Volume 14 | Number 4 Article 1

10-1-1959

Iowa Farm Science Vol. 14, No. 4

Agricultural and Home Economics Experiment Station

Cooperative Extension Service in Agriculture and Home Economics

Volume 14, No. 4; October 1959

Iowa Farm science

Iowa State University of Science and Technology / Ames, Iowa

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Are new practices and techniques adopted simply because they're discovered and made available? "Not unless they're profitable," is the answer that research is giving. Here's an example based on the use of fertilizer in Iowa.

Martin H. Yeh and Earl O. Heady

October Iowa Farm Science Reprints

(available about mid-month)

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chat with the editors

COW POOLS: Dairymen in the state have been watching the cow pool development in Iowa with some interest. And there's also some concern about the future direction of such pools. An Iowa State dairy marketing economist, in the article beginning on the opposite page takes a look at some of the possibilities and potentials.

FARM KITCHENS: Julia Pond, in her article starting on page 10, reports some of the results of an analysis of Iowa farm kitchens. She says, in effect, "Here's the situation as we found it." Some additional articles are scheduled for future issues to help you take a more critical look at your own kitchen and to provide some pointers for kitchen planning.

TECHNOLOGY: Friend or villian? It's usually not adopted unless it's profitable so that the adopter ends up better off than he was before, says the author of the article on page 14. Perhaps more basic answers lie in what factors and circumstances serve to make the adoption of "new practices" profitable.

NEXT MONTH: We're planning some changes beginning with the November issue of Iowa Farm Science. We hope you'll like them.

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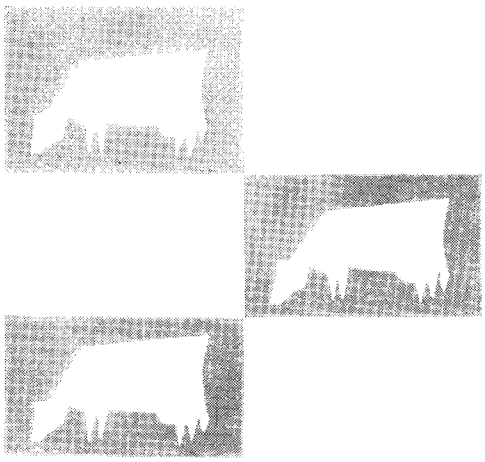
IOWA FARM SCIENCE is published monthly by the Agricultural and Home Economics Experiment Station and the Cooperative Extension Service in Agriculture and Home Economics, Iowa State University of Science and Technology. It is available free of charge to Iowa residents upon request. Out-of-state subscriptions are available on a self-supporting basis of $1 per calendar year.

Address all general correspondence to the Editor, IOWA FARM SCIENCE, Morrill Hall, Iowa State University, Ames, Iowa. Address subscription correspondence and requests for reprints and other publications to the Publications Distribution Room, Morrill Hall, Iowa State University, Ames, Iowa.



Cow Pools, A Step Toward Integration?

What's the basis for interest in and, on the other hand, concern about the use of cow pools in Iowa? This article answers this question and points up some of the implications of which producers should be aware.

by J. R. Strain

VERTICAL INTEGRATION among dairy farmers is relatively common today. They've long affiliated themselves together in cooperative butter and cheese producing associations. Large cooperative bargaining associations with surplus grade A handling facilities—and, lately, bottling and distributing facilities — have permitted groups of producers to extend their control over their milk beyond the limits of the barnlot driveway. Acting jointly through a cooperative association has enabled these producers to vertically integrate on their own.

Why Worry? If vertical integration is nothing new to farmers, why the recent flurry of interest in the subject? Probably because of questions in two areas:

The first involves who will do the integrating. Farmers are realizing that others — such as feed companies and retail grocers — also are investigating the possible savings of vertical integration.

The second concerns the speed at which integration can take place. In the past, the methods of integration more familiar to farmers depended upon the relatively slow process of accumulating money to build or buy additional firms — or of developing cooperative associations of farm firms for joint ownership of facilities to perform the next step in the marketing process.

But today, companies national in scope could conceivably, through contract, obtain rather complete integration between two or more phases of production, processing or marketing without the usual time lag and fund accumulation needed for acquiring ownership of the facilities.

Horizontal Combination or integration occurs when two or more firms at the same level of production, processing or marketing combine into one unit. In the dairy industry, for example, horizontal combination occurs when two or more creameries merge or consolidate into one business unit.

Combinations of this type have been quite common at the farm level also. Between 1940 and 1954, for instance, 213,000 Iowa farms combined into 193,000. Growth in the average size of farms has also been accompanied by increased specialization. In 1940, 90 percent of the 213,000 Iowa farms produced milk. In 1954, only 68 percent of 193,000 farms produced milk. Similarly only 2.2 percent of all farms milking cows received at least half of their income from the sale of dairy products in 1945. But 9 years later, in 1954, 4.4 percent did so.

Increased production per cow has accompanied specialization in milk production. The total number of dairy cows in the state dropped from near 1½ million in 1943 to less than a million in 1958, though total milk production has remained fairly constant. The 1947-56 state average was 6,073 million pounds of milk annually. In 1958 production was estimated at 6,163 million pounds.

What About Pools? Cow pools, as such, aren't a part of vertical integration. They're merely another step in specializing milk production. In a cow pool or contract milking arrangement, the milking and feeding of cows has simply been separated and set aside from the other activities performed by the farm family. A specialized firm, the cow pool, has combined the milking operations of many farm firms through contractual arrangements. Thus, cow pools are examples of *horizontal* combination rather than *vertical* integration.

The cow pool differs from other specialized large milking units. Both types represent an extension of the trend in horizontal combination of milk production. But the cow pool collects cows through contracts with many farm firms, while nonpool milking units col-

J. R. STRAIN is assistant professor of agricultural economics specializing in dairy marketing.

lect cows by acquiring ownership or buying them.

Either means of horizontal combination conceivably could replace the 125,000 farmers milking cows in Iowa in 1954 with less than a thousand milking units of around 1,000 cows each. And, if increase in output per cow accompanies this increased specialization as it has in the past, even fewer units would be needed to maintain Iowa's present milk output.

Aid Vertical Integration? Large specialized operations such as a cow pool may attract potential integrators. Feed companies may wish to form or affiliate themselves with existing pools to make the outlet for their feed more certain. Some cow pool operators may choose to own their own hauling equipment—integrating themselves with one more step toward the consumer.

Some potential cow pool operators are indicating a desire to integrate—either through ownership or contractual arrangement — their milk-producing unit with a milk-processing and distribution firm. So the cow pool, while basically a horizontal combination, seems to lend itself to possible vertical integration.

Pools More Efficient? There are still some questions as to how widespread a cow-pool type of arrangement can become. Present interest in cow pools in Iowa is based almost entirely on a marketing phenomenon rather than a production efficiency phenomenon. The cow pool has offered a number of farmers the opportunity to move from a manufactured milk market to a superior grade A market without investing in buildings, equipment and bulk tank coolers and without learning the skills necessary to produce grade A milk.

If cow pools become more prevalent, opportunities to shift manufacturing milk into grade A outlets will diminish or disappear completely. If that happens, the only basis on which new cow pools could be started would be on a production efficiency rather than a market basis.

The relative production efficiency of a cow pool as compared with a large farm herd hasn't yet been satisfactorily determined. It appears at this time, however, that a cow-pool arrangement can produce milk with considerably less physical facilities and physical costs per cow than can the average *small* Iowa dairyman. But physical efficiencies are only slightly greater than those of *large* efficient dairymen. Thus the prices paid for labor and other expense items in a cow pool could possibly be enough higher to offset the physical efficiencies. Put another way: Many producers don't value their labor or managerial skills as highly as they must pay for them in a commercial milking operation.

Future Form? *If* cow pools can provide a lower-cost method of producing milk than even our largest one-man dairy herds, cow pools will be likely to develop as follows: Privately owned and operated cow pools probably will be replaced by large milking units in which both the cows and facilities are owned by the operator or a corporation using investment capital. If large milking units are a profitable way for farmers to invest money, they probably will be profitable also for nonfarm investors.

If this is true, then the present cow-pool arrangement must be considered as a convenient or necessary stepping stone or transition from farmer-owned cows to pool operator or corporate-owned cows. The milking facilities operator, for example, will find one board of investors less complicated than 60-80 farmers with interests in specific cows. In addition, record keeping and payments to investors would be greatly simplified and less costly if all of the cows can be considered in one herd rather than in separate or several herds.

Cooperative Cow Pools? In the past, farmers have invested money off the farm in cooperative creameries, cheese factories and bargaining facilities. The cow pool may offer an additional opportunity for cooperative investment. Investment in cows in a cow pool, for example, might permit a farm operator to tie up or integrate his marketing of grain and roughage without hiring extra farm help to care for a herd of cows.

Investment in a cooperative cow pool could be coupled with existing investment in cooperative milk-processing plants. This kind of arrangement, through a cooperative association of farm firms, could permit almost complete vertical integration between an individual farm firm and the retail sale of milk and milk products.

Producers, on the other hand, may not wish to integrate in this type of operation cooperatively. If not, other forms of investor capital soon may be willing to integrate the production and marketing of milk and milk products for them.

Another Possibility: Another and more far-reaching implication of the cow-pool idea is that it possibly can produce milk at a lower cost than our present farm herds. If so, we must anticipate more milk at present prices, a general lowering of milk prices, or both—similar to what has happened in the poultry industry. This, of course, would mean increasing difficulty for the small producer with but a few cows.

In these circumstances, cow pools would hold another implication for our manufacturing creameries and cheese plants. As milk switched from our present creameries to a cow pool seeking a grade A outlet, the volume of ungraded milk available to our existing plants would decline. The day when all milk sold is grade A milk would be hastened. Similarly, the trend toward manufacturing milk products being made in central surplus disposal plants from excess grade A rather than from ungraded milk would be hastened.

And finally, a widespread and wholesale integration of milk production units with processing and distribution systems could do more than merely lower the general price for dairy products. It could close the grade A markets now available to the relatively small and less efficient dairyman. This could also be true for the independent grade A processor.

FOR YOUR INTEREST

forages

Top Yields From Alfalfa Pasture Rotationally Grazed

THE ACREAGE of alfalfa has doubled during the past 10 years. And experience and research evidence suggest that alfalfa should find even wider use—particularly for pasture on plowable land and under a good management system.

Pastures improved by renovation and seeded to Vernal alfalfa have produced over 2½ times as much beef as unimproved bluegrass pastures in a 3-year trial at the Pasture Improvement Farm at Albia. Renovation included the use of fertilizer and lime as indicated by soil tests, plowing, preparation of a good seedbed and the seeding of Vernal alfalfa and bromegrass.

A rotational system of grazing alfalfa has shown a consistent advantage over continuous grazing. The rotationally grazed alfalfa produced 298 pounds of beef per acre compared with 215 pounds for continuously grazed alfalfa for the 3-year period, 1956-58. Alfalfa is a potentially high-producing legume when managed to allow periods of recovery between cutting or grazing periods. A 3- to 4-week interval between grazing periods has been found to be desirable.

The effect of grazing management on the survival of the alfalfa plants is still under study. In 1958, rotationally grazed pastures had an average of 6.8 plants per square foot as compared with 5.6 plants in the continuously grazed pastures. Plants in the rotationally grazed pastures also seemed to have larger crowns. Plants will be collected in later years to make a final evaluation of plant survival and size.

J. M. Scholl, H. D. Hughes, J. T. Pesek and Walter Woods are key personnel conducting this study of methods of increasing returns from permanent pastures.

Seek To Improve Germination Testing

IN ADDITION to conducting year-around seed testing services, personnel at the Iowa State University Seed Laboratory are constantly searching for ways in which the services may be improved. Part of this involves the improvement of the testing procedures themselves to provide the most rapid and accurate tests possible.

During the past year, for example, an extensive study was made of the germination of seven kinds of crop seeds in a moisture range between 25 and 100 percent saturation of the germination base. Under these conditions, the variation in germination of different lots of the same kinds of seeds was generally about 5 percent, never greater than 11 percent. The rate of germination, on the other hand, increased rapidly as the moisture availability to the seeds was increased, report Duane Isely and Michael Chilton of the seed laboratory.

Study Summer Blackstem Of Alfalfa, Red Clover

IN SEEKING plant breeding sources of resistance to summer blackstem of alfalfa and red clover, scientists at the Experiment Station are cooperating with several other state experiment stations and the Forage and Range Research Branch, USDA. Once good sources of resistance are found, breeding and selection work can proceed in attempting to combine this resistance with other desirable characteristics of the two forage crops.

In the course of this work, the researchers evaluated hybrid progenies from a number of crosses of spotted aphid-resistant alfalfa clones from Nevada with highly adapted, but aphid-suscep-

This photo shows a Stultz germinator used for germinating seed in covered petri dishes at the Seed Laboratory.

tible Iowa selections. Most of the plants in these progenies, however, as well as the aphid-resistant Lahontan variety, were found to be highly susceptible to a number of the blackstem diseases under humid midwestern conditions. About 50 plants out of 6,000 were relatively free from foliar diseases and were saved for further evaluation and breeding, report C. P. Wilsie and W. H. Bragonier.

farm business and management

Seek Better Methods To Forecast Livestock Market

STATISTICIANS and agricultural economists at the Experiment Station are studying different methods of forecasting the livestock market and testing their accuracy. The purpose is to find possible ways in which market forecasting services might be improved. Key personnel in this work are Wilbur R. Maki, Norman V. Strand, Francis A. Kutish and Y. I. Tu.

"Parity Returns" Work Better Than Parity Ratio?

"PARITY RETURNS" indexes and prices based on them would provide a more accurate measure of farm economic status relative to other occupations than the parity ratios and prices now used, according to agricultural economists at the Experiment Station. For several years, they have been studying alternative parity formulas for agriculture in cooperation with economists at the Washington and Kentucky agricultural experiment stations.

They've concluded from their studies that parity returns prices would reflect changes in the costs of producing different farm products more accurately than the existing modernized parity prices.

They point out, however, that substituting parity returns prices for present parity prices would not, in itself, prevent storage stocks from rising to excessive heights under a support and storage program. To overcome the buildup of excessive stocks, the economists suggest that measures of changes in the demand for different farm products might be developed to use along with the parity returns prices as bases for setting the levels of price supports. The use of the two measures together, they believe, would permit loan rates to be set at the right levels for price-stabilization purposes.

G. S. Shepherd, Raymond R. Beneke, Glen Purnell and Wayne Fuller have been conducting the work in Iowa in cooperation with E. J. Working and Dana Card of the Washington and Kentucky agricultural experiment stations, respectively.

More Information Sought On U. S. Farm Exports

HOW HAS the pattern of farm exports from the United States changed over the past 25-30 years? What have been the factors behind the changes? A specific and detailed knowledge of the answers to both of these questions is being sought at the Experiment Station.

This knowledge will be useful not only in explaining past shifts and trends but also in looking to the future regarding export demand for American farm products, reports Erik Thorbecke.

Study Future Opportunities For Farm Youth in State

THE EXPERIMENT STATION at Iowa State is cooperating with the Agricultural Law Center, State University of Iowa, and the USDA in a study of some of the present and future adjustments necessary for stability in agriculture. Special emphasis is being given to the opportunities for young farm adults.

In addition to estimating future farming opportunities in different areas of the state, the researchers also are studying the economic and legal aspects of the installment land contract and other means of financing farm real estate purchases with relatively low initial investments. The findings are being published in IOWA FARM SCIENCE and elsewhere as the work progresses.

Of special interest also is a "case history" study of 185 farm operators who began farming for the first time in southern Iowa and northern Missouri in 1953 and of the "success" and "failure" factors encountered. About 80 percent of the 185 began farming as tenants, 11 percent as part-owners and 9 percent as full-owners. Thus far, the part-owners appear to have made the greatest gains in net worth and the full-owners the least.

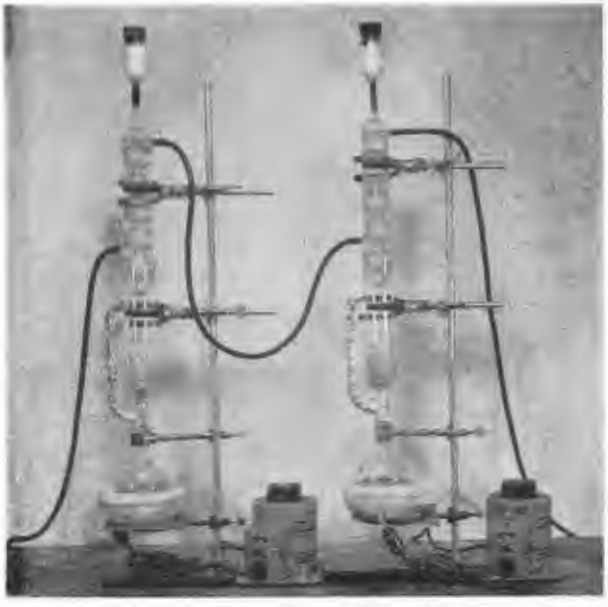
Directing this work are John F. Timmons of the Experiment Station and Marshall Harris of the Agricultural Law Center and the USDA.

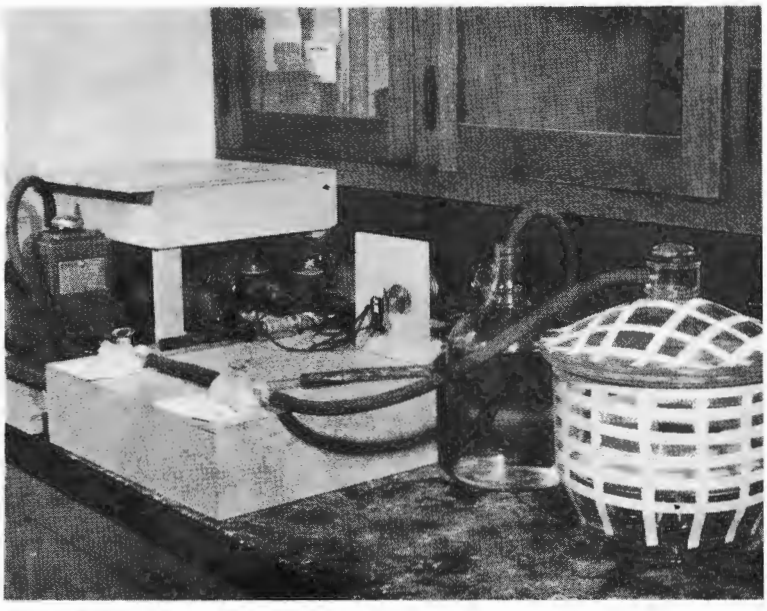
trees, woodlots

Consumers Rate Charcoal Forms

COMSUMER PREFERENCES for lump or briquet charcoal were surveyed by Experiment Station forester N. J. Hansen and coworkers as part of a larger study on developing secondary markets for wood in Iowa. This survey showed that 26 percent of the test consumers — those who had tried both forms of charcoal—said they liked the lump better than briquets. But 36 percent thought there wasn't much difference between the two types, and 38 percent said that they preferred the briquets.

Another point brought out by the survey was that most of the consumers questioned had used charcoal for 3-4 years. Also, the average amount of charcoal used per consumer per year increased over the years. This, says Hansen, suggests that the amount of outdoor cooking is increasing. Markets for domestic charcoal should continue to expand since both the number of users and the amount consumed per user increases with time.





These two photos show some of the equipment used in studying coniferous wood quality. At left: Two Soxhlet extractors with heating mantels used in extracting resin from samples of wood. At right: A vacuum and solenoid saturation device used in other tests of samples for wood quality.

Look for Factors Affecting Coniferous Wood Quality

PLANTATION-GROWN conifers in the Midwest have proven to be satisfactory vegetative cover on many lands of marginal fertility and low productive capacity. At the present time, however, many of the plantations which were established for this purpose are approaching merchantable age. This brings up the question of the quality of wood from these plantations.

Of primary concern in the establishment and care of plantation-grown conifers is the effect of growing conditions on the quality of wood produced. A major standard for measuring wood quality is the specific gravity of the wood, and silviculturists are interested in management practices and environmental conditions which will lead to the production of wood of high specific gravity.

During the past year, D. W. Bensend and Glenn Cooper of the Experiment Station have been studying environmental factors and growth characteristics which influence the density of the wood of plantation-grown red pine. A new method developed by the Forest Products Laboratory was chosen to determine the specific gravity of the sample trees. Climate information on the growing site also is being compiled.

grains

Test Winter Wheat Varieties for Iowa

THE EXPERIMENTAL winter wheat variety, Ia. 5373, continued its record of high yield in tests at four Iowa locations in 1958. It was the highest-yielding entry at all of the locations, and its average yield exceeded the next highest variety by 6 bushels per acre, report R. E. Atkins, J. G. Wheat, K. J. Frey and J. A. Browning of the Experiment Station.

Seed of this variety is also being grown in purification rodrows, and the seed from this increase will be used as breeder's seed for this selection if, pending further tests, it is named and distributed to growers.

Other work in the development and increase of superior, disease-resistant varieties of wheat at the Experiment Station is also under the direction of Atkins, Wheat, Frey and Browning. They are also responsible for Iowa's cooperation in the uniform regional nursery work for winter wheat, winter barley, spring barley and flax.

Learn More About Corn Maturity

THE STAGE in the development of corn kernels at which the greatest dry weight is first reached is

Part of a red pine plantation. The tree marked with an arrow is one of the trees studied for wood quality.

known as physiologic maturity. The ripening process thereafter is essentially a loss of moisture from the grain.

A detailed study of the moisture content of the grain and the time to reach physiologic maturity was started in 1957 for two inbred lines of corn.

Results indicated that both lines, B14 and Oh45, reached physiologic maturity 58 days after silking. At this stage, B14 had a kernel moisture content of 39.8 percent, while Oh45 had a kernel moisture content of 35.8 percent.

The study is being continued under the direction of A. R. Hallauer and associates to see if weather conditions in different years affect either the time or moisture level at which corn reaches physiologic maturity.

New Popcorn Hybrid Introduced in Iowa

A NEW experimental yellow popcorn hybrid has been introduced by the Experiment Station. The hybrid, Iowa 4258, was developed at the Experiment Station and has been tested at a number of locations in the state and also in other states.

The new hybrid has tended to outyield Iopop 6 in the southern half of the state, with about equal yields in the northern half. Tests indicate that both Iowa 4258 and Iopop 6 have almost the same maturity and that the new hybrid can be grown wherever Iopop 6 has been grown successfully.

Iopop 6 has already established a reputation for high eating quality, with a high popping volume and relative freedom from hull on the popped flake. Iowa 4258 has a popped flake equally free of hull and appears to have a slightly higher popping volume. Iowa 4258 also has a slightly larger kernel size.

Important to growers is that, in tests so far, the new hybrid appears to have fewer dropped ears than most other popcorn hybrids when the moisture of the grain is below 18 percent in the field.

Seed of the new hybrid should be generally available in 1960, report Walter I. Thomas and John C. Eldredge of the Experiment Station.

Jonadel apples from the horticultural variety test plantings.

horticulture

Jonadel Apple Variety Not Alternate Bearer

JONADEL APPLE variety is not an alternate bearer, according to the results of 1958 apple variety trials conducted by C. C. Doll of the Experiment Station. Jonadel produced some fruit in 1958 after a heavy crop in 1957. The same was true of the variety Delcon—which has little commercial value but is an excellent variety for home planting. Ames 603, one of the seedling varieties of the station's breeding program, kept exceedingly well in storage in 1957, produced again in 1958 and is again storing well, reports Doll.

Two-Eared Sweetcorn Under Further Study

THE PRODUCTION of two-eared sweetcorn hybrids for the canning industry has been under study at the Experiment Station for the past 3 years. Two sweetcorn hybrids were tested in 1958 because of their ability to produce two usable ears per plant under ideal conditions: namely, Victory Golden and an experimental hybrid, Improved Goldencross Bantam. The distance between plants in the row and the width of the row were examined to see their effect on the development of two usable ears.

Results showed that sweetcorn planted in hills either 42x42 inches or 36x36 inches will produce fewer ears and less corn per acre than when planted by drilling at 12 inches in the row or when power checked at 18x36 inches. Generally, closer spacing in the row will reduce the numbers of second ears as well as size and weight. When the row distance is less than 36 inches, the size of ears also is reduced.

During the 3 years that this experiment has been conducted, say E. S. Haber and Walter White, no hybrid (22 have been tested) has consistently produced two usable ears per stalk—even though most of those tested were reported to be two-eared hybrids.

Progress is being made, however; yields of ears are increasing, as is the yield of cut corn per acre. But, report Haber and White, the effect of spacing and of more than one ear per stalk on the yield of cut corn needs further study. Increasing the tons per acre will benefit the farmer. But if cut corn per ton is reduced or even maintained in two-ear hybrids, the canner may suffer. He will be purchasing more cob and more husks per ton and getting less corn.

Iowa Station Cooperates In Flower-Grading Study

Iowa is one of several states cooperating in testing the commercial suitability of tentative grades for cut chrysanthemums and carnations. This program is a part of a larger Experiment Station study of market grades and standards for floricultural crops.

Preliminary work with Easter lilies has indicated that bulb weight is a better means of predicting the forcing potential of the lilies than is the present grading by bulb circumference. The relative importance of weight in respect to both measurable and unmeasurable characteristics (such as infestations) affecting potential yield is also being studied, according to C. H. Sherwood, who is conducting this research.

Studies with chrysanthemums indicated that there were many variety differences in the production of finished plants from cutting. There was, however, more consistent production of flowers for the number of cuttings from unpinched than from pinched plants. The unpinched plants also remained salable longer, though they were a few days later in reaching a salable condition.

New Onion Inbred Released to Seedsmen

The onion inbred, Iowa 736, has been outstanding in performance in many locations across the country for the past 3 years, report A. E. Kehr and J. C. Horton. It has recently been released to seedsmen for seed increase and production. This inbred combines well with several pollinator inbreds and contributes high yields, deep color, tight scales, earliness and long storage qualities to its hybrids. A hybrid will probably be named from this breeding soon.

livestock

No Effect on Pig Gains From Gibberellic Acid

Experiment Station researchers conducted two trials to study the effect of gibberellic acid on gains and feed conversion of baby pigs. Levels of 2.5, 5 and 10 grams per ton were without effect. These results, says Virgil W. Hays, are in agreement with other reports that gibberellin—though a potent stimulant for plant growth—has little or no effect on the rate of growth of animals.

Milk From Cows Grazed on Pure Brome May Have Off-Flavor

A serious flavor defect—an "unclean" flavor—has been noted in the milk from certain cows grazing pure stands of bromegrass. Though this defect was found in the milk of only 10 percent of the cows studied, reports C. F. Foreman, the flavor was strong enough to contaminate the milk from the entire herd.

Most undesirable feed flavors in milk are removed during processing. This particular feed flavor from cows grazing pure stands of brome, however, may still give an undesirable taste and odor even after the milk is pasteurized and homogenized.

One of the problems of this "unclean" flavor, says Foreman, is that it may not appear in the milk when delivered to the plant or immediately after processing. But it may be present after storage at the time the container is opened by the homemaker. The defect is extremely variable and occurs in the milk of only some of the cows and in rather irregular fashion. In addition, the flavor may occur, disappear and reoccur in the same sample over a period of several days.

This off-flavor has been found during periods when pure stands of brome are grazed, chopped and fed fresh daily as soilage or when put up as hay. The problem has been controlled in the Iowa State herd by removing the cows from the brome pasture and feeding alfalfa hay at least 4 hours before milking.

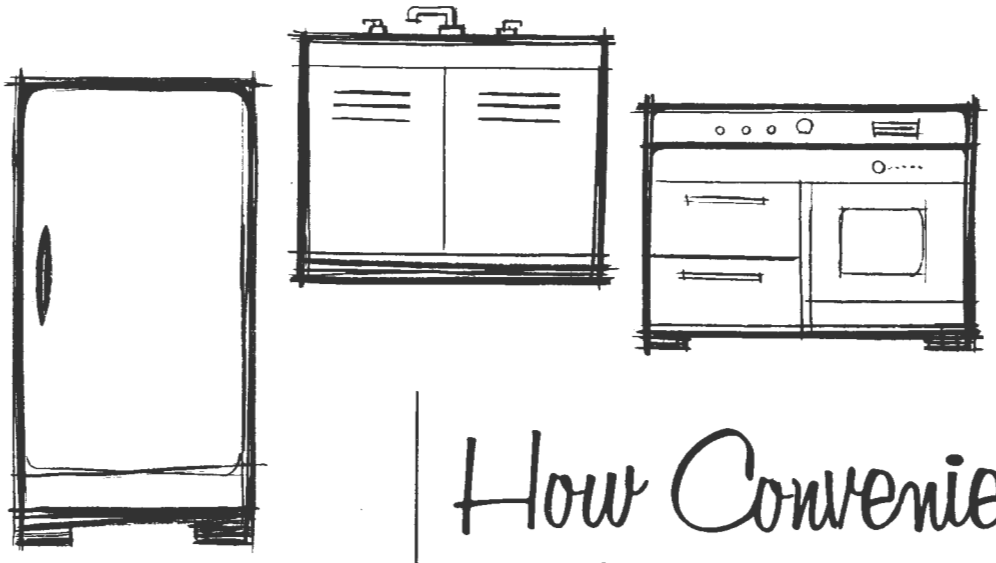
If bromegrass is being grazed in a mixture there may be no problem. But, warns Foreman, if brome is the predominant or only variety of grass being grazed, removal of the herd from pasture and feeding hay several hours before milking time is strongly recommended. The effect of this flavor on milk sales and milk consumption should not be ignored, Foreman adds. The marketing of an off-flavored milk may result in sales losses to the processor and a drop in milk consumption that affects the entire industry.

How Frequently Should Lambs Be Fed?

Is there any value in feeding lambs frequently throughout the day? The value of frequency of feeding a fattening ration to lambs was studied in two growth tests to learn the answer to this question. The same amount of feed was divided so it could be fed two, four or six times in a 12-hour period.

Results showed little benefit from feeding more than two times daily when a low roughage (33 percent) pellet was fed. But in feeding a completely mixed ration containing 50 percent alfalfa hay, gains were increased by 0.04 pound per day when the lambs were fed four times a day. Increasing to six feeding times per day, however, didn't increase gains further. There was a corresponding increase in feed efficiency.

This research is part of a larger study on increasing the usefulness of forage crops and high-cellulose roughages by improved rumen function in beef cattle and sheep. Key personnel working on this study include Walter Woods and Robert Rhodes.



How Convenient Is Your Kitchen?

Convenience and safety are important characteristics of a well-planned kitchen. A recent survey, however, shows that many Iowa farm kitchens are weak in these features. What about your kitchen? Is it Grade A?

by Julia Pond

REMEMBER the old saying, "You can't judge a book by its cover"? Likewise, you can't judge today's kitchens just by the modern equipment found there. The location of these appliances in relation to each other and in relation to the counter and storage space counts a lot toward the convenience, safety and appearance of every kitchen.

New developments and research have given us much information about kitchen equipment, cabinets, work heights and arrangements. This information gives us guides to use in planning new kitchens and in analyzing existing ones.

From a recent farm housing study in north-central and southern Iowa, we have information on the amount and location of counter space, amount of storage space and kitchen arrangement in many Iowa farm homes. Interviewers obtained information directly from 227 homemakers. You may be interested in what we found out about these kitchens—about how well they measure up in some ways, how poorly in others.

While some of the kitchens examined had adequate storage cabinets and counter space, many were lacking in these respects. Often the counter wasn't located where it was needed most. On the good side, however, a high proportion of kitchens had adequate counter space for mixing and food preparation.

In some cases, the refrigerator was in another room, and there were some kitchens without a sink. In most of the kitchens, at least one of the three major pieces of equipment—sink, range and refrigerator—was separated from the other work centers. In many of the kitchens, we found three or more doors which resulted in main traffic lanes through the kitchen work areas.

To see how the kitchens differed, we worked out a system for scoring them. The points given for a number of features were totaled to obtain scores by which each kitchen was classified as A, B or C. The kitchens having the highest scores were in group A; these had the most desirable features and the least undesirable features. Those with the lowest scores were in group C. If you were to visit these different kitchens, what would you probably find?

A-Score Kitchen . . .

Few, if any, of the kitchens had all the desirable features without any undesirable ones. One of the A-score kitchens which has only two of the less-desirable features is illustrated in sketch 1. The door into the hall makes it necessary that the refrigerator stand by itself with no counter space beside it. Secondly, the location of this door means that the one traffic lane crosses the kitchen work area.

As for the good points, notice that the kitchen work centers are in one end of the room. Counter

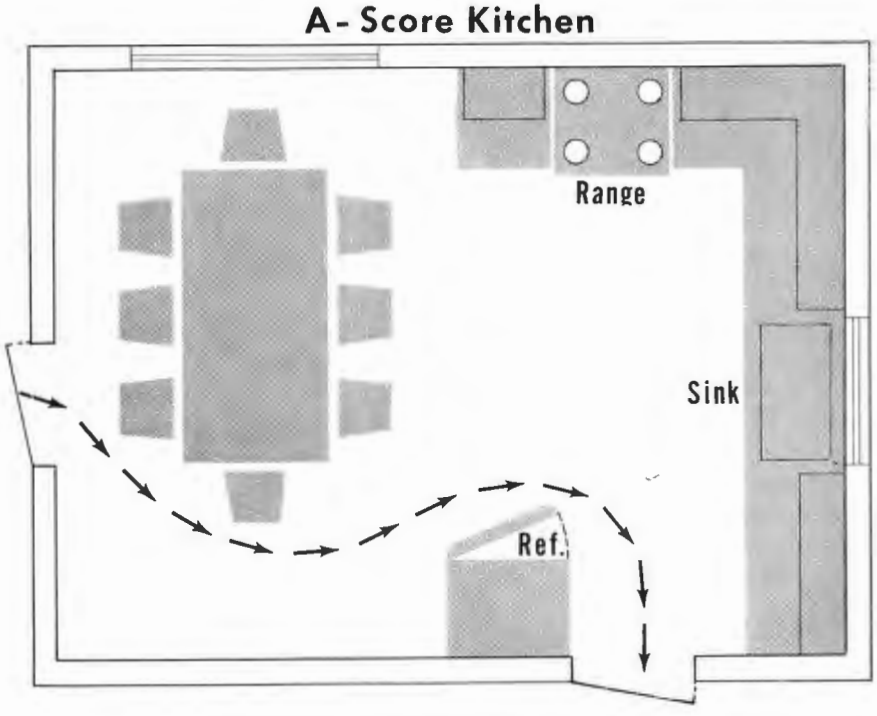
JULIA POND is an associate in home management at Iowa State.

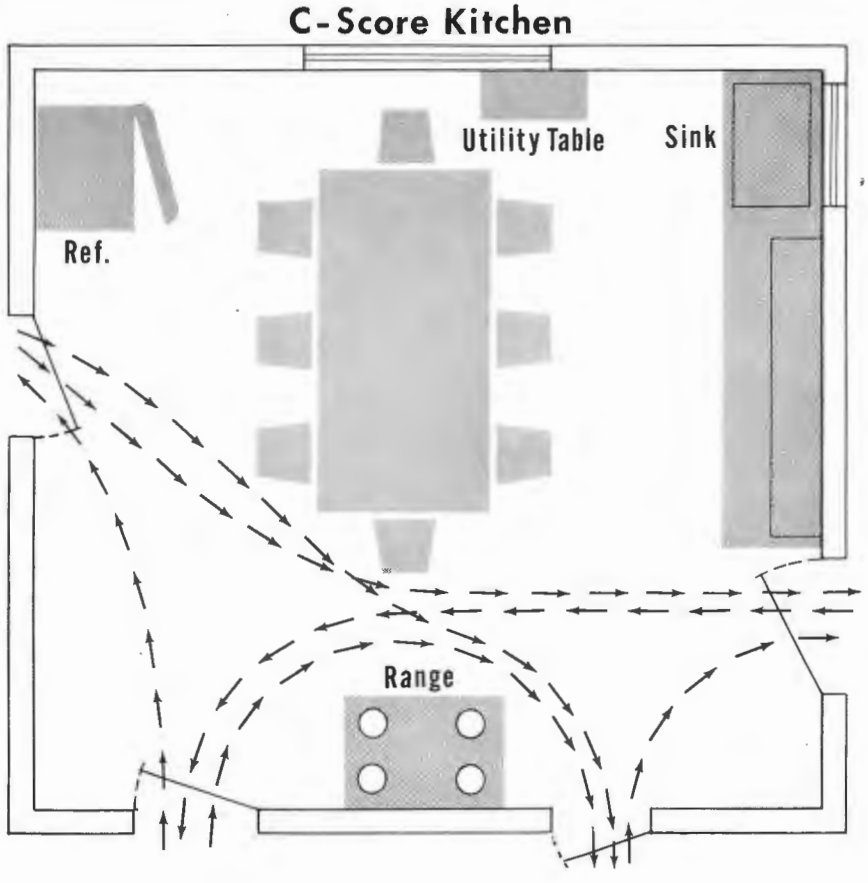
space is ample and well distributed—there's plenty on each side of both the sink and the range. There are no vacant spaces separating the cabinets from the range and the sink. Adequate base and wall cabinets provide storage where it's needed. And the uncrowded eating area is located away from the kitchen work centers—though some traffic does cross it.

B-Score Kitchen . . .

Our B-score kitchen (not shown) is smaller than the A-score one we just described, but that isn't the greatest difference. The range, sink and cabinets are on one side of the room, while the refrigerator is across the room on the opposite side. There's no counter space beside it. The three doors are located so there's a main traffic lane through the kitchen work area.

At the left of the sink, there's more than enough counter space but a very small amount on the right. This same small stretch of counter is the only counter by the range—which means that serving space also is short. When we total the amounts of counter space and base and wall cabinets, we find that this kitchen doesn't have enough of any of them. The table where the family eats its meals is at one side of the room but very close to the range and cabinet.





C-Score Kitchen . . .

In the C-score kitchen, shown in sketch 2, there's a sink, range and refrigerator—but each is located on a different side of the room. There's no counter space by the range, by the refrigerator or at the left of the sink. The only counter and storage spaces are at the right of the sink. The small utility table which stands midway between the sink and the refrigerator is used mainly for storage and cannot be easily moved to provide the needed counter space. This kitchen, like our B-score one, is lacking in total amounts of counter, base and wall cabinets.

The four doors mean that traffic lanes cross the work area. The kitchen eating area is in the center of the room, so the homemaker walks around the table many times a day. The main traffic lanes cross this part of the kitchen.

Who Have "A" Kitchens?

Do kitchens vary much from one area of Iowa to another? Do farm-owner families have better kitchens than families who rent? Does the age of the homemaker make a difference—or does eco-

nomic status? Are the best kitchens found in houses which are in a good state of repair? To find answers to such questions as these, we grouped the families within the two sections of the state according to these characteristics and then noted the kitchen scores.

Location: Let's see first how our A-, B- and C-score kitchens were distributed in north-central Iowa and in southern Iowa. We found that, though these two sections of the state differed greatly as to the percentage of kitchens in groups A and C, they had the same percentage in group B. In the north-central area, the A group was the largest and the C group the smallest, while the reverse was true in the south.

We also found area differences within the north-central group and within the southern group. But with respect to certain features, the north-central and southern Iowa kitchens were quite similar.

Tenure: The owner houses of both north-central and southern Iowa had a higher proportion of A-score kitchens than did the renter houses. But both owner and renter houses of the south had more C-score kitchens than did those of the north. This indicates that the kitchens most in need of improvements are in the renter houses of north-central Iowa and in both the owner and renter houses of southern Iowa.

Age of homemaker: In the south, almost half of the homes of the middle-aged and young homemakers had C-score kitchens. In the north-central counties, age didn't seem to be related to the kitchen score, though more C-score kitchens were found in the homes of the young and older homemakers than in those of homemakers 35 to 49 years of age.

Economic status: This was measured by a consumer-possessions score made up of the following items or features: six or more rooms, running water, kitchen sink with drain, completely equipped bath, septic tank, central heat, telephone, automatic water heater, automatic clothes dryer, home freezer, electric sewing machine, vacuum, and rug on the living room floor. The greater number of these features a house had, the higher the consumer-possessions score.

As might be expected, the houses having the high consumer-possessions scores were the houses having the best kitchens. Those with a medium or low consumer-possessions score had the medium- or low-score kitchens. This was true for both north-central and southern Iowa.

Condition of the house: The condition or state of repair of the house was associated with the type of kitchen but not to the degree that the consumer-possessions score was. In the south, more than 60 percent of the poor houses had poor kitchens. The medium and good houses of the south and the poor and medium houses of the north-central counties had a rather even distribution of A-, B- and C-score kitchens. A little less than 60 percent of the good houses in the north-central counties had A-score kitchens.

Housing Values . . .

In addition to facts about the house itself, we also learned something of the families' attitudes, goals and values as related to family housing. One bit of information related particularly to kitchens was that these Iowa farm homemakers considered *convenience* and *safety* among the most important characteristics of the entire house.

From a list of 10 housing values, these two were among the top three selected by all homemakers. The housing values considered were: convenience, safety, comfort, promotes health, location, promotes friendship activities, not expensive, promotes privacy, beauty and promotes personal interest.

Family Eating Center . . .

In addition to the work centers, there's usually an eating area in the kitchen. Where does your family eat most of its meals? Are you like the four-fifths or more of Iowa farm families who eat some or all of their meals in the kitchen? A higher percentage of the A-score and B-score kitchens studied had an eating center than did the C-score kitchens. In a fourth of the houses in the north-central region and a third of those in the south, the eating center in the kitchen was the only one.

Over two-fifths of the families in both areas reported that they can seat seven or more persons at the kitchen table without crowding. One-fourth of these families, however, often need to seat more people. What about the eating area in your kitchen? Is it large enough?

Another feature frequently overlooked when planning the kitchen eating center is its location. Too often the dining table is in the kitchen work area or is located so main traffic lanes cross it. This was the case in 90 percent of the houses we studied. Even among three-fourths of the best kitchens where space wasn't a problem, more than four-fifths of the dining centers were poorly located — making them "just a place to eat."

Thus it seems that the eating centers of many Iowa farm houses could be improved. Is the dining center in your kitchen one of these? If so, when you do some-

How Much Is "Too Little," "Enough" or "More Than Enough" Counter and Cabinet Space?[a]

	"Too little"	"Enough"	"More than enough"
Counter at right of sink	less than 36"	36" to 47"	48" and over
Counter at left of sink	less than 36"	36" to 41"	42" and over
Counter beside isolated range	less than 18"	18" to 23"	24" and over
Counter beside isolated refrigerator	less than 12"	12" to 17"	18" and over
Total counter space	less than 9' 6"	9' 6" to 10' 5"	10' 6" and over
Total base cabinet space	less than 11' 6"	11' 6" to 13' 5"	13' 6" and over
Total wall cabinet space	less than 8' 0"	8' 0" to 9' 11"	10' 0" and over

[a]These are the dimensions used in scoring the kitchens in the study, but not necessarily recommended for all farm kitchens.

Score Your Own Kitchen!

The questions asked homemakers to obtain the information in this study are questions you might use in taking a look at your own kitchen. These questions and measurements are based on previous research and may give you ideas for improvements you can make.

1. Do you have more than three doors in your kitchen? _____
2. Are there traffic lanes through the kitchen work area? _____
   Imagine that a triangle connects your sink, refrigerator and range. If people cross this triangle when they come into the kitchen and go to other parts of the house, your answer is yes.
3. Are the refrigerator, range or sink separated from each other by such things as doors, low windows or empty wall and floor space? _____
4. Are the sink, range and refrigerator in your kitchen? _____

Note: When you answer questions 5 through 12 measure only the distance across the front of the counter or cabinet where there are or could be doors, drawers or knee-hole space.

5. Do you have 36 to 47 inches of counter space at the right of the sink? _____
6. Do you have 36 to 41 inches of counter space at the left of the sink? _____
7. Do you have 18 to 23 inches of counter space beside the range? _____
8. Do you have 12 to 17 inches of counter space beside the refrigerator? _____ Is this counter next to the door handle of the refrigerator? _____
9. Do you have an unbroken stretch of counter space of 36 inches or more for mixing and preparing foods? _____
10. Do you have a total of 9 feet 6 inches to 10 feet 5 inches of counter space in your kitchen? _____ You can include the table if it isn't the family dining table. Don't forget the wheel or utility table if you use one.
11. Do you have a total of 11 feet 6 inches to 13 feet 5 inches of base cabinets in your kitchen? _____ This is the cabinet below the counter or work surface.
12. Do you have a total of 8 feet to 9 feet 11 inches of wall cabinet in your kitchen? _____ This is the cabinet above the counter or work surface. Don't include the wall cabinets above the range or refrigerator. You may count as wall cabinet a floor-to-ceiling type of cabinet equipped with shelves.
13. If you have a family eating center in your kitchen, can you seat, without crowding, the number of people you usually need to seat? _____

If you answered "No" to the first three questions and "Yes" to the others, your kitchen probably is an A-score kitchen.

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thing about it, make every effort to see that it will be attractive, large enough to meet your family needs and not a thoroughfare or part of the kitchen work area.

Changes You Can Make . . .

If you're interested in improving your kitchen—in adding to its convenience and safety—you may be able to capitalize on some of the ideas brought out in this study. First of all, make a list of these improvements before you forget them. Next, discuss them with your family. Successful kitchen planning is always a family affair in which suggestions of each member are considered.

Kitchen improvements can usually be grouped into one of three types depending on the amount of money, labor and materials required. The first and possibly the easiest type of change to make is to relocate small supplies and equipment, storing them where they are first and most frequently used. This may mean some duplication of items such as spoons, knives, seasonings, sugar and flour.

The second type of improvement can be made by adding or moving portable cabinets, tables or equipment. You may find it possible to move the refrigerator or even the range to a more convenient location. Don't hesitate to stand cabinets, refrigerator, range or table in front of an unnecessary door. Base cabinets or a table can be located in front of a low window. Often equipment or cabinets can be placed away from walls, thus forming an island or peninsula to improve work centers and eliminate undesirable traffic lanes.

The third type of improvement is the one in which extensive rearrangement or remodeling is done. This type is the most costly. It often means eliminating, adding or relocating doors and windows. In many cases new cabinets are installed. Some families may decide to move the kitchen to another room or, perhaps, to add a new room for the kitchen.

If you are considering relocating cabinets or major pieces of equipment, remodeling your present kitchen or building a new one, detailed and accurately drawn plans are important. For instructions on how to draw these plans and the basic principles of kitchen planning, contact your county extension home economist, high school homemaking teacher or other trained persons.

Since family needs and interests vary, the above questions and measurements are general guides rather than specific standards — what might be enough or more than enough storage or counter space for some families may be too little for others. Some families may choose to give up other things to have a truly "Grade-A" kitchen. Others may prefer to sacrifice certain features in the kitchen to realize other goals they consider more essential.

Additional articles on kitchen planning will appear in future issues.

Why Do We Use "New Practices"?

Are new practices and techniques adopted simply because they're discovered and made available? "Not unless they're profitable," is the answer that research is giving. Here's an example based on the use of fertilizer in Iowa.

by Martin H. Yeh and Earl O. Heady

ONE OF THE biggest changes in agriculture over the past 25 years has been the growing use of nonfarm resources or inputs—materials or services obtained from nonfarm sources for use in farming. In fact, these "outside" inputs represent the major "new practices" or innovations which are being used to increase production per acre and total output.

Some innovations or "new practices" represent rearrangements within farming itself. Examples are the adoption of better rotations and livestock sanitation practices. But during the last 20 years, innovations or new practices have more generally meant buying materials or services from off the farm and putting them to work in agriculture.

Farm families have greatly increased their use of nonfarm resources and the practices which they represent. Examples are fertilizers, insecticides, machinery, fuel, oil, many kinds of seeds, etc. These are the types of inputs that have been very important in increasing production per man and total output from agriculture as well. These are the inputs which are substituting for much of the labor formerly used in farming.

Why Are They Used?

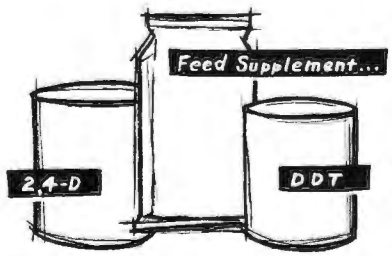
Why do farm operators use so many of these outside resources or off-the-farm inputs and the practices which they represent? Is the adoption of these practices dependent merely on their development and farm families obtaining knowledge, contact and experience with them? Knowledge and experience are important. But they're not the whole story—or probably not even the main reason for adopting the practices or using more of the nonfarm inputs. An important explanation lies in the price of these nonfarm resources relative to the price of farm products.

This is the story which our studies at Iowa State are beginning to confirm: Briefly, that these resources and the practices associated with them either would not be adopted or at least not used extensively unless they're found to be profitable!

Not only do these inputs substitute for labor, but they also substitute for land. By using more chemicals, steel and petroleum products, for example, we can increase yields per acre so that fewer acres are needed to produce the necessary food.

But remember, farm operators don't adopt new practices just because they learn about them or see someone else using them. They're adopted because they're profitable! The lower the price of the material or input relative to the price of the product which it produces, the more profitable it is to use. And the price of many of these inputs has declined relative to the price of farm products over the past 20 years.

All prices have gone up because of inflation. But some nonfarm inputs haven't gone up in price as rapidly as farm product prices. So, in effect, the *relative price* of of these inputs has gone *down*.



New resources and practices aren't used widely just because they're discovered. They're adopted extensively only after their use is found profitable.

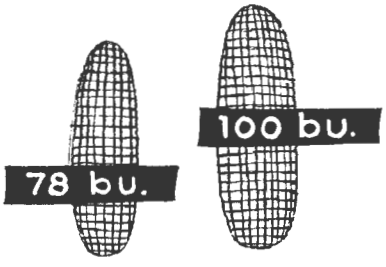
MARTIN H. YEH formerly was an associate in agricultural economics at Iowa State. EARL O. HEADY is professor of agricultural economics and executive director of the Center for Agricultural and Economic Adjustment.

This means that it takes less farm production to pay for their use than in former times. Their use, thus, has been extremely profitable when they've also increased yields.

A good example to illustrate some of these effects is the use of fertilizer, though our studies of the demand and use of other "outside" resources are beginning to turn up similar answers also.

The Fertilizer Resource . . .

The amount of fertilizer which a given amount of crop would purchase almost doubled between 1926 and 1956. And between 1945 and 1955 alone, the use of all chemical fertilizers in Iowa increased by nearly 400 percent. For the individual major nutrients: use of nitrogen doubled, phosphorus tripled, and potassium increased sixfold.



A farm operator doesn't use fertilizer until he knows about it and something of the results he can expect from it.

Many factors or variables influence the amounts of fertilizer used by Iowa farm operators. One important thing is knowledge. A farm operator doesn't use fertilizer until he knows about it and something of the response he can get from it. But once knowledge is present, other factors determine how much fertilizer is used.

One of these is the capital and tenure position of the operator. Generally, operators with more limited funds and those on rented farms use less fertilizer than those with more capital and on their own farms. And use varies considerably on rented farms, depending on whether or not fertilizer costs are shared in the same proportions as the crops on which fertilizer might be used.

Three Main Factors . . .

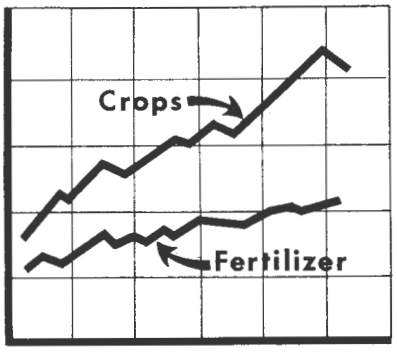
We found three other main variables related to the total amount of fertilizer used by Iowa farm operators. These three "explain" about 98 percent of the variation in total fertilizer use in the state over the past 30 years.

One of these factors is the amount of fertilizer used previously—in the year before. If we wished, for instance, merely to predict the total amount of fertilizer to be used next year, the best single clue is the amount used this year. But since neither individual farm operators nor all farmers in total use exactly the same amount of fertilizer every year, we have to look further to find what causes farmers in total to change fertilizer use from "usual amounts." The two main factors, here, are price relationships and knowledge as related to time.

The important price relationship in explaining fertilizer use in Iowa has been the ratio of fertilizer prices to crop prices. This ratio is figured by dividing the unit price of fertilizer by the unit price of crops. If fertilizer is selling at 10 cents per pound and corn at $1 per bushel, for example, the price ratio is $0.10/$1.00 = 0.10. If fertilizer is 15 cents and corn is $1, the ratio is 0.15, or if fertilizer is 12 cents and corn is 80 cents, the ratio also is 0.15.

Fertilizer use goes down as this ratio goes up. An increasing ratio means that it takes more of the crop to pay for a given amount of fertilizer. A drop in the ratio has the opposite effect. The ratio increases when the price of fertilizer goes up or when the price of crops goes down. It decreases when the fertilizer price decreases or when crop prices increase. It also increases when crop prices increase more rapidly than fertilizer prices—even though both may be increasing.

Over the past 20 years, crop



Except for the last few years, crop prices have gone up more rapidly or to higher levels than have fertilizer costs over a period of 20 years.

prices have gone up more rapidly, or to higher levels, than the cost of fertilizer. Fertilizer costs haven't gone up as rapidly as crop prices. This is largely because of technical and marketing improvements in the fertilizer industry.

Using 1940 as a base point, crop prices in the Corn Belt had risen 135 percent by 1950 and 156 percent by 1955. In contrast, fertilizer prices had risen only 47 percent by 1950 and 56 percent by 1955. Crop prices, however, have fallen relative to fertilizer prices in the last few years.

How Much Effect . . .

How much effect do these changes have on fertilizer use? Our study has revealed that, in the last 30 years, there has been a close relationship between these changes and fertilizer use.

A 1-percent change in the fertilizer-crop price ratio has been associated with a 0.68-percent change in total fertilizer use in the short run—that is, between years. If the price ratio increases by 1 percent because the fertilizer price goes up or the crop price goes down, fertilizer use can be predicted to drop by about 0.68 percent. Likewise, from a drop of 1 percent in the price ratio, an increase of about 0.68 percent in fertilizer use can be predicted, though knowledge and other factors related to time may partly offset these changes.

The figure for nitrogen alone is much greater in the short run. A

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change in the price ratio of 1 percent has been associated with a change of 1.01 percent in the use of nitrogen. The corresponding figure for potash is only 0.41 percent.

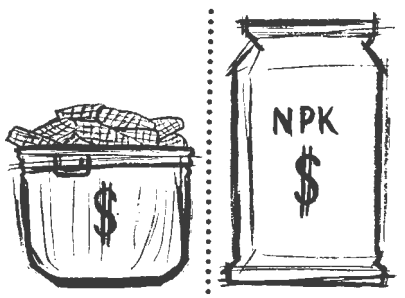
These figures apply only to the short run. Over the long run—a long enough time for farm operators to make adjustments in decisions and farm organization—a 1-percent change in the fertilizer-crop price ratio is associated with about a 5-percent change in the use of all fertilizer. The comparable figures for individual nutrients are 9 percent for nitrogen and about 2½ percent for phosphorus and potassium.

All of these figures, however, are based on the past 30 years—a period when the long-run tendencies were for lower relative prices of fertilizer and increased knowledge about fertilizer returns. So the figures may be too optimistic to apply to the future, particularly from the standpoint of increased fertilizer use.

Knowledge of fertilizer and other forces related to time also have their effects. We couldn't measure the effects of all of these forces individually. But as a group, their influence was always toward an increased use of fertilizer—averaging slightly less than an increase of ¼ percent per year in the short run. The figure is greater for the long run, amounting to about a ½-percent change with a 1-percent change in time, knowledge or the other factors, except the price changes already discussed.

The Relative Effect . . .

The *single most important* variable affecting fertilizer use in Iowa over the next 10 years most likely will be *the price of crops and the price of fertilizer compared with each other.* Increased knowledge of fertilizer responses will also tend to increase fertilizer use, but the relative effect of prices will be greater.



The relationship between crop prices and fertilizer costs is an important factor affecting the use of fertilizer.

If, for example, support prices on crops were lowered substantially and if fertilizer prices remained the same, use of fertilizer would probably decline. Our analysis indicates that, if corn were allowed to fall to 80 cents per bushel in 1959 (and the prices of all other crops fell accordingly), total fertilizer use by 1960 would fall by about 10 percent from that actually used in 1958 — or from about 604,000 tons in 1958 to 540,000 tons in 1960. Use of nitrogen could be expected to decline by 21 percent, and potash, by 11 percent.

Such changes, of course, would be quite drastic and aren't likely to occur. But these are the types of changes that could be expected in fertilizer use under such price conditions.

Other Factors?

We're also exploring certain other factors important in determining the amount of fertilizer and other resources used by individual farm operators. Since farms aren't operated with unlimited capital, the amount of fertilizer that's most profitable depends also on the prices of materials used for other enterprises and the prices received for their products. For example, an operator with limited funds can make money in shifting capital from fertilizer to hogs if the price of hogs increases at the same time that the price of fertilizer increases. If, on the other hand, both of these prices decline, he can increase his returns by shifting funds from hogs to fertilizer.

One of the things we're attempting to learn in further studies is how large these relative price changes must be to have a meaningful effect on the use of fertilizer and other purchased-off-the-farm inputs. Eventually we hope to learn the effects of different pricing structures on the total quantity of such inputs used in farming and the relation of these inputs to the total output of agriculture. From these it also may be possible to predict how these inputs may affect the amount of labor and land needed in the future to produce the nation's food requirements.