a comprehensive cooperative, and coordinated program for agricultural research is a first order of business.
Factors Affecting Change

There is general agreement that the station's research programs have changed in the past and that they must continue to change in the future if the stations are to serve the role for which they were founded.

What are some of the factors that limit, impede, or facilitate the changes that are needed.

Traditionally, great autonomy is reserved to the individual departments and to the individual workers.

There is no question but that there is competition for resources between departments and between individual staff members within a department.

This is good. But when urgent problems arise it is difficult to re-allocate resources among departments or between individuals. There is also a tendency to continue low priority work for fear that support may be lost.

The departmental structure system tends to discourage an interdisciplinary team approach so essential for effective solution of many of today's complex problems. But this really may not be serious, because experience has shown that most staff members recognize and are convinced of the needs and merits of teaming up with scientists from other disciplines for effective solution of many of today's complex problems.

Generally, the most effective interdisciplinary work is done on a voluntary, informal basis.

If staff members want to work together they will, and if they don't nothing much can be done.

Administrators can do much to make this important activity more meaningful and productive with simple fiscal and reporting procedures.

If a staff with the necessary training and qualification is not available to undertake work of the type identified as urgent, change must wait until resignation makes replacement possible unless additional resources are available. Staff tenure must be respected.

But normal turnover in staff permits recruitment of personnel qualified to do a particular job.

Resistance may be encountered if the changes require moving resources from one department to another or even between individual staff members within a department. But such moves must be made if needed changes are to be made, and they become routine action if provided for in the goals and objectives of a long-time research plan.
Where sizeable investments have already gone into ongoing work and there is tangible evidence of a potential pay-off, the work probably should be completed before initiating new work of higher priority. This type of delay need be only temporary and not a serious deterrent to reaching long-time goals, unless the time is extended beyond the designated closing date. There is a tendency for this to happen, and it takes firm action to prevent it.

Resistance by pressure groups too often delays or prevents change. This can't always be avoided, but will be less of a problem if steps are taken to keep groups informed about the goals and objectives of the total program.

**A Comprehensive Plan**

Planning the development and coordination of research programs has been an important activity of the state agricultural experiment stations and the Department of Agriculture from the very beginning of their existence, more than 100 years ago.

It has been done many ways, many times, at many places, at many organization levels, by many groups, and for many purposes.

In scope it has involved parts or all of a station department, areas of work or the entire station program, and areas of work on a regional or national basis.

It has been done by individual states and by divisions of the Department of Agriculture working independently. It has been a state-federal cooperative effort.

It has been prompted by the need for program evaluation and development, for information to support requests to legislative groups for funds, administrators at various levels, and for many other reasons.

In total, considerable effort has gone into program planning, development, and coordination and has played an important role in helping to make the agricultural research program the success it is.

But much of the planning has been haphazard and on a piecemeal basis. It is not surprising that planning has been this way since the stations and the Department of Agriculture are legal entities unto themselves, with specific responsibilities and some limitation on use of funds and methods of budgeting.

The size and complexity of the agricultural research program has grown and today there is an urgent need for a comprehensive plan for agricultural research. It is a difficult task, but it can and must be done if we are to assure that available state, federal, and industry resources are used most effectively in providing information for the solution of urgent problems now and in the future.
Probably the greatest weakness in the past has been failure to

1. Identify the most urgent problems
2. Establish goals and priorities
3. Establish responsibilities for different phases of the program
4. Provide and organize arrangements and mechanisms for comprehensive and coordinated planning
5. Establish administrative and fiscal arrangements to implement action to achieve the goals

Each state station needs to develop a comprehensive plan to assure that it is meeting the needs of the people within its own state. The Department of Agriculture needs to do the same thing.

Separate plans cannot be made on a realistic basis without full knowledge of what is being done and what is planned in other state, federal, and industry programs. There must be provision for over-all comprehensive planning, for cooperation on programs, and for coordination.

Sound planning must be based on the best possible estimates of trends and population growth, economic activity, technology, yield, imports and exports, and the requirement of all the various uses competing for these resources.

More and more research is being done by private industry. Such effort is directed primarily to producing and selling a particular product at a profit. Some of the research that experiment stations have done in the past will more and more be done by private industry.

This frees public funds for research in areas of importance to society but which do not attract support from the private sector.

For example, support for research on problems such as plant-soil-water relationships, land use, conservation, water utilization, and economic and social problems depends on public funds.

A comprehensive plan must recognize the state, regional, and national aspects of the problem and provide for a cooperative, coordinated approach that will assure the most effective use of manpower and facilities.

We need to evaluate the competitive position in particular areas for producing crop and livestock products to determine the comparative advantages among regions.

We need to appraise, evaluate, and develop ways to open up the markets throughout the world. Such a development offers a partial solution to surplus problems at home and also help to relieve hunger and poverty in underdeveloped countries abroad.

We need to appraise our staff, our facilities, and the needs, and decide on the areas in which we should build strength.
We need to develop a research environment that will bring together the most competent, scientific talent, financial resources, and research equipment on a problem or a program basis.

Agricultural experiment stations are confronted today with problems of broad regional and national scope that require talents and facilities beyond the means of any one station.

In what areas of research should stations attempt to build strength?

A team approach that includes scientists from many disciplines is becoming increasingly important for the effective solution of today's complex problems.

To help assure that the best minds are focused on the problems and to avoid unnecessary duplication of effort and facilities, the establishment of "technical research committees" is needed to review, project, and plan programs necessary to solve the major problems of the future.

The quality and quantity of a research program are influenced in a large measure by the characteristics of the scientist, the problems on which he bases his project, and the environment in which he works.

A research worker must be willing to acknowledge his basic obligation to put the public interest ahead of partisan or personal interest.

A research worker must be alert to new developments and new needs. He will see a problem in his specialized area before it becomes obvious to the general public and make an appraisal of its potential importance.

The ability to choose wisely the area of investigation which offers largest promise of solving important problem is one of the most valuable attributes a research worker can possess.

What type of scientists and how many will we need? Well trained, imaginative and visionary scientists will be required to cope with the complex problems of the future.

Have our graduate training programs been updated to help do this?

New knowledge is being developed so fast that someone has said the "half-life" of a scientist is less than 10 years. Positive steps need to be taken that will provide greater opportunity and encouragement for scientists to "re-educate" themselves to keep abreast of the changing times.

There is a continuing need to develop better ways to measure the amount and kind of support available in terms of the quality of research achieved.
Each research project should be evaluated as to its potential contribution to the solution of present and future problems.

We need to estimate the nature of the agricultural industry during the next 10 to 20 years.

We need to estimate what agricultural production will be in various sections of the state and the country.

What will be the crucial problems? What priorities must be established to assure new information most likely to be required in the future?

We must determine the long-range objectives as the means of defining needed change and for building strong research programs.

Program evaluation serves as a basis for identifying the nature of programs and determining the needs and opportunities for improvement.

In recent years important steps have been taken to provide for over-all, long-range planning and coordination. At best, progress will be slow, but we need to keep at it.

No longer can we afford the luxury of not getting the greatest mileage possible from manpower and funds expended for research on the most urgent problems.

Research Classification

In recent years the state experiment stations have been sharply criticized for too much emphasis on "production research" and too little emphasis on "utilization, marketing, and economic and social research."

The term "production research" is firmly associated with departments whose work in earlier years was primarily oriented to improving productivity of land, plants, and animals.

Spurred on by consumer demand for a wider variety of better quality, wholesome, convenience foods, research in "production" departments has shifted more and more to studies on quality improvement of products, processing, and utilization.

For example, one of the major objectives of a North Central regional project is to learn how to influence, change, and improve the quality of beef carcasses. It is expected that results from these studies will establish basic genetic principles that beef cattle breeders and feeders can use to make changes that may be required as consumer demands change.
The dramatic change within the last five years from "fatty" to 'meaty' type marketed swine carcasses was possible largely because information was available from years of swine breeding and nutrition research.

To continue to classify studies such as these under "production research" as is commonly done, is not descriptive of what really is being done. This practice leads to public misunderstanding, and results in unjustified criticism and inadequate financial support for research to furnish information essential for continued economic growth.

This situation serves to emphasize the need for research classifications that are logical, descriptive, and in terms that are readily understood by everyone. Grouping of research activity into a few broad areas of work or programs generally has not been done. There is no single, best classification to serve all needs, but there is a growing recognition that this needs to be done.

Confusion will develop if many different groupings are used. Therefore, there should be a cooperative and coordinated effort to develop a uniform system that will be used by all groups - research, teaching, and extension.

Grouping research into areas of work or programs does not eliminate the need for individual project outlines, regional projects or line projects in the Department of Agriculture. They serve well the purpose for which they were intended and should be continued. There is wide difference of opinion on how projects should be organized. Some believe it best to have a few "Mother Hubbard" projects that allow leeway to go in any direction desired by the scientist or as suggested by the research results obtained. Others feel that projects should be narrow and specific. Some place between these extremes should be the goal. In general, there now are too many "fragmented" and "piece-meal" projects. Fewer, well-defined, well-organized, and adequately-financed projects will help make research more efficient and meaningful.

Research Mix

There is wide difference of opinion and no general agreement on "what should be the research mix among the various sciences and how should they be related."

The large number of areas requiring research makes it necessary to establish priorities and limit the use of scientific talent and resources to only as many programs as can be adequately supported with available resources.

Can we identify the most important problems using methods now available?

If present methods are inadequate can we develop new methods or guidelines that will help to determine the research mix that will produce the greatest benefits?
In recent years the social scientists have developed sophisticated techniques, methodology and procedures now used extensively by industry and others as an aid in decision making.

Modern computer science has opened up many possibilities not feasible previously.

In the physical sciences, and to a less extent in the biological sciences, response to a given set of conditions can be controlled and results predicted with reasonable accuracy.

Economic and social reactions depend on many uncontrolled factors making predictable results difficult and less accurate, given our present state of knowledge.

The problem of identifying the most significant problems is a difficult one, but I see no reason to believe that is isn't possible to improve on the "hit and miss" methods now being used. Some research has been done on this problem with encouraging results. More needs to be done.

To argue the merits of basic and applied research and the proper balance between them is academic and serves no useful purpose.

Both basic and applied research are required for the effective solution of most problems.

How much of each is needed can't be predetermined because it depends on the problem to be solved.

In general, we need to expand and strengthen basic research in order to build up a backlog of knowledge, to improve future technology, to retain highly competent staff, and to assure high quality training of future scientists and engineers.

**Pressure for Research**

Suggestions, requests, and pressure for research to solve a wide variety of problems come to the stations from many sources. Occasionally the pressure is for work on an entirely new problem, but more often it is for more effort on a particular problem, on an area of work, or for a shift in emphasis in the type of research being done.

Experiment stations have responded to pressures in the past, and they must continue to respond to pressures in the future if they are to serve the purpose for which they were established and if they expect public support for work that they are uniquely qualified to do.
The important consideration is: How can the stations make best use of the suggestions regardless of source to strengthen the present program to serve the people better?

Too often the experiment station responds to pressures for research on an individual basis. This is more likely to happen when an articulated long-range program plan is not available.

The net effect of responding to individual requests has been that limited resources have been spread over so many areas of work that there aren't enough resources available to adequately support work on the most significant problems.

The stations should not simply be reacting late to overripe needs with stop-gap information. They should be diagnosing the symptoms not yet even understood by the public and starting processes in motion to provide basic and applied information for solution.

Scientists should have insights into the needs well before the public recognizes or articulates them.

There never has been and probably never will be resources to support research to work on all of the problems. It isn't necessary or even desirable for a particular state to spread its limited resources over too wide a range of problems since there are other state, federal, and industry groups to help share the load.

Furthermore, the amount of pressure generated for research on a particular problem is not necessarily related to the needs for research that would bring the greatest benefit to all of society, or to even an important part of it.

How then do we avoid the pitfall of committing limited resources to work on lower priority problems?

I believe there is no sure way of even coming close to allocating the resources necessary to solve the most important problems until there is a well-planned, nationwide program.

This will mean putting low priority problems on the shelf, at least temporarily, a decrease in the effort on some work, and actually phasing out of work on the low priority problems. This is not easy to do, but it must be done to free resources for work on as many of the important problems as possible.

Unless and until we develop a comprehensive, long-time plan for developing research programs to meet the needs, it will not be possible to gain public understanding, acceptance, and public support.

Research is time consuming and expensive. It can't be turned on and off like a water faucet without serious loss of time and money.
Many of today's complex problems can be solved best by a team of highly trained specialists, working together in adequate facilities equipped with special types of equipment that often are quite expensive.

Research on which the results have regional or national application should be limited to a few well-supported locations, thus freeing resources for other important work.

Depending upon the nature of the problem to be studied, some research centers will be small while others will be large. Essential to their success is joint planning, beginning at the initial stages and including both state and federal representation by both scientists and administrators.

To assure that the information from these research centers will be put to use as soon as possible in the solution of applied problems, close working relations must be maintained with workers in the areas where the results are to be used.

Too often in the past, research centers became islands unto themselves mainly because there was not enough time and effort put into developing plans that provided for all phases of work necessary to assure maximum benefits.

Beyond the initial planning and development stages there must be joint responsibility by the cooperating groups at the technical and administrative level for maximum results.

For effective solution of many types of problems satellite locations will be required. These should be provided for in the initial comprehensive plan.

Programs that include several persons at different locations should have a research coordinator responsible for coordinating and integrating all technical work in the program and for liaison with administrators to assure that budgetary and similar needs are considered.

Pressures for research will continue to exceed resources available. We can best meet the important needs and in doing so return the greatest benefits if a comprehensive plan is available to guide us.

**Pay-off for Research**

The answer to the question, "What is the relative pay-off for various research activities?" is very important in evaluating current programs and determining future programs.

Different methods have been used to estimate the pay-off from research. A common one is the cost-benefit analysis using yield increases, greater efficiency, quality of products, or similar values to measure the benefits.
Evaluation using results from past experience can be done with reasonable accuracy when there are tangible benefits that can be measured.

But for most research it is not possible to project the end results or the benefits, with any degree of accuracy, at the time the research is initiated. If it could be done, in most cases there would be little reason for doing the research.

Sometimes benefits far exceed expectations. Other times the results have little or no immediate application. In still other cases the results are negative.

For example, negative results may be as valuable or more valuable than positive results if they show us things that won't work or suggest additional research which provides information necessary to solve the problem. Can the benefits of results of this type be evaluated?

An example of a problem in Wisconsin illustrates how impossible it is to visualize the potential benefits from research.

Several years ago cows grazing sweet clover pastures were dying from internal bleeding. Scientists at the university extracted and identified coumarin, the compound responsible for losses. Plant breeders developed a coumarin-free sweet clover that could be eaten without harm to cattle.

But by this time alfalfa had replaced sweet clover in the forage mixture. An evaluation of the research at this time and point would have shown that the problem had been solved, not directly by the results of the original research, but indirectly by technologies that grew out of a related research effort.

The conclusion might have been that there were no benefits from the original research. A more reasonable and likely conclusion was that a definite indirect benefit resulted from the research as originally proposed.

But this is only part of the story. The anticoagulating properties of coumarin became the essential ingredient in a product effective in controlling rats. The Wisconsin Research Foundation used the income from this development to support other research projects and graduate assistants. How would you calculate the benefits at this stage?

The biggest pay-off of all was the successful treatment of heart patients with a compound made possible by the original research, which demonstrated the anticoagulating properties of coumarin.

This illustrates that it is extremely difficult, if not impossible, to project benefits that may accrue from research before or at the time the work is initiated.

I know of no systematic, conscientious effort to develop methods to help quantify benefits from research or to set guidelines for what can be done or what can't be done.
The methods may not be as good as we would like them to be, but we must be willing to evaluate programs, establish priorities, develop comprehensive plans, and implement them.

Conclusions

Past and future changes in the commercial farm firm have important implications on the stations' research programs. There is no cut and dried formula to chart our course. The signs on the road are not very clear.

I hope there won't be too many detours, but there will and should be some, because many great discoveries come from unknown and unchartered paths. There will be stop signs, go signs and warning signs. We need to observe and profit by them.

And most important of all, we will need to build some new roads. But before deciding on the best route, engineers often explore and investigate a dozen or more possibilities.

We need to do this too, and we need to be serious about it. But once the route is clear and the blueprints are drawn, let's get the machinery rolling.

There probably won't be new money for new machines. But there is a lot of service in old machinery that is not being used to capacity or being used inefficiently in maintaining roads with little traffic.

Let's identify these roads and fit them into the over-all system and move ahead with an aggressive program geared to the most important problems.
One of the nation's leading magazines on business and industry, Fortune\(^1\), recently carried an article entitled "Harnessing the R and D Monster." Although the article was not directed specifically to research or development programs in farm related firms or agribusiness, it does indicate that commercial R and D is being closely watched, scrutinized, and questioned by top management. What comes out of this reappraisal of research in industry is certain to directly affect all aspects of agribusiness including farm firms.

Industry has become a major force in agricultural research in the last few decades. Recent estimates\(^2\) indicate that industry spends about $400 million annually for agricultural research. The federal and state governments, in comparison, spend together about $326 million annually.

According to the Fortune article evidence of management's concern or dissatisfaction with R and D is widespread. A number of companies are reducing as well as reorganizing R and D staffs. Symposia are also being held to find new and better ways to manage research. One of the nation's leading industrialists, former Board Chairman Charles Allen Thomas of Monsanto, reportedly feels that the nation's R and D "is now stumbling in a plethora of projects, sinking in a sea of money, and is being built on a quicksand of changing objectives."

We are convinced that R and D in agri-industry will not be curtailed. Fundamental research in the biological and physical sciences will continue at an increased pace, and applied research will undoubtedly become much more effective because of what we term the "systems approach." Some time ago we gave up thinking in terms of plant genetics alone or proper rates of nitrogen, phosphorus, and potassium and have directed our thinking at the total interaction of seed, plant population, soil moisture, pesticides, growth regulators, etc. Today our thoughts extend beyond the production of a particular crop to the systems of cropping, feeding, processing, and distribution. We are extending our horizons to the quality - yes, even the flavor - of farm products as they may be influenced at each stage in the production system.

\(^{1}\)Hubert Kay, "Harnessing the R and D Monster, Fortune, January 1965.
At International Minerals and Chemical Corporation we are nurturing science with a major expansion in facilities and staff while simultaneously developing our overall marketing program geared to the agriculture of the future. This expansion in R and D combined with imaginative, creative marketing and business outlook is designed and is expected to have a major impact on the company's business and profits. It should be clearly understood that R and D by itself will have little impact on the farm firm. But as one component of a forward looking corporate entity R and D can play a major role in a changing agriculture. Our immediate customer is the farmer, but our ultimate customer is everyone who eats. We as a company already are directly influencing farmer practices, preferences, and management. We expect through an expanding, dynamic technology to play an ever increasing role in the operation of the farm firm as it relates to consumer needs and demands for lower cost, better quality food and fiber.

The rapid development of scientific knowledge is making obsolete the so-called Edisonian system of research. This more or less blind approach to problem solving is giving way to sophisticated technology in industry as it has in agricultural research in universities and government laboratories. At IMC we are concentrating heavily in the life sciences. For many it will be a surprise if not somewhat of a shock to learn that a fertilizer company is actively pursuing research on messenger RNA and nucleic acid components. But we are working in molecular biology and we expect to increase our efforts along these lines. We believe that advances in molecular biology will have a major impact on the growth of crops and animals. New insights into plant and animal chemistry are certain to make much of present agriculture ultimately obsolete, and we expect to lead and profit by these changes.

By developing a capability in the forefront of life science research we expect to design new cultural techniques, new practices - new systems for maximizing energy fixation in the form of useful agricultural products.

Let us digress for a moment to discuss how this expansion in what some might even call fundamental research relates to federal or state experiment station programs. First, we see this expansion in our own business as supplementing and strengthening the research efforts of state or federal agencies, not as competition to them. Regardless of all of industry's efforts, we believe that the majority of the entirely new information inputs, 95 percent or higher, will evolve in research laboratories of universities and other public supported research centers. Most research in industry must be conducted indirectly, if not directly for a profit. This, in itself, will give specific direction to all company programs and limit the amount of money, time and effort devoted to probing in depth the unknown. With a highly competent scientific staff in the life sciences we expect not only to keep fully abreast of major scientific breakthroughs but to assist in putting these breakthroughs to work for the farmer. Other agriculturally oriented companies apparently are thinking along similar lines as evidenced by their recruitment programs. We do not want to offend industrial scientists or purists, but we feel that in industry we essentially will be engaged in a very, very, sophisticated development program. Putting it another way we will be expanding on and we will be applying the "basic" research supplied from academia. This approach by industry will call for even
The forceful and directed application or development of scientific inputs into useful products and processes for the farmer is already being felt at the farm level and in fact within some government agencies such as the extension service. As U.S. agriculture continues to "commercialize," these new inputs from agribusiness are in fact being demanded by the farmer. The fertilizer dealer now not only sells fertilizer but must advise on government programs, pest control, cultural practices, financing, etc. The systems approach to business farming is rapidly coming about. It is via this concept of a system that industrial R and D will have its greatest impact on the farm firm.

The systems concept is not new to industry. It has been used very successfully in the nation's space industry.

Segments of the concept have been used in some components of agriculture and agribusiness for many years, i.e., poultry production and pesticide sales. The technical inputs have been supplied by the supplier to the user—the farmer. It seems logical that more and more of the technical decisions made by farmers will be left to the experts—the suppliers who serve them. These technical inputs must be correct; they must be timely; they must be related and interpreted on a system basis.

We at IMC look at the progressive farmer of today and the farmer of tomorrow as an associate businessman in the chemical industry. After all, these men are producing proteins, fats, cellulosics, carbohydrates—all of which are processed chemicals. Furthermore, the proper use of chemical raw materials is the most important factor in the most efficient production of these processed chemicals. So they are running a chemical synthesis factory with their soil, and as complex and as uncontrolled as it may be it is a chemical plant. The goal of this chemical plant operator, the farmer, is not to grow a crop of lettuce, a herd of steers, etc., but to maximize his return on investment. And as a business man or plant operator he will strive to standardize production processes and to eliminate uncontrolled conditions from his operation. The farmer today is already looking for profit-making crop or animal production system of matched products, practices, and services that will minimize risk and assure him of greater, more consistent profits than he ever had before. It will be the role of industrial research in the life sciences, physical sciences, economics and marketing to insure that improved profit systems are always on the drawing boards.

The system concept to be operational must be broken down into sub-units or components. Actually, as a practical matter, we must look first at sub-systems and then at the overall complex.

We look at the total agricultural system as composed of three major sub-units or sub-systems:

Each of these units, of course, is complex in itself but tied together in a large bundle they will give us the overall "Farm System."

In industry, as previously explained, fundamental technical approaches and skills will be used in solving problems within each sub-unit. For example, I mentioned that research in molecular biology is part of our R and D program at IMC. But industrial research is mostly involved in working across components which essentially is the first element of the system approach. Research on salt tolerance and root penetration of fertilizer bands being conducted in our own laboratories is a good example of research in depth involving a combination of plant, soil, and water components. The development by Mr. Smith of what is now called a weather impact service to evaluate soil moisture conditions in all agricultural areas east of the Rocky Mountains is further evidence of advanced technology across two sub-groupings. There are many other industrially based examples in the field of pesticides, plant breeding, and the like. But it will, for the most part, be the universities and experiment stations who will supply the fundamentals and new knowledge necessary for major breakthroughs such as programming of crop or animal growth through manipulation of DNA or messenger RNA.

Another example of the systems approach or combination of sub-unit operation components can be found in a high yield soybean system that we are now aggressively developing. This is a total crop production system for the soybean farmer based on selected varieties, special fertilizers, pre-emergence chemical weed control, alteration of between row and within row plant spacing to insure maximum energy utilization, a special growth regulator to change the shape of the soybean plant and reduce lodging plus advanced computerized information on moisture supplies. This particular growth regulator, incidentally, is the product of research conducted by the Iowa Agriculture and Home Economics Experiment Station. We expect to develop or assist in developing similar systems for every major crop in every important agricultural area.

The soybean system is but one example, but it clearly represents the concept involved. The farmer of tomorrow will need to have these types of production decisions made for him. These particular decisions can be made by companies truly agriculturally oriented in the modern sense.

To successfully carry out this systems approach on a national or even world wide level is no easy or small task. In 1980 we expect that there will be less than one million high production farmers in the United States. A highly trained salesman with today's techniques could probably effectively serve 50 customers on a year round basis. For this level of operation the industry would need 20,000 college trained farm management specialists who were expert in every technical aspect of crop production. It is highly improbable that such men will ever be available. It is apparent that some other alternative must be found. This alternative is already being used -- it is electronic
Data processing equipment at the Skokie, Ill. headquarters of International Minerals & Chemical Corp. handles computerized weather impact programs as well as other programs affecting agribusiness and farm management.

Steam distillation apparatus determines volatile fatty acids in animal nutrition research at IMC.
Seed germination is tested under controlled light and temperature conditions in IMC's microbiological plant growth chamber.

Availability of phosphorus is compared in fertilizer compounds.

Leaf disk assay apparatus is used to test the effect of chemical compounds on tobacco leaves.
data transmission and processing. It is not too far-fetched to visualize expanding use of that alternative. When technically sound profitable production systems and inputs are available, economic and scientific data will be accumulated by the salesman and transmitted to a control data processing center. The computer print-out will go back to the salesman who will then take the results directly to his farmer customer. It is even conceivable that, as electronic communications are improved, data will be transmitted directly to and from the farmer. It goes without saying that much more research is needed to make such concepts operational. But remember, remarkable breakthroughs in data transmission and processing have already been made. We don't believe that we are dealing with any so-called anti-gravity device! In the future, from a central data processing headquarters, planting recommendations, pesticide recommendations, land use maps, etc. could flow routinely from supplier to user. Marketing information would be supplied as needed and danger signals identified whenever they arise. Modern farm service centers of tomorrow are not likely to be solely shopping centers with all items needed for farming such as seed, petroleum products, pesticides and fertilizers. They almost certainly will have the added input of technology as the basis of crop and animal production systems.

The systems approach also would seem to indicate that the role of the county agent will change, with extension agents being grouped into teams, with experts from all the agricultural disciplines.

Instead of a county agent, there might be a clinic of experts covering a wider area, in greater depth. This systems approach would allow extension agents to use their specialized skills to the maximum and for the greater benefit of agriculture.

This system concept is certain to have a major impact on the farm firm and its manager in the next decade or two. In fact, the system concept is going to have a major impact on industry itself. The system will not function without sophisticated technological inputs. The companies that use this systems-service approach must be research conscious and maintain highly competent scientific staffs.

As the system concept continues to develop from a relatively simple cropping program, it's reasonable to expect that it will be expanded to the whole agricultural complex. Through computer techniques we will continually add variables that affect the operation of the farm firm. Distribution, processing, and marketing information will be routine inputs in addition to the variables of soil, herbicides, water, and energy now being employed. These will all be put together to define the specific overall agricultural system, not only for a single farm but perhaps for a given geographic area.

Essentially what we have predicted is technical selling and technical support with management guidance for maximum profit systems.

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Many of your are no doubt asking, Where does this leave the agricultural extension service-- the historical friend of the farmer?

The trends in industrial research and technology would certainly indicate that the future will bring great changes in the information component of the extension service. It wasn't but a half century ago that the farmer neither cared nor bothered about what was going on in the next county - it was less than a quarter century ago that he became concerned with production in neighboring or distant states. But to be successful today he must wrap his mind around events all over the world and interpret and relate those events in a meaningful fashion in terms of a farm complex that covers only one or two square miles.

Examples of such needed advance interpretations are the impact of Puerto Rican pineapples on Hawaiian farmers and African tobacco production on farmers in our South East. Foreign or distant production or policy changes seriously and rapidly affect all domestic producers. It would seem then that extension should be concerned with this kind of information. It would make itself aware of and keep domestic farmers informed of all of the foreign competition progress, problems, and reorientation. In other words, the "service" would assume some aspects of the G-2 system.

Likewise, the capital risks - the production risks - or rather the profit risks of the farmer will become more severe. Environmental factors such as moisture and temperature will be increasingly important. The service of the future, then, would conceivably be geared to supply this information as needed area by area to protect farmers from surprises and minimize losses. Information and guidance on capital supply and financial problems would have to be an integral part of this "agricultural operations service." In fact, the business or management aspects of the new "service" probably would be the most important item of its total program.

We must recognize, of course, that the present day extension service is performing certain aspects of these tasks. The farm management associations in the Corn Belt are but one example. But the signs seem to point to a complete modernization to support the food and fiber producers and suppliers in the total agricultural business. This change would probably call for the development of regional operational centers staffed with highly skilled technical, business-oriented personnel and equipped with modern data transmission and processing machines. When operational these centers would serve the entire agricultural business community -- the farm firm and the farm firm suppliers in a given economic area. Applied research programs involving the system or package concept would insure continued progress and serve as a source of problem feedback to both government and private research departments.

These thoughts should certainly not be considered as a completely defined set of recommendations. They are expressed as a reflection of the signs of the times in agriculture and of the views expressed by recognized agricultural economists, educators, and technologists. All of these signs and these views would indicate, it seems, that the concepts for regional centers touched on here deserve serious consideration.
Electronic data processing (EDP) has become a definite part of our economic life. *Business Week* estimates that $4 billion will be spent on computers and EDP systems this year and no signs of slowdown are indicated. Not too long ago a comment was observed in a newspaper editorial that went something like this: "At the rate computers are being adapted, we can visualize in the not too distant future, junk yards of obsolete computers the same as we now have unsightly junk yards of old and obsolete automobiles." This comment, although intended to be somewhat facetious, however, is reinforced by the fact that the first UNIVAC was recently placed in the Smithsonian Institute as an antique.

In this paper the following assumptions are made concerning future developments in EDP technology:

1. There will be a continued and probably accelerated development of new electronic data processing hardware and processing techniques. The developments should greatly improve or provide new and better ways of manipulating data and transmitting data from source to processing facilities.

2. There will be a steady improvement of methods and techniques for facilitating communication between users and EDP facilities.

3. There will be a continuing reduction in the cost of data processing, particularly on the per unit of work basis. Also, it is assumed that initial overhead investment required to own or rent comparable amounts of processing capacities will continue to be reduced.

4. There will be widespread increase in the knowledge of EDP and its effective use by both farmers and the general public.

Any forecasts or estimates of the use of future EDP services in agriculture obviously becomes a hazardous pursuit. Nonetheless a greatly increases use of EDP in agriculture over the next 10 to 15 years appears to be a foregone conclusion. However, further growth in the effective use of EDP in agriculture will not come without forward planning and organization.

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From experience up to present we know that it takes trial and error, experimentation, and continuous perfecting of techniques. We know, too, that much training, knowledge, and judgment are required on the part of both the managers of agricultural firms and professional personnel involved in using EDP. However, compared to future developments the present stage of EDP use in agriculture may turn out to be as primitive as the very earliest of the Model T Ford was in comparison to the present-day Cadillac.

The advent of EDP technology -- along with simultaneous structural changes which are placing greater emphasis on management inputs -- offers a unique opportunity to the agricultural colleges in the country. (This might also be considered a responsibility.) It is well acknowledged that our agricultural colleges and the USDA have contributed immensely to the development and understanding of production technology in agriculture. Colleges have considered production technology to be their responsibility; they have taken active leadership; and they have gained tremendous public respect for their research and extension activities in this field.

However, this situation does not seem so clearly to exist in regard to management technology. But in the period ahead will the agricultural colleges and the USDA play the same role in regard to developing, testing, and implementing management technology in agriculture? With the past and prospective changes in agriculture, these public institutions well may find their main opportunity to contribute to agriculture and to the general economic progress of the nation through serving a leading role in management technology. Yet the colleges seem to be laggard in their responsibility and opportunity to point out the management revolution in agriculture and to assess potential of new managerial tools for farmers.

**Current Uses**

A major current use of EDP as an applied management tool in agriculture is in record keeping projects. Farm records are being processed in cooperation with college-operated projects at 15 locations around the country. Some of the processing locations are regional or multi-state operations. It is estimated that 35 state colleges are processing their farm records through one of these 15 EDP facilities. In addition, some colleges are also using EDP to analyze records kept with the traditional record book.

Over the years various techniques have been developed which utilize EDP for studying ways to improve farm management decision making. Of the techniques most used, linear programming has been outstanding. Many variations of programming have been developed to handle different types of questions and problems that have arisen.

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1Some shortcomings of mathematical programming have been solved or will be solved in the near future. Two common criticisms of the use of linear programming have been the linearity and divisibility assumptions. However, routines for integer and concave programming are now in practical use. As we use these "refined" programs, we may perhaps conclude that the non-integer and linear aspects of the older routines were not as inhibiting as once thought, but merely served to take focus off of some still unsolved problems.
Almost all the states have programmed a single farm situation here and there but only a few have worked directly with farmers in implementing farm reorganizations called for by solutions. One of the largest-scale operations to date is the Rapid Adjustment Program cooperatively sponsored by TVA and the colleges in the TVA region.

Likewise, in some instances, linear programming has been used to obtain least-cost or minimum-cost solutions. This aspect of linear programming is especially appropriate for many farm and agri-business problems. Managers of large-scale cattle feeding operations are much interested in this technique, and the Extension people at Texas A & M are specifically testing some least-cost rations with some feedlot operators in west Texas.\(^2\) Other examples of practical application by colleges of least-cost linear programming include work with poultry operations in the east in formulating minimum-cost rations and fertilizer plants in the midwest in determining least-cost specification fertilizer mixes. It is well known that various agri-business firms, such as feed companies and meat processors, are using linear programming to obtain least-cost blends.\(^3\)

**Future Possibilities**

Some possibilities for the near future are obvious for perfecting record processing and improving their usefulness. Increasing the promptness of return of record data is one avenue for improving the decision-making potential of records. This depends, however, on the farmer's promptness in reporting and having the processing system well organized. With present and prospective processing equipment it is possible to manipulate record data so that many different kinds of analyses could be prepared that were not within the realm of practicability in the past. Also, as the numbers of cooperating farmers increase it becomes possible to have more homogeneous groupings of farms in analysis reports. As farm size increases and farms become more specialized the homogeneous grouping becomes increasingly more important, especially with respect to resource and enterprise comparisons.

Such homogeneity would greatly improve the value of record analysis to the individual farmer for analyzing for possible adjustments. It would enable more relevant cost comparisons between farms on an intra-regional and inter-regional basis. Great advantages could be foreseen in having local and regional enterprise cost data available to the individual farmer to guide in operational cost control and long-run investment decisions. For example, prompt information on detailed production and marketing costs in poultry and beef feeding operations for competing locations would be most valuable to producers as well as the agri-business and marketing firms involved.


\(^3\)For example, I. Katzman "Solving Feed Problems Through Linear Programming" Journal of Farm Economics, May 1956 or Robert M. Finley et al "Minimum Cost Mixing for a Bulk Blending Fertilizer Plant" Station Bulletin 466, Nebraska Agricultural Experiment Station in cooperation with TVA, October 1961.
We have long had dreams of enterprise cost data being derived from farm record projects. However, these generally have not materialized. There appears to be a new hope that with EDP record systems we can obtain enterprise cost data from at least a relevant fraction of farm firms. In fact, several states are attempting to incorporate the enterprise cost studies with their farm financial records.

However, many farmers do not do this, and they may continue to feel that it is not worth the effort to record data by enterprises or sub-enterprises or lots within an enterprise. This is probably a correct decision for a considerable number of farms as currently operated. However, an increasing number of farm managers are finding this a worthwhile activity. Also, as large farms engage specialized personnel or accountants to help them in record keeping, it becomes more feasible to record data on a highly detailed enterprise basis.

A standard coding system for the United States would be another important method improving the usefulness of EDP record programs. Such a comprehensive coding system would be a real advantage to all those who make use of farm record data. With a standard code, many comparisons not now possible would be available. For example, types of farming could be easily compared. Many state lines are merely political lines and do not conform with type of farming areas, and often farms of the same type although located 1,000 or more miles apart are more similar than farms across the road. If all states used the same coding system then the extension and/or research worker could combine samples from several states and a more meaningful analysis would be forthcoming. Furthermore, communication among workers in different states and perhaps even different disciplines would increase. Warren Vincent in 1963 explained such a system in a scholarly article "A Proposed Coding System for Agricultural Research and Service Projects." Vincent has subsequently developed a proposed national code in connection with a project for the Federal Extension Service.

As we learn more about the intricacies of data storage and retrieval, some problems associated with heterogeneous coding systems will be overcome. The coding systems used by, say, Texas, Missouri, and Colorado could be read into storage, and if only coding numbers are different, then comparisons and analysis could be made almost as quickly as if a standard coding were in use. Inadequacies of the above would be apparent when not only coding is different, but when various code items are combined in one system and not others, or when code items are subdivided for one system and not others.

What are future prospects that any substantial use will be made by farms of linear programming and other decision-making techniques using EDP? There appears to be little question but that a high percentage of farmers would initially receive relatively large returns from an initial series of programming solutions. However, after a farmer has had one initial solution how soon will he be interested in another solution? Many farmers would be logically interested in an occasional recheck of optimum solutions from time to time.

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The advent of a new production technology, availability of new resources, or a change in the enterprise interest of the farmer could precipitate his seeking a new linear programming solution.

However, the frequency that complete re-programming might be worthwhile will be limited to the type of farming and the resources the farmer can employ. Then such non-EDP techniques as partial budgeting, simplified programming, and block budgeting may be more appropriate. There is much agreement that future prospects for applied use of linear programming will hinge upon the growth of understanding by farmers of these techniques and the availability of reasonably usable data for individual farms. From present observations of farmer's reactions to linear programming, farmers are much more interested and willing to use the technique than many professional farm management people anticipate. There seems to be a tendency by some economists to regard programming as almost as strictly a research technique and exhibit little imagination regarding its use in actual on-farm planning and decision-making. It appears that farmers do not need to know or do they want to know the complexities of the computing process. Generally, the farmer only indicates the choice of enterprise and coefficients of the program format; he has faith in the computational process. He is far more interested and concerned about the implementation of the resulting solution or solutions.

On the question of obtaining data for linear programming or any other form of budgeting, many believe that more accurate input-output data are required and that individual enterprise farm records are almost essential in order to have usable data. Certainly improved data from research and farm record projects are highly desirable, and we need to consistently work in that direction. However, the individual farmer undoubtedly is willing to accept the best data available as determined by the judgment of the farm management worker and himself. These judgments would, of course, be based upon research data, the farmer's own data, and synthesized data adapted to the enterprises under consideration. Detailed enterprise records on an individual farm are desirable and useful, but they do not provide data either (1) on enterprises not now in production on that farm, or (2) on new production technology or production systems which might be considered.

We may have almost completed a full circle in our thinking about the applied use of linear programming. A decade or so ago, the complete programming of many individual farms was thought to be a best use of the technique. Then, later, the philosophy appeared to be that of only programming a few case farms or representative farms which would serve as benchmarks for management recommendations. Now, if we assess the tenor of current thinking correctly, the trend is again toward complete programming of individual farms. This happening results not only from a shift in the thinking of farm management personnel but also from farmers' increased awareness of a need for more precise and complete budgeting. The structural changes projected in this conference indicate a growing uniqueness in the characteristics of the individual farm firms and in the magnitude of their management decisions.
If we cast our thoughts still further ahead we can see far-reaching effects of EDP in agriculture. Even at present, we could store complete farm records on the memory drums of a computer. We already store technique routines in this manner. Even on small computers when a certain routine such as multiple regression or linear programming is needed, a call signal is given through the typewriter or an instruction card and thus a step involved in introducing the routine deck (on tape) is eliminated. As memory storage becomes larger (and cheaper) we can put all entries of a record in memory storage. Thus, the result should not only speed up the operation but also much of the human error attendant with handling of decks or tapes will be eliminated. When a monthly, quarterly, or yearly summary of X farm is needed, an instruction card (tape) is used to recall specific data or measure for this and/or any prior year. Also combining relevant comparative or descriptive data from similar farms would be simplified.

Another innovation in EDP which is on the horizon is voice recording of data. This promises to have impact on our traditional coding and recording methods. We can envisage farmers having a tape or belt and a recorder by which they merely dictate their expenses, receipts, and other data for that day, or week. Then they would mail the tape or belt to the college. Or farmers could call in information directly to the computer for recording and storage.

Furthermore, to facilitate decision-making a basic programming matrix for a farm could be stored in memory. Uses of this are obvious; for example, a farmer could indicate a need for information concerning the purchase of, say, feeder cattle. The profit (or loss) as well as effects on the entire farm organization of such purchases could be quickly evaluated by calling forth the stored program. Another example could be where a farmer wishes to know the effects upon organization and income for this and subsequent years of the purchase of a new farm machine or an additional acreage. Communication could be made with the EDP center where his records and matrix were stored and a range of solutions could be requested. The range of solutions would be used to assess the alternatives using various discount rates, resource situations, weather patterns, prices, etc.

The possibility of simulation models should not be overlooked. Simulation holds promise of becoming an important management tool. An individual farmer might have a simulation model for his farm which would be continually perfected and updated. As more information and relationships of this farm and other competing farms were established they would be incorporated into his model. For example, a vegetable farmer, just prior to planting, could use a simulation model to appraise the consequences of growing certain vegetable crops singularly or in combination.

If forward planning is to become more accurate and hence more useful, our predictive models must be improved. With EDP, great quantities of data can be utilized conveniently and quickly. Hypotheses relating to price-making and weather factors can be tested and compared in far greater number than previously possible. A result should be more sophisticated forecasting models. It must be recognized, however, that we will always be working with historical data; still, certainly the predictions forthcoming should be improved assuming that some normal statistical logic underlies the past performances. With longer range forecasts of economic and weather conditions we may move from conditions of uncertainty towards those of risk.

When more accurate forecasts are possible, not only will farm planning be more accurate, but partial and general equilibrium studies will benefit. For example, for several years Fred Olson has been exploring and experimenting with the possibilities of projected equilibrium for cattle on a monthly or quarterly basis. He has recently formalized a model and presented an outline of such. This technique, which is applicable to other commodities, may hold considerable promise in improving decision-making.

Commodity demand and supply forces will be more accurately depicted and forecasts will enable researchers to delve more rigorously into problems concerning inter-regional competition, industry and firm structural changes, effects of product and/or technology changes, etc. Furthermore, such complex models could be placed in computer memory banks; they could be retrievable and alterable with relative simplicity.

As pointed out in previous papers, specification production of farm goods of standardized quality will appear more dominant in the future. The role of EDP can be important in such endeavors. In fact, EDP is already being used in one state to standardize quality, predict production, and aid in replacement practices of dairy cows. The cows are rated according to individual performance to the rest of the herd and other management information is recorded and summarized; this includes expected performance during the present lactation, breeding information, grain required based on milk records, mastitis tests, and many other management items. It is possible to maintain at low cost the individual card records on, say, each lot of feeder cattle or caged layer. With feeding and marketing coordinated the efficiency of the industry and firm will increase.

Also, in the future the need for expensive specialized machinery will expand. For some, this will be met by ownership of the machines, but for others the most profitable avenue will be to lease or custom hire a specialized machine, which may be idle 90 percent of the year on individual farms. The appropriate model using EDP can aid in making this decision.

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example, the cost of leasing machinery can be compared with the cost of owning machinery (the latter taking into account the alternative opportunities for using his capital resources which a farmer must pass up in order to buy machinery).

Emphasis upon machinery scheduling (matching machinery to farm jobs and evaluating the match for timeliness of operation) as well as machinery selection will receive increased attention of engineers and economists. Arriving at appropriate probabilities of weather conditions and machinery repair will demand continued attention. Some recent efforts along this line are encouraging and are amenable to EDP.

Although we believe that better input-output data and more accurate weather and economic forecasts will be soon forthcoming, what can we do in the meantime? We know usable answers can be obtained with use of the approximated and synthesized data which can be made available. Price and resource mapping have shown that farm organization are often relatively stable. A recent study at the University of Missouri has shown that certain input-output data could vary over wide ranges with but little change in a basic farm organization. However, as the size and complexity of farm businesses increase it may become more useful to have more precise information on production coefficients.

As we progress into extensive use of EDP in agriculture a key question looms concerning the financing of the operations. Some precedence has been established: e.g. in many states farmers pay all or part of the costs involved in the record projects. At present, several states are investigating the possibilities of offering certain EDP operations (primarily linear programming) on a fee basis. The extension service in one state has recently launched a project of this nature and is now receiving fees and computing solutions. A group of county agents are being trained for direct contact with farmers.

Also, some commercial agri-business firms have a growing interest in providing services such as linear programming. Some of these firms seemingly are interested in offering such services without cost to farmers who are regular customers. It is questionable, however, that in the near future the extra volume of supplies sold would furnish enough profit margin to carry the cost of linear programming of each individual farm.

8It is only on the corners of the production function or boundaries of the price (or resource) map that exact knowledge of input-output data is really necessary.
But for all the potential of EDP in agriculture, perhaps we overlook the most critical issue of all. Charles Beer\(^9\) has pointed out that "high speed computers may enable a group of progressive managers to bring about change more rapidly than society as a whole is ready to accept this change." Supporting this statement he indicates that large-scale operators are in a better position to take advantage of knowledge.

There is always a problem in becoming computer oriented rather than problem oriented in our research. We do need to know something about computers, the extent of which is an unsettled question. Ludwig Eisgruber\(^10\) has summarized the role of computers as follows: "... the researcher is challenged to examine carefully (a) whether certain computer applications enhance or impair his productivity, (b) which problems can be analyzed more effectively if the electronic tool is used, (c) which problems can be analyzed only if computers are used, (d) which organizational changes are needed because of the possibility of electronic computer application and (e) what skills are needed for effective work in computer utilizing research."

Use of computers should not allow us to become careless about model formation. As previously indicated there is always a temptation to become computer-oriented. In other words rather than the researcher determining the model with its attendant variables we may be tempted to "load up" the computer with all conceivable variables and let it sort out the relevant ones. While this approach has a certain appeal, it generally should be avoided. There will always be a degree of arbitrariness involved in variable selection, but this should be the domain of the researcher.

**Summary**

More information is now available for decision-making than at any other time in history. The basic problem is to organize such information into usable and meaningful framework in order to facilitate use. With advances in data processing we can foresee important possibilities for achieving more accurate and definitive farm planning. Mere faster and better methods of data manipulation do not transform inadequate data into adequate data. But EDP methods allow the more thorough testing of both hypotheses and data. Too often the gathering and organization of data have been considered the duty and responsibility of extension. Researchers must take a stronger cooperative role in data development if more meaningful analyses are to be forthcoming.

\(^9\)Charles Beer "Use of High Speed Computers for Farm Record Keeping and Data Collection-In Farm Management Extension Programs," *Journal of Farm Economics*, December 1963, p. 1209.

IMPLICATIONS FOR RESEARCH:
A DISCUSSION
by Earl W. Kehrberg*

My objective as discussant is one of drawing together from three very stimulating papers a few points from which to start group discussion. For this purpose it is not necessary for me to give a balanced and unbiased view of the papers since my objective is not one of presenting a review. The authors can reemphasize their most important points if I fail to mention them. I hope that what I leave unsaid may stimulate as much discussion as what I may say.

First, it is interesting to note that the authors of these papers could not discuss the implications of change in the economy of the commercial farm firm for research without also taking into account the other side of the coin. That is, research affects farm structure. Army and Smith incorporated the idea into the title of their paper, "Research and Development in Farm Related Firms--Its Impact on Agriculture." Early in his paper, Browning attributes new technology to research and also complex economic and social problems to new technology. Then he calls for research to solve a number of these problems that have arisen in agriculture. Lanpher and Finley likewise stress the role of colleges in developing, testing, and implementing management technology in agriculture. They also stress the impact that computers in the hands of progressive managers can make on changes in agricultural structure. The point is that we are discussing the impact of interaction of structural changes in the economy of the commercial farm firm with the organizational structure of our research and research services. This interaction is a dynamic process in which one change leads to another.

Browning calls for a comprehensive plan for development and coordination of research activity. By listing the failures of the past he infers that this plan should:

1. Identify problems
2. Establish goals
3. Establish responsibilities
4. Provide coordination and planning
5. Provide administration and financing

Browning, Army and Smith agree that private research will play a large role in the research of the future. The comprehensive plan is required to bring about the team work required among individuals and institutions to solve problems of a broad regional, national, and international scope which are beyond the talents and facilities of a single station or research organization.

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Likewise, Army and Smith emphasize the "systems approach" and cite the space program as a successful application. Although a comprehensive plan for research and the systems approach are not the same thing, both in this case are advanced with emphasis upon the broad nature of the problems, necessitating a team of specialists cutting across traditional departmental and subject matter lines. Likewise, one could infer that the make-up of the teams would change with the problems. Hence, a major requirement of any comprehensive plan of research and especially the formal organizational structure behind it must be one of flexibility.

Although I am in agreement that long range planning is needed to permit successful handling of large complex problems involving large outlays of resources in their solution, I wonder whether a framework in which the plans can be made and altered easily isn't more important than the plan. Perhaps some modifications in our present research organizations are in order to create a better environment for longer range projects, inter-disciplinary teams, inter-station teams and research. One should not lose sight of the fact that one of the strengths of our experiment stations has been their flexibility in permitting work on problems arising from the grass roots of both farming and science. Any long range planning or comprehensive planning that eliminates this situation could do more harm than good.

With respect to team approach, "if the staff wants to work together they will" and its converse are probably correct as Browning says. However, this leaves out a substantial group, those who have no strong feelings for or against such activity. This latter group may in fact be the most important group since its members may be more concerned with problems of research than the organizational structure of administration. For these people there are important factors which administrators influence to some extent. Each member of a team must find it easy to receive professional recognition in his own field or he will consider himself as a mere underpaid consultant. The administration can influence this situation to some extent in two ways. The individual departments must clearly recognize that the time spent by its members on such teams is an important claim. Part of such recognition is shown in the willingness of departments to contribute materially from their budgets to such joint projects. Second, the administrative organization of projects must be such that the members of a team can truly take joint responsibility. Where the handling of funds and the lines of authority in the organization and administering of a project become involved, researchers shy away. The world is full of interesting problems. Researchers generally have little trouble becoming interested. If team research is desired, organizational structure must encourage rather than just permit such research.

Although Browning calls for planning and establishment of priorities in research he admits that the payoff of research is unpredictable. Often the least impressive research at the planning stage turns out most productive. Successful solution of a recognized problem may be unimportant relative to the by-product discoveries made in solving an unimportant problem. While these facts do not negate the value of planning, they do raise questions about how tightly research plans should be structured with respect to use
of funds. It raises questions about the way in which priorities are set. In fact one can question whether there is any good overall criteria for setting such priorities.

Army and Smith and Browning alike emphasize long range planning and the former declare that the more or less blind Edisonian approach to problem solving is obsolete. However, the objective of industrial research is much clearer than that of experiment station research. Both papers point out that industrial research is conducted directly or indirectly for profit. Under this objective, systems analysis which carries current basic knowledge into merchandizable packages can be given priority. Longer term research or research simply to increase knowledge of a subject area would receive less attention. Army and Smith suggest the universities would still be a prime source of the latter "fundamental" research. Both papers suggest that the broader industry-wide problems, national and international, may be in the universities' area of research.

The suggestion that electronic data processing and communications use will control tomorrow's farm operations is intriguing. Management decision analysis service will be supplied by phone to every farmer. The technological information and directions he doesn't get by phone he can purchase at the shopping center as a crop systems kit. This may appear a bit far fetched as even looks into the near future. Nevertheless, the idea of selling technical support and management guidance as a part of the package farmers will purchase from their agribusiness suppliers is a real possibility tomorrow even if one has to wait until the day after tomorrow to get the computer hook-up.

Will such trends have an effect on the structure of our extension service? Very likely they will. These trends could also increase the traffic of farmers trying to obtain an evaluation of the relative merits of various techno-management packages advertised for sale at the local farm service center. More likely, extension specialists will be called upon to give training in greater depth in a wide variety of subjects. If more specific information is furnished by suppliers, more background information will be required to evaluate this information.

Although Lanpher and Finley haven't been quite as optimistic about the role of electronic data processing as have Army and Smith, this may be one of planning horizon. The former have tried to be practical and I believe conservatively so. They recognize the trial and error and experimentation required to incorporate electronic data processing into record keeping and extension activities. I think these authors will also agree that use of computers requires more rather than less management. Someone has to furnish this, either the farmer, the extension worker, or the agribusiness agent. When you bring the EDP to bear on farm management problems you have about the same effect as doubling the machinery complement on a small farm. More land or an increase in farm size is generally required to make the latter arrangement profitable. More technical know-how and management ability are required in the former.
Reading between the lines of the Lanpher-Finley paper I think I detect the idea of process control as a potential use of EDP. The farmer's plan (program) and his records could be matched and quarterly or so he could have a summary and analysis of the differences from which to direct current decisions and evaluate progress. With a little imagination we can visualize weather data, changes in the market situation, and other factors incorporated into the analysis.

The question is whether such service can really be furnished on an individual basis. Perhaps it can because of noncontinuous requirements allowing one center to handle many different farm problems, one after another. In other industries there might be a more or less continuous analysis required.

In summary, these are points of agreement among the papers. There will be rapid changes. Research and research institutions will change. Long-range planning and provisions to handle large inter-disciplinary problems are essential. EDP will play an important part in the new research. The new research is, in turn, expected to further affect the structure of the commercial farm firm and its management.
IMPLICATIONS OF STRUCTURAL CHANGES IN
THE ECONOMY OF THE COMMERCIAL
FARM FIRM ON FARM SUPPLY FIRMS

by Melvin E. Sims*

New era farm operators will not support the inefficiencies of yesterday. The rebellion may result from their own determination or it may accrue from the rewards of our free competitive economy. Regardless of its origin, the firms that supply the expendable inputs to farmers are caught up in an evolving process of innovation, integration, and accelerated efficiency. This process is accompanied by the extension of broader and more personalized services, improved product quality, and the complementary delivery of new technological advances.

The result of these forces appears to project a rather uncertain future for the farm supply firms. Lower margins on the one hand and increased costs on the other generally spell disaster for those who are either unable or unwilling to adjust to the changes which are occurring about them. As it gasps its last breath of solvency, the company proclaims, "I'd rather fight than change."

This, however, need not be the case; tomorrrow can be bright, exciting, and captivating for those who find the solutions. Margins will be smaller, but the new efficiencies and innovations and greater volume can generate a satisfactory return for the resources which are applied.

As the commercial farmer negotiates on a price for a specific supply item, he commands increasing attention as his volume increases. He is inclined to bargain for a year's supply at one time. He is willing to schedule delivery within rather broad limits and is ready to provide adequate storage and handling facilities. There will be a growing tendency, I believe, toward lumping all the items together which are the least bit compatible, so as to exert the greatest leverage with this total volume. For instance, the farmer might bargain for his annual supply of feed, plant food, and petroleum from one supplier. In addition, he may agree to sell his grain and perhaps other farm production items through the same organization if the terms are sufficiently attractive. Depending upon credit status, the last idea may originate with the merchant.

In addition to pooling his own purchasing requirements, the farmer will force continued economies, also through group action. His participation in cooperatives or in proprietary corporations engaged in related business is actually a means of integration for the farmer. It provides him with an opportunity to share in the profit of another segment of the food industry. Cooperatives, for the most part, will engage in responsible price administration, so that the health of the industry can be maintained.

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Innovation in Farm Supply Firms

The constant pressure for competitive advantage will continue to foster innovation. The dry bulk blending concept in plant food distribution is an excellent example. The change was initially resisted because it tended to make existing central, chemical mixing plants obsolete, or at least surplus. It placed one of the three central plants operated by FS in the surplus category. Regardless of this problem, the process of blending dry ingredients and applying it to the soil in bulk has proven to be the easiest and most efficient method of apply large quantities of plant food to the soil. During the past few years the entire industry has moved rapidly in this direction.

There is considerable interest in slurry and liquid mixed fertilizer and in handling of liquid feed. A major breakthrough in altering the level of usable protein in corn could be on the horizon. Increased governmental supervision of agricultural chemicals could change the structure and relative position of supply firms. Perhaps feed companies should become more aggressive in assisting farmers to develop their own feed processing. Feed additives (probably in the form of pre-mixes) quality control, and technical service would be important contributions to the success of such a farm unit.

Innovations will be adopted more rapidly by farmers than was true in the past. The acceptance of hybrid corn was fairly rapid, but the conversion to the picker sheller is probably twice as fast. Modern communications media are more effective. Farmers are more mobile and travel more extensively than in the past. It is not uncommon to hear of a farmer checking or investigating possible useful ideas in California, Europe, or elsewhere around the globe.

This means that the supply firms have less time to adjust. It means that they must accurately predict at an earlier date the future trend of farming. It means that more emphasis and resources must be applied to research. The successful firm will be bringing about change rather than following change.

Integration in Farm Supply Firms

Both vertical and horizontal integration continues at a rapid pace. This is especially true in the plant food industry. Most of the major plant food companies now have basic production in at least two of the three primary elements - nitrogen, potassium, and phosphorous. A few have control of all three. There are some who believe that sulphur will soon be added to the primary list and provide the opportunity to integrate still further. Those who have historically been engaged in distribution and also perhaps manufacturing are acquiring basic production facilities. Those who have historically been engaged in basic production in one element and perhaps in manufacturing are now tying in with basic production in the other elements and integrating into manufacturing and distribution.
Activity in horizontal integration is of a more recent period. Major petroleum companies have moved into the plant food industry within the past two years. A major chemical company, W.R. Grace, has recently purchased a feed company as well as a seed company. This type of activity could very well develop into a trend and be the prelude to the full implementation of the service center concept.

There appears to be considerable interest currently in the service center approach to retail distribution. It is not particularly new, because some organizations exist which have built their entire system on this pattern. Actually, it appears to be a departure from the era of specialization to the old general store concept. It will resemble the old general store, however, only in diversity of product. It will be a well staffed, dynamic, and efficient operation.

We have general agreement, I believe, that the farmer of tomorrow will be better educated and more astute. He will be more management oriented than his father was. He will have considerable technical knowledge in certain fields, but the technological changes will be too rapid for him to keep abreast in all areas. He will seek technical advice from others. He may seek this advice from the farm adviser or a professional farm management service, because of their unbiased position. It will be easier for him to accept it from the well informed salesman, or his specialist, who will bring the information to his farm.

The service center will have competent persons at their disposal, will win the confidence of the farmer in one product line and, therefore, attract his patronage in others. This complementary promotion, as between product lines, is a significant reason for the service center trend. Of course, the opposite can be true—a blunder or error in one area can lose the customer in all categories. There is always the hazard of the overzealous sales representative who presses sales at the expense of the farmer’s best interest. The problem of securing salesmen and/or specialists who possess the required skills will continue to present a pressing problem. There will be too much at stake to risk incompetence; the value of repeat business will not permit promiscuity; success will be linked with integrity.

One stop service enables the farmer to become more intimately acquainted with his dealer and supply organization. More contacts are made because of the greater number of transactions. A common trade-mark can be used for more efficient advertising. Credit administration is simplified when a fewer number of open accounts are maintained by the farmer.

As the farmer becomes a more skilled purchasing agent, he will use all the volume he can assemble as a bargaining tool. A farm unit which has an annual requirement of 12,000 gallons of power fuels, 6,000 gallons of LP-gas, 100 tons of feed, 150 tons of plant food, and $1,000 worth of agricultural chemicals will command more attention from one supply firm than it would from any combination of two or more. A $20,000 order will justify the time of an agronomist to assist in planning a fertility and chemical program, and the
time of an animal nutritionist to help solve a livestock feeding problem. The competent farm operator will gladly schedule an afternoon during the winter months, in his office on the farm, to consider new products, schedule delivery of supply items, and negotiate the terms for his next season's requirements.

**Increased Efficiency in Farm Supply Items**

The obvious solution to the pressure of more aggressive bargaining on the part of farmers and greater concessions by competition in an effort to attract new business, is increased volume and greater efficiency on the part of the supply firm. Procurement and manufacturing have been reduced to a rather exact science. Departures from the conventional distribution pattern seem to hold the most promise for increased efficiencies.

A rather detailed study of petroleum distribution to farmers was conducted by FS Services, Inc. Tachograph recorders were installed in the delivery trucks and time and cost records were accumulated. It was determined that power fuels could be delivered to a farmer who would contract for 10,000 gallons or more per year, provide at least 2,000 gallons storage, and accept delivery at option of company for three cents per gallon less than the farmer who used less than 500 gallons per year and had less than 300 gallons storage. In fact, the study revealed that a delivery of 75 gallons or less at one stop was a money losing proposition under current margins. If farmers could acclimate to the practice of night-time deliveries, delivery equipment could be utilized around the clock at considerable savings. Of course, the advent of a self-contained atomic power unit which would supply energy for the life of the tractor would eliminate this distribution problem.

Large volume feed accounts which can accommodate 10-20 ton bulk feed trucks can receive product direct from the mill at a significant saving. The drop-trailer program is an intriguing economizer. Bagged feed supplements are manufactured directly into a dry cargo van. A tractor pulls the trailer to a retail service center during the night, drops the loaded trailer, and spots the empty back at the mill. The retail outlet sells and delivers the fresh feed directly from the trailer during the following day. Any remainder is moved into the warehouse at the close of the business hours.

Extra trailers are required in the drop-trailer program, but the tractors are employed day and night. The tractor and driver are not delayed during the unloading process. The local company can schedule the unloading task during a slack period and can actually use the trailer for warehouse, thus eliminating one handling. Significant savings are available to the integrated firm.
Commercial and industrial organizations have become rather proficient in the techniques of long range planning. As the farming operation becomes larger and more complex, more time and effort must be applied to planning. Credit institutions and supply firms can lend valuable assistance in this area. The formulation of a simple budget would be a helpful tool to many farmers. Extension people, materials handling equipment firms, and electrical power use advisors have become quite active in the area of farmstead planning.

This philosophy may not continue, but farmers as a group have been reluctant to employ engineers and technicians to assist in solving problems. They apparently would prefer that these costs be buried in the price of the buildings or equipment. The rapid transition from ear corn to shelled corn harvesting has demanded changes in storage facilities and the addition of drying equipment. The firms supplying farmers with this type of building and equipment have generally provided the engineering and lay-out work for the improvement. As farmstead mechanization and automation continues to be employed on more farms, which is certain to happen, the supplying firms will be expected to provide this personalized service.

The decision-making process on the modern farm will become more refined. Too much has been left to hunches and guesses in the past. We are currently trying to decide in our farming operation which application of capital will bring the greatest return - another mechanical cattle feeding set-up or a confined swine finishing house. It is not easy for one who is more used to handling tractors and animals than figures to solve this problem and have confidence in his conclusion. There is considerable interest in providing computer service to farmers. At least two large firms supplying farmers have a contractual arrangement whereby their computers can be programmed to solve specific problems for individual farmers. Pennsylvania State University and possibly others are supplying this service. The cost, I believe, is $150 per problem solution. Banks and financing institutions are studying the possibility. The desire for this type of service is almost certain to be present; who will provide the service and who will be willing to pay for it remains uncertain.

Farm Supply Credit Service

It is easy to build a case in favor of the farmer obtaining his total line of credit from a regular established credit institution. It is cheaper and a greater variety of credit services are available from the experts. It would seem logical that the farmer of tomorrow with his better education and increased credit requirement would devote the amount of time necessary to establish a line of credit with an institution which would provide the most efficient and effective service.
Yet, there is a sizable amount of credit extended by merchants today. "The Balance Sheet of Agriculture"\(^1\) lists a total of $6,720,000 in debts owed to non-reporting creditors as compared to a total of $16,185,000 in total non-real estate farm debts, excluding Commodity Credit Corporation loans. Merchant and dealer credit and individual lenders comprise the major portion of non-reporting creditors. The farmer is already established with his supply firm and it is often a more convenient source of credit. The supply salesman appears to be somewhat more aggressive in selling his product than is the case with the credit representative. This need not be the situation and may change in the future. At the present, however, it seems that the supply salesman, in his eagerness to complete a sale, is willing to deliver the credit package to the farm.

More supply firms will probably provide a credit institution in the future; many, of course, already have. It does not necessarily follow, however, that a greater percentage of the total credit will be supplied by this route. I would expect that the greatest shift would be from open accounts to the formalized credit institution.

The advantages of a wholly owned credit corporation to a supply firm are as follows:

1. An opportunity to tie in more effective credit administration
2. Potential sales advantage by offering a total package
3. Reduces the shopping around by the customer - more convenient
4. A uniform program
5. Ability to compete with competitor programs
6. Helps relieve the working capital problem.

There is risk involved. It will not solve all the accounts receivable problems, and the operation may not cover costs - at least in the early stages.

Capital Leasing

Leasing as a device to acquire more capital or credit will probably continue to a limited degree. Here again, credit from normal channels will probably be somewhat lower in total cost. Building and equipment dealers may meet this cost and extend additional amounts of credit over and above that normally extended by conventional credit institutions because of their sales margin.

The presence of equipment which is subject to frequent obsolescence may spark additional interest in the leasing field. Row spacing could be an example. An operator with leased equipment could more readily adjust to narrow row farming than one who is locked in by equipment with several years of life remaining.

\(^{1}\)Page 19 of Agriculture Information Bulletin No. 290, Economic Research Service, United States Department of Agriculture.
Leasing of a building or storage facilities by a tenant to be placed on leased acreage should grow in popularity. Firms supplying this type of capital items bear the risk of repossessing an item which may be difficult to remove but also have a chance of receiving the full price in rent and still owning the unit. There is a tax advantage to some operators but the lease agreement must not be interpreted as a conditional sales contract by the Internal Revenue Service.

It is my opinion that more interest will develop in rental equipment. The rental of cars, trucks, and trailers is now commonplace. A self-propelled forage windrower, for instance, is an expensive piece of equipment. If custom operators are not available or custom operators are somewhat careless, farmers like to rent expensive machines which are used only a few days a year.

A major deterrent to an equipment rental program is, of course, the repair aspect. The rent must be high enough to cover the cost of making repairs for the damage done by the unskilled operator, the careless and wreckless operator, the unfamiliar operator, and those who tend to be somewhat less attentive when another person's property is involved. If a contract could be developed which would provide incentive for proper care and maintenance of the machine, implement firms could cultivate a thriving business in rental of high cost machinery.

**SUMMARY**

The implications of structural changes in the economy of the commercial farm to farm supply firms are numerous. The farmer will become a more sophisticated purchasing agent and will demand and receive a price which will result in narrower margins for the supply firm. He will continue to concentrate his volume and to bargain more effectively. This will also bring pressure on present margin structures. The farmer will seek additional services which will help him solve his technical problems, his credit and capital problems, and he will expect to exploit the new developments of research carried on for him.

The supply firm will employ greater amounts of capital and a higher caliber of people to meet the demands of tomorrow's farmers. More highly skilled people as farm operators must be matched by improved management in farm supply firms. More emphasis will be placed upon merchandising as compared to production. The narrower margins will be overcome by greater volume, further integration - both horizontal and vertical, additional efficiencies, and by new developments which result from research and innovation.

Success will not come easy; it never has. Some will suffer defeat. For those organizations which have people with imagination, vision, brilliance, and determination, the future holds a thrilling experience.
FARM MARKETS: PROCUREMENT, BARGAINING, AND MARKET CHANGES

by Peter Helmberger*

The purpose of this paper is to analyze the evolving patterns in procurement practices and policies in farm markets, giving due attention to some basic causal forces. First, attention is focused on certain theoretical notions regarding the role of information in determining the boundaries of the firm. Attention then is centered on traditional procurement methods of marketing firms and their seemingly slow demise in the face of vertical integration. Thereafter, bargaining efforts and marketing control programs are surveyed from the viewpoint of their possible future roles in agricultural marketing. Finally, we survey certain market changes at the processor and distributor levels of the food distribution system and puzzle over their future implications for market organization and performance.

The Firm As An Allocative Mechanism
In a World of Imperfect Information

It has been suggested that in the stationary state of a perfectly competitive market, it would be very difficult to think of reasons for vertically integrating relationships among firms. Indeed, in this ideal type environment, it would seem difficult to explain the emergence of the firm in the first place — at least as we usually think of a firm as consisting of more than one man performing a single process. Rather, it would be easier to conceive of the economic system as one giant ant hill, in which the agents move about with seemingly great purpose and in near perfect harmony and where instinct rather than rationality rules. The fact is, however, that complex firms do emerge. And if we cannot find the reasons for their emergence in the perfectly competitive environment, perhaps we can find the reasons in the differences between that theoretical environment and the blooming confusion and complexity of the real world. A central premise of this paper is that a search of this type will lay bare the possible reasons for the various forms of vertical integration that are observed and of which the firm is the most important type.

Economists are fond of emphasizing the market system as a device for allocating resources among competing ends. Price movements automatically coordinate production and consumption through numerous exchange transactions. In this system there is no need for a central authority to undertake economic planning. An increase in demand for some good will result in a higher price, which in turn attracts resources. As resources flow into the industry price begins to fall, thus decreasing somewhat the incentive for additional resources to enter the industry. Finally the incentive disappears entirely.

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In a well known paper, Coase points out that the description of a market system as a coordinative device fits the internal workings of a firm very poorly. Coordination within the firm is the result of economic planning by a more-or-less centralized authority. Resources flow from one department to another not because price beckons, but because the entrepreneur points his finger. This raises a very important question. What determines the extent to which and the circumstances under which the market mechanism is superseded by firms in the allocation of resources?

Coase argues that firms emerge because of costs associated with using a market mechanism. More specifically, he notes that prices are not known and costs must be incurred in finding out what the relevant prices are. In addition, where entrepreneurs rely on an exchange system they must pay the cost of negotiating and concluding contracts. Such costs may be avoided if the transactions take place among the departments within the firm. Basically, the costs of compiling information on quantities of products expected to be offered, on relevant prices and on the costs of negotiating contracts rise out of a lack of information that pervades the real world.

Mallegren takes up the argument and indicates in what ways market instability arising out of uncertainty and ignorance can cause marketing costs. The emergence of the firm is seen to be the result of an imbalance of information among market participants. According to Mallegren, "if not everyone in the market can take up a new opportunity because they do not perceive it, or perceiving it cannot profitably assimilate the transaction as fast, there exists a gain for those 'in the know'." What limits the size of the firm if indeed limits exist? Taking time to profitably assimilate new activities might slow down the rate of growth. In addition there is the possibility that the internal communications network might become bogged down in irrelevant details or, alternatively, fail to transmit suitable information. Of course, if attention were limited to a single product firm, market demand could limit the size of the firm.

In light of the purpose of this paper, it is convenient to develop further some of these arguments. We may suppose that a marketing firm is scanning the economic horizon in search of activities than can be profitably added to existing ones. The firm can be expected to measure the revenues and costs associated with each of various alternatives, and then choose that one which yields the greatest profit. What does the firm find when it looks backward at farm markets?

3Ibid., p. 416.
Procurement of Farm Products

Farm industries are atomistic in nature and, in spite of the continuing growth in the size of the farm firm, they seem destined to remain so in the foreseeable future. At present, as in the past, farm production plans are made and processes begun prior to the moment of pricing. Aberrations from market equilibria and the results of the vagaries of weather together cause instability in production. Heterogeneity in farm resources and production methods give rise to heterogeneity in the offering of farm products. The result is -- as it has been perhaps to an even greater extent in the past -- an unwieldy mass of small heterogeneous lots scattered hither and yon across broad geographic areas, with considerable variability in both quality and quantity.

In this production setting the marketing firm must take the farm product offering as a given or attempt directly to influence decisions at the farm level in order to better coordinate farm production with marketing activities. Procurement in traditional open markets tends to reflect acceptance of the first alternative; vertical integration means acceptance of the second. This terminology is in keeping with common usage and suggests that vertical integration leads to a withering away of open markets. The implication is perfectly valid where integration takes the form of outright ownership and control, in which case a commodity market disappears entirely. Where integration takes the form of contracts, however, it might be better to say than an open market for contracts has arisen in the wake of a disintegrating commodity market. It is also true that many such arrangements essentially displace to some extent the marketing system as an allocative device.

Traditional Procurement Methods in Open Markets

Under traditional methods, then, the individual marketing firm stands willing to take whatever shirt-tail odds and ends are produced and assemble these in some semblance of order in light of the needs of marketing firms further up the channel. The buying practices of local elevators, egg assemblers, livestock dealers, milk manufacturers, auction buyers, and some fresh fruit and vegetable shippers come readily to mind as fairly good examples. The fact that traces of vertically integrating relationships exist even in these markets is mere evidence of the large number of such coordinative devices.

By and large, however, the primary reliance for coordination between farm production and marketing in the traditional markets rests on the market mechanism itself. Those farmers who, through foresight or good fortune, happen to produce outputs that tend to meet the requirements of buyers are able to trade more advantageously; those who produce outputs that tend not to meet requirements are punished accordingly. Marketing firms that innovate and seek more efficient methods of assembly, grading, packaging, processing, etc., excel profitwise and force others to follow suit. So goes the theory.
In practice, however, there are severe problems associated with using an open market system, and it is wholly proper for governments and researchers to seek ways of improvement. These problems arise out of a lack of information among market participants and give rise to costs which marketing firms might seek to avoid through vertical integration. Economic aspects of a pricing system that merit at least brief examination in this context include (1) price as a signal; (2) uncertainty, risk bearing, and the costs of disequilibria; (3) interrelatedness of input-output relationships at different stages of production; (4) transaction costs; and (5) abuse of market power.

1. **Price as a Signal.** It has been suggested that price can be an ambiguous signal to the producer in terms of the product attributes desired by buyers. This would not be so if the product under consideration were perfectly standarized, in which case a single price would do very nicely. Grading can be used where product quantity varies. Ambiguity can arise, however, when the various grades do not mirror all specifications the buyer wants. The producer is then hard put to translate the price message into optimal production plans. The effectiveness of a pricing system is diminished to the extent price is an inadequate signal of desired attributes.

2. **Uncertainty, Risk Bearing, and the Cost of Disequilibria.** Uncertainty can cause economic mischief in numerous and devious ways. Where production processes are begun prior to pricing, fluctuating price and output levels cause increased processing and marketing costs. Producers may be slow in adopting new technologies and expanding productive capacity because of ignorance, fear of risk, or lack of adequate financing. Processing firms seeking large volumes and scale economies might find that raising price is a slow and inefficient way of encouraging expanded production at points close to plant locations. This may be especially true where the existence of a small number of buyers makes for uncertainty of market outlets from the view point of farmers, where production at the farm level requires highly specialized pieces of equipment, and where farmers are poorly informed concerning prices paid by the various buyers. Here, then, is a whole category of costs arising out of imperfect knowledge.

3. **Interrelatedness of Input-Output Relations at Successive Levels.** Poor coordination can be very costly where the input-output relationship that exists at one stage is highly dependent on the manner in which a previous process has been performed. Agricultural processing industries abound with examples. Many perishable products must be processed or marketed within a short period if serious quality deterioration is to be avoided.


5. In a study of cattle slaughter in California, Logan estimates that for the one-bed plant, $8.45 for the two-bed establishment, and $8.23 for the three-bed plant compared with $9.48, $8.48, and $8.41 respectively, under uniform capacity kills. See Samuel Logan, "The Effects of Short-Run Variations in Supplies of Cattle and Costs of Slaughtering in California," *Jour. of Farm Econ.*, 1963, p. 630.

4. **Cost of Transactions.** Transfer of ownership involves expense for buyers and sellers alike. Legal fees, billing costs, and the cost of sales efforts are examples. Under certain conditions these costs can become fairly substantial. Buyers, when few in number, resort to competition on nonprice terms. Excessive salesmen, service competition, and inputs supplied free or at partial cost can give rise to gross inefficiency.

5. **Abuse of Market Power.** The consequences of the abuse of market power in terms of economic efficiency need little elaboration here. Where excessive profits appear, products are being sold at prices that could be lowered -- or inputs are being purchased at prices that could be raised. The incentive to avoid dealing with firms that have market power is always present, but the alternatives offer problems too. This type of market imperfection may be most relevant in a discussion of integration through ownership and control.

**Vertical Integration in Farm Markets**

In comparison with traditional methods, vertical integration might give rise to the use of new inputs, different prices paid for old inputs, increased productivity (new production functions) and different prices for the final products. The marginal revenues and marginal costs of integration depend, of course, on what form integration takes. Integration may consist of hiring a few fieldmen to offer farmers advice on good management practices. The extra cost in this case is nominal, especially if the fieldmen discredit the honesty of competitors. The other extreme is outright ownership and control, under which both revenues and costs might be substantially altered.

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9 Willard Mueller and Leon Garoian, op. cit., pp. 78-88, seem to imply that grocery chains are most likely to integrate into industries with high barriers to entry and therefore high profit rates. Hoffman takes issue with this argument and suggests instead that chains are more likely to integrate into industries with low barriers to entry and low profit rates. See A.C. Hoffman's review of "Changes in the Market Structure of Grocery Retailing," by Willard Mueller and Leon Garoian, *Jour. of Farm Econ.* XLIII. 4, 1961, p. 973. According to a more balanced view, and one doubtless recognized but not well developed by Mueller and Garoian, high profits always act as an inducement to entry but barriers prevent the actual attainment of profits through entry. On this argument chains are primarily interested in the profits that remain after the costs of entry have been met. Unprofitably industries offer no inducements for entry and industries with very high barriers, soup manufacture, for example, will not allow entry. Successful entry likely takes place in the in-between cases, particularly where chains are uniquely fitted to surmount barriers.
In terms of revenue, vertically integrating relationships can mean price premiums in final product markets, especially if high and uniform product quality is achieved along with mass volume.\textsuperscript{10} The rise of food chains and the voluntary and cooperative groups in food retailing will likely increase the demand for the types of supplies that can be produced through vertical integration.\textsuperscript{11} Growth of bigness in retailing might well mean price premiums for flows of commodities that meet retailer specifications. It is worth emphasizing, however, that this is merely one factor among many. My expectation is that some writers on grocery retailing have exaggerated the importance of specification buying on the part of retailers as a cause of integration. Other factors, for example, would seem primarily responsible for integration in such commodities as processing fruits and vegetables, sugar beets, and broilers. That product price falls as a result of vertical integration on the part of one firm does not appear likely. Results of behavior in the aggregate may be quite different. As a consequence of the widespread introduction of vertically integrating relationships, price can be lowered substantially because of increasing output. Broiler production is a classic example.

Through vertically integrating arrangements, marketing firms can avoid certain costs associated with using open markets. At the same time, however the closer coordination of production at the farm level with marketing activities requires additional inputs, and these inputs are not free. The cost of fieldmen and their supporting budgets and the extra paper work that is involved in contracting are examples.\textsuperscript{12} Integration places an additional strain on management of the integrating company and the results can be disastrous.\textsuperscript{13} Moreover, integration often involves the financing of farm operations so that the opportunity costs of these funds must be reckoned in computing profit. Additional risks are also assumed. The relative productivity of farm firms (production functions) can be greatly affected by the technological know-how which the marketing firm passes on to the producer. Complete integration might mean reduced efficiency with increased size of operation (diseconomies of scale) and/or the payment of higher wages for labor than the farm family is typically content to take.

On the matter of costs, Kohls gives great emphasis to "scientific management" as a reason for integration.\textsuperscript{14} This emphasis is pegged in part on greater control over product specifications which recent production technology affords and greater organizational efficiency flowing from the


\textsuperscript{13}C.R. Mitchell, National Hog Farmer, September, 1964, p. 6.

separation of supervision from actual production activities. On this argument, the physical efficiency of inputs used to secure greater coordination between farm production and marketing has been improving in recent years.

Prospects for Increasing Integration

In light of the complexity of the relationships that determine the growth of vertical integration, it is not surprising that some writers on the subject have not been very bold in their projections of future trends. After a long and thorough study of these matters, Mighell and Jones conclude that some likelihood exists for more vertical integration in beef and, particularly, pork production. Writers on food retailing expect more widespread use of integration as a result of the demands of big retailers for continuous flows of high and uniform quality products in mass volume and the increasing importance of big retailers.

Simple projections of our experience since World War II and other fragmentary evidence suggests to me that vertical integration will continue its inroads on open market operations. In beef cattle, feeder pigs, and eggs, considerable inroads have already been made. Those firms who have the financial backing and are first to perceive the new combinations of productive resources and activities made profitable by the changing technological and institutional base reap the rewards and force imitation from others. These new combinations can be assembled through a variety of integrating techniques and an important question is: who will end up in control. A related question concerns the impact on the organization of farm industries and the family farm.16

Role of Farm Bargaining Associations

The prospect of greater use of contract production has led many people to see an expanded role for cooperative bargaining associations in farm markets. The urge to bargain is a recurrent theme in the history of farm policy. Most of the more dramatic attempts to gain market power in this manner have been abortive, and elements of radicalism and violence have not been uncommon. The view espoused here is that while the role of bargaining

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15 Mighell and Jones, op.cit., pp. 64-72.
ceoperatives is limited, it can be useful, nonetheless. In order to understand this role, however, it is necessary to understand both the nature of the economic agent and the manner in which the market environment constrains its effectiveness.

The key to the market power of the bargaining association is the membership agreement whereby the member appoints the association as his exclusive sales agent. Through this instrument, the selling operations of member-producers are integrated horizontally; producers outside the association continue to sell their products independently. It is worth stressing that the type of organization here considered controls the disposition rather than the amount of production, and that possession of the output of members is not ordinarily assumed. This is in contrast to the large dominant firm whose production decisions reflect likely price effects and price targets. For the moment, we abstract from marketing order programs.

When a sufficient quantity of output comes under its control, the bargaining association asserts itself to processors, packers, or to other first buyers. Recognition of its right to bargain for member-producers is sought as a preliminary to negotiation over price and nonprice terms of trade. Of course the farming industry is highly competitive (atomistic) and the quest for market power is very much in the nature of a bootstrap operation.

Assuming that the bargaining group becomes established and is recognized by buyers, under what conditions will it be able to effect lasting price increases? The potential for price enhancement through bargaining is constrained by the degree of competition among buyers in farm markets; and, as the degree of competition approaches the limit of perfect competition, the potential for farmer gains erodes and disappears in the long-run. The logic behind this conclusion is a bit technical.

Success on the part of the association in enhancing price will have the net effect of increasing the quantity produced. The additional supplies can be marketed in normal trade channels, if there is a buyer's monopoly or near buyer's monopoly (monopsony or oligopsony) at the outset. If price is negotiated for some future period and is made independent of the quantity purchased during that period, buyers will have no incentive to restrict purchases in order to lower the price they have to pay. In other words, if price is determined through negotiation rather than through the amount purchased by buyers, it is entirely feasible that buyers will wind up purchasing more and paying a higher price. In addition, consumer prices

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will tend to fall. The feasibility of this result is pegged on the existence of excess profits at the buyer level which allow paying more for the raw material at the same time the price of the finished product is falling.\textsuperscript{18} Obviously, buyers would be something less than delighted with the result.

What happens if buyers are highly competitive in procurement, earning no more than a normal return on investment? Under these circumstances, a price hike by the bargaining group will lead eventually to a market surplus and the members of the bargaining group would need carry the cost of surplus disposal while the nonmembers reaped the full benefits of the association's efforts. The resulting bargaining agent is not so much a bargaining association as we know it today as it is a cartel. In the history of industrial experience, successful cartels in industries with many firms and no barriers to entry, and without the coercive powers of government in support, are virtually unknown. Theory and fact agree that cartilization of agriculture is extremely unlikely in the absence of government.

The potential gains to farmers from collective bargaining in farm markets, then, depend on the extent that elements of a buyers monopoly (monopsony) in farm markets support excessive profits. It would be nice to be able to report that the consequences of market power in the procurement of farm products have been thoroughly studied by economists, and that a consensus has been reached. Unfortunately, this is not true, and the one who seeks out an expert for an authoritative opinion is very much his own expert. While we shall return to this issue, it is worth noting here that total profits of firms marketing our farm food products constitute a tiny component of the total food marketing bill. In 1960, for example, total profits of these firms, after taxes, amounted to less than 3 percent of the marketing bill for domestically produced farm food products sold to civilian consumers. The pickings appear to be slim, and the mere existence of potential gains still leaves the problem of their realization.

Getting a better price is not the only objective of bargaining cooperatives. Some of the so-called secondary objectives may well prove to be the significant ones in terms of actual achievements. This is particularly true to the extent that vertical integration through contracts becomes commonplace in farmers' markets. In this connection, the experience gained in local vegetable processing markets provides some good lessons.

\textsuperscript{18} This conclusion is in sharp variance with the view that marketing firms can simply pass price increases along to consumers, quite without regard to the amount marketed. In order to get consumers to buy the increased production, price must be lowered, not raised. Higher farm prices coupled with restricted marketings could, of course, give rise to higher consumer prices, but we argue below that bargaining associations are ill-equipped to engage in production control which might, in any event, be in violation of antitrust laws.
Studies of processor-grower contracts used in Midwest vegetable markets, where cooperative bargaining has not flourished much, have revealed a problem of sporadic discrimination among growers. "Passed" acreage is easily the most notorious example. In the event a processor cannot process all the crop which matures at a given point in time, he might elect to pass up some of his contracted acreage; the growers whose acreages are not harvested suffer the entire loss. Grading is occasionally left to the judgment of the canner. Where grading is provided, contracts frequently fail to specify sampling methods or the number of samples to be taken. Moreover, there is a great deal of variability among contracts. Some canners provide growers with seed free of cost, some at partial cost, and some at full cost. Costs of other services provided by canners vary in like manner. Returns to growers are further modified by the date of harvest and the time of planting, which the canners control. Varying contract provisions make it difficult for growers to evaluate the attractiveness of offers of various processors.

The contracting procedures of canners in the Midwest stand in sharp contrast to those in Utah, for example, where a cooperative bargaining association (the Utah State Canning Crops Association) has been active for many years. There, member-growers are bound to sign only those contracts that have been approved by the association. The approved contract for canning peas, for example, clearly protects the grower from "passed" acreage, and it specifies that all peas will be graded by a tenderometer, what the sampling procedures will be, how payments to growers will be made, the cost of seed, the methods to be used in arbitrating disputes, and other items. The situation is similar to that prevailing in other markets where cooperative bargaining is strongly entrenched.

It is of interest to note that studies of processor contracts in areas where cooperative bargaining is not present usually contain lists of recommended changes which generally favor growers. Since these recommendations are not designed to benefit processors particularly, there seem few good reasons why processors would adopt them. Cooperative bargaining is a vehicle through which such recommendations can be put into practice.

More generally, there might well be a need for a producer organization that represents the preferences, gripes, and interests of producers as to contract terms. The producers would be given a say, and the result might well be greater democracy, much as unions have engendered in labor markets. In the absence of some type of bargaining association, con-

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tracts will be drawn up to protect further the interests of integrators. Roughly speaking, such contracts will be offered on a take-it-or-leave-it basis, and it will not ordinarily pay a producer to incur the expense of drafting his own contract. Through group action, however, members can share the cost of developing and enforcing contracts that exhibit greater mutual advantages to producer and processor—contracts in which the rights and duties of both parties are clearly set forth.

Other services provided by bargaining groups include assistance in procuring labor, collecting and disseminating information on superior cultural practices and new technologies, and instigating research on new crops, machine improvements, etc. Cooperative bargaining can have a salutary impact on price formation in that the whole price-making process receives more attention and is based on more economic-marketing data and analyses. Organization of a bargaining cooperative might be the first step in taking over other marketing functions such as processing. Finally, in marketing order programs there is a need for legitimized leadership that can speak with authority for the interests of farmers; bargaining associations are well suited to this purpose.

Marketing Agreements and Orders

A discussion of the procurement of farm products would be incomplete without some attention given to marketing order programs. At present such programs can be initiated for milk, fruits, vegetables, turkeys, and a few other farm products. The enabling legislation is subject to change, however, and the list of commodities for which such programs can be established can always be lengthened.

A marketing order has been aptly referred to as a tool, and economic appraisal must make reference to the manner in which this tool is to be used. One way in which marketing control should not be used is evidenced by experience gained in fluid milk distribution and in cling peaches in California. The simple theory of market control should have made much of this experience and the associated costs unnecessary.

With the authority of the government, whether state or federal, a market can be broken up into its component parts according to the various groups of buyers that can be separated according to such market dimensions as time, space, or form of final products to be produced. The control agency, taking total production as given and beyond its control, can maximize receipts and the average returns to producers by equating marginal revenues in the various separated markets. The commodity can be dumped to rot in order to avoid negative marginal revenues, and — in theory at least — it makes little difference whether the agency chooses to manipulate prices in the


22 The possibility of control of farm production through handlers might be possible for commodities other than milk. To my knowledge, this type of program has never reached an operation stage.
various markets or the quantities sold. For any given level of total production, depending on the demand situation, market control can return higher average returns to producers than would result in perfect competition. The trouble is that neither production nor the entry of additional productive capacity is regulated. With no barriers to entry, supplies tend to expand, and as they do profits tend toward normal levels. If the farm industry is one in which costs per unit of output are the same regardless of the level of output, even average receipts tend to equal the perfectly competitive level! And in the meantime, the allocation of resources becomes increasingly bizarre.

This is not to suggest that marketing control programs have been operated so as to maximize receipts to producers. The assumption of maximization is merely very useful, analytically, in showing qualitative tendencies that result from discriminatory marketing. In comparison with the results of pure competition, these tendencies are rather unlovely. The point is that marketing orders can at best act as a palliative in an industry characterized by excess productive capacity. The fear is that short-run price and income gains will be gobbled up at the expense of engendering an even more serious long-run problem of excess capacity.

The role for agreements and orders in farm markets is modest in comparison with the role of the national price propping programs that occupy the center stage in the debate over farm policy. These marketing devices can be used to achieve stability in returns to producers where there is violent instability in market performance. Price setting can be an efficient remedy where actions of a limited number of buyers depress returns to milk producers, if only care is taken to avoid wanton price increases.\(^{23}\) Where the independent decisions of fresh fruit and vegetable shippers give rise to alternating market gluts and famines, regulations on the rate of flow of these commodities can be used to achieve order and evenness. If producers in some specialized production area desire to improve the quality image of their products among traders and consumers, a marketing order might well be the right tool for the job.

It might also be noted that federal programs impose regulations on handlers, not producers. They may therefore be viewed as a form of vertical integration, but at one step above the farm level.

**Market Changes**

From the magnitude of the marketing bill, it is clear that market changes in the food distribution system affect in important ways the procurement practices and policies at the farm level. For expository purpose, market changes may be grouped conveniently into three categories: (1) those pertaining to

\(^{23}\text{Edmond Harris, "Classified Pricing of Milk," Tech. Bul. 1184, USDA, 1958, pp. 18-21.}\)
Environmental characteristics, including market structure as usually defined: (2) those internal to business organizations, and (3) those pertaining to government's role in agricultural marketing. In the remainder of this paper each of these categories will be discussed in turn, although space -- when balanced against the range of issues involved -- allows only brief sketching.

Environmental Change

Many of the changes taking place in the economic environment represent mere continuation of well established trends. Improved transfer systems will likely continue to greatly broaden farm markets to take in more geographical area and further decentralize the marketing system. Improved highways, trucks, shipping containers, and methods are main factors. An important question here concerns the future status of unregulated truck transportation of farm products. Technological change in food preservation and quality control will offer new competition to older methods. Hydrocooling, freezing, and the use of chemicals such as growth regulators have assumed increased importance in the period since World War II. Irradiation and freeze-drying are potentially very important preservation methods; and to dramatize the prospects for synthetic foods, we have the imaginative Professor Boulding who tells us that "agriculture is really a terribly primitive way of producing food." Technological improvements in food preservation will be welcome by consumers with higher per capita income who want more food services and the chance to pay premiums for high quality.

Just what all these changes pretend for organization and procurement practices and methods in farm markets requires high order soothsaying. Breimyer seems to feel that freeze-drying could wreck conventional livestock markets in favor of contract production. My impression, however, is that the impact of future technological change on market organization and practices has not been probed very deeply. There is one implication having to do with the question of competition that can be developed momentarily.

One of the most remarkable postwar trends is the decline in the number of firms in the food industries. Using data compiled by the Bureau of the Census, Hiemstra notes that over the period 1947 to 1958, the number of companies declined in 17 of the 25 food manufacturing industries included in his survey. Although a large increase took place in meat packing, declines of one-third or more took place in creamery butter, flour and meal, cereal breakfast foods, raw cane sugar, and soybean oil mills.

As to levels of concentration, Hiemstra found that only seven of 29 food processing industries were in concentration categories above that which Bain refers to as "low-moderate" concentration. Too much can easily be made of these data. Many of the enterprise aggregates involved are not theoretic industries, and even after refinement economists can disagree substantially as to the implications for competition.

Regarding trends in concentration, different conclusions are drawn from the very same set of secondary data. There does appear to be a rough and ready consensus, however, that between 1947 and 1958 concentration hasn't changed much one way or the other. In some industries, flour mixes, for example, it has increased; in others, meat packing, it has fallen. At this juncture, however, it is convenient to tie some loose ends left from the previous discussion.

Quite aside from analysis at one point in time, we must be very careful in attaching much significance to trends in concentration ratios as these are recorded by the Bureau of the Census. In agriculture the geographic boundaries of markets have been widening as a result of improved transfer facilities and better information. Secondly, because

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29 The views of Heflebower, op. cit., and Robert F. Lanzillote, "Market Power and the Farm Problem" Jour. of Farm Econ., XLII, 5, 1960 give a fair indication of the range in diversity of opinion. A good part of the difficulty is that market structure has many dimensions and to focus attention on only one of them at the expense of others is incomplete analysis. Moreover, there appears to be a tendency for researchers in this area to present considerable data on market structure, particularly concentration, reiterate some vague theorems from oligopoly theory, and then pass on to policy implications. This great faith in price theory would not be so discomforting if (1) theory were not so ambivalent and iffy in numerous respects; and (2) economists to the man drew similar conclusions from their data, which of course they don't.
of technological advance in food preservation and income growth, the range of products that can be substituted for each other at the consumer level is also growing rapidly. These changes mean that the arena of competition is being enlarged in commodities across the board so that even where concentration on a national basis is increasing, it is not at all clear that the forces of competition are eroding away. In the absence of detailed case studies, it might be that concentration ratios prepared by the Census can only be used in identifying industries where concentration has, in fact, fallen. Apparently, this argument lends support to the view that concentration in the food processing industries generally has not been increasing.

Another important factor favoring competition in food processing is the encroachment of private labels on the position of national brands. In his monumental study of advertising, Borden gave considerable stress to the importance of private labels in checking excessive advertising costs and service competition; and the efficiency of distribution through large retailers under private labels is evidenced by the substantial differences in prices between private and brand name merchandise which he reported. Over a decade ago, Nicholas Kaldor pointed out that early in the development of the marketing system, wholesalers were in a dominant position in the distribution system. In his view "the growth of modern advertising is closely linked up with the manufacturer's attempt to control the marketing and distributive mechanism..." Through this control large companies emerged that were capable of taking advantage of economies of scale and provide the wherewithal and incentive for engaging in product and process research. Although Kaldor saw some benefit in the rise of the dominant processors, he also wondered whether giant distributors might in turn wrest control from them. At this point, it does not seem improbable that the use of private labels by the giant retailers plus their control over shelf-space will seriously undermine product differentiation as a source of market power for processors. The conclusion has extremely important implications for farmers in their cooperative ventures. Has for example, the time for investing large sums in the battle for market power at the processor level passed? Viewed in this light, the intrusion of farmer cooperatives in food retailing becomes more understandable.

Concentration in food retailing tends to be of greater concern, it seems to me, than in food processing. The number of grocery stores fell from 360,000 in 1948 to 260,000 in 1958; and between 1945 and 1958, the market share of chains with 11 or more stores increased from 25 to 41 percent.

32 Ibid., p. 18.
Viewed as a national industry, however, food retailing is not highly concentrated. In 1958, the top four chains accounted for 19.7 percent of total food store sales, and one of these, A & P, accounted for 10 percent by itself. It is in the many local retail markets that the concentration rather soars. Some examples will illustrate the point. In Altoona, A & P accounted for 40 percent of the retail food sales according to a 1958 study. American Stores accounted for another 15 percent. Thus the two companies combined made over half the sales. In Denver, Safeway had 39.4 percent of the sales, National Tea had 20.3 percent and King Soopers had 13.7 percent; thus the top three together accounted for 73.4 percent of food sales. These are high levels of concentration, and one must try very hard to believe Mehren and Cochrane when they tell us that competition among grocery retailers is not competition among the few. Indeed, such trade publications as "Supermarket News" are replete with evidence on the recognized interdependency among retailers.

Concentration in local retail food markets has a counterpart in the food processing sector. Although food processors might sell in national or regional markets, supplies are often purchased in local markets where concentration, as traditionally conceived, can be quite high. There are mitigating factors, however, which are illustrated by a study of local grower-processor vegetable markets, which gave evidence of high concentration in procurement. This study suggests that if the quantities of farm products offered for sale to marketing firms are highly responsive to farm price levels, farmers are somewhat protected against a few buyers holding those prices down. In this vein, one might think of the farm sector as an aggregate of productive capacity that can be allocated in many ways over the long-run; buyers of one farm product compete to some degree with buyers of all others. In addition, agricultural economists need no reminding of the role of cooperatives in local markets, particularly for such important commodities as livestock, grain, and dairy products. Although to a decreasing extent, the large central markets also facilitate competitive pricing though yielding price quotations that constrain and determine prices in the surrounding local territory.

Internal Organization of Firms

This brings me to changes taking place in organizational structure and activity within the business firm. What are these changes and how might

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35 Ibid., p. 249.
36 Cochrane, op. cit., and Mehren, op. cit.
38 Helmberger and Hoos, op. cit.
they affect the market conduct of business enterprises in general and their procurement practices in particular? To my mind these questions have not received the attention they deserve in agricultural marketing research, although glimmerings of increased concern exist. Two issues seem to require further analysis and investigation. The first pertains to the separation of ownership and control in the giant business enterprise; the second to the rise of so-called "scientific" management.

Regarding the first issue, the separation of ownership and control was enunciated by Berle and Means many years ago. Only recently, however, in the works of Baumol, Marris, and Cyert and March have the possible economic implications of this separation been given much analytical treatment. Other economists argue that in spite of all the fussing over stockholders who do nothing but hold stock and corporate managers who must be taught to protect the public weal lest they become "irresponsible oligarchs," the traditional theory of the firm will take modern capitalism in its stride. The questions posed in this debate are no less relevant to practitioners of agricultural economics than to economic theorists for, aside from industrial giants in the food sector, separation of ownership and control might well characterize the bulk of cooperative business. Questions posed include: What goals besides the quest for profit guide business behavior? Do such nonprofit goals also guide decision making processes in the giant farmer cooperative? Might not managerial desire for approbation and prestige culminate in conglomerate growth? If so, how will the effectiveness of a market system be affected? My impression is that these types of questions are important and as yet unanswered.

Regarding the focus on problems of management, it seems abundantly clear that the electronic computers are engendering an information explosion. Information retrieval and analysis can now take place on a scale that vastly exceeds precomputer age possibilities. Along with the computers have come new techniques of analysis in management science, such as mathematical programming, that require use of computer services. Earlier we described the crucial role of information in the creation of enterprise, in the establishment of enterprise boundaries, and in the nature of a firm as an allocative mechanism. Now the question is how will advances in management control over information affect the balance between firms and the market mechanism

in planning economic activities. Herbert Simon suggests that recent studies "are already calling into question beliefs that allocation through markets, simplified information processing as compared with centralized allocative processes." 42 And, perhaps what is even more noteworthy, an economist from the University of Chicago almost agrees with him! 43 The two issues raised by changes in the organization of the business enterprise obviously have significant interaction. Managerial control, when buttressed by the advances in management science and fostered by our tax structure, might provide both the will and the way for creating monstrous conglomerates that would make the ghost of Senator Sherman scratch its head and wonder if there oughtn't to be a law.

**Government and Policy in Agriculture Marketing**

Our survey of the evolving procurement patterns in farm markets and market changes further up the channel poses several areas of public concern. Without taking a position on the merits of demerits of integration, we might begin by asking what can be done to improve the efficiency of the more-or-less traditional farm markets.

The answer, I think, is to continue doing many of the things that we have been doing in the past. Paul Farris emphasizes the importance of accurate price quotations that reflect quality, service arrangements, and other benefits. 44 This implies using accurate sampling methods and meaningful quality standards in grading. If it is true that the market value of nonfat milk solids is increasing, for example, then greater reliance on protein pricing plans are in order. If consumers really do prefer lean to fat pork, ways of translating such preferences into marketing and production activities should indeed be sought. Of equal importance is the need to inform farmers of price advantages of alternative market outlets. Burnett and Clodius have made a case for frequent publication of base milk prices, hauling rates, premiums, and differentials by the press in local manufacturing milk markets. 45 The more general cause is for a continued updating and expansion of price reporting services and for effort by extension workers to alert farmers to the need for knowing their markets. In a work, government should continue its historic role of enforcing certain rules of the game, supplying certain marketing services, and otherwise encouraging the efficient functioning of markets.

In addition, private economic agents operating in the traditional sphere of open markets must be quick to innovate and adopt new technologies.

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43 See the discussion of Simon's paper, Ibid., p. 17, by W. Allen Wallis.  
45 Burnett and Clodius, op. cit., p. 35.
The current experiments with systems of mass selling by description in livestock marketing and the recent initiation of cattle futures contracts are illustrative of the type of continuous search for better methods and institutions that will further strengthen the open market approach.

After all is said and done, however, there is no assurance that the open market system can compete in every commodity market with systems that utilize various forms of integration. We have noted basic reasons why certain resources and activities become fused into a business enterprise and why the center of control in a firm might reach out in various directions to secure control over additional processes. The imbalance of market information, the interrelatedness of processes in vertical sequences, the propensities to assume risks, etc. -- all of these change over time. Thus it would be foolish to suppose that some particular type of firm such as the family farm will retain control over its traditional economic functions in the face of whatever technological and institutional changes take place.

We have noted a possible role of bargaining cooperatives in contract production. The role as visualized here is a modest one. Where concentration in local markets supports monopolistic exploitation, farmers might well from bargaining groups to redress their weak market position. In the past, farm leaders have pushed for legislation that would foster group bargaining in farm markets much as the Wagner Act has done in labor markets. The bargaining environment could doubtless be changed to support farm groups. Another alternative is for farm cooperatives to seek greater control over the entire food marketing sector. At the first buyer level the cooperative form of enterprise might have real merit where economies of scale necessitate high concentration in procurement.

In this connection, the interest which leading farm organizations have shown in the prospects for entry of cooperatives into the food retailing industry could have profound implications. Much depends on the intentions of the organizations involved. If acquisition of a chain is merely viewed as an investment outlet for farmers' savings, the move will likely not amount to much. If, on the other hand, this move is a first step in a series thought to be the most efficient way to control food marketing, the result might well be an ascendency to power of cooperatives not unlike those observed in certain foreign countries where cooperatives have acquired the status of quasi-public institutions. Distribution of profits according to patronage would seem to dictate cooperative control over much of the intermediate marketing functions. The probability that the sleeping giant from toad lane will arise from his deep slumber, to use Wesley McCune's analogy, is quite another matter.\(^\text{46}\)

Concentration in procurement of farm products arising out of economies of scale in marketing pose a most troublesome question for antitrust enthusiasts. The same can be said for concentration in local food retail markets. Yet the stakes in preserving lively competition in our food industries are high and few are prepared to downgrade vigorous antitrust action. The Brown Shoe Case is heartening in this respect, for apparently merger sprees and acquisition orgies simply will not be tolerated. 47 If some of our previous speculation is correct, conglomerate growth of giant corporations merits close scrutiny in the years ahead.

The previous papers have set the stage -- farm numbers are declining and will continue to decline; average farm size is increasing and will continue to increase; capital per farm will continue to increase at a faster pace than average size of farm; and other dynamic changes will occur among individual farm firms. Our assignment is to focus on the implications that these changes portend for financial and capital markets serving agriculture.

In the first part of the paper we treat the relatively recent development of nontraditional institutions in agriculture, particularly as these innovations relate to capital markets. The second part discusses some of the implications of these nontraditional institutions for the traditional sources of farm credit. The changing structure of farms probably has a bigger impact on commercial banks than on the other major sources of farm credit. Hence, in the third part of the paper we discuss implications of the increasing capitalization of farms for commercial banks.

**Innovation of Nontraditional Institutions**

The distinction that we make between traditional and nontraditional institutions is somewhat artificial. In general, nontraditional institutions include developments since World War II: leasing of capital equipment, "permanent debt," vertical integration, horizontal combination, and the trend toward incorporation of family farms. Traditional institutional sources of farm credit include the cooperative farm credit agencies as well as commercial banks and insurance companies.

A major problem in agricultural finance is how to arrange for capable farm managers to have access to enough capital on a continuing basis to employ their managerial and labor resources efficiently. This problem has become more critical in the post-World War II period, and has been partly responsible for the appearance of several nontraditional institutions.

**Incorporation of Farms**

The trend toward fewer and larger farms, higher investments, and increased complexity of financial-legal management has given rise to a closer look at the corporate type of organization for the family farm. The most stout-hearted pro-
ponents of incorporation see this institution as a means of avoiding small and uneconomic units, inadequate capital, and the struggle to recapitalize every generation. If successful on these points, incorporation might serve as an aid to family farming. At the other extreme are those who fear that corporate farming signifies the end of the traditional family farm. The truth, undoubtedly, lies between.

Research in Alabama, involving case studies of corporate farms, indicates that corporate-type organization of farm business has much to offer certain individual family farms, but is not the solution to all maladjustments in agriculture.\(^1\)

Another study, involving a stratified, random sample of 80 out of more than 300 farm-ranch corporations in Oregon -- mostly closely held family corporations -- yielded similar conclusions. Referring specifically to the financing and capitalization aspects of these corporate farms, Hubbard concluded that:

The finance and credit picture of farms has changed little as a result of incorporation. Stock has not been sold to raise equity capital; stockholders have not used debt securities in their capital structure. Loans are still received from the same sources and operators are still personally liable for farm debts. Farm-ranch corporations do not extensively use dividends because most earnings are "plowed back" into the corporation. In addition, many stockholders have made loans to the corporation, indicating that an important part of farm financing is still internal financing. Incorporation did not seem to greatly limit or expand available external credit but did complicate procedures of borrowing. Incorporation has not significantly changed farm peoples' attitude toward the use of perpetual debt; most are still opposed to the idea.\(^2\)

Stockholders are personally liable for farm debts in nearly all of these cases, because they were asked to sign personally for corporation loans, negating any limited liability for corporate debt. Traditional lenders seem to like the idea of incorporating farms because of the continuity of the business, but apparently they are reluctant to lend only on the corporate signatures.

The recent trend toward incorporation of farms is likely to continue -- not so much because of the potential advantages of financing and capitalization as for the advantages offered for tax and estate management. Perhaps some day

operator-managers of closely held family farm corporations will actively try to sell either common or preferred stock of their corporations to people outside the family as a means of increasing the size of their business, but a wholesale shift in this direction is not likely in the next decade or two. The goal of family ownership -- debt-free, if possible -- still will prevail. Patterns of finance and credit likely will change very slowly as a result of any step-up in the rate of incorporation of farms.

Even though incorporation likely will have an insignificant impact on capital and credit markets and on the financial management of farms, it may have an indirect effect that should be noted. Any technique that proves useful in tax and estate management will tend to strengthen the competitive position of the larger and more successful family farms. Incorporation also will tend to lengthen the life of farm businesses and will make it easier for new management to develop within the family business and eventually to assume control without necessarily acquiring financial control.

**Leasing Capital**

Leasing of capital equipment has become more popular in recent years. Such action is taken most commonly by farm operators facing external credit rationing who want to conserve their credit base for items with a higher turnover rate than is usual for most machinery and equipment. Capital leasing is not so popular among farmers with ample operating capital or with a good chance of obtaining all the credit they need at going rates of interest.

Leasing is not the answer for most farm operators, or normal ownership would not be as commonplace as it is. Farm management studies on the economics of farm machinery operation indicate rapidly decreasing costs as the volume of use increases. By the same token there may be some scale economies on the part of the lessors resulting from mass buying power. However, limited evidence fails to suggest that lessors enjoy any great cost advantages over farm operators generally. It follows that the farmers who will tend to benefit the most from leasing arrangements will be those who either (1) have limited annual use for a machine, (2) have an uncertain or variable annual use, or (3) are quite limited on capital so that the opportunity cost of funds invested in farm machines is high (in terms of other investment opportunities passed up).

As with most new markets, the capital leasing market has been rather unstable. Rates have fluctuated as more has been learned about costs. Several former lessors have discontinued leasing to farmers because of unfavorable events. Others seem fairly well entrenched and claim to be making profits.

As this market matures, capital leasing may become the answer among more of those farmers who want to conserve working capital or credit bases. In the kind of environment that is being projected for agriculture, it seems likely that the proportion of farmers with working capital restrictions may increase.
Permanent Debt

With average size of farms increasing, it is becoming less and less feasible for a farmer to pay off his debt during his productive lifetime, and maintain full ownership of all capital in the business. Several individuals have proposed that we may need to revise the generally accepted goal of achieving full debt-free ownership of a family-size farm through investing savings realized from the business during the productive lifetime of an individual. Proposals suggest that "permanent debt" may not be a bad idea—that a loan agreement could be written so that the debt would be amortized until the balance would be reduced to, say, 40 to 50 percent of the value of the farm. From then on, only interest payments would be made.3

Experience with so-called permanent debt in agriculture is quite limited. A very few instances are known in which a conventional lending institution has made an agreement with a farm operator nearing retirement whereby the operator would make only interest payments on the remaining debt until he retires, at which time he would liquidate the business and pay off the debt. In these cases, the farmer's equity is usually substantial enough that the loan is "safe," but it would pose a hardship on the operator at that age, under certain circumstances, to require him also to reduce outstanding indebtedness.

Referring to this type of agreement as permanent debt is probably a misnomer. This raises the question, What is permanent debt? Presumably, except in the case of corporations, permanence coincides with the productive lifetime of the farmer. Even with assurance that permanency will be for not more than 30 or 40 years, few lenders are prepared to extend a substantial total amount of credit on this basis. Unless the creditor is "locked in," he would be tempted to refinance if the level of interest rates subsequently declined. On the other hand, the lender would not like to be committed to the going interest rate for such a long time, with the possibility that the level of rates might rise. Perhaps it would be possible to devise a way to renegotiate the interest rate periodically. Unless some such breakthrough occurs, any increase in the institution of permanent debt among noncorporate farms likely

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3Preliminary investigation suggests that the percentage withdrawal associated with the farm operator financing expansion from his net farm income may be increasing. In other words, if a farm operator wishes to increase the size of his business by (say) 10 percent, the percentage of his net farm income that must be reinvested at the present time is greater than it has generally been historically because capital inputs are becoming relatively more important. The consequence of this is that greater pressure will be placed on the capital markets unless incomes are increased sufficiently to result in smaller sacrifice on the part of the farm operator even though the percentage reinvestment requirement is higher. This hypothesis needs to be tested under a variety of conditions.
will be minimal. 4

The potential, at least, appears greater for corporate farms -- not as permanent debt, per se, but in the form of preferred stock. If the management of a corporate farm wants to increase the capital of the business, but does not want to dilute the common stock, and does not want to make amortization payments on debt, preferred stock might be sold. Dividends paid on the preferred stock would be somewhat analogous to interest payments on permanent debt. The objectional long-term commitment on interest rates would not apply as it does to debt -- the value of the preferred stock would change as relative rates and yields changed. At a later date, the corporation might choose to buy back the preferred stock with retained earnings. This would be analogous to paying off permanent debt. 5

Up to now, apparently, preferred stocks have not been used much among corporate farms. While their use may increase some in the future, use is not likely to become widespread -- partly because the market for stocks of family farm corporations generally is limited to local people familiar with the operation, and partly because of the prevalent desire for full ownership among farm families.

Vertical Integration and Contracting

In general, the trend in American agriculture in recent decades has been toward vertical disintegration -- toward specializing in fewer stages of production. In pork production, for example, one farmer may specialize in producing feeder pigs while another specializes in fattening shoats. Numerous examples of disintegration are found in poultry and egg production, with such narrow specialities as: (1) producing layer-type hatching eggs; (2) hatching and sexing chicks; (3) growing layer pullets from purchased female chicks; and (4) producing eggs from purchased pullets. By specializing in fewer stages of production, the farmer can increase the size of his operation to obtain economies of scale. The capital and financing problems in these cases may be more acute than those of a more diversified and integrated operation, because the uncertainties of production and price are larger as the number of stages of production diminishes. 6 As specialization increases, firms tend to become less self-sufficient; a larger percentage of total inputs is purchased, a development which increases capital requirements.

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4The concern about "permanent" debt is perhaps a reflection of a more basic concern. This is the tendency in agriculture for the life cycle of the farm firm to coincide with the life of the farm operator. If devices can be developed to reduce such coincidence then the issue of "permanent debt" may lose relevance. The corporation may be one such device.

5Of course, there are legal differences between a mortgage instrument (debt) and preferred stock. The holder of preferred stock would not normally have recourse to foreclose. Hence, he probably would expect a higher yield than he would on a mortgage investment.

Contracts with farm suppliers or processors are one way of reducing uncertainties in some kinds of production -- particularly for specialty products with a limited market or for certain perishable products. By guaranteeing a market and reducing production uncertainties through improved technology and supervision, contractual arrangements often improve a farmer's prospects of obtaining credit from traditional credit institutions. In some cases, contractors may help their producers negotiate loans with a bank, production credit association, or other lender.

While a contract may give a producer better access to customary lenders, some contracts may reduce the farmer's need for borrowed funds. Many of the operating capital inputs may be advanced by the contractor on credit, or they may even be owned by the contractor. The contractor, in turn, may finance these inputs from the company's own funds or by borrowing.

In some instances, industrial corporations may integrate vertically into agriculture. The motivation for vertical integration varies, but may come about because of the reluctance or inability of farmers to produce enough or to meet the specific product requirements of the integrating company; financial requirements or risk may be too large for an individual. Potential monopoly control may be the motivation in some instances. In any case, the primary incentive for vertical integration comes from the firms that do business with agriculture.

As a rule, though, processors and suppliers avoid investing directly in agriculture if they can. Mighell and Jones, in a very comprehensive study of vertical coordination, state that:

> Only in few instances does it seem advantageous for processors and other businesses to finance farm production entirely within their firms. Important here are specialized farm products for which the market structure involves a high degree of producer or buyer concentration with relatively high barriers to entry. Vertical integration then offers a way of gaining or maintaining a strong market position.\(^7\)

They go on to say that, "...financing of farm production by nonfarm businessmen--either under contract or vertical integration--is mainly necessary only when open production fails to achieve the market outlet or procurement objectives of these businesses."

Thus, the bulk of farm output likely will continue from "open production," from farms neither vertically integrated nor with contracts. However, processors of farm products and suppliers of farm inputs may be expected to grow in relative importance as sources of farm capital.

\(^7\)Ibid., p. 63.
Horizontal Combination

In certain kinds of specialized agricultural (usually livestock production, advantages are sometimes obtained by combining farm units at the same stage of production -- combining them horizontally. Several broiler farms, for instance, may be owned and controlled as one firm. The incentive for combining units under the superstructure of one firm stems from the economies of marketing the product and buying supplies in larger lots, and from more efficient use of the management resource.

Only those kinds of agricultural production that lend themselves to routinization are likely candidates for combination. For nonroutine farm production, management either becomes spread too thin or administrative overhead becomes too burdensome to realize economies of scale when several units are combined. The combining of farms horizontally is not likely to take place on a large scale because most farm production is not routine. However, some additional combining may occur among such types of operations as egg and broiler production and cattle feeding.

Our ability to increase routinized production in agriculture will depend on the kinds of technological improvements that are made. Scientific progress makes it possible to specify advance instructions for producing agricultural commodities. A single firm may then control several production units and depend on hired workers to carry out routine tasks. Farm management remains an art, but the progress of the underlying sciences will determine to a very great extent the ultimate power of the management resource.

Implications of Nontraditional Institutions for Traditional Sources of Farm Credit

Economic innovations frequently conflict with established customs and institutions and are often resisted. In discussing resistance to some recent economic innovations in agriculture, Mighell and Jones state:

Part of the expressed concern comes from representatives of farm organizations, market groups, and the banking system rather than farmers. These established institutions are concerned about the adjustments that may be necessary in their own activities as a result of new institutions. 8

One could argue that established institutions are frequently better off after having adjusted to the environment of a new institution that they were prior to the innovation, but that does not obviate the fact that adjustments

8Ibid., p. 2.
had to be made -- and change is sometimes painful. Furthermore, not all conventional institutions are better off even after having adjusted to a new institution. Hence, the apprehension implied in the above quotation may be based on accurate analysis.

In general, the advent of nontraditional institutions has tended to divert loan business away from the smaller rural banks -- and, in some cases, from other traditional sources of farm credit -- to larger banks and financial institutions. The nonfarm business firms that lease capital to agriculture, or that have integrated vertically into agriculture, or that contract with agriculture, typically are large relative to farm firms and likely would obtain any necessary credit in larger nonfarm financial institutions or money centers. Farm operations that have combined horizontally probably have outgrown local credit facilities in some cases, and have gravitated to larger financial institutions. To the extent that integration, contracting, capital leasing, and horizontal combination have increased in importance, there has been pressure for a larger share of capital and credit in agriculture to come from larger financial institutions at the expense of smaller ones.

Particularly in the case of contracting, the above generalization is not always true. As mentioned earlier, a contract often reduces risk for the farmer and may improve his prospects of getting credit from traditional sources. Whether credit is obtained by the farmer locally or is extended by the contractor depends partly on whether the contract is with a supplier or a processing firm.

Patterns of financing apparently have not changed significantly because of the incorporation of farms, at least in the case of closely held family corporations. However, it would seem that if incorporation becomes more widespread, the credit requirements for transferring ownership of farms will be reduced. Ownership of incorporated family farms would tend to be passed on to all the brothers and sisters in a farm family (although only one might become the manager-operator). To the extent that the brothers and sisters retained their stocks, they would help to finance the farm business. If one brother took over the farm under sole ownership, he probably would have to use considerably more credit.

So the implications to traditional credit sources are somewhat different, depending on which of the new innovations is being considered. To summarize, it would seem to us that any further increase in the number of corporate farms would tend to reduce the demand for credit, particularly long-term credit, below what it would be under conditions of sole ownership. Any further increase in capital leasing, horizontal combination, and vertical integration would tend to divert the demand for credit away from smaller banks and other traditional sources of farm credit to larger banks and financial institutions. Deposits in the banking system would tend also to be shifted from smaller banks to the larger ones.
Implications of Increasing Capitalization of Farms for Commercial Banks

Capital and credit requirements of individual farm firms are increasing rapidly and are projected to continue increasing. The implications are more pungent to commercial banks than to most other sources of farm credit; commercial banks have been losing out, relative to other sources of credit. The share of total farm credit extended by banks has been decreasing during the past 12 to 15 years. The changing structure of individual farm firms is probably at least partly responsible, because capital and credit requirements per farm have increased at a faster rate than the ability of banks to finance them.

Loan Size

Country banks, in particular, are frequently unable to grant loans as large as a farmer desires, since state and national laws limit the size of loan that banks may make to any individual, depending upon the size of a bank’s capital and surplus. The National Banking Act limits the size of loan that a national bank can make to 10 percent of the bank's net unimpaired capital and surplus, unless that loan is secured by livestock, in which case the limit is 25 percent. Most states have laws that limit the size of loan that state banks can make. The percentages vary among states.

Individual banks in the Tenth (Kansas City) Federal Reserve District were analyzed by applying the National Banking Act limits to the national banks and the appropriate state laws to the state banks. Results indicate that several banks may be unable to finance some of the larger farm operators, unless some supplemental method is used, such as sharing the loan with a correspondent bank.

For 10 percent of all country banks in the Tenth District at midyear 1964, the maximum size of loan that could be made to individual farmers was $10,000 or less, unless the loan was secured by livestock. Some of these could not have made a loan as large as $10,000 even if secured by livestock. For 39 percent of the country banks in the Tenth District, the maximum size of loan was $20,000, unless secured by livestock. A large proportion of these could not make a loan of $20,000, even if secured by livestock. More than half of the agricultural banks in the district could not make loans to an individual farmer for as much as $20,000, unless secured by livestock, and many of these had limits considerably less than $20,000. 9

Bankers are very much aware of this problem and many have taken steps to improve their ability to service the larger loan requests. For one thing, several have increased their capital and surplus accounts. Of the national banks in the district in 1964 that were classified as agricultural banks, 56 percent had loan limits of $20,000 or less; 74 percent had such limits in 1959. The 1964 figure represents considerable improvement.

9Agricultural banks are defined here as banks in which farm loans were at least 50 percent of total loans.
While bankers have adjusted to the increased demand for larger-sized farm loans, some evidence indicates that their ability to service farmers has not kept pace with the increased capital requirements of individual farm firms. Since 1940, the average value per farm of assets used in production and average production expenses per farm have both increased about 700 percent. The average capital and surplus of country banks in the Tenth Federal Reserve District was increased by only about 450 percent during this period.

Another indication that individual farm capital and credit requirements are increasing faster than the ability of rural banks to finance them comes from recent surveys by the American Bankers Association. They state that:

Midyear reports since 1962 reflect an upward trend in the proportion of agricultural banks receiving acceptable farm loan applications which exceed their individual lending limits. During the first six months of 1964, 34 percent of the banks received one or more such requests. This was up from 29 percent (the year before) and 24 percent for the comparable period in 1962. ¹⁰

The more aggressive bankers have used various means to honor the requests of farmers for loans larger than their bank could legally grant. A method that is becoming more common is for the smaller banks to have "correspondent bank" connections, usually with city banks that have larger capital and surplus accounts and can make larger loans. For example, a farmer may request a $25,000 loan from his local banker, but the bank legally can lend him, say, only $10,000. Assuming that the loan request is sound, the banker may invite his city correspondent to "take the overline," or extend the additional $15,000. One indication of the growing importance of this kind of sharing of loans is the number of city banks during the last three or four years that have added "bank agricultural specialists" to their staffs. For the most part, these men are hired to cultivate correspondent accounts with country banks rather than to make direct farm loans. Another example of the importance of this phenomenon in banking is a recent series of "Correspondent Agribanking Forums" sponsored by the American Bankers Association for the benefit of both country and city banks.

A relatively few country bankers have formed agricultural credit corporations as subsidiaries to their banks, by which means they can "discount" their agricultural paper with a federal intermediate credit bank in essentially the same manner as a production credit association. This can be a solution not only for some of the excess loan applications, but also can serve as a source of funds for banks that are "loaned up."

Supply of Funds

Deposit liabilities constitute the main source of loanable funds of banks. Many rural banks depend primarily upon agriculture for deposits as well as for loan business. While gross farm income -- the major source of deposits for many banks -- has been trending upward at a modest rate, credit demands of farmers have been increasing at a faster rate. Consequently, loan/deposit ratios have been increasing. Many banks that are heavily dependent on agriculture are loaned up.

A recent analysis by the Federal Reserve Bank of Kansas City indicates that, "...agricultural banks have had strong loan demands in relation to deposits and that loan/deposit ratios of these banks are higher than for comparable sized banks that are not so dominated by agriculture." 11 On the other hand, this same analysis suggests that agricultural banks may not be competing as vigorously for deposits as the other banks. Of course, considerable variation exists among rural banks in the extent to which they have adjusted to increasing credit demands. Some rural bankers have innovated about as fast as their farm customers.

Some new money tools have been said to have caused a "quiet revolution" in banking,12 Limited evidence indicates that use of these tools may be spreading in country banks, although state-chartered banks do not have enabling legislation in some states.

One of these new tools is the negotiable certificate of deposit -- introduced in 1961. It enables bankers to "buy" deposits in money markets, and has the effect of moving funds from surplus areas to areas in which credit demand is greater.

The issuing of capital debentures by commercial banks is a new tool for increasing a bank's capital account and, therefore, its lending limit, as well as increasing its supply of loanable funds. If used discreetly, these new technologies in banking offer a potential for helping to satisfy the growing demand for farm credit, although use to date in rural areas is quite limited.

One of the most consistently discussed possibilities for channeling funds into agriculture is the institution of branch banking. Proposals for the liberalization of restrictions on acquiring or establishing branches by banks are submitted periodically to legislatures in states that do not have branching. Needless to say, the idea is quite controversial among bankers.

Dialogue on the merits and evils of branch banking is not new. One of the nation's better-known economists published an article 31 years ago in the Journal of Farm Economics, titled, "Branch Banking and Its Bearing Upon Agricultural Credit." In this article, John Kenneth Galbraith discussed with clarity

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the various viewpoints, advantages, and difficulties associated with the concept of branch banking. Galbraith was notably in favor of reducing restrictions to branch banking as one means of increasing the availability of loanable funds in the agricultural community. At the same time he recognized the power of the opposition in a statement that would stand as well today: "...even the more sanguine proponents of branch banking must concede that it is a development which is capable of generating a powerful resistance."13

Branch banking, of course, is common in the western United States. In Oregon, for example, two banking firms compete in every sizable community and are the only banks in many communities. Where branch banking is permitted it has grown rapidly. This suggests that there are certain economies that result from branch banking. Data are not available on the service rendered by branch as compared to nonbranch banks. The main complaint heard about branch banks is the lack of autonomy at the local level. The referral of decisions to the central office may mean that decisions are made by individuals unfamiliar with local situations. In Oregon, independent banks have been able to compete successfully with the branches when they have had adequate capital accounts and when the management was capable and aggressive.

CONCLUSIONS

1. The individual impact of the nontraditional institutions -- incorporation, capital leasing, permanent debt, vertical integration and contracting, and horizontal combination -- has not been of major significance. Nevertheless, the total development has been significant, reflecting the influence of the changing capital structure of individual farms on the financial and capital markets. These developments suggest that the traditional credit institutions will have to adjust to changing conditions if they are to maintain their relative positions.

2. The development of nontraditional institutions has had considerable impact on the traditional sources of credit. The principal effect has been to divert loan business away from smaller rural banks to larger banks and financial institutions.

3. The changing structure of farms probably has had a bigger impact on commercial banks than on the other major sources of farm credit.

4. Banking has adjusted by the stepped-up use of existing techniques as well as by the development of new techniques. Some of these techniques are:

   a) Correspondent agribanking
   b) Agricultural credit corporations
   c) Capital debentures
   d) Certificates of deposit
5. While banking has adjusted, some may question whether its rate of adjustment has been comparable to that of the farm borrower. In any case, it would appear that increasing reliance on the specialized agricultural lender will be necessary to match the challenge of an agriculture that is becoming increasingly more sophisticated in its financial management.
IMPLICATIONS FOR ORGANIZATION OF FARM RELATED MARKETS:
A DISCUSSION

by John C. Redman*

In reading, listening, and reflecting on the general topic of this conference I am reminded of what a professor told me recently. He said that one day he dreamed that he was lecturing to a class and that when he awoke he discovered that he was. I am afraid that most of us have been sleeping; and now, after dreaming of a changing economy, we have awaked to discover that changes have been going on and will likely continue to accelerate in the next 15 or 20 years.

There seems to be present in agriculture and closely related sectors a primary revolution which is largely technological in nature, and this is generating some secondary revolutions which are largely economic and cultural in scope. The technology being developed is enabling the American farmer to produce a volume of output much larger than the capacity of the economy to utilize at a price sufficient to reward resource owners with returns comparable with nonfarm earnings. This gap between what exists and the potential at a particular time is an uprooting factor in causing re-allocative action by the members of the economy. Associated with this uprooting act is a cultural and intellectual approach to the problems involved. In addition, the time dimension is becoming more pronounced in all mainstreams of American life, while at the same time our values and beliefs are being examined. We are experiencing the feeling that we either have the wrong or inappropriate answers to the right questions or the wrong question to the correct answer. Perhaps, our problem is illustrated by the response of a professor when questioned: "The questions don't change but the answers do." No doubt, within the next 20 years the answers will be very much different to the same questions which face us today.

The paper by Sims on "Factor Supply Firms and Markets" dealt largely with the effect of the structural changes on firms which handle expendable inputs. It was pointed out that the farm supply firm faces an uncertain future. This would be true for the firm as currently organized and operated. However, the supply firm can be expected to undergo rather important changes to meet the changing needs of the farm firm. The question seems to center around the extent and direction of the change. Will there be an opportunity for the small supply firm to provide a share of the large commercial farm's requirements? Will the large commercial farm or a group of commercial farms buy inputs according to specifications cheaper by buying direct from the manufacturer?

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1In more precise economic terms, new technology shifts the supply schedule to the right.
and thus bypass the supply firm? This practice has been followed in the fertilizer inputs category for some time and it is likely to spread for all types of farm inputs. In some areas there may be some interest in rediscovering and adapting the old general store idea. However, this approach is not likely to get very far unless it assumes the functions of a broker representing the farmer or the manufacturer.

An increased need for a supply of advisory services was suggested, and this need may be met from many sources, such as the extension service, sales engineers, or consulting firms. It is my opinion that the equality of advisory service needed by the commercial farm of tomorrow is much greater than these sources are now able to provide.

A major resource market of which no mention was made is that of labor. No doubt, the farm of tomorrow will substitute capital for labor, but how far this substitution will go will depend not only on the substitution rate but on the relative cost of labor and capital. The principal factor determining the cost of labor in farming likely is the available alternative opportunities. A much higher quality of the labor input will be needed, and this will be forthcoming as a result of the cultural and intellectual revolution now taking place. As special farm skills are developed and utilized by the bigger commercial farms, there seems to be a good possibility that farm laborers will organized into unions which could be rather demanding since farmers are subjected to a rather exacting time schedule in their production process.

The land input will take on increased significance. The price for real estate promises to be rather high for some time to come. It is true that with the heavy applications of technology and capital along with higher levels of management, productivity of an acre of land will be increased, and a given output can be produced with less acreage. There will be a need for considerable consolidation to achieve an optimum level of land input. Other competing uses for land -- recreational areas, highways, lakes, urban developments, farm residences, etc. also -- hold the market price up. Will there be any innovations in the land input category.

The paper on "Finance and Capital Markets" had the objective of discussing the implication of the changes in the farm sector on the finance and capital markets. The nontraditional ways of acquiring control over capital centered around the leasing of capital equipment, vertical integration, horizontal combination, incorporation of farms, and living with permanent debt rather than seeking to achieve the time honored goal of a debt-free farm. While a bare mention was made of cooperative farm credit agencies and insurance companies, only commercial banks received any attention as traditional institutional sources of credit. It is doubted very much that only commercial banks will experience any impact of structural changes in agriculture. However, because of their very nature, the commercial banks may experience greater difficulty in adjusting to the impact of the structural changes.

2 In more precise economic terms, the marginal physical productivity of the land input will be increased.
It is likely that unless the legal framework under which the commercial bank operates is changed, this source of credit will become increasingly less important. The commercial bank being engaged in a profit-making activity will be facing the usual problem of allocating its loanable funds among the various opportunities which promise the greatest profit. What alternative opportunities are available to the bank? Recent trends in loans outstanding suggest that installment credit is a very profitable field which will offer approximately twice the return that can be expected from farm loans.

The sales finance corporation, which may be a subsidiary of the parent corporation, appears to hold an important place in the credit field, particularly in the more durable input category. This type of corporation can offer a reasonable rate and terms to the farmer and at the same time achieve a reasonable return to the company on the amount of funds outstanding. The capital leasing activity will undergo modifications, the nature of which are open to speculation.

The production credit associations have experienced rapid growth since about 1955, when they were more or less pressured into making adjustments in lending terms and purposes. Since they are now virtually farmer-owned agencies, there is no reason why they can not make rather rapid adjustments to meet the needs of the farm of tomorrow. These are organizations specializing in loans designed for farming activities. Some PCA's are adding fieldmen to assist in general advisory work. It is the on-spot contacts which acquire loan business, get it utilized properly, and get it repaid. PCA loans are very flexible and can be tailored to fit the needs of the farmer. PCA's loan not only for production purposes but for purchase of real estate, automobiles, medical expenses, etc. The future role of the PCA in serving farmers seems to be very bright, while the commercial bank with all the problems of traditionalism (six months note, collateral requirements, etc.), restrictions imposed, supervisory agencies, lack of specialization in farm lending business, and alternative opportunities for greater return may become a less important source of short-term credit for farmers. In addition, the commercial bank must be in position to meet the demand of the public it serves, and this necessity places an added burden on the commercial bank in competing with nonbanking agencies engaged in the loan business. In my opinion, correspondent banking is not the answer. Nor do I think that such gimmicks as certificates of deposits will have a great impact on tomorrow's activities. It will not be easy for the commercial bank to overcome these problems.

It is somewhat surprising that a discussion relative to long-term financing was completely eliminated. With fewer and larger farms in prospect, the problem of long-term financing looms as a major concern. Permanent debt has received some attention, but most agencies appear to insist that some plan be followed to liquidate the debt. In practice, the debt in many cases becomes permanent through constant use of the refinancing privileges. A loan to the large commercial farmer is what life insurance companies relish; thus with their low equity requirements and long-term loans, life insurance companies should occupy a more dominant role in long-term agricultural credit in the future.
Pressures are mounting in the Federal Land Bank to modify the concept underlying the loan limits and to give the Federal Land Bank Association manager more authority in making loans. Whether or not the Federal Land Banks will continue to be a major lender will depend upon how quickly they adjust their institutional setting and the values and beliefs held by the officials in the system. Since PCA and the Federal Land Bank Associations compete for much of the same type of business, there appears to be a need for consolidation of these agencies to serve the needs of the farmer adequately.

Savings and loan associations, which are now entering the area of residential farms and seeking to enter the consumer installment field, may find further ventures into large-scale financing of farms worth pursuing. Credit unions, which rank third in volume of consumer credit, have an opportunity to team up with supply cooperatives to handle the problem of accounts receivable.

Other agencies may become interested in the farm financing, particularly when large commercial units are in the market for funds. Managers of trusts, pension funds, etc., are looking for diversification of their portfolios and may find an outlet in this area. The most important source of financing is the farm firm itself. Through internal financing, the firm can meet most of its financial obligations. The management of these internally generated funds will be more critical in the future than in the past, and this is the area about which we know very little. While there are many agencies willing to offer partial financing for various purposes, there will be greater need to think of financing as sort of a package plan, utilizing internally generated funds and using supplemental funds from other sources.

Heimberger's stimulating paper had much to offer which is very important and useful in approaching a study of the current evolving pattern of the market place. However, I wish he had elaborated and committed himself more clearly and concisely on what changes are implied in product markets as a consequence of projected changes in the structure of agriculture as set out in the background papers (first four chapters of this report.) If we accept the idea that economic incentive is the principal reason for the existence of the firm, then I predict that the market firm of tomorrow, rather than procuring resources in the traditional market, will be a vertically integrated one which influences decisions from the farm level to the final disposal in order to gain coordination of activities. Thus, open markets are expected to diminish in the commercial sector of agriculture. The judgment was expressed that it was wholly proper for governments to seek ways and means for improving or safeguarding the declining open market. Opportunities may exist to make price a more accurate signal. These opportunities will be largely through concentration and standardization of the small lots, reducing uncertainty (chiefly by improving the state of knowledge) improving knowledge of input-output relationships, lowering the transfer cost through reducing the influence of oligopsonistic elements, and finding adequate control to prevent an abuse of market power. The question remaining here is how far society should go in safeguarding a traditional market structure which is declining in economic importance. Perhaps, it can be justified on noneconomic grounds.
Largely because of economic reasons, vertical integration in farm markets can be expected to increase. The question was correctly asked, "Who will end up in control?" An additional question would center around the economic and social desirability of accepting monopsonistic elements in the market procurement practices. Not all monopsonies are bad, but care must be exercised to see that society benefits by permitting these deviations from the highly competitive structures to occur. How much of the farmer's freedom can he afford to give up under vertically integrated arrangements? Will he, over a long period of time, lose some of this decision-making ability? It is possible that we may be oversold on the economic advantages of vertical integration and may neglect some of the non-economic costs.

Bargaining associations will be encouraged to help protect and advance the cause of the farmer component of the farmer-market firm integrated process. Dependent on the purposes of the bargaining associations, they may have varying degrees of success in an oligopolistic setting.

I fully agree that we know very little about the impact of technological change on the market organization. There appears to be considerable lag in the impact of technology, creating a considerable gap in what currently exists and the potential. But, as technology is adopted, we can expect adjustments to take place in the boundaries of the market, changes in forces affecting the competitive structure of the market, and changes in the internal organization of the market firm. Many persons will argue that in market firms where ownership and management are rather widely separated, the motivating goal of management becomes one not of maximizing of profits but of maximizing gross sales or gross volume of business.

It appears that Helmberger has mixed emotions, and I share this feeling. Integration is an accepted market policy to be fostered and guided. Yet I am very reluctant to see the traditional open market erode away. Perhaps, these adjustments will be so gradual that no serious pain will be experienced.
FARM ORGANIZATIONS IN 1980: ROLES AND SERVICES

by William J. Block*

The purpose of this paper is to look forward to the roles and functions of the farm organizations in 1980. When we reach that year, we shall have completed nearly 200 years in which American agricultural societies have existed. By far the greatest number and variety have been organized since World War I, however.

The bewildering profusion of private associations in this nation has been as significant a characteristic of its political life as the federal system and the two-party system. As one observer commented:

The political associations that exist in the United States are only a single feature in the midst of the immense assemblage of associations in that country. Americans of all ages, all conditions, all dispositions, constantly form associations. They have not only commercial and manufacturing companies, in which all take part, but associations of a thousand other kinds kinds, in which religious, moral, serious, futile, general or restricted, enormous, or diminutive... If it is proposed to inculcate some truth or to foster some feeling...they form a society.¹

That observer was Alexis de Tocqueville and the time was 130 years ago. Unless George Orwell's gloomy pictures of the atomization of group loyalties in his book 1984 come to pass, American agriculturalists will still have an opportunity to belong to several types of farm organizations 15 years hence.

There are two major sources upon which the predictions as to the character of farm organizations and the services which they may provide in 1980 are based. The first is the series of background papers. To build on this and to make a more detailed projection, a four-page questionnaire was sent to 30 associations in the farm organization field. With only four exceptions, all organizations responded. This activity was followed by personal interviews with representatives of nine organizations in Washington, D.C.

¹Alexis de Tocqueville, Democracy in America, Alfred A. Knopf (1945), 106.
The answers to the questionnaire and the interviews demonstrated that most officials and staff members of farm organizations have done little thinking or planning about their organizations' role a decade or more in the future. This well illustrates what March and Simon refer to as the "Gresham's Law" of planning: that daily routine drives out planning. This conference may help to remedy the situation.

Before looking forward to 1980, we might look back 15 years at the changes which have occurred in American agriculture over a comparable time period. This has been a period of new techniques, fantastic output, declining farm population, steady increases in farm size, rising farm costs, and unprofitable enterprises for many producers. It was during this time that vertical integration revolutionized the poultry industry. It has been 15 years of new demands on the education and skill of farmers. It has been a time of a changing rural environment, with suburban fingers probing into agricultural areas and a time of depopulation of some rural communities. It has also been a time of widening markets and of focused interest in the development of international markets. During this time the industrial nations denied earlier predictions that they would abandon agriculture and rely on developing nations for their food.

This has been a period of controversies over the Brannan Plan, flexible versus rigid price supports, the Soil Bank, the 1961 Omnibus bill, the commodity approach, and mandatory versus voluntary programs. The one governmental program which has drawn widest support has been Public Law 480 and its combined concern for human welfare and emphasis upon private enterprise.

These technological, social, economic, and political changes have had profound and far reaching effects on the organizations which have represented agricultural producers.

Debates over policy issues during this period involved most farm organizations and provided each with some victories and some defeats. Differences between them on such issues as the level of price supports and voluntary versus mandatory production control programs hardened, leaving some little room for maneuver. Probably the Farm Bureau's greatest satisfaction came during the Eisenhower-Bernon Administration in 1953 to 1961 and the defeat of the Kennedy Administration wheat program in the referendum of May 1963. The Grange and Farmers Union have undoubtedly found greater satisfaction in the programs which have been adopted by the Kennedy-Johnson Administrations. That none of these organizations found favor in the eyes of some farmers was evidenced in the creation of the National Farmers' Organization in 1955. Its emphasis on collective bargaining as a means of determining prices of farm commodities, while rejecting the cooperative approach, has evidently been less

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2James G. March and Herbert A. Simon, Organizations, John Wiley and Sons, Inc. (1959), 185.
than successful; yet this organization can still outdraw the others at meetings in several states of the Midwest.

Other dissatisfaction with existing farm organizations led to the development of new commodity associations in wheat in 1950, corn in 1956, and tobacco in 1962. The commodity organizations were brought into the Department of Agriculture policy development process to a greater extent after 1961.

Certainly the declining farm population did not induce a parallel reduction in the number of farm organizations. Neither did the reduction in number of farmers reflect itself uniformly in the membership rolls of these organizations. The Farm Bureau increased by 1.36 percent between 1950 and 1965. The Farmers Union declined slightly, and the Grange's addition of suburban and small town members partially offset its loss of farm members in New England. Although NFO figures are not published, membership in 1962 was said to be one-third less than its 180,000 peak of 1958. In some states there is considerable overlapping membership among farm organizations.

The decline in farm population and the increase in the size of farm units has had significant effects upon cooperatives during the past decade and a half. Most have lost members but have increased the volume of their business. At least three trends have been apparent in the farm supply and farm marketing field. The first has been that of using the slack resources of management to diversify. Thus marketing cooperatives have gone into related supply services for their members, and supply cooperatives have moved into the marketing field. The second has been the greater modernization and sophistication of cooperatives, which have become more competitive. The third has been the merger of cooperatives to get the size necessary to make them competitive. This development has occurred primarily because of a widening of markets, a trend which has made local cooperatives ineffective and has forced

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3 The National Association of Wheat Growers has some 75,000 members while The National Corn Growers Association has but a few thousand. Older active commodity associations are the American National Cattlemen's Association (1897), American Soybean Association (1925), American Sugar Cane League (1922), and the National Wool Growers Association (1865).

4 The Farm Bureau membership total of 1,647,455 for 1954 represents that many families. Both the Farm Bureau and the Grange accept non-farm members Only farmers may join the Farmers Union.

5 George Brandsberg, The Two Sides in NFO's Battle, Iowa State University Press, (1964) pp. 70, 72, 75, 222.

consolidation. A new element in the cooperative marketing picture is Farm Bureau's affiliate, the American Agricultural Marketing Association. Operating primarily through state Farm Bureau cooperatives, this has enabled the general farm organization to tie in with producers of some 15 different specialty commodities.

Population shifts have not been wholly unfavorable to cooperatives. Suburban growth into rural cooperative territories has enhanced the position of these groups and has widened and strengthened their markets. On the other side this growth and consequent service has brought the rural electric cooperatives into a new conflict with the private power companies. Rural electric cooperatives have stabilized in number in the past 15 years and have lost individual members, but have sold more electricity to their remaining customers. The federal government system under which rural electric cooperatives live has threatened them on two fronts. The first is in Congress and the Administration, where there are constant challenges to the loan program; the other is in the states, where the location of boundaries and regulation of service is determined by public service commissions or state legislatures.

Increased production which outran population growth in the United States forced producers and processors to give attention to foreign markets. This interest spurred the passage of Public Law 480 in 1954 and focused further attention on foreign market development. Further, the Foreign Agriculture Service's administrative decision to develop overseas markets through private trade associations brought about the creation of additional vertically integrated commodity trade associations with farm organization members. These associations -- which tied together seedsmen, producers, processors, and exporters -- may be one of the most portentous structures in the farm organization field. They increase the incentive to create and continue commodity organizations and have provided new channels of communications between producers and exporters. As vertically integrated trade associations in a commodity which is not vertically integrated economically, they may be hastening the day in which vertical integration becomes a fact.

7In the 12 years ending in 1962, the 7,409 supply cooperatives declined by 417, or 5 percent. Ibid., p. 75.
8Among the post-PL 480 market development associations are: Soybean Council of America (farmers, farm organizations, country elevators, cooperatives, processors, grain handlers, exporters, trade associations, and servicing industries), 1956; U.S. Feed Grains Council (two producer organizations, cooperatives, grain and grain processing firms, exporters, and shipping lines), 1960; and the Rice Council for Market Development (producers and rice processing firms), 1957. Perhaps they were patterned after the National Cotton Council, organized in 1939. It is made up of six segments of the industry.
Factors Which May Affect Farm Organization

As we move into the future toward 1980, we find that the background papers are in substantial agreement as to the picture which they project of the farm firm of the future. There will be between 800,000 and 1,500,000 farmers, with some two-thirds of this number producing the vast majority of the output. The farm population will be less than 4 percent of the nation's total. The decrease in the number of farms will be accompanied by an increase in the average size of farms and a substantial increase in the number of largest farms. The production units will be more specialized, more mechanized, and more dependent upon a high level of management skill. Most of our background papers suggested that the family farm would persist, although it would be quite different from the family farm of history and sentiment. As to a hint on the role of farm organizations, Dr. Breimyer suggests the further growth of super farms and of vertical integration. He has suggested that when the latter is complete, sovereignty in agriculture may be retained only through cooperatives.

Other factors than the farm firm structure will affect farm organizations and the services that they provide. The decrease in the size of farm population might be noted next. The increased urbanization of the nation will mean that the vast majority of the population will have no direct interest in agriculture and that relatively few will have ties of background and kinship to agriculture. Agriculture's problems of political representation will stem partially from its minority position in the total voting population. This will be accentuated, however, by the fact that it will probably not be able to exercise the disproportionate political power that it has enjoyed while its population has been steadily declining in recent decades.

The decrease in agriculture's excessive representation began with the federal court decision of 1962, which declared that failure to reapportion a state legislature according to the state constitution was a judicial question. This was followed by the 1964 Supreme Court decision that the equal protection of the laws clause of the Fourteenth Amendment required that both houses of a state legislature be apportioned according to population. We know the immediate results. Failing to initiate a constitutional amendment in Congress, rural interests and their allies have attempted to rush through state legislatures a resolution requesting Congress to call a constitutional convention to permit apportionment of one house of a state legislature on bases other than population. Although 25 states have passed such a resolution, the prospect that nine more will do so is uncertain and the further probability that Congress might comply with the request is not at all sure. Even if Congress responds by proposing such an amendment itself and if such an amendment is adopted by three-fourths of the states, agricultural interests have made a new concession. Seldom in recent years have they conceded that even one house or legislature shall be on the basis on population.
Agricultural interests are paying the penalty for decades in which many state legislatures refused to reapportion themselves as required by their own constitutions. The time is late, and the reconstitution of state legislatures according to the one man-one vote principle and the growing urbanization of the nation make it seem likely that agriculture's representation in state legislatures would not be greatly disproportionate to the number of people engaged in agriculture. It would be more in accordance with the situation in which manufacturing, commercial, and financial interests found themselves in the past. The upshot is that, lacking direct political representation of their interests, agricultural producers would be much more dependent upon functional or organizational representation.

The nature and structure of other groups in the economy by 1980 will also have an effect upon the needs for farm associations. Lacking the restraint of governmental action, it seems likely that manufacturing, financial, and retail enterprises will continue their large scale organization. Those who deal with them, particularly as sellers of raw materials, may be in a very weak bargaining position as individuals. The prediction that the middleman will disappear in the export grain trade, leaving the producer to bargain with the exporter, accentuates the disparity in bargaining ability of the participants. Today's firm emphasis upon bargaining power by such diverse organizations as the NFO and the Farm Bureau indicate a developing situation.

The development and control of markets in an international sense will have a major impact upon producers of raw materials. The overseas demands for food products seem to be due for an inevitable boost by the exploding populations of Latin America, Asia, and Africa, and by rising living standards in other parts of the world. This may result in two kinds of markets, the latter being one in which the United States exports commodities in exchange for dollars and the former one which would provide food stuffs for barter, counterpart funds, or simply for the maintenance of a stable society. If our export sales are to be only for dollars, the role of our government is primarily that of encouraging access of our products into markets of other nations and of minimizing barriers against them. In the other situation, the role of the United States government would be quite different.

The international scene will, of course, affect farm organizations in 1980 by the fact that the world may be characterized by either global or limited wars or by comparative peace. A major war would affect the kind of domestic and international society which survives and in which private associations would endeavor to continue. Widespread disruption of public government might make the local farm organization a viable institution upon which to build a socio-economic and political relationship between interdependent individuals. On the other hand, private associations might be such disruptive and parochial threats to the rebuilding of a unified political society that they might be outlawed.
Most likely (and optimistically) military warfare will be limited but economic warfare carried on between regional or ideological blocs. In such a situation, and considering population predictions, food would be a potent weapon. However, its use as an arm of foreign policy would be inevitably intertwined with domestic policy. The compromise of foreign with domestic demands would inevitably affect the organizations which represent producers.

The kind of elected and appointed leadership which each organization will have may affect its future considerably. Those who view the world objectively and perceive the need for changes and try to move the organization toward it may help the association to survive. Those who are inclined to let the organization float with the current may assist it to drift to relative ineffectiveness. The organization may not disappear, but its existence would hardly matter.

Last, science and technology will have much to do with the kind of agriculture which we will have and the role of farm organizations. The creation in the laboratory of synthetics which can be produced commercially has had considerable impact on cotton and wool. Other research may change the chemical composition of a particular commodity so as to widen its use. Ultimately, agriculture as we know it may face the pressure of synthetic foodstuffs. While we would not expect this to affect immediately the production of all food and fiber, it is likely to move in competition to particular products at one time and to have a significant impact in this way. The oleomargarine-butter controversy of the 1940's and 1950's was an early example of the impact of science and technology upon the competitive position of different agricultural products.

As we look at farm organizations today and consider their future it is well to apply what organization theory has to say about the creation and survival of human organizations. The Barnard-Simon theory states the conditions under which an organization can induce its members to continue their membership, thus helping to assure its survival. These observers have stated that an organization will continue to exist as long as contributions from members are sufficient to support and supply the organization with inducements large enough to get members to continue to contribute. They have suggested two variables affecting a member's likelihood of withdrawing from an organization. The first is the desirability of movement as the member sees it and the second is the ease of movement as he sees it.

For example, if a member is dissatisfied with a farm organization, he does have several alternatives open to him: (1) he may attempt to change the policy or practice with which he disagrees; (2) he may with-

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9James G. March and Herbert A. Simon, *op. cit.*, p. 84f.
draw his membership; (3) after withdrawing, he may join another organization which he expects to satisfy his aspirations; or (4) he may retain his membership in the organization with which he is dissatisfied because of other benefits which he derives from it and join another organization which promises greater satisfaction in the area of discontent. An organization, the survival of which is threatened, may adapt to a new situation. It is difficult for the membership to force this action directly, but they may be able to pressure the management and elected leaders to do so over a period of time. We can keep these factors in mind as we look ahead at the kind of services that may be needed in 1980.

Assuming the gradual decline in number of farmers which has been predicted and the highly capitalized, specialized production unit which will characterize American agriculture, what services will farmers need that farm organizations can provide in 1980? Related to this is the kind of farm organization which can provide this service.

**Services Needed in 1980**

We may expect the following services to be needed by farmers in 1980, all of which may be provided by farm organizations: Policy development, representation, education and information, supply, marketing, market development, management training and aids, public relations, and social institution.

**Policy Development**

Just as now, there will be need for a structure through which ideas for trade and governmental policies may originate or be studied, challenged, and forged into a viewpoint which can be supported by an organized group. No policies or programs in a society as complex as ours can be termed simple, but the development of policy is less complicated in an organization based on a single commodity than in a general farm organization. When a problem presents itself, a commodity group can proceed to consider it and bring forth alternative solutions on a relatively narrow basis. Once the organization as a formal group has expressed its opinion by resolution it can focus its attention more intensely than a group with wider interests. The predicted continued increase in specialized farm production would mean more producers concentrating on only one or two commodities. Their interest in policy development would thus coincide more nearly with the commodity organization. Marketing cooperatives would be in a similar position to commodity groups except in those matters which affect cooperatives along. This would be a unifying factor. In 1980, as now, the chief internal problem of some commodity organizations may be that of regional competition.
On the other hand, the general farm organization, representing several or many commodities, is able to consider their problems and alternatives and coordinate them with each other before presentation to government. Thus the general farm organization may help to compromise conflicting interests before they enter the public arena. The American Farm Bureau Federation, the most widely organized of the three general farm organizations, should continue to be effective in this way. Both the Grange and the Farmers Union are more regionally based organizations and thus would have fewer commodities represented within their structure. The overhead cooperative organizations will be able to speak for those whose products are marketed cooperatively, but here too is an inherent problem. The unifying factor in this organization is the method of marketing, not the interrelationships of the commodities.

The vertically integrated commodity organization probably will be the most unsatisfactory machine for policy development. Structurally, the involvement of all elements from producer to processor may place too much strain on attainment of a consensus on goals. If unanimity is required, the experience of the National Cotton Council in 1963 may be instructive. Its effort to support the Administration cotton subsidy bill foundered when Farm Bureau officials, dominating the production sector, vetoed the policy proposal. The restriction of policy development and support by the U.S. Feed Grains Council to export policies only is an attempt to narrow areas upon which agreement must be reached.

Of all the functions of farm organizations, that of policy development is most likely to provide the basis for threatening the organization itself. When a dissenting minority believes that it cannot accept the organization position, the individual members can choose the alternatives suggested by Simon.

Here the multifunctional organization has an advantage in terms of survival. Members may disagree with the Farm Bureau's policy stands, but wish to continue buying fertilizer or insurance from the Farm Bureau co-op, or the Farmers Union member who disagrees doesn't want to cut himself off from the grain marketing co-op. Dissenters may join another organization for its policy stand, but retain membership in the general organization.

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10 The American Farm Bureau has state units chartered in 49 states (Alaska excepted) and Puerto Rico. The Farmers Union has state units in 22 states. It has no units in the South and Southeast except for Virginia, Arkansas, and Texas. The Grange is organized in 38 states.

11 Specifically, the National Council of Farm Cooperatives, the National Federation of Grain Cooperatives, the National Livestock Producers Association, and the National Milk Producers Federation.

12 Seven years ago, President Jim Patton of the National Farmers Union told the writer, "No farm organization can build membership on policy alone; it must provide other services."
Thus the commodity organization which is primarily concerned with policy development and support seems most vulnerable in the years ahead.

**Representation**

Representation is perhaps the most fundamental reason for organization. It was deemed essential for men to band together for similar objectives at the time of de Tocqueville's visit in the first decade of Jacksonian democracy. How much more necessary it has become in the heavily populated, specialized and complex world of the Twentieth Century to have spokesmen for particular interests.

Direct democracy has been used considerably in agriculture, but the needs of producers to express opinions go far beyond choices. We can hold a referendum to give producers a choice between one of two wheat programs or of rejecting or accepting a 19.5 percent cut in tobacco allotments. These are one-time, alternative choices which can be decided by a mass vote. The details which go into the preparation of such choices cannot be presented to all producers over and over again.

The private association has proved itself effective and useful in the United States as a representative device. It has facilitated communications between economic groups, and by 1980 the need for this may increase. Currently, the Farm Bureau's continuing contacts with buying and processing groups and NFO's negotiations with livestock buying firms illustrate the functioning of the representative role in the private sector.

The pervasiveness of public government in the agricultural economy is well known. By 1980, government may not be called upon to decide on the use or degree of production controls or of price supports. It may be requested to determine shipping rates and services, the propriety of economic pricing and competitive practices, and labor relations. The interrelationship of technology and government would expand government's role as regulator in the public interest. Issues such as the cranberry scare of 1959, the *Silent Spring* controversy of 1963-64, and the recent smoking and health issue may develop. Thus affected agricultural interests would need to see them through with the least harm.

Representatives of agricultural interests will, of course, need to appear before legislative bodies, administrative agencies, regulatory agencies, and occasionally the courts. As now, state legislatures and county governing bodies will be making decisions affecting agriculture. Locally, farmers will need representation to present their viewpoints on matters of taxation, local government boundaries, schools, subdivision regulations, zoning, and extension of governmental services.
The need for effective representation will, as mentioned before, be greater as the farm population's overrepresentation in legislative bodies diminishes. Functional representation through private association can to some extent offset numerical losses.

Representation poses some problems which are worthy of consideration. First, by 1980, the spokesman for a farm organization would need some back-up specialists. The general and commodity organizations today rely principally on their elected officials and a legislative specialist. The agricultural world of 15 years hence may severely strain such resources.

Second is the problem of communicating with legislators who will have no background in agriculture. Unless Congress improves its staffing, most of its members in 1980 will have to depend almost entirely on what the Administration and lobbyists tell them about agricultural problems.

Third, as organizations become larger, the distance between members and their delegated representatives becomes greater and more difficult to bridge. This is controlled somewhat by Farm Bureau and Farmers Union by retaining their national headquarters in Chicago and Denver, respectively, but is by itself no guarantee.

Fourth is the question of bureaucratic control. Some organizations permit their executive secretary to testify on matters of public policy; others prohibit it. The executive secretary may be better informed as the complexity of issues at the top, but he does not always live with the problem on the farm.

Fifth is the problem of formal representation of interests. By 1980, the National Association of Soil and Water Conservation Districts may be heavily involved in programs affecting urban and suburban residents. Will these people have a formal share in the selection of representatives? The answer involves a change in the nature of the organization.

Sixth is the basic question propounded by Sir Edmund Burke almost 200 years ago: Should the representative carry out the wishes of his constituents or should he represent them on the basis of his own best judgment and information? Some men of integrity have chosen one; some have selected the other. Undoubtedly the level of knowledge and interest of the members should be a factor.

Last is the question, Who is represented? It is customary for farm organization leaders to insist that they speak for all members. We know that this can be so only in the smallest and most cohesive groups. In any farm organization there are members who are interested and in favor of a particular policy, and members who are disinterested, and members who are interested but oppose that policy. Unless that last group makes its opposition known, we can assume that the organization does speak for all.

Ideally, effective and accurate representation of all farmer viewpoints in 1980 would call for several farm organizations similar to those existing today. Predictions that farmers will be represented by "one big organization" seems unlikely -- their interest will be too diverse.
Education and Information

That the farmer of 1980 would need to be well educated in technology, economics, and management is clear. In some type of agricultural production, knowledge and understanding of administration would be essential. In many cases, continuing education of this kind could be provided best by public agencies such as the extension service and community colleges. Specific information could be provided by commercial organizations and by cooperatives.

"Now and in the future nothing is more important than to educate the farmer as the operator of a business enterprise about the national and international economic, social, and political forces that affect his market."\(^\text{13}\) If we accept this idea, and it seems reasonable, since markets have moved from local to regional to national to international, the educational task is considerable. Much of it can be performed by public agencies, but objectivity is not their possession alone. The education of adults is necessarily voluntary education. Hence the clientele must be sought where it can be contacted and interested and taught. From the point of motivation alone, since it will be concerned with policy development and representation, the farm organization, whether general, commodity, or cooperative can perform this function if it has the specialized staff to select material and train discussion leaders. If it does so, it will be doing what some large industrial firms have done for years.

The weakness in farm organization sponsorship of educational programs is a possible lack of objectivity. Once a policy position has been hammered out, leaders do not like to put it in the position of being questioned. Farm organizations, like most private associations, generally do not advertise their internal disagreements in their member publications. Nevertheless, some of the state Farm Bureaus have done commendable educational work on international trade, for example. Education will be needed in 1980, and farm organizations should have some share in it.

Supply Services

During the past two decades cash production expenses have increased relative to gross cash receipts until they now are 75 percent of gross cash receipts. This trend has been predicted to continue. If predictions that agriculture prices will deline are borne out, economies in production will be essential. Cooperatives which are larger and competitive with other businesses may provide many production items at savings or act to keep private prices' in line. To provide this service cooperatives must have efficient management and a fairly large scale of operations, and must receive overhead services

from their national cooperative associations.\textsuperscript{14}

In some communities, supply cooperatives and electric cooperatives must continue to widen their clientele to include suburban and city residents.\textsuperscript{15} However, the cooperatives' success stimulate private utilities to try to restrict them. The cooperative defense then may be to sell not only to suburban residents but to make them members. The distinction between a farm supply cooperative and a consumer cooperative may become blurred, but it will fit the kind of society in which it operates more closely.

\textbf{Marketing}

Even as agricultural producers become fewer but larger, they are merely paralleling the pattern followed by those who buy their products. Concern about the bargaining power of farmers is now expressed by leaders of practically all farm organizations. Probably no changes in agriculture will be greater than those in market structure.

The cooperatives, as farm organizations, may have a major role to play in attempting to give individual producers bargaining strength. If they do this, they must be fewer in number and larger and must have able management. If vertical integration moves rapidly into other commodities, the marketing cooperative seems the final hope in retaining sovereignty with the production unit. Of all functions suggested, this seems to be the one which most defies prediction.

\textbf{Market Development}

Domestic market development and promotion has been carried out through demonstration and advertising campaigns for several years. It has centered around a single commodity and has been financed by assessments.

Public Law 480 made available substantial amounts of public funds to private groups for overseas market development. It was thus a major stimulus, although a few commodities had been the objects of foreign promotion by producer or trade groups before passage of P.L. 480. Currently some 45 trade associations are operating foreign market development programs, using foreign currencies under FAS supervision. Some are producer dominated, such as Great Plains Wheat, Incorporated and Western Wheat Associates, Incorporated, both supported from fees levied by state wheat commissions.

\textsuperscript{14}The National Council of Farmer Cooperatives, the Cooperative League of the U.S.A., the National Milk Producers Federation, the National Rural Electric Cooperative Association and the American Institute of Cooperation.

\textsuperscript{15}REA has estimated a three-fold increase in demand for power requirements from cooperative systems between 1962 and 1980.
on each bushel of what sold. In others, such as the Rice Development Council, U.S. Feed Grains Council, and Tobacco Associates, producers are outnumbered by processing and marketing interests.

Market promotion is based upon the effort of one commodity or product to obtain a competitive advantage over others. Therefore, there is little incentive to integrate several promotional efforts, either domestic or foreign, within one organization. Barring economic studies which would show the relative lack of effectiveness of a market development program, we can expect domestic programs to continue at least until 1980. They would still focus on a single commodity but might operate at different levels in the economy.

Several factors may contribute to the continuance of abandonment of foreign market development programs. Increased demands for American foodstuffs should come from the 2 to 3 percent increase in population of many nations and rising standards of living in Europe and Japan. Factors which may dampen demands are the increased agricultural output of the more industrialized nations and the rising tide of agricultural protectionism. Despite increasing demands on the one hand and trade barriers on the other, foreign market development programs can be expected to continue for 15 more years. The major reason for most of them being discontinued would be the withdrawal of government counterpart funds. If such a policy change were made within the next five years, few would continue on producer and industry assessments alone. (Tobacco Associates has had a year of drastically restricted operation because of USDA's temporary withdrawal of counterpart funds related to the "Smoking and Health" issue.) Given five more years of operation, some of these associations can develop enough momentum to carry on with their own funds. Thus in 1980 it is probably that the two types of trade development associations, the producer oriented and the vertically integrated trade oriented, will still be operative, although their clientele and techniques may be quite different from today's.

Management Training and Aids

The great need for improved management by the 1980 farmer has been pointed out in Dr. Nielson's paper. Education in management will be a continuous process which may be performed best by the extension service and adult education centers. The farm organization could serve only where there are relatively few producers organized in a commodity association, where the more detailed aspects of management can be tailored to the students.

The farm organization can provide management aids, such as record-keeping services, as part of its regular contact with members. Some legal services may also be provided.
Other farmer organizations, such as cooperatives, will need increasingly higher level management education and training, and related services. This will be crucial particularly if cooperatives move into vertically integrated operations which will require the highest types of specialist and management skills. Such services, from education to data processing systems, must be provided to the overhead cooperatives, such as the National Council of Farmer Cooperatives, the Cooperative League of the U.S.A., the National Milk Producers Federation, the National Rural Electric Cooperative Association, and the American Institute of Cooperation.

Public Relations

A great deal has been said and written the past few years about the deplorable state of agriculture's public relations. There seems to be general agreement only that too much has been said about some aspects of agriculture (by someone else who has emphasized the wrong things) and that many citizens are woefully misinformed about agriculture's contributions to the economy. By 1980 much of the present disagreement among farmers and farm organizations may have disappeared, but the vast majority of American citizens will not have a farm background or even know a farmer. As a minority which produces a vital necessity, farmers must communicate something of their role and their problems to opinion leaders. The responsibility is too great to be delegated beyond the farm organization. If, as today, different organizations communicate different views, that is the penalty their members will pay for living in a pluralistic society.

Social Institutions

Practically all private organizations provide some personal and social satisfaction to active members and greater rewards to their officers and leaders. The sense of accomplishment and success which individuals gain in voluntary programs is a major triumph of American life. Membership in an organization which can socialize its members into the community through participation in a variety of activities may be extremely useful in the more mobile society of 15 years hence. Farm organizations have played useful roles as social and community organizations, particularly in the decades before World War II, when rural residents were tied to their immediate rural environment. Farm or farm-related organizations have done little to alleviate the disappointments and frustrations of rural residents on the lower end of the economic scale. Their commercial orientation has precluded such interests.

By 1980, farm organizations should continue to provide personal and social satisfaction to their reduced membership. Few would appeal to the suburban resident or the non-farm rural resident whose homes will line the country roads. Perhaps two, the Grange and the Farmers Union, will attract such members. The Grange would do so because it has always been as much a social order as a commercial farm organization. The Farmers Union, if it does, will continue its traditional friendliness toward organized labor and the consumer.
by providing a new type of membership for non-farmers. The Farm Bureau has a considerable number of associate members who are small town and city business and professional men who agree with its policies. In general, this group needs no social satisfaction from a farm organization.

The cooperatives may, as they become more urban and consumer oriented, act as community social organizations as well as business institutions.

Summary

Just as evolutionary change in the farm firm was predicted in the background papers, so it seem that gradual change will characterize most farm organizations in the next 15 years. Of today's farm organizations, most will continue to operate in 1980. An exception could be the cooperatives, many of which may merge or dissolve, so that cooperatives might be fewer but larger. Membership would decline in general farm organizations and most commodity organizations, but the inclusion of non-farm members may swell the rolls in some.$^{16}$ The commodity-industry export promotion organization, which at most is only farm-related, would in all likelihood be around in considerable numbers, but the international situation in all aspects may determine this.

Professional staffs may be larger and more specialized. They would be the key to wider and better service and to continued survival of the organization. A capable bureaucracy could observe those services which become obsolete and replace them with services which would win and tie members to the organization.

The services which we have been discussing may or may not be provided by farm organizations. They are services which would be needed, but we can expect producers to seek them where they can be most satisfactorily performed. The challenge to farm organizations in 1980 will be to do the kind of job that will assure continued and loyal membership.

Although there will be fewer producers, a greater proportion than today will be members of one or more farm organizations. The farmer of 1980 will be an "Organization Man."
Nielsen, in his paper "Managerial Requirements of Farm Firms, 1980," discussed demand for managerial services and supply of managerial services for farms. He stated that during the next 15 years we will need to give attention to the managerial requirements of farm units with fairly wide diversification, those which specialize in one product but carry it forward through a number of stages in processing, and those which specialize down to one stage on one product. In the next 15 years there will certainly be an increase, perhaps a doubling, in the average size of farms. He also stated that there will be increased similarities between farm and non-farm businesses.

I expect the demand for management assistance to increase as these changes take place in larger operations as well as highly specialized operations.

Before we look at future managerial services let us review the services available today. Farm management services are provided today primarily (1) by individuals who manage farms they operate as an owner or as a tenant, (2) by individuals who manage for a group of absentee owners, (3) by resident managers on large farms held under one ownership, (4) by management firms that employ two or more managers, (5) by banks that manage farms on both agency and trust accounts, (6) by suppliers, manufacturers and distributors, and (7) by marketing firms.

Services Provided

In the Corn Belt most of the service provided by professional managers is in the management of absentee owned farms operated by tenants and in appraisals of farm property. In the southeastern, southwestern, and western states, and in some metropolitan areas, their emphasis shifts to the management of farms, plantations, and ranches operated by hired labor. Farm appraisals are usually offered as another service by these firms. Some farm management firms offer allied special services such as farm accounting, programming, and agricultural engineering work for their own clients as well as to other farm owners who are interested in these services.

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1See James Nielsen, "Managerial Requirements of Farm Firms, 1980," pages 51-75 of this report.
A continuing increase is being reported in the amount of consultation work being done by existing farm management firms in Illinois. Both firms specializing in the field of farm management and banks that have farm management departments do this work for a fee. Manufacturers, suppliers, and marketing firms often do it without a direct charge as a service to customers.

Where Are They Located?

Firms offering management services for a fee are concentrated in the Corn Belt, with the greatest number operating in Illinois. On the other hand one large firm has headquarters in Phoenix, another in Denver, one in New York City, and one in Albany, Georgia. Farm managers working for manufacturers, suppliers, and marketing firms are usually located in the home or branch offices of these firms.

Major Changes in Services Provided
Since 1920

During the 1920 to 1930 period, professional management was largely limited to the management of absentee owned tenant-operated farms in the Corn Belt.

During the period from 1930-1940 many insurance companies, that acquired farm land through foreclosure hired agriculturally-trained men, vocational agriculture teachers, and extension workers to assist with land management. As the land moved back into private ownership, the managers moved with it. Often they formed small management companies or started businesses of their own.

It was during this 10-year period that considerable growth occurred in the management of hired labor units, especially in Ohio. A few firms increased emphasis on farm accounting and agricultural engineering by offering an accounting service to farmers whose farms were not managed by the firm and by offering the services of an agricultural engineer to farm operators and owners who requested it.

Few banks had yet started offering farm management as an additional service. In fact, most of the increase in management services in Illinois by banks has occurred since 1950. Some banks employ men to do farm management only, others on a part time basis with the agricultural man spending some of his time in agricultural credit. In 1958, 18 percent of the farm managers in Illinois were affiliated with banks. Five years later 28 percent of them were connected with banks.²

²J.J. Wallace, paper given to Iowa Society of Farm Managers and Rural Appraisers, January 30, 1964,
More suppliers, manufacturers, and marketing firms have recently been adding farm managers to their staffs. These men program farming operations, offer advice to customers when requested, administer production contracts, and assist in making sales and collections.

**Present Situations**

Professional managers are combining several farms into one operation under one tenant. For example one Illinois bank rents several farms with a total of over 2,000 acres to one tenant. An Ohio firm rents to one tenant 2,200 acres owned by two people.

An increasing number of manufacturers, suppliers, and marketing firms are employing farm management specialists to provide a variety of services to their customers. They offer recommendations and program farming operations on request. Right now a large chemical firm is trying to locate three managers to assist them on a full time basis primarily with management problems of corn production.

I expect some farm cooperatives now providing supplies and equipment to farmers to add farm management, consultation, appraisal, accounting, agricultural engineering, and legal services to their businesses. Some of the cost of the services offered by these organizations will be recovered, as some manufacturers do today in the sale of products. And I think the services available will be offered for a fee to members requesting them.

Some management firms are conducting special studies for manufacturers, suppliers, marketing firms, processing firms, and service companies. City banks are placing increased emphasis on farm management problems. Several city correspondents are employing men who are what I choose to call management specialists in farm finance.

An increasing number of professional managers, as determined by interviewing 20 such men in Illinois, are doing more consultation work for farm operators who are neither clients nor tenants.

**How These Services May Structure into the Management Requirements of Farm Firms, 1975-1980**

The farm manager, whether he is an individual with a management firm or a bank that offers management to absentee owners, will continue to combine farms held under several ownerships into one operation. In so doing he will encounter a number of problems with which he will need the help of research and extension people as well as of management specialists. For example, they may need help in leasing, in determining who will furnish the headquarters and at what cost, and in selecting, training, supervising, and paying farm labor. They may also have problems dealing with fringe benefits, retirement programs, and incentives.
Some increase in specialization on the part of management has already taken place, and I expect this increase to continue at an accelerated rate as farms, ranches, and plantations become more specialized.

The number of management firms employing several men will probably become more specialized. The firm with one, two, or three managers will find it difficult to specialize enough to effectively handle the management problems confronting them. I expect these small firms to hire outside consultants to assist them. As one farm manager said, "The day of the individual farm manager as we have known him is almost extinct. He will find it very difficult to get started. He will go to a company or a bank to seek employment."³

We seem to be moving in a direction similar to that taken by the medical profession. We will have fewer and fewer "general practitioners" and more specialists. The general practitioner will rely more and more on specialists and consultants to help him.

The number of manufacturers, suppliers, and marketing firms employing their own farm managers will increase materially. One of the big questions here is, How will the farmer accept the recommendations of these men who probably will be interested in increasing sales or improving the quality of marketed commodities?

I believe large industries, on the other hand, will employ their own specialists rather than employing outside consultants. By so doing they will have more control over their activities and the recommendations given to farm customers. Feed companies may want management specialists in swine, in beef cattle, in dairy, or in poultry.

Marketing firms and processors will also tend to employ their own managers. I expect them to employ some consultants to work with them on highly technical problems. Canning companies, for example, will probably need an entomologist or plant pathologist on a part-time basis.

There will probably be an increase in the number of family partnerships and corporations. Specialists to help form these organizations are needed today, and I think much more similar help will be needed in the future. A team made up of a manager and an attorney is a desirable combination to cope with these problems. A tax consultant might also be added to this team. Very few of these people are available today. Our universities have some responsibility for developing these specialists, who will be able to assist materially in this area.

Managerial Services for the Smaller Farm Operators

It is very doubtful that the smaller farm operators will be willing to pay directly for the management service they need. I believe most of the service will be provided by manufacturing, supply or market firms and lenders

³H.M. Primm, immediate past president, American Society of Farm Managers and Rural Appraisers.
with which these farmers deal. It will be supplied as it is in many instances today, with a bag of feed, a ton of fertilizer, or in a production contract.

The smaller farmer needs management help and will continue to need it. This conference, however, deals primarily with the commercial farmer, but we should keep the small farmer in mind. He may not be able to become re-trained and hold another job. He may be better off as a small farmer than seeking other employment in the city. Perhaps our best way to help him is through the supplier.

_**Competition for Personnel**_

The farm management profession will continue to compete with industry for the managers we are attempting to structure into commercial agriculture. Because manufacturers and suppliers serving agriculture presently are and will continue to be competing vigorously for men with the management ability and potential that we are seeking, we will find it increasingly difficult to attract them. We may get only those who are dedicated to serving the farmer as a manager. We can, however, provide opportunities for them to participate in continuation studies in farm management as well as workshops and seminars in strategic locations throughout the states in which we work.

**Who Will Pay for It?**

The "general practitioner" manager who manages farms for absentee owners and who does consultation work for a fee for farm operators, farm owners, manufacturers, suppliers, and market firms will continue to be paid by those who employ him. Specialists, who are primarily consultants, will also be paid by those who employ them.

Manufacturing, supply, marketing, and service firms will hope to increase sales and service and to improve products to pay for their full-time firm managers.

Banks will be paid in part through management and consulting fees but will also hope to attract more loan and trust business through their farm departments.

In reality the farm owner, operator, or tenant will pay for it. He either will pay a direct fee, or the cost will be hidden and added to what he buys or sells, or to the capital he borrows.

**Relations Between Professional Management and Extension Personnel**

Several members of the Illinois Society of Farm Managers and Rural Appraisers were interviewed on this question.
One of the problems is a geographic one. It is relatively easy for a manager located near the university to call or stop and see an extension specialist, a research professor, or the classroom teacher of his choice. Not so with those who live some distance away.

Extension personnel frequently are not familiar with the job of the professional farm manager, especially with his relationship with his client. The manager may feel he knows more about the problem than the specialist.

Management needs during the coming years of increased specialization and larger units can be provided if extension specialists become more familiar with the problems of the professional manager and his client. This problem is not peculiar to extension farm management personnel but to all specialists who work with the professional farm manager. Extension specialists can in this way reach many people presently not being reached.

Relation Between Managerial Services and the Press

Farmers have been slow to request help for specific management problems. I believe there are two major reasons for this: (1) They do not know where to turn for help, and (2) they dislike admitting that they need help. Industry and educational institutions have moved much faster in the direction of employing consultation than the farmer.

The press can be of considerable help in this area, however, by reporting what other farmers have done using managerial services provided by individuals, management firms, or manufacturers and suppliers who have their own management specialists.
Requirements for Success in Farm Management Firms

A. Present
1. Practical farm "know-how"
2. Technical agricultural knowledge
3. Ability to sell ideas and services
4. Ability to work with people
5. High degree of intelligence
6. Thorough knowledge of management principles
7. Ability to program farm operations

B. Future -- increased emphasis on present requirements, plus the following:
1. High degree of specialization in one field
2. Ability to judge potential long-time income from any given farm operation over a period of years
3. High degree of ability in analyzing a farmer's requirements for power and equipment
4. An increasing reliance on experiment station and extension personnel
5. An increased interest in public relations
6. Participation in a continuing education
7. Ability to select, train, supervise, and develop incentives and fringe benefits for farm labor
8. Ability to motivate farmers who are not tenants on managed farms to accept their recommendations
9. Ability to work within the policies and framework of large manufacturing and distributing firms
10. Develop more ability in financial management
11. A willingness to use consulting specialists when he needs them
SOCIAL OVERHEAD SERVICES IN RURAL AREAS

by Howard W. Ottoson* and Jack Timmons**

Insufficient attention has been given to the problems of providing public services in rural communities, compared to that directed at expanding urban areas. In terms of research attention one is conscious of the efforts of a multitude of institutes, planning centers, and other well organized and financed activities working on the various aspects of metropolitan growth in contrast to the modest efforts a few individuals have given to the problem of rural government and services. Yet the problems in the public sector in rural communities may be more difficult since they have to be solved in an environment characterized by relatively few people occupying large areas of space, and further where the spatial aspects are magnified by out-migration and shrinking economic bases. In urban areas, in contrast, many problems can be dealt with under the assumption of growth in population and in the economic base which can offset errors in estimation and planning.

Our assignment calls for attention to rural areas in general. However, our empirical examples and our generalizations will be in terms of the more sparsely populated areas of the western Corn Belt and Northern Plains, since the authors are most familiar with those areas. We assume that our ideas similarly apply to other rural areas.

Further, particular attention is given to the problems associated with population loss through off-farm migration. Our objectives are to delineate problems, to develop hypotheses amenable to research, and to suggest alternative policies.

We recognize the existence of a different set of problems in rural areas affected by urban expansion. However, we have not dealt with them in this paper.

General Concept

It is useful to indicate the general model toward which our discussion is oriented. We are assuming the desirability of social efficiency in the long-run sense. What does this mean? Presumably it implies notions of the kinds of social service objectives about which there exists some consensus as to...
desirability. With these identified, one can determine the social costs involved in attaining them.

Any discussion of social services is oriented to geographic space. Thus, in a sense, we ask ourselves, What would the rural landscape look like were we to start with a blank map and chart in the features of social organization and economic relations which would appear efficient and feasible? Several features would be included.

First on our map would appear "adjusted" farms, which would be of the sizes and which would employ the combinations of inputs necessary to meet standards of production efficiency and income. Also on the map would be other primary production activities of a non-farm nature, their nature depending upon available resources, available markets, transportation, and the energies of local chambers of commerce. Built around the primary production sector would be the supporting commercial services, including credit, transportation, food, dental and medical, and other services. Finally, overlaying this emerging spatial structure would be various kinds of public services supporting the commercial and social activities of the area. We recognize the general environment and the necessity of interplay between these various components. Also, by mentioning it last we do not intend to minimize the importance of the public sector. Thus the nature of the resources available for production, the possibilities for private efficiency in the area, and the attractiveness of the area as a place in which to live will depend importantly upon the public sector.

On our map would now materialize the outlines of social organization. Political and economic regions would emerge; they may or may not coincide. Economic centers, which may label central cities, might be evident. Around them would appear satellite points, performing various functions spatially related to consumers, producers, and the central cities. Connecting all of these entities would be logistical links -- roads, power, telephone, radio, television, mail services, etc.

Presumably the economic and social organisms now outlined would be efficient in the broadest social sense. Efficiency would be represented in terms of production costs, the cost of consumer goods, and the costs of public and private services. Also it would be represented in terms of satisfactory opportunities for a desirable level of living.

Our intellectual problem is defined by comparing the model expressed above with what we find in the existing rural landscape, particularly in areas where we are losing population. The alternative means by which these communities can move toward more desirable situations become questions of policy to be determined by the people involved. However, the lack of descriptive knowledge, the need for knowledge about the consequences of alternative courses of action represent the challenges to research.
Nature of Adjustments in Rural Areas

We can define what happens in depopulating areas in terms of population shifts, economic status, or differential development in various sectors. Let us first examine population shifts.

The movement of people off farms is well documented; however, we know less about the age breakdown of those leaving the farm. Some people have naively assumed that adjustment is an osmotic process which operates in some random fashion. Actually, the population losses from farms have been primarily from two groups—the young who leave for other occupations, and the old who retire. Migration of the former reduces the competition for land; migration of the latter makes land available to neighbors. The adjustability of established farmers has been greatly exaggerated by those who have looked at the adjustment process as simply a matter of bearing down harder with the forces of economic coercion. A relatively small number of boys are starting on their own, because of the financial requirements for a decent income. Of course the makeup of farm population movements in terms of age, income level and other factors has been altered in specific areas by droughts or other severe economic phenomena.

The shifts of population from the rural towns are related to size; the smaller the towns, the larger the percentage decline, up to a size which has held its own, population-wise. Towns of larger size have generally grown in population. The net depopulation of the smaller towns has probably lagged behind that of their supporting rural areas for several reasons. First, older retiring farmers tend to move into smaller rural towns. A few young people tend to move from country to small towns, and then to larger towns, with latter attracting proportionately more of them. Also there is an increasing amount of farming done by farmers living in town.

As a result of these shifts, the age level of persons living in the countryside is at an all time high, on the average. The same is true of many small towns which are simply "hanging on" economically. Persons living in central cities and larger cities tend to be more youthful.

Changes are also taking place in the economic status of rural people. The size of farms is increasing as farm units decrease in number, and the land is tending to concentrate in stronger hands. As a result, income levels per farm have been increasing, as sizes of farms have increased but significant numbers of farmers still have relatively low incomes. Commercial farmers are becoming more like their city cousins in their cultural and economic aspirations, and in their consumption habits. Of course, pockets of rural poverty exist in all states, associated with factors of nationality, race, lack of educational opportunities, lack of developed resources, or other factors conducive to immobility.
On the average the depopulating small towns are probably quite similar in per capita income levels to the surrounding countryside. We have not seen sufficient empirical evidence on this, however. Of course one will find professional people and entrepreneurial people with higher incomes, but most small town residents are engaged in manual labor, clerical work, and other activities providing them with nominal returns. Many others run small commercial enterprises which provide them with returns to their labor and capital which are about as low as to the returns earned by small farms.

On the other hand, the central cities are experiencing growth in income per capita as well as in numbers of people. This increase is associated partly with a relative scarcity of certain types of labor, and the consequent bidding up of wage rates. More fundamentally per capita income has increased in central cities as such cities have acquired economic activities in which what labor produces has a higher market value. It also stems from the changes in existing business units. Their volumes and size to plant are increasing, with associated economies. Witness the growth of the supermarket and the retail sellers of farm production items.

In general we are probably seeing a gradual strengthening of the economy of the countryside, and that of the central cities. The small towns are lagging behind, economically, as their economic functions are lost or removed to the central city.

The Public Sector in Rural Communities

Nature and Cost of Services

How do the sparse and declining populations of rural areas affect the cost of social overhead services? We shall first look at local governments, and then at some specific services, in examining this question. Our basic premise is that because the overhead costs of governmental services are relatively constant over ranges of population, densely populated areas tend to enjoy lower unit costs than more sparsely populated areas. For example, Shapiro found in most states a U-shaped cost pattern when he related per capita general expenditures of local government to county populations. Counties with populations of less the 5,000 typically showed higher costs per capita than counties of 5,000 to 10,000 population. Stocker found similar results when he compared the per capita costs of local government in the smallest counties of 17 Western states with the average for each state.

1In more precise economic terms, the marginal value product is higher.
2Social overhead services are provided by society as a whole and are necessary for economic growth.
Because of the spatial aspects of rural communities farm people have tended to use smaller scale services -- smaller schools and smaller hospitals -- and to have smaller numbers of people per township or county, giving them higher costs per unit of comparable service. To partially offset these costs they have accepted inferior services, such as less well trained teachers, poorer roads, and more limited recreational facilities.

These cost disparities are being enhanced by the further out-migration of people from the country and the smaller towns. Thus the example of the rural mail carrier in New York who lost one family per year in his 20 years on his route. Norris Public Power, a rural public power district in Nebraska, has lost 1,920 customers in the last 12 years, a loss representing $1,387,200 in idle or retired service investment.

In the meantime the standards of rural people are rising; their expectations are becoming urbanized as far as services are concerned. The types of services needed are also altered by the aging of the rural population. Finally, new types of services are available through advancing technology. Thus the difficulties of determining what services will be required and of providing efficient services are compounded as we look to the future.

The Number of Local Governments. It is ironic that the areas of low population are already blessed with a multiplicity of governmental units. For example, only four states have as many governmental units as Nebraska's 5,125. Each of these states except Kansas has more than twice Nebraska's population. While all counties in the U.S. have an average of 29 governmental units including school districts, counties in the four Northern Plains states of Kansas, Nebraska, North and South Dakota range from an average of 52 units per county in Kansas to 86 in South Dakota. In 1962, one fourth of the 318 counties in these states contained more than 100 units of government each. With 4.3 percent of the country's population the seven Northern Plains states have 23.1 percent of the local governmental units. However Figure 19.1 indicates that this area has no monopoly on low numbers of people per unit of government.

The population in these areas will probably shrink faster than the local government units will disappear, which means that the disparity will be enhanced in the future. Most of the units, 52 percent in the Northern Plains, are school districts. Other important types include special districts for functions such as irrigation, sewer and water installation, mosquito control, soil conservation, weed control, roads, fire protection, flood control, wind erosion control, and library service. These are of course, in addition to town, county and township units.

Schools. With 4.3 percent of the population, the seven states of Kansas, Nebraska, North Dakota, South Dakota, Minnesota, Missouri, and Iowa had 32 percent of the school districts in the U.S. in 1962. The number of school

districts in this region has been decreasing steadily, but no faster than for the nation as a whole. In 1958, these states had more than 50 percent of the one room rural schools, and 55 percent of the districts with nine or fewer teachers. 6

Rural migration obviously affects enrollment in schools. In Sherman County, Nebraska, for example, the enrollment in rural schools has declined by 60 percent in the past 25 years. While the number of rural schools has decreased by 45 percent, the average enrollment per school has dropped from 16 to 10. More than half of the rural teachers in a five county area in central Nebraska are teaching in schools with fewer than 10 pupils. One in five of the secondary teachers served schools of less than 50 students, while 60 percent taught in schools with less than 100 students.

In his study of the American high school, Dr. James B. Conant recommended a size large enough to have 100 in the graduating class; this means a total enrollment of more than 400, depending upon dropouts, which may approximate 20-25 percent of the freshman class. Such a goal may be difficult to achieve in many sparsely populated areas. However, achieving a goal of even 200 students per high school in a five county area in central Nebraska would involve a reduction of the number of high schools from 25 to 14.

To produce a secondary enrollment of 300, a compromise target in this five county area, would mean that a minimum number of children in grades kindergarten through eight in a high school district would number 675. Thus the total number of young people in grades kindergarten through 12 would be 975. This is bare minimum for a reorganized district. Reorganizing the districts on the minimum basis would mean a reduction in the total number of districts from 242 to ten consolidated kindergarten-through-12th grade districts in this area.

Special Districts. This type of governmental unit has increased rather rapidly in numbers in the nation in recent years, and even more rapidly in the seven Northern Plains-Mountain states. This tendency may be evidence of a failure of traditional local governments to meet the felt needs of the people.

Counties. County consolidation is like weather. It is much discussed, but not much has been done about it. The number of counties in the United States was reduced by three between 1942 and 1957. Later Connecticut abolished its eight counties and Wisconsin added one. Thus the total number of counties in 1962 was 3,043. There is some tendency toward consolidation of county offices, and intercounty cooperation, however.

Some evidence from research in Nebraska illustrates how counties measure up to minimum standards. We assumed that today's county might be appraised against four criteria: (1) the county seat should be no further than 100 miles from any point in the county; (2) it might typically include a maximum of 4,000 square miles of area; (3) it should have at least 30,000 people; (4) it should have $40,000,000 of assessed valuation. In applying these four standards in Nebraska we found that only six counties met the two criteria on population and valuation; 15 met one criterion but not the other; 72 were deficient on both counts. Seventy-three counties have areas of less than 900 square miles. Two-thirds of the counties could not satisfy any of the last three criteria.

**Townships**

The number of townships has been reduced by 1 percent in the United States in the last 20 years. However, many of them are nearly dormant, being little more than voting units. Others have surrendered most functions to the counties except the maintenance of certain roads, and in Nebraska, the operation of a few small libraries. The research available suggests that the services provided by townships in rural areas are inefficient and costly.

**Cities, Towns and Villages.** In the past 10 years the number of these units has increased slightly in most other states as in the Northern Plains -- Mountain states, except for South Dakota. This increase is not surprising since there is no procedure for unincorporating towns that fall below the minimum population except by a vote of the citizens of the town. Nebraska and Iowa have many incorporated communities with from 1 to 100 population although the minimum for incorporating a new village in Nebraska is 100. Some have difficulty finding persons to fill the village offices. Like the townships, they may fade away but they rarely disappear.

**Roads.** Nebraska had 90,000 miles of county and township roads in 1956, or one mile of road per commercial farm. Over half of these were earth roads, 37,000 were gravel or crushed stone roads, and 700 miles were dustless surface roads. Lancaster County, an urban, eastern Nebraska county, had more miles of dirt county roads than paved. The difficulties faced by a sparsely populated state are illustrated by the fact that Nebraska ranked 12th in the nation in total road mileage, but only 34th in population. The contrast in Wyoming, North Dakota, South Dakota, and Montana is even greater.

In terms of its proportionate support for its road systems, Nebraska ranks fairly well. In 1959 it spent 27 percent of all expenditures for state and local government for roads, compared to 20 percent in the country as a whole. In per capita expenditures it ranked 21st, spending $69 per capita compared to $55 in the United States as a whole. The combination of high cost per taxpaying unit and inferior service is illustrated in these data. Obviously a reduction of population in rural areas will increase the cost to those who remain.
The Costs of Local Government.

What is the evidence concerning the effect of population on the cost of local government? Several sources are illustrative.

A study of Iowa county government analyzed the effects of population, area, method of selecting a county board, and the degree of urbanization on per capita costs. Population had the largest effect on per capita costs of county government. A study in Nebraska showed similar results. Per capita costs for general administration in counties of less than 5,000 residents were $12.67. For counties of 5,000 to 10,000 the costs dropped to $7.23; in counties of 10–15,000, 15–20,000, and 20–36,000 the costs were $6.01, $5.97, and $4.75 per capita, respectively. The two largest counties, Lancaster with 155,000 residents and Douglas with 343,000 residents, had costs of $2.96 and $3.40 per capita, respectively.

Another study of Iowa government found a tendency toward a widening of the cost differentials between sparsely populated counties and those with greater population, compared to 1920 when the two groups showed little difference.

The data in Table 19.1 indicate the effect of population per county on all expenditures for county government in seven Northern Plains states. The costs show substantial increases for population levels of less than 10,000 persons.

Table 19.1 Costs of County Government, per capita, in seven states in the Northern Plains.

<table>
<thead>
<tr>
<th>State</th>
<th>100,000 and over</th>
<th>50 to 99,000</th>
<th>25 to 49,000</th>
<th>10 to 24,999</th>
<th>Under 10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>$176.51</td>
<td>$71.50</td>
<td>$123.60</td>
<td>$135.57</td>
<td>$210.31</td>
</tr>
<tr>
<td>Kansas</td>
<td>115.56</td>
<td>52.32</td>
<td>59.57</td>
<td>74.47</td>
<td>106.63</td>
</tr>
<tr>
<td>Montana</td>
<td>92.24</td>
<td>-</td>
<td>65.52</td>
<td>66.22</td>
<td>69.54</td>
</tr>
<tr>
<td>Nebraska</td>
<td>89.24</td>
<td>38.83</td>
<td>-</td>
<td>65.70</td>
<td>74.11</td>
</tr>
<tr>
<td>North Dakota</td>
<td>73.55</td>
<td>-</td>
<td>44.43</td>
<td>51.61</td>
<td>68.26</td>
</tr>
<tr>
<td>South Dakota</td>
<td>78.78</td>
<td>-</td>
<td>32.36</td>
<td>39.81</td>
<td>54.85</td>
</tr>
<tr>
<td>Wyoming</td>
<td>83.47</td>
<td>-</td>
<td>51.00</td>
<td>73.18</td>
<td>83.42</td>
</tr>
</tbody>
</table>

aData obtained from Census of Governments, 1962, Bureau of Census.

9Donald E. Boles, "County Government in Iowa," Iowa College-Community, Res. Center, 1962, Iowa State University, pp. 4-5.
It should be noted that the traditional administrative offices of county government do not make up the bulk of these costs. Rather, the major costs stem from expenditures for education and roads.

**The Quality of Services.**

One may find in comparing two communities that high costs per unit of public service stem from superiority of the services provided. The evidence in rural areas indicate rather that inferior services are frequently a corollary of high costs, compared to the situation in a more urban area. Thus one student of local government characterizes rural governments as "amateur" governments, lacking in specialization and expertise. He points out such deficiencies as haphazard budgeting, accounting, and financial reporting, the lack of competitive purchasing, and deficient employment practices.

Many services can be provided only at high cost in sparsely populated areas. Others may not be provided at all. Thus, in some Northern Plains counties, public health service, parks and playgrounds, hospitals, and police and fire protection are sometimes lacking. Many farm areas do not have fire districts or arrangements with nearby towns for fire protection. The provision of adequate outdoor recreation facilities by counties has been the exception rather than the rule. Some states have relied chiefly on the federal government to provide such facilities.

With a few exceptions, educational services are deficient in small rural schools. Laboratories, specialized teachers, counseling services, and other specialized services are too expensive for them. In Minnesota 20 percent of the public high schools in 1960 were unable to provide even the minimum levels of mathematics required for entrance into freshman college algebra courses. High school teachers are expected to teach too many different kinds of subject matter. Teachers in rural one-room schools are poorly paid, but also poorly trained.

Road service is also deficient in many areas. Many roads are unsurfaced, impassable in wet weather, and poorly maintained. Many streets in smaller towns are similarly deficient.

Similar difficulties exist in other service areas in the rural communities. Snider has pointed out the deficiencies in rural libraries, public health services, hospitals, public welfare, and other services.

It is likely that the outmigration of rural people has a dampening effect on the quality of rural services, not only because the cost per capita...
is increased as a result, but because leadership may be shifted to older, less innovative hands.

**Changing Demands for Social Overhead Services**

The easiest way in which to characterize changes in the demand for social overhead services is to say the rural people are becoming urbanized. Their educational levels are rising. Income disparities between rural and urban people can be expected to narrow. The modern communications media—personal contact, newspapers, radio, and television—have made rural people more aware of consumer goods and personal services available to them. In addition, they are more sensitive to the arts and the esthetic.

What are the implications of these developments to social overhead services? In the first place, rural people will probably be more critical of the performance of local levels of government. They will be less tolerant of inefficiency. They will travel farther and pay more for higher quality services in such areas as health and medical care, education, and recreation. They will request and pay for new kinds of services—new kinds of recreation, health services, and educational experiences as well as additional facilities for the aged, and transportation.

The topic of changing demands and desirable standards of performance for social services needs much attention. For example, we really do not know what the demand for local outdoor recreation will be 20 years from now. We need a better basis for organization than sheer conjecture on this point. What will be the demand for retirement housing by older persons in given rural areas? One might infer from the current interest in such facilities that a retirement home is one of the hopes for saving many rural towns from further shrinkage. What medical and hospital facilities are needed by rural families, and where should they be located? There is evidence that farm families may tend to bypass the local general practitioner, for example, in favor of a specialist, even though the latter is located some distance away. The availability of medical facilities is also important when considering location of homes for the elderly.

These examples illustrate that one cannot simply apply urban standards by a little clipping and pasting. Because of the spatial factor, the basic problem is how to devise performance criteria and organize to provide services in rural areas, with their particular spatial aspects, in order to meet broader expectations.

**Policy Alternatives with Respect to Rural Social Overhead**

What are the alternative courses which can be followed by a local government in order to provide adequate services at reasonable cost? Many of the means discussed can be used by local governments with no assistance from federal and state levels. However, in the following we suggest the possibilities for the use of resources of higher levels of government to encourage and assist adjustments which will improve social overhead services in rural areas.
Relocation Assistance for Nonfarm Labor

In the discussion of redundant labor in farming, and recent policy measures taken to enhance the mobility of rural people through training programs, the fact that workers can be redundant in the nonfarm sector of small towns has not been adequately considered. As in farming, there are people in small towns whose economic role is possible only because they accept low labor incomes. With the reduction of farm population, their position becomes even more tenuous. Policy attention might be directed at them in terms of retraining assistance and other means of increasing their job mobility.

The general programs such as the Manpower Development and Training Act of 1962 and the Vocational Training Act of 1963 have provided limited opportunities for retraining and basic education. The Economic Opportunities Act offers promise of more extensive assistance. However, with some exceptions, these programs have tended in the past to center on urban areas. Rural communities have some difficulty in organizing and applying for job training assistance because they lack both the information as to what kind of training is best suited to their needs and of what programs are available.

The training aspect of present programs is progressing fairly well. There is some doubt, judging from the projects completed, that the programs have applied equally to rural and urban areas. Some study is called for to determine why this is so, and if so, how to correct it.

Assistance to Small Town Business

The position of small town business in rural areas may be somewhat comparable to that of farmers operating units too small to make a living. In some ways they are worse off than the farmer. Their investment disappears while the farmer still has land value and equipment which are marketable and mortgageable. With declining farm population they can experience a price-cost squeeze similar to that of farmers under adverse price conditions. Because of their number, shouldn't we be cognizant of them from the policy standpoint? Are planning assistance and credit resources available to a business which considers the possibility of relocating, expanding or diversifying? Of course, many rural businesses are characterized by entrepreneurs in latter stages of their business life cycles; they may be farmers who retired early, or people on Social Security who are simply operating to earn extra income. They are not likely to be as mobile as younger people.

The Small Business Administration and the ARA carry on some activities which help alleviate this situation. However, their activity is sporadic rather than of a planned nature.
Industrial Development, and the Location of Industry

Nothing brings a gleam to the eyes of a good chamber of commerce secretary like the prospects of a new plant. Certainly many success stories can be cited of country towns which have experienced the heady impacts of a new enterprise, expanded labor force, more families, and the other multiplier effects which have been generated. On the other hand there is considerable wishful thinking in many rural communities about the therapeutic effects of a possible new plant. There are many cases where un-economic ventures have been subsidized heavily by communities for a time but failed in the end. The development of industry in rural areas involves changes in social overhead facilities—schools, roads, utilities, communications, and recreation. The residents of many communities are unaware of the impacts of new industry on social overhead and on existing industry -- until too late! These communities are caught in a dilemma. If they do not invest in additional services, they may not attract new industry. If they do invest, they have no assurance that a new plant will result.

One may note that rural areas lack knowledge concerning new industry. But one may also marvel that we have been content to let the whole course of industrial location go its way. Seemingly there has been a minimum of policy direction in industrial location except through the politics involved in locating defense industry, or through the magnetic influence of public resource development programs. Thus we have seen the growth of the sprawling Megapolis, with social overhead problems associated with the moving of labor, plant, and equipment to a proliferating series of new plant sites. Once established, public resources are made available at local, state and national levels to provide for overhead services.

Are there situations where generating new enterprises in rural areas would involve less social overhead cost than moving and reestablishing farm and nonfarm rural people in already crowded urban areas, and providing them with necessary services? We need to know more about this matter. In addition to knowing the resource requirements of plants of different types, and their locational limits from the standpoint of transportation, we ought also to have available information on the social overhead requirements in smaller as well as larger cities. Perhaps for some kinds of industries the impediments to their location in rural areas may not be as great as is sometimes assumed. At any rate this matter deserves the attention of research people and planners, as well as makers of policy.

Assistance to the Social Overhead in Rural Areas

It is not our intention to argue for or against transfer payments to rural communities to reduce disparities in financial support for social overhead services. We would point out that the precedent is well established; indeed, important types of financial aid are now being given to rural communities by higher levels of government, particularly federal agencies. The rationalization for such assistance might well be that the problems faced by depopulating rural communities are related to national economic development.
and the transfer of people to urban areas. Since society as a whole has benefited, partly at the expense of these communities, it may be appropriate that society share some of the benefit with them. Studies indicate that substantial subsidies have bee provided by rural areas to urban areas in the form of education for rural young people moving to the city, farm capital inherited by city dwellers and in other forms. In the 1920's these subsidies were estimated at about $1.4 billion per year. There is reason to believe the pattern is similar today, although somewhat more offset by farm programs. 13 Such assistance to rural areas could be either as permanent subsidies, or as assistance to facilitate organizational adjustments of an adaptive nature.

We would suggest that in the long years of discussion about resource adjustment in agriculture, the problems of reorganizing rural communities and their overhead services have been overlooked in many ways, with some important exceptions such as hospitals. There are perhaps several reasons. The nonfarm sectors of rural communities have not always been completely aware of the population adjustments taking place on the nearby farms, and all of the implications of these shifts. They have not been noted as social innovators, but rather as preservers of the status quo. However, in their defense it should be noted that it is far easier to innovate in an expansion situation, than one in which the problem is how to perform an orderly retreat; they have more to lose by the change than most other groups including farmers. They have in their group mentality a contradictory mixture of optimism that somehow the future will be better, with a reluctance to take actions which violate tradition. Underlying all of this may be the fact that effective communication between farm people and their town neighbors is sometimes lacking, particularly on issues of social overhead, even though their equity in social overhead services may be equally great. The townsmen have always had difficulty sensing all of the economic relations between town and country; to them, the town is a somewhat independent entity which faces the world which lies outside of its gates; conversely, many country people, also have difficulty in recognizing their vested interest in the services located in these towns, or in visualizing themselves as part of an economic entity involving both town and country.

Transfer payments can perform a catalytic function above their intrinsic subsidy value. They add weight to the social coercions which are encouraging change. They can influence the choice between alternatives. They can bring the initiation of action in a traditional situation where action is not presently forthcoming. Thus the skillful application of transfer payments can bring changes out of proportion to their volume, if the direction of the change is inherently sensible. Ineptly used, or used without a sense of direction, they can have the opposite effect, namely preserving the status quo; they can even result in overbuilding of facilities and services, as may be the case of hospitals, old age homes, and sewer systems in some rural areas. A sense of direction implies knowledge about the alternatives, and some consensus about what the directions of change should be.

Consolidation of Governmental Units. Despite the staying power of the counties in rural areas, the direction of social coercion suggests as one possibility their ultimate consolidation into larger units. Or, an alternative fate would be their eventual dissolution in favor of state administration on a piece-meal basis, unless their problems can be solved through larger scale organization of other types. The counties are creatures of the state, and it is probably at the state level that pressure for change can most effectively be exerted. Relevant questions can be raised at certain strategic times. Thus, are all counties to be encouraged to build new courthouses, when the old ones have deteriorated? Can counties be encouraged to consider consolidation when they become dissatisfied with their old buildings? What kind of state laws are needed to facilitate consolidation? Is sufficient information available for determining sound consolidated areas? Would the inducement of selective transfer payments encourage such discussion? (Thus, outside funds might be made available to help finance one new structure somewhere in a multi-county area provided that local support for the idea would be present.) Obviously, the question of new facilities can hardly be considered without parallel discussion of consolidation of functions and staff. Far-fetched as the idea may seem, the incentive of having outside funds available to help support salaries of "consolidated staff" for a period might encourage such discussion.

County consolidation is not the only alternative. Another is county-city consolidation. This possibility would be particularly relevant in counties which include a central city whose economic relations extend at least to the county borders. A joint county-city building is a first step. Again, financial inducement might stimulate the parties concerned to creative thinking. The next step is the possibility of joint departments, and joint employees. A third step would be joint elected officials, such as a city-county treasurer. At this point the distinction between city and county becomes quite vague -- we are on the threshold of integrated government for a geographical region already bound together by a multitude of economic realltions, as well as by public problems such as zoning, roads and streets, sewage disposal, and power. Already outside assistance is available for public hospitals servicing large geographical areas. Can assistance be used constructively to broaden the points of consolidation? Do we know which communities, if any, should be encouraged along this line?

Another form of consolidation might be possible between two or more town governments. The common type has been between a large town and its suburban satellite when the two have grown together through expanding population -- not a common phenomenon in rural areas. However, in visualizing a town-county government oriented toward a central city, we should recognize that such an arrangement must also involve the smaller towns in the county. The matter becomes complex, but somewhat akin to that involving a city and a self-contained shopping center within its limits.

Internal Reorganization of Governmental Units. Perhaps the greatest possibilities for improvement lie with the counties. In the first place county offices can be combined and the number of elected administrators reduced. Second, the chief governing body of the county -- the board -- performs both legislative and executive functions, but at the same time has little control over the independently elected officials. Our hypothesis is that the efficiency, effectiveness, and responsiveness of government would be improved if the legislative and executive functions were separated, and a chief executive, either elected or appointed as in the county manager system, were given clear responsibility for administration. Greater responsiveness in the executive branch would result if the other county officers were appointed by the chief executive, rather than elected independently. With the greater emphasis on administration implied in the above arrangement could come greater attention to qualifications of other county employees, the possibilities of centralized purchasing, and greater possibilities for focusing on current problems. Financial assistance might be coupled with standards of performance and organizational criteria as an incentive to adjustment in governmental organization by the counties.

Consolidation of Services. The popular discussion of the consolidation of schools has tended to obscure the opportunities for consolidating the various other services in the rural community. We ought to know more about the factors affecting the progress of school consolidation in various localities. At least one writer feels that the success which has attended school reform has siphoned off much of the potential support for other kinds of governmental reform at the local level.  

State aid has certainly played an important role in bringing about the consolidation of rural schools, the raising of educational standards, and other reforms. Federal funds have been instrumental in creating vocational programs in agriculture and home economics in rural high schools. The absence of substantial state aid certainly restrains school consolidation in states like Nebraska. With the present reliance on property taxes many farmers in rural districts are unwilling to support consolidation because it would mean substantial increases in property tax payments. State aid from sources other than property tax provides a means of alleviating this circumstance. Federal aid would provide additional resources which could be used to encourage further desired shifts, including further consolidation of both elementary and high schools, broadening of curricula, raising of salaries, and improved transportation. Such assistance seems particularly important to areas which are exporting population; typically such areas experience the unhappy combination of low average incomes and population distributions which are weighted heavily by the young and older age groups, both of which represent financial commitments on the community. The export of trained young people represents a very real capital loss to the communities.

in terms of the expenditures by families to rear such young people and by the community to educate them. These losses represent one rational basis for transfer payments to support education.

The reasons used for supporting transfer payments for education can be applied to other services as well. In the case of roads the dual problem is again one of how to improve service while consolidating facilities. Some farmers have moved to town in order to be closer to educational, recreational, and other services. To what extent can the relocation of rural residences be encouraged in the long-run in keeping with a long-run county road plan? The federal government has subsidized several hundred thousand miles of secondary roads in the country. Subsidizing the relocation of rural residences may be an economic alternative to road construction in many depopulating areas.

Health, library, and recreational services, fire protection, and police protection may also benefit from consolidation. In each case consolidation implies a look at a larger planning area, working out of a plan for the achievement of desired objectives over time, and then organizing for the program.

**Intercounty Cooperation.** In the absence of county consolidation, multi-county arrangements offer many possibilities for efficiencies and enhanced effectiveness in providing specific services. Transfer payments can serve as the catalyst for their formation. A current example of this type of activity is the inter-county district for extension work in agriculture and home economics. We could have district superintendents of schools rather than county superintendents. Property assessment could be handled on a district basis for purposes of data processing, equalization and other overhead tasks. Health districts can include several counties; several counties can cooperate in jointly operated hospitals. Similarly, several counties can go together in establishing road districts large enough to justify full-time trained engineers and modern equipment. Recreation plans should be made on a district basis. Economic development programs should visualize areas larger than counties in most cases. Junior colleges and vocational schools can be more effectively supported on an inter-county basis rather than by a city or a single county. Library service, police protection, and jails may also be provided on an inter-county basis.

It is possible that desirable adjustments will be delayed by the encouragement of partial solutions to the problem. Will functional consolidation, for example, delay by several years or decades the area consolidation that might be necessary for realistic long range adjustment?

Back to the Blank Map

The previous discussion has served to emphasize the importance of planning. We cannot ignore the economic bases of today's rural communities. How would we sketch these economic and the accompanying social relations on a blank map if we were starting afresh? Presumably we migh devise a
system of economic areas quite different from those implied by today's counties.\textsuperscript{16} Such areas would be larger, encompassing the areas of several existing counties. Continuing with our sketch we might insert county boundaries which coincided roughly with economic boundaries. The result -- a greatly reduced number of counties. The central city around which this area might organize would be the county seat; the governments of the central city and the county might be housed together, with many of their functions integrated or coordinated.

This central city would be the logical location for the many federal agencies operating in country communities; they might be housed in a federal building, which might be next door to the city-county building. Perhaps, instead of the federal building, we might find a federal-state building, which would include the district offices of state activities such as highway department, parks department, forestry department, and others.

Drawing such a map may seem to be at the minimum an enjoyable but abstract academic exercise. Our map may never materialize in this initial form. However, the map does represent a model, with logical basis, toward which change may be oriented. If transfer resources are to be applied to rural communities by state and federal governments, and if the organization forms in which social overhead services are provided have any significance, these resources can provide leverage for changes which might be in the directions implied by our map.

\textbf{The Need for Research and Planning}\textsuperscript{17}

Significant amounts of money have been available for planning activities related to economic development through specific programs like RAD. However, it is doubtful that the planning activity in RAD or its predecessors focused adequately on problems of social overhead. At any rate, planning and research on problems related to social overhead services should most appropriately be initiated at state levels, or at the minimum on an inter-county regional basis. Inter-county regions which are organized so as to work effectively with these problems are rare. Neither has the attention given at state government levels to these matters been of much consequence. It is at the state level that planning and research, and consequent legislative and executive leadership, must take place. In the words of the Council of State Governments in a study of 1956 for the Governor's Conference:

\footnotesize{\textsuperscript{16}Fox has dealt extensively with the concept of the functional economic area, and has explored the implications in detail. See, for example, his paper on "The Use of Regional Accounts in the Development of Programs for Economic Growth."}

\footnotesize{\textsuperscript{17}See Stocker, \textit{Op. Cit.}, pp. 59-60 on research needs.}
Although the roles of local government and the national government are indispensable, the states are the key to solving complex difficulties that make the general metropolitan problem. To achieve adequate results the state governments -- the legislative and executive branches and the people -- need to exert positive, comprehensive, and sustained leadership in solving the problem and keeping it solved.18

This thought is equally applicable to the problems or rural communities.

Studies are needed to determine the extent to which state constitutions limit adjustments in organization of local governments, and the other types of innovations referred to earlier. An agency of the state government could be established to concern itself with problems of local government services, and overhead services. It could receive funds for research and planning from state and federal sources. It should be in a position to contract research work with appropriate research agencies. It should coordinate the activities of state government which affect local government in rural areas. It should provide consulting assistance and other resources to towns, counties, or inter-county commissions concerned with government structure.

Such an agency should concern itself with questions such as how changes in social overhead can take place in orderly fashion in rural communities, desirable directions for adjustment and improvement in social overhead services and new services that will be needed. It should represent the interest of effective local government in relation to such outside forces as farm programs, economic development programs, and the multitude of other federal and state assistance programs which affect the rural community.

The Economic Opportunity Act provides for several approaches to the social overhead problem in rural areas. The Job Corps, Volunteers in Service to America19, and the various community work training programs will provide manpower and some equipment and supplies for work on public services. The social overhead needs in both urban and rural areas are so vast that efforts almost anywhere will be useful. However, the communities need guidance and planning assistance in determining priorities so as to use the EOA constructively. We are not sure these priorities have been established.

What Course Evolution?

The history of local government in rural areas in America does not give much basis for thinking that the unguided processes of nature will bring about desirable changes in social services and local government. However, some aspects of social overhead have been neglected in the economic and social programs directed toward rural areas. Our rural governments are inadequate in meeting the greater expectations of the people. Neither do they become more efficient and effective by reorganizing so as to take advantage of new technologies available to them.

19Established under Title VI of the Economic Opportunity Act.
Professor Block gave us a rather complete and interesting discussion of various aspects of farm organizations. He indicated that, in the future, farm organizations will need to give increased emphasis to international aspects of the food and fiber industry. He pointed out a number of other factors that will affect the farm organization of the future including fewer and larger farms, greater specialization, urbanized influences and legislative re-apportionment. Finally, he discussed some of the kinds of services that farm organizations provide.

Personally, I would like to have had more information on the changes in the number and types of farm organizations and services performed by farm organizations over the past 15 or 20 years. This might have been more suggestive of relevant trends in coming years. What types of farm organizations have been organized in the past 15 years to provide what services to farmers? How successful have they been? More specifically, have the increased specialization of farming, the reduced number of farmers, and the continued low prices brought about new commodity oriented farm organizations? If so, how successful have they been in achieving their more narrow and more specific goals? With a continuation of present trends in specialization, farm numbers, and margins, one must ask, At what point does bargaining by producers become feasible and by what type of farm organization?

Moreover, we have probably been far too conservative in our estimate of changes. Professor Block suggested that the development of synthetics in the future would undoubtedly affect farmers. One need not put this one over the next hill. Synthetic sour cream, ham, poultry, and other foods are on the market already. They serve primarily as alternatives for a few consumers for health or religious reasons; as yet they are not competitive in price with the real thing. Let me remind you, however, of the diet soft drink--a similar recent innovation. Within another year it is expected to make up 25 percent of soft drink sales. A pertinent question is whether farm organizations learned anything in the oleo-butter controversy which might be applicable to some of the emerging problems.

In discussing the services of farm organizations, I wish Professor Block would have gone further in suggesting which services are likely to be most critical and which types of farm organizations might reasonably be expected to provide specific services. One might hypothesize that policy development,

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representation, and market development are relatively specific aspects which a commodity interest might wish to tackle. This does not agree with Block's statement that a general farm organization might present a coordinated policy proposal or position to the government. Can a general farm organization agree to a coordinated farm policy? If not, what are the alternatives? And the consequences? Probably a producer's commodity group can present a unified policy proposal -- for its commodity. But then who determines how conflicting commodity policies get settled?

If there is a trend toward commodity organizations because of the increased specialization of farming and fewer producers, might there also be a trend toward farmers belonging to two organizations: the commodity oriented and the general? Specific policies, viewpoints, and action programs might originate from the commodity organization. Supplies, public relations, training aids, and social services might be obtained through the general organization.

Finally, are there services that farm organizations might provide that they do not now provide? For example, with larger and larger farm units it becomes rather important for farm operators to give increased emphasis to estate planning or other orderly transfer of the farm operations. Might the farm organization of the future provide a legal expert to aid in the solution of such problems at a nominal cost to the member? Might the general farm organization take over the electronic record keeping for commercial farmers? Perhaps as a next step they might then provide tax consultants as well.

Block also indicated in a footnote that there is little information available on the age patterns of farm organizations. Perhaps one of the most important needs of farm organizations is some research on their membership -- not only on age, but on their affiliation with other farm organizations, type of farming, farm problems, and what members feel they get or would like to get from membership in the organization.

Professor Holcomb reviewed the demand for farm managerial services. He indicated the kinds of jobs professional farm managers hold now, and then considered some of the changes that are likely to come about in the future. Some of the important future developments are expected to be increased specialization by professional farm managers and closer working relationships with educational specialists.

I felt it would have been helpful if, early in the paper, Professor Holcomb had indicated what type of managerial services he was referring to. I believe he was dealing with the professionally trained farm manager. While he indicated that owner-operators and tenant operators provide such services, I gathered that his concern was aimed almost completely at the remainder of professional farm managers.
Holcomb predicted that the professional farm manager will become increasingly specialized in the future. I would have liked further elaboration. Does this mean that one farm manager will specialize in crops or even in certain crops and another in livestock or in certain kinds of livestock? Or does he mean that one manager will specialize in farm records, another in budgeting and programming, and still another in legal matters? With this increased specialization do students major in crops and take a few courses in management or do they major in management and take a heavy dose of crops? Exactly what are the implications of this increased specialization for the on-campus teaching program from which our specialists would graduate? Also, it was not completely clear whether he was talking about farm management specialists or technical specialists in production areas such as agricultural engineers or crop scientists.

Holcomb indicated that farmers are typically slow to request help for specific management problems. He offered two reasons for this: lack of knowledge of the help available and inability to admit that help is needed. There are a great many other people who would offer a third explanation. That is that farmers are so used to getting free information and advice that they are not willing to pay a consulting fee and do not recognize the value of a consultant. Several Michigan bankers told me last week that it is tremendously difficult to get a farmer to visit an attorney for the purpose of estate planning -- especially if the farmer has any idea at all of the cost. Why should a farmer call a professional farm manager to solve a specific problem when he can get free information from the extension services, a specialist, or a researcher at the university?

The point was also made that extension people often may not be aware of the problems that professional farm managers face. It seems to me that one of the clear implications of all these papers is the increased difficulty that extension people and applied researchers as well will have in getting ahead and staying ahead of developments in a field. It's going to be much easier in the future for educators to find themselves behind the commercial farmer rather than in front providing leadership.

Ottoson and Timmons' stimulating paper reviewed some of the problems of rural areas with respect to social overhead services. They suggest that many rural areas do not have a desirable level of quality of such services and that the problem is likely to worsen due to outmigration. They review several possibilities for attacking the problem including transfer payments, governmental consolidation and reorganization, consolidation of services, and inter-county cooperation.

Personally, I thought their general model of social services was a desirable place to start. It helped to focus on some of the relevant aspects of providing social services. Unfortunately, there are evidently few data available to bring to bear on the problem of what constitutes an economic
population unit for purposes of providing such services.

It seems to me that we are in rather desperate need of research on economies of size with respect to the number of people within a local governmental unit (such as the county unit), the number of people served by a school district, the number needed to support a hospital, etc. Economists have many of the tools for making such studies, and it seem high time they started to do some research on these questions. One of the specific needs is for some research on a theory of investment applied to a business or industry with declining markets. This would be applicable to rural, small town businesses. When these towns developed originally, there was a move away from the general store toward specialization in clothing, groceries, hardware, feed, etc. With a declining market, does the process reverse itself? How does one analyze how much investment is justified in remodeling or diversifying to adjust to a decreasing market?

When Ottoson and Timmons indicated that the average U.S. county had 38 governmental units, I wish they had defined exactly what they mean by a governmental unit. Also, it would be interesting to know how many of these governmental units were local, or state, or federal. Further information would help in visualizing possibilities for combining two or more functions together.

They also made a strong case for school consolidation although they failed to mention whether the consolidation would result in better quality of instruction or in efficiencies. Presumably they were arguing quality since they later suggested that farmers were often unwilling to support consolidation because it would result in substantial increases in property taxes.

The paper made an interesting case for decreasing costs of local government with increases in county population. There is little question but that some counties may be too sparsely populated to keep local government costs down. However, one should not push this too far. There are a few counties in Michigan and probably in many Midwest states where taxes are very high because population is too thin. However, some of the lower tax rates are achieved by rural Michigan counties whereas Wayne County (Detroit) has one of the highest taxes for county government in the state. Also there is another question of importance here. If taxes are based on property holdings and if few people hold large properties in a sparsely populated area, then naturally the tax per capita or costs of local government per capita will be higher. But little evidence was presented on the resulting quality of local government. Perhaps large property holders need more government services in the form of roads, police protection, fire protection, etc., than more populated counties. Should government costs tend to be equal per capita across a state or should costs be in line with benefits received?
Ottoson and Timmons at one point indicated that they expect income disparities between rural and urban people to narrow. If rural communities continue to diminish in size from outmigration and if it is increasingly true that those who are left are the older members of the community with investments in homes and businesses which will be difficult to salvage, then I fail to see this narrowing of the income gap. The income gap does not narrow because rural and urban people watch the same TV commercials; rather it becomes narrower through mobility and comparable marketable skills.

Also it seems to me their paper did not focus sufficiently on the governmental level at which pressure should be brought to bear and at which decisions are made. If consolidation of counties is to take place, the decision will be made at the state level since counties, as our authors said, are a creature of the state. On the other hand, school consolidation is a local issue and pertinent information on benefits and costs of consolidation should be made available at the local level.

In a city-county type of consolidation, members of each governmental unit have a legitimate concern as to how their interests will be affected. Will the city inhabitant, if he controls the consolidated unit, have respect for minority needs (that is, the farmers' needs) or vice versa?

From a political standpoint, in many states the county unit of government is the basic building block for our political party structure. If we were to go so far as to suggest that counties as a governmental unit be abolished, this recommendation carries some fairly serious implications for our political party organization. It might be useful to ask what would replace the county party organization in the political system.

Finally, I simply disagree with a couple of thoughts presented in the paper. I'm not convinced that a chief executive of county government with an appointed cabinet of county officers would bring about efficiency, effectiveness and responsiveness of government. In fact, I suspect that an elected county officer who can be voted out of office at the next election tends to be more responsive than an appointive officer. Similarly, I fail to see how the establishment of a chief executive in itself can lead, or would lead, to centralized purchasing and other administrative efficiencies — especially considering the implied salary increase that would be required in line with the administrator's executive abilities. Perhaps a useful alternative would be to force county elected officials to obtain professional training and instruction in administration by the state or by their own state wide organization, if they have such. In other words, why not train local people who have the community and local experience to be better administrators rather than hire professional administrators and expect them to get the necessary feel for the community and its problems?
Neither am I convinced that the answer to these social overhead problems should at least at this time, come from a national policy. Rural people want their children to be well-educated. They want adequate medical services. They want successful local business. If researchers can provide information on what is needed to achieve these goals and on the alternative means for achieving them, I have no doubt that rural people can and will make the necessary decisions. Perhaps national and state policy can help them achieve whatever goals they choose, but our function at this time is to point out the problems, provide information, and help evaluate alternatives.

In summary, each of these papers had many interesting and useful things to contribute. I only wish that each of them could have gone further in revealing the future. Perhaps that is asking too much. Maybe we'll simply have to wait and see what further implications will be.
My purpose in this paper is limited -- to identify and analyze four aspects of organization and administration that, in my judgment, will be critical in the future growth of the colleges of agriculture. These are planning, internal structure, college-university relations, and staffing. In none of these areas do I offer structural or procedural panaceas, principally because I doubt that any exist. The observation that follow are based mainly on some 350 interviews with agricultural administrators and faculty conducted as part of the Carnegie-sponsored study of American colleges of agriculture directed by Dr. Charles E. Kellogg. They do not necessarily coincide in all respects with the forthcoming report of that study.

Before turning to my main discussion I should like first to review with you those attributes that lend special organizational distinction to the American agricultural college. When taken together, these attributes constitute a conception of purpose and method that affects both positively and negatively the capacity of the agricultural faculties and administrators to adapt their organizations to the changing agricultural, social, scientific, and academic scene.

Organizational Attributes

American agricultural colleges have been guided throughout their growth and development by a belief that knowledge should serve people.¹ In fact, among American academic organizations, agricultural colleges have been uniquely outward-looking or service-oriented. But not all have interpreted "service" in the same way. Some have assumed that the college serves society best when it gives forward-looking intellectual leadership to people. Others have interpreted service to mean responsiveness to what people themselves think they most need at any given moment. The two concepts, it should go without saying, are quite different.

Involvement with society has brought to the colleges a host of external relationships: some stemming from their role as instruments of cooperative federalism in agricultural research and education; some from their continuing service to a variety of special clientele groups. These group ties, both formal and informal, have had a powerful influence on organizational character. Bound into the fabric of the national agricultural establishment, college faculties have tended to draw their values more from other

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agriculturists than from the on-campus community of scholars. Outside loyalties and commitments have facilitated the colleges' capacity to act as agents of technological and social change, but they have also retarded at times their capacity to adapt as organizations to new situations.

Because they share teaching, research, and extension functions with many other private and public institutions, the role of the colleges within the agricultural establishment is subject to continuous change. What other institutions do or can be expected to do conditions the obligations that the colleges undertake. Their distinctive role would seem to be to act as pioneers, to experiment, to innovate. Work that the colleges initiate and prove feasible often is later taken over by business and government, with the result that college resources can be released for new endeavors in new fields. Often, perhaps too often, colleges have been slow to recognize that what was once innovation is now common practice, and, thus, some have lagged behind in re-defining their role in the institution mix in modern agriculture. Perhaps this situation partly explains why business and industry have become such major innovating forces in agricultural technology today.

To a unique degree, the colleges of agriculture are tied together in an informal national academic system, a result principally of their status as grant-in-aid agencies for federal programs. In fact, agricultural college faculties and administrators talk to each other about mutual problems of education, research, and organization more than most academicians. Although the consequences of inter-college ties are many, only two need be noted here. First, new programs and changes in old programs are readily communicated among college administrators and faculty. Thus, the time lag between innovations in programs in leading colleges and adoption by others is relatively small. In other words, for better or worse, conformity in program directions is strong among agricultural colleges. Second, college faculties have cooperated on a regional basis in research and to a lesser extent in other phases of their programs, but such regional cooperation has been less than one might expect. Although I do not discuss regional arrangements here, I believe that much more needs to be done and can be done to foster inter-institutional cooperation in the future.

In summary, at their best, the American agricultural colleges have been truly leaders and innovators. Their faculties have helped individuals private groups, and public agencies to anticipate and identify critical social and technological problems before they occur, and to design

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alternative solutions, ready for use when they arise. At their poorest, they have aided people, but by responding to needs already defined by clientele groups with knowledge already developed elsewhere.

Within their respective universities, the agricultural colleges are mainly centers of knowledge about the technology of renewable resource use and the sciences out of which technology grows. In this broad area, their faculties have concentrated on resource use for agriculture, broadly defined -- on knowledge about food and fiber, production distribution, and processing -- largely in the United States, but also lately, in emerging nations throughout the world. Increasingly, faculty specialists have departed from this traditional interpretation of purpose, seeking to advance and transmit knowledge about a wider range of problems: the effects of environmental change on plants, animals, and man; the viability of existing social institutions for improving rural human welfare.

I should note that many college faculties still interpret their mission as service to agriculture, defined mainly as improving the technology of commercial agriculture. It seems to me that the mission in rural areas must be much broader. The colleges themselves have helped to create, through education and research in technology, many of the social problems that Professor Ottoson has described. That the college has an obligation to help solve such problems seems both logical and inescapable.

In the decades ahead, we can expect the colleges to expand even more their range of interests, largely because, with structural changes in commercial agriculture, states will differ greatly in renewable resource patterns. Both the groups looking to the colleges for leadership, and the kinds of problems that will require their assistance, will become more diverse. With change, the fundamental challenge before the colleges is to preserve the best in their traditional organizational character, yet at the same time meet these many new demands and pressures. In other words, in the face of continuing change, the colleges will need to decide how they can best serve society by putting new and old kinds of knowledge to work in new and different ways for new and old clienteles. All colleges cannot and should not seek to meet the challenge in identical ways; for, with the agricultural revolution and urbanization of the nation, the role of the college as a knowledge center, devoted to service in the state, must perforce be different in different states.

Most colleges, in my opinion, have many faculty members who are cognizant of the implications of changing agriculture and society for their programs. Yet many seem baffled by how their colleges, as organizations, can adjust to the present, let alone 1980. The reason lies, I believe, in the basic fact that, despite its service outlook, the college of agriculture
is still and academic organization, suffering from all of its deficiencies as an adaptable form of organization. For a number of reasons, universities are not well adapted to rapid change and team action. Academicians, it has long been noted, may be radical in their ideas about how others should behave, but remain extremely conservative about modifying their own behavior patterns.

What follows is addressed to the problem of organizational adaptation to change. My comments are not in themselves radical, being more a suggestion of tinkering with present forms than general overhaul, a projection of future organization in terms of the possible rather than ideal.

Planning and Administrative Leadership

Confronted by urgent but often routine and repetitive operating decisions and pressed by external commitments, agricultural college administrators seem to find little time for long-range planning. Programs have been put together by deans mainly by a process of negotiation and compromise among departments. As long as agricultural faculties were knit together by common understandings of purpose and method, this short-range approach to planning and decision-making was probably feasible. 3

In a period of almost explosive change, however, such as the colleges have recently experienced and may expect to experience well into the future, neglect of long-range planning can leave the college without clearly conceived operational goals. With many competing, conflicting, and shifting professional, clientele, and institutional demands and pressures upon them, college faculties are being pulled in many directions. As a result, the short-run, the immediate, the power-backed, the prestigious, and the urgent propositions often tend to take priority over the significant in education, research, service, and the leadership to the community. Hence, without planning of operational goals and clear decisions on priorities among fields, functions, and levels of quality, the colleges are in danger of losing unity of purpose, of becoming followers rather than leaders.

Faculty self-studies such as those that have been common in recent years can help to chart future directions. But such efforts are essentially planning in spurts, leading to change by revolution. Planning in the colleges of agriculture needs to be regarded, in my view, as a continuing process.

As such, it encompasses first, a continuing survey of current knowledge and the prediction of future trends, accompanied by a review of existing programs; second, the design, as necessary, of new goals to meet future needs; and third, decision, the selection of appropriate means to attain goals. College-wide planning is a joint responsibility of administrators and faculty, but, by necessity, the initiative, leadership, and especially the decision must rest with administrators.

Some have suggested that a special planning staff is needed in the office of the dean to collect information about trends, to design operational goals, and to help administrators evaluate the consequences of decisions allocating resources among various programs. Personally, I doubt that such a staff is either necessary or desirable. With a dean and two or three associates, almost all colleges are well-staffed administratively for planning. What is most needed is a perspective on administration that gives planning as high a priority as other activities. Moreover, I doubt that deans should interpose a special staff between them and their faculties, because to do so would easily increase a psychological and physical distance that is already too great.

The college faculty is the administrator's best staff for planning. Faculty members have or should have knowledge and insight on resource use and development trends. Through their work with agricultural and other group leaders, they are knowledgeable about informed judgments on how the college can best serve the public. And, if the faculty is alert to the latest advances in scientific knowledge, its members can be an invaluable source of ideas and speculation about future directions.

For effective planning, these faculty resources need to be marshalled, synthesized, and used systematically. Deans and their associates need to work and talk with their faculties about trends, not only in the various fields that lie within the college but also in those that lie outside yet impinge upon college functions. Substance, in other words, deserves relatively more attention than administrative procedures in dean-faculty relationships. At the same time, if administrators are to interpret knowledge about trends and translate such knowledge into effective operational goals, they must be sufficiently free from routine paperwork that they can set aside time to think, read, and contemplate about intellectual matters. As Lawrence Chamberlain, vice president of Columbia University, recently suggested, the academic administrator must fight to find time to preserve the intellectual acuity necessary to his job.

Colleges of agriculture do not stand alone in the need to recognize planning as an integral part of academic administration. But because they are complex organizations, dedicated to the service of people, planning has special urgency for them. In summary, as the colleges need priorities of time and attention to plan effective academic programs.

**Internal Structure**

With their interdisciplinary approach to problem-focussed research and extension, colleges of agriculture fit the definition of purposive organization better than most academic units. They are, in essence, organizations that bring together the knowledge and skills of specialists to accomplish well-defined objectives. Yet the internal structure of the colleges seems ill-adapted in certain respects to their basic character.

Like other schools, agricultural colleges have come to resemble confederations of autonomous departments, each of which has the power, because of academic budgeting and tenure procedures, to proceed along a relatively independent course. If college goals were constant and derived solely by adding up the professional objectives and clientele interests of the individual departments, then the freezing of money and manpower resources along departmental lines would be of little concern. But, as I have suggested, with the almost revolutionary state of change that now characterizes the colleges' working environment, operational goals and balance among programs and functions are always altering. Thus, it would seem logical that the organizational structure should be flexible enough to accommodate changing goals and objectives, as they are indentified through on-going planning.

In the past, colleges have coped with new problems and new developments in knowledge mainly by creating new departments. Subfields have been broken off from parent disciplines, and specialists with narrow commodity interests have been separated from more general departments. By breaking off departmental segments, the colleges have sought to innovate and escape from traditional patterns of thought about teaching, research, and extension functions. While many of these efforts have been successful, they have resulted in a departmental proliferation that has simply aggravated the problem of frozen resources. Departmental funds and manpower have been tied to always narrower objectives. In the event of crisis, many administrators have been left with but one recourse -- to search out new funds for new manpower and new equipment to serve new purposes.

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Reorganization and consolidation are not simple cures for rigidity in administration. But they can be helpful if preceded by careful analyses of how work and knowledge need to be organized in academic units that combine teaching with research and extension. The fundamental need, it seems to me, is to get away from the idea that the departmental form of organization should be the basic, all-purpose administrative sub-unit of the college.

The department within the college of agriculture is probably best thought of as a pool of manpower with specialized knowledge in a broadly conceived discipline. As a social scientist, I do not pretend to have the competence to define the bounds of these disciplines. I am not dismayed by my incompetence, however, because I find that natural scientists themselves are now having difficulty in re-defining professional fields, in both agriculture and biology generally. The departmental faculty can offer instruction in basic principles and carry on individual and team research designed to advance fundamental scientific knowledge in a field. A disciplinary department can also serve as a professional base of operations for extension specialists.

The department, from this view, is an association of peers, with common subject matter interests and loyalty to a distinct professional field. But it is not an administrative unit for interdisciplinary, problem-solving research or extension. For this purpose, the time-tested device of the special institute, center, or interdisciplinary committee is a more suitable organizational form.

A "paper organization" with no faculty of its own, except a director responsible for planning and coordinating work and external relations, the institute or center may engage in graduate teaching as well as research and extension. It draws upon the staff of disciplinary departments for technical skills and knowledge, but it is not identified with any single department, remaining directly under the supervision and control of the college administrator. If the institute or center has objectives that are clearly long-range, many departmental members may be assigned to it on a continuing and almost full-time basis. Yet, because it remains without tenured faculty in its own right, the institute, center, or committee can be dissolved with relative (and I stress "relative") ease, and its members shifted to other purposes whenever this is deemed necessary.

This approach to internal structure that employs two separate, but equal, organizational forms does not automatically guarantee flexibility and adaptability in administration. New organizational emphasis need to be accompanied by administrative leadership in budgeting and staffing that

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10 Millett, op. cit., p. 84.
facilitates change. Specifically, to make a dual internal structure effective, deans need to take a more active role and department heads a less autonomous role in deciding how staff time should be allocated. In other words, the dean must work directly with both institute or center directors and department heads in deciding where existing talent can be best used. In addition, college administrators probably need discretionary funds to a greater degree than most academic administrators, mainly because the need for new programs in agriculture does not necessarily coincide with budgetary cycles.

**College-University Relations**

Earlier I stated that colleges of agriculture have looked outward to the agricultural community more than inward to the community of scholars. Gradually, this perspective has been changing, so that agriculture is no longer the autonomous part of the land-grant college or university that it once was. In teaching, the agricultural faculties depend upon knowledge centered in other colleges for as much as 60 percent of the education of undergraduates; moreover, as the experiment stations are faced by problems not easily solved by empirical techniques, college research faculties have become more dependent upon the basic natural and social sciences and mathematics. Yet barriers to effective working relations between the agricultural college and the rest of the university remain; some are barriers of the mind, some barriers of organization. I am concerned here with one aspect of the latter.

For many years, the agricultural college was the only component of the land-grant university organized and staffed for research and extension services, just as it stood alone in its involvement with public and private groups. Hence, departments outside the college were poorly equipped to help solve the many social and technological problems that perplexed rural people. For these and other reasons, the colleges sought only occasionally to draw upon the knowledge and skills of other departments, and then, often with only indifferent success.

Now organizational barriers are disappearing. Land-grant universities are beginning to organize, staff, and finance themselves so that they can serve society as a whole just as colleges of agriculture long served one segment of society.\(^{11}\) Non-agricultural departments are being staffed with extension specialists. Hopefully, as this occurs these departments will adopt and make use of the problem-solving approach to knowledge that has led to agricultural college success. Field organizations and extension centers are being established to move knowledge outward to the community. Urban and suburban groups, long untouched by the land-grant university, are looking

to it for leadership and technical assistance. While the college of agriculture is thus losing its uniqueness, it now has new opportunities to integrate its activities with those of the parent institution.

Decisions on organizational relationships with university-wide extension programs now confront college administrators and faculty in three general areas:

First, if, as I anticipate, land-grant universities continue to decentralize with regional campuses and extension centers, agricultural colleges need to decide which, if any, of their main campus instructional programs can be decentralized; how much extension education at the county level can be centralized to regional centers; which and how many extension specialists can be located at regional sites; and how much "adaptability research" can be transferred from the main campus to extension centers or branch campuses.

Second, they need to decide whether and how they can organize problem-solving research and extension services for urban and suburban groups, and whether traditional methods and organization are adapted to these different clientele.

Third, colleges need to explore and determine the feasibility of new patterns of contractual and cooperative relationships with non-agricultural departments, for both organized research and extension services to rural clientele. Most especially, they need to decide how and in what ways the social sciences, law, and humanities relate to the needs and problems of rural people. In this respect, it might be worth noting that, in the future, colleges of agriculture may well need to allocate more of their funds for coordinating research and extension efforts outside the college proper, and less for their own operations.

As these questions are resolved, we can expect organizational patterns for off-campus services to differ greatly from state to state. What California or Missouri or Wisconsin does will not necessarily be the model for all. But it is difficult to believe that any college of agriculture for more than a decade can escape making decisions on how to relate extension services, backed up by research, to the broadening activities of the university as a whole. In the process, the college will understandably and necessarily guard against any inroads on the combination of teaching, research, and extension in the disciplines that lie within it. But, this does not mean that the college need refrain from making its knowledge widely available to new groups or from searching for new ways to better serve old groups.
Staffing the College

Because colleges of agriculture differ in the scope and mix of functions that they perform, the faculty size, composition, and distribution among fields must also vary. However, we can state several propositions that apply equally to most colleges of agriculture.

First, the faculty of the college will probably remain a corps of specialists with training in the natural sciences and the economics of agriculture and renewable resource use. As I have implied earlier, the colleges need not and should not build a faculty that encompasses all fields of knowledge or set up special agriculturally-oriented departments or sections of established disciplines. When knowledge outside the usual areas is needed, the college can and should augment its own resources by contractual or cooperative arrangements for the services of specialists from other colleges.

Second, while most colleges give lip service to equality among their teaching, research, and extension obligations, many tend to hire faculty mainly for their research potential. If the colleges are to have continued strength as teaching and service institutions, procedures need to be developed that weight all functions equally in hiring, budgeting, and promoting faculty. These will be especially important for those colleges that wish to stress quality in undergraduate education as the key to strength and vitality in all of American agriculture.

Third, it is perhaps axiomatic that a college's capacity to adapt to change, like the quality of its programs, is governed by the quality of its faculty. Thus, while referring to the agricultural faculty as specialists, I assume that they should also be men and women with broad training and intellectual interests. Perhaps the faculty qualities required are self-evident; but, even if they are, they deserve repetition in some detail.

The agricultural specialist, as much as any other scholar, needs depth of knowledge, intellectual discipline, and breadth of view. Because progress in agricultural technology no longer comes from purely empirical investigations, he must be well educated in the basic sciences and mathematics, capable of adapting the exponential growth of knowledge in these fields to his own. Like specialists in other fields, the agriculturist must understand the scientific method, be able to identify and design research projects around critical questions, and interpret results. The intellectual discipline that gives rise to such understanding and capacity is essential, one might note, in teaching and extension as well as in research. (In fact, I see few if any necessary distinctions in the backgrounds of teaching, research, and extension faculties in the future.) Perhaps even more than most, the specialist in agriculture needs to be outward-looking beyond his own field, able to perceive the effect of a wide variety of forces and events -- scientific, technological, and cultural -- on his own specialty.
The faculty in the college of agriculture must also be knowledgeable about conditions within the state and responsive to the needs of its citizens. Some colleges in the past in hiring faculty for teaching, research and extension, have tended to emphasize familiarity with local environment and capacity to work with local people. While these qualities are important, it seems likely that a faculty serves people most effectively when it gives them intellectual leadership. Quite probably, the more cosmopolitan the college faculty is in geographic and intellectual experience, the more sensitive it will be to its leadership role, anticipating potential problems in advance and having solutions available when crises occur.  

To reiterate, now and in the future the agricultural college requires teaching, research, and extension faculties who are truly professionals and subject-matter specialists; capable, by reason of training and native ability, of growing intellectually and professionally throughout a lifetime, of shifting intellectual gears when the times demand; unwilling to rest on past laurels or the tenure plateau when change in college programs seems necessary. The need, in other words, is for scholarship and intellectual vigor as high in quality as any in American higher education.

Colleges of agriculture, unlike many other academic institutions, have the power to determine far in advance the basic quality of their faculties. Most of the men and women who staff teaching, research, and extension programs are educated in land-grant colleges. By offering undergraduate students an education that is broad, grounded on basic principles of science, and conducive to intellectual self-discipline, the colleges can do more not only to attract young people of quality to their doors, but also, simultaneously lay the foundation for teaching, research, and extension faculties that are creative, service-oriented, and adaptable to change.

Remembrance of Things Past

The colleges of agriculture have had a great and, one might say, glorious past. As much as any other social institution, they have helped to make the United States a nation with abundant, low-cost, high-quality food produced by an ever-diminishing labor force. More than most colleges, they have worked directly with laymen to transfer knowledge into material well-being. As a result, they have enjoyed power, prestige, and status in their universities, states, and the nation.

Remembrance of these past glories is perhaps the greatest deterrent to adjustment to the future. Faculties and administrators, like other members of the agricultural establishment, have difficulty understanding why their service to the nation now seems to count for less than it once did.

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The public, they say, simply does not understand or appreciate modern agriculture and its importance to the nation. In part they are right. Yet, if the colleges seem to receive less credit and acclaim, it is also because our urban, industrial, internationally-involved nation now has more worries and more varied worries than it did in the simpler days of yesteryear.

Past power and glories may be gone, but new power and new glory lie ahead -- yet only if the men and women who are the college of agriculture possess confidence in themselves and demonstrate their own capacity to innovate and lead. College faculties and administrators need to explain modern agriculture, and their own role in it, to the public. Yet they cannot permit the search for understanding and appreciation to over-ride an even greater need to reduce time-lags in redefining their leadership role in American agriculture and American society. In this process, no change in organization or procedures can be an effective substitute for the will to decide, to make choices, and to depart from tradition, once all the facts and opinions about the substance and direction of change are in.