INPUT MARKETS FOR LABOR AND LABOR SUBSTITUTES

by B. F. Jones*

If in the next 15 years the farm population were to decrease by the same absolute amount as in the past 15 years, there would be no farm population by about 1980. A similar statement can be made about changes in the number of man-hours required in farm production. These have been astounding changes and are indicative of the rapid changes in American agriculture which have occurred since about 1950.

Within the general framework of this activity, the objective of this paper is to focus on the input markets for labor and labor substitutes. The assignment here is to discuss the implications of changes in those markets for research in farm management and marketing.

The paper is organized into four main parts. The first part discusses the extent of capital-labor substitution in agricultural production and presents a classification of production based on the present status of mechanization and types of labor required. The second part of the paper considers some of the research implications of economic changes and relationships. The third part emphasizes research implications of recent legislative developments. The last part contains some concluding comments about our traditional backward-looking approach.

The Extent of Capital-Labor Substitution

A common policy prescription for increasing per capita farm income has been to encourage farm-employed labor to seek alternative nonfarm employment. Persistent low relative income has been one of the symptoms back of this proposed remedy. Also, studies of the agricultural adjustment process have indicated a need for continued downward adjustment in labor use in agriculture. And projections of farm employment based on productivity trends have indicated that continued reduction in farm employment is likely. Although these relationships appear consistent at the aggregate level, they have not been consistent with farmers' pleas of a labor shortage and government policy which permitted importation of foreign labor until January 1965.

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It is helpful in gaining perspective on the farm labor markets to divide farm crop production into two broad classes. Grain production and, more recently, cotton production represent a type of farm production with rather distinct labor requirement characteristics. Fruits, vegetables, and specialty crops represent a separate class of products with different labor requirements. Distinctions between the two groups is developed in the following section. This classification will be maintained throughout the remainder of the paper.

After listening to papers that have been presented, I believe this distinction is important. We have been discussing aggregate problems and I believe we tend to think of U.S. agriculture with a Midwest perspective. But there are some important regional differences and some important differences in capital-labor substitution situations based on type of production or kind of product.

Consider now the first class of products represented by grain production. In this class technology is now available which permits most, if not all, functions to be done by machine. Future capital-labor substitution possibilities consist of substituting larger machines for smaller ones or for substituting chemical or biological forms of inputs for mechanical forms of capital. Questions arise about the rate of discard of smaller machines and the rate at which it is economically feasible to adopt the newer labor-saving methods. The adjustment process involves recombination of farms into larger production units, with release of labor one consequence. With the exception of cotton farms, production units have typically been organized around the labor available from the farm family with hired labor of only minor importance.

Continuing with this generalization, it has been the food grains, feed grains and cotton which have been in over-supply and thus "too much" labor has been devoted to production of those commodities. Tobacco production, also in over-supply, is a labor-intensive crop and presumably at present does not have the same capital-labor substitution possibilities exhibited by grain and cotton production.

The second type of production includes fruits, vegetables, nuts and other specialty crops. A principal difference in labor requirements between this kind of production and grain production consists of the level of mechanization available and the amount of labor required per unit of production. Planting and cultivating are largely mechanized, but the extent of additional mechanization varies among crops, and is much further developed in some lines of production than others. Harvesting methods vary from use of a high proportion of hand labor to use of highly sophisticated machines. At present levels of technology, capital-labor substitution consists of substituting machine methods for hand
methods rather than larger, more efficient machines being substituted for smaller machines. For some job operations mechanization possibilities are limited because machines have not yet been invented or their performance is unsatisfactory because of plant characteristics which make them unsuitable for mechanization. Further mechanization depends upon development of suitable machines and development of varieties which are adapted to machine operations.

Typically, production of fruits, vegetables and specialty crops has been organized into economic units which require more labor during peak seasons than is available from the farm operator family. Thus, seasonal hired labor is required during peak seasons.

Over-production of fruits, vegetables and specialty crops has been less a problem than for grains and cotton. Labor has been more a "shortage" problem than a "surplus" problem.

When this classification scheme is extended to livestock production, it appears that most, if not all, livestock production comes under the same heading as grain production. Technology in the form of materials-handling equipment and housing is available or is becoming available which permits substitution of capital for labor. The extent to which substitution has occurred has depended upon fixety of resources in production, relative costs of capital and labor, and size of production units.

Studies of farm labor markets have been highly aggregate-type studies which have considered national or regional markets for labor. Classification by type of farm labor, i.e., family and hired labor, on a national or regional basis has comprised the extent of disaggregation attempted in econometric studies of labor. These studies have provided useful estimates of the parameters of the demand and supply functions for agricultural labor. However, a lower level of aggregation is required to analyze the relationships implied in the classification presented above.

Sources of Supply of Labor

The farm family has been the traditional source of supply for the bulk of labor requirements on most grain and livestock farms. On these farms both the operator and hired labor supply have come largely from the farm community and farm families. Relative wage rates, individual preferences for kinds of work, and employment opportunities in the farm and nonfarm sectors have been the relevant factors determining the number of persons seeking employment in the farm sector. It is clear that the level of aggregate demand and the level of unemployment in the nonfarm sector are important factors determining
the rate of out-migration from agriculture and hence are factors
determining the quantity of labor supplied to agriculture.

In general, farms which produce specialty crops have relied less
on family labor and more on hired labor than have grain and livestock
farms. Historically, claims have been made that domestic labor
supplies have been inadequate to meet the demands of specialty
crop production. Manpower policies instigated during World War II
are evidence of this purported shortage. Until 1965, legislation
(P.L. 78) permitted recruitment and importation of foreign nationals
where need could be demonstrated. Refusal to extend P.L. 78 beyond
1964 does not represent a decrease in the claimed shortage, but a
decline in the power of agricultural interests to secure the legislation
which it favors.

Although farm wage rates have been low relative to nonfarm
wages, it is not clear that higher wages would bring forth the
"desired" supplies. Also, it is not clear that workers, on the
average, have been paid less than the value of their marginal pro-
duct, given that skill levels are low and that functions to be per-
formed are relatively simple. Because of the low status attached to
this type work by our society, the value placed on leisure, avail-
ability of welfare payments and nonfarm employment opportunities,
labor seeking this type of employment represents a residual supply.
Thus it remains employed in agriculture only so long as nothing
"better" is available.

It can be argued that labor engaged in grain and livestock pro-
duction as contrasted to labor engaged in specialty crop production
represents non-competing groups. Surplus operator labor in grain
production is not likely to be seeking employment as hired labor in
specialty crop production. Earnings may be comparable (although
at low levels), but the low status attached to hired labor, particularly
of the type done by migrant labor, precludes movement of operators
to fill available hired worker positions except under severe economic
pressures.

The labor surplus-shortage situation in U.S. agriculture can be
summed up as follows. Low relative incomes indicate an excess
supply of labor in agriculture. Disaggregation suggests a large pro-
portion of the surplus labor is in grain, cotton and livestock produc-
tion. Technology imbedded in various forms of capital is available
which would permit continued release of labor from farm production.
The rate of release of labor is dependent upon the ability of operators
to modernize agriculture through acquisition of capital. The adjust-
ment process requires recombination of farms into larger units, and
temporary shortages of labor develop in this sector as operators are
slow to acquire labor-saving technology and are slow to respond to rising wage rates.

The labor situation has different aspects in specialty crop production. Machine technology is available only to a limited (but growing) extent, and thus opportunities for substituting capital for labor are limited. I do not wish to minimize the present extent of mechanization available or efforts being made to develop machines. But many functions which require hand labor have been difficult to mechanize. Relatively simple tasks remain to be done which require only limited skills. These tasks have undesirable work characteristics and jobs are taken only by workers who are unable to find employment elsewhere. High levels of economic activity which enable workers to find nonfarm employment result in hired-labor supply schedules shifting upward and to the right with the wage rate tending to equal or exceed the marginal value product of the labor in agriculture.

Research Implications of Economic Changes

Given the classification scheme presented here and the structural changes developed in the base papers, what research areas are implied? The following list is not intended to be all-inclusive; the intention is to present major areas where additional work would appear to be fruitful.

Projected Labor Requirements
Assuming Various Capital Situations

A combination of factors which includes the long-time trend of farm wage rates rising relative to the cost of substitute inputs, labor "surplus" in some areas of production and "shortages" in others indicates a need for additional research attention to labor questions per se. This need will become greater as additional slack is removed from the agricultural labor force. Furthermore, the slack is likely to become less over the next decade, if one assumes economic growth rates comparable to those attained in the 1960's which have permitted unprecedented removal of labor from agriculture.

Research should be undertaken which would project future demand for agricultural labor under various conceivable capital situations and economic organizations of agriculture. The approach should be sufficiently disaggregated that numbers of workers could be estimated together with the skills required for the various capital situations.

Analysis of the kind being suggested here would provide information for policy decisions when recruitment of workers into agriculture is required. Also, it is not clear that present agricultural training
provides the type and amount of training for workers using modern equipment and methods. A projection of skill needs would provide information useful in setting up training programs for persons presently in the agricultural labor force and whose best opportunities probably remain in the agricultural labor force because of age or other reasons.

Cohort analysis indicates an age structure of farm operators heavily weighted with the age groups past 50 years. Due to their relative immobility, it is important to know what upgrading of skill requirements will be required of them. It is conceivable that capital suppliers could provide part of the needed training if they had better information about what skills are required.

**Capital-Labor Substitution**

The substitution of capital services for labor has been a major factor in the release of labor from farm employment. As labor costs continue to rise, opportunities for substituting additional capital for labor will be sought. For example, technology is currently available which permits one man to double or triple pork production without increasing the labor input, but it is not in use on many farms. These facilities require relatively large sums of money, are highly specialized and have expected life of 10 to 20 years. Because of the tendency of farmers to over-invest in fixed facilities, it is important to have good estimates of capital-labor substitution rates. However, economic analysis of alternative building and equipment systems is hindered by lack of good technical information on the capital-labor substitution process.

Farm management manuals prepared for use in teaching farm planning and organization of farms contain labor coefficients for the various enterprises. However, these are usually average coefficients for a given size of enterprise and often are not accompanied by sufficient detail about what specific capital is included. Limitations of these data are probably a reflection of the lack of research data on capital-labor substitution relationships at a sufficiently disaggregated level. What is needed is analysis of systems of production with sufficient information available to identify size of operation and other relevant facts. In order to secure these data for analysis, it may be necessary to engage in interdepartmental cooperation between economists and the physical scientists in laying out experiments emenable to economic analysis.

Since farm operators are interested in new equipment as it comes on the market, they are interested in economic evaluation before it is available from traditional sources. Capital suppliers have become
increasingly involved in research and development, but they are more concerned with design, marketability, and consumer acceptance than in analysis which permits comparison with other systems. Also, objective analysis without vested interest is a consideration.

New approaches which permit more rapid evaluation of new labor-saving technology need to be tried. One approach would be for university researchers to work directly with firms supplying equipment. An example would be for an interdepartmental university group to serve as consultants to a firm in the building and equipment supply industry for feeding experiments set up to evaluate controlled-environment feeding of cattle. Problems would arise with respect to release of experimental results, "apparent" university endorsement, and objectivity of the analysis, but they do not appear to be insurmountable problems.

Location of Production

One response to rising labor costs which an industry can make is to move to a new location where labor costs are lower. A movement of production may involve gains in employment opportunities for one region at the expense of losses in other regions. Other reasons for a region to gain or lose in competitive position consist of new production or business organization techniques which facilitate production in a new location, e.g., movement of broiler production to the South.

Assuming that underemployed agricultural labor is spatially relatively immobile, what opportunities exist for shifts in location of production to reduce underemployment and for making more efficient use of labor resources? What role has regional differences in labor costs had in shifting locations of production and in the development of geographic specialization?

Other locational questions arise over the possibility of shifts in location of production to areas outside the U.S., where labor costs are lower. For example, what is the likelihood of labor-intensive vegetable production shifting to Mexico, where workers are willing to engage in hand labor? This shift is quite likely as the movement is already underway, but what is known of its extent? What are the impacts for the U.S. and Mexico of such international specialization?

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Use of Available Supplies of Labor

Agricultural production has become increasingly specialized by geographic region and on farms within regions. This development has been contrary to the trend of horizontal integration in nonfarm business organizations. This specialization has lead to loss of some of the traditional complementary relations between enterprises. Questions of how to organize to make efficient use of available labor arise. One alternative is to make greater use of seasonal labor. What are the possibilities, particularly on Midwest crop farms, of making greater use of part-time help during peak work periods? Would this take hourly wage rates two or three times greater than present farm wage rates? If so, is this a lower-cost and more-efficient alternative than use of full-time labor which is kept employed in only a modestly efficient livestock operation for the remainder of the year?

Regular part-time labor may be a real possibility near industrial areas where workers have farm backgrounds, have had experience with machinery, and may want to earn additional income. How could an organization be set up to utilize this source of supply of labor to farms? What form would it take? Might this be a cooperative venture organized by employers rather than as an employment agency? How would industrial unions react to organized, planned multiple-job holding?

An alternative solution to the "tight" labor situation is to purchase labor along with other commercially supplied inputs. New forms of fertilizer have reduced the amount of labor required in their application. Also, bulk spreading of fertilizer by the farm supplier results in less on-farm labor required. Custom application of pesticides, insecticides, off-farm processing of feeds, and commercial seed production all represent purchase of labor services with the product and all permit greater output with a fixed on-farm supply of labor. These inputs represent the trend toward use on farms of a larger proportion of purchased inputs. It follows that crop and livestock production is becoming less a primary production process and more a transformation process using purchased inputs and thus is moving closer to industrial-type production.

Growing use of purchased inputs leads to questions about optimum combinations of purchased and nonpurchased inputs. Which services should be performed on the farm? For example, where is the optimum location of grain-drying facilities? On farms? Or in commercial elevators? What are the economics of grain-drying facilities? Also, how does access or lack of access to these facilities affect the prices received by producers for grain?
Personnel managers in industrial firms have recognized the importance of selection, training and supervision of workers in increasing the productivity of labor. Traditional attitudes of most farm operators toward hired labor and the relatively small labor force on most farms have not contributed to good personnel management on farms which hire labor. What kind of personnel management training programs should be provided to farm operators? Who should train the workers for tomorrow? How should they be recruited? What kind of training should they receive? Surely the day of hiring the first person that comes down the road is about over in agriculture.

Aging of Farm Operators

The changing age structure of farm operators is the major change in demographic characteristics of the farm labor force. The increasing average age of farm operators is a reflection of the fact that the reduction in numbers of farm operators has been accomplished through reduced entry rates and relatively low exit rates with aging farmers remaining in agriculture. The net entry and exit rates as determined by cohort analysis do not reveal the extent of movement in and out of the agricultural labor force. Perkins and Hathaway found that gross exit rates of persons in the agricultural work force were relatively high. But because they were not able to maintain permanent employment in the nonfarm sector, they shifted back to farm employment; hence, net annual off-farm migration rates were relatively small.

Kanel found that younger farmers tended to make greater adjustments in size of farm and in volume of products sold than did older farmers. Despite this competition, older workers have chosen to remain in agriculture voluntarily or because of lack of alternative opportunities. Thus, both off-farm alternatives and on-farm opportunities have been more limited for older workers than for younger workers.

On the other hand, older workers do not make particularly good candidates for retraining because of the relatively short period of time for recovering training costs. Since their limited contribution may be greatest in agriculture, it is important that they have access to resources and that they be provided with technical and managerial

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training. What are their needs and how can they be met?

Legislative Developments and Research Opportunities

A conspicuous aspect of federal labor legislation has been its exceptions for agricultural labor. Social Security coverage was not extended to agricultural labor until 1950. And then only a small segment of the labor force was provided with coverage. Social Security coverage for self-employed farm operators was not available until passage of enabling legislation in 1956. Minimum wage legislation exempted farm labor until February 1, 1967. Manpower programs initiated during World War II evolved into legislation providing for the importation of foreign nationals for farm work in the U.S. This enabling legislation was extended periodically until January 1, 1965, when the program was allowed to expire despite much protest from agricultural interests.

Expiration of P.L. 78 appears to be the turning point for exceptions for agricultural labor. Since that time agricultural labor appears to be gradually entering the mainstream of labor legislation.

Unionization

It is not clear how rapidly or to what extent agricultural labor will become unionized. But recent successes at organization suggest that it will be only a matter of time before unionized agricultural labor becomes a viable force in agriculture. As farms become larger, unionization will become more feasible. However, it is important to maintain perspective on the size of the future labor force on farms. Daly estimates there will be fewer than one million commercial farms by 1980. He also estimates they will be using around three and one-half million workers by that date. This would indicate an average of only three and one-half to four workers per farm, including operator labor. Thus, the average labor force on farms will not be large by industrial standards. However, because of wide variation between farms in organization and size, there is likely to be wide variation in the number of workers per farm.

Schuh has argued that the growth of unionization and the impact which it has on wage levels, employment practices and working conditions will depend upon the form which it takes. If it is assumed that unionization is accomplished, what services will the unions

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perform for their members and for the employers? Will they facilitate hiring practices and be useful in assuring a source of supply of labor through a hiring hall?

Will employers be able to bargain effectively with the union on an individual basis, or will a producer bargaining organization be required? If the monopoly union emerges, it would appear that a form of producer organization or board would be required for conducting negotiations on a counterveiling-power basis. How will this transfer of power to a bargaining association affect firm decision-making? How will the public interest be represented in these negotiations? What lessons in dealing with organized labor can be learned from industry experience?

The federal government has looked with favor on efforts at unionization of agricultural labor. Probably activities of unions will come under increased scrutiny as they grow in power, particularly if the flow of food supplies is seriously threatened.

The Traditional Approach--The Backward Look

As an appendage to this paper, I wish to briefly consider our traditional approach and the possibility of its being biased by our values and attitudes toward farm organization. I suspect we are biased even though we make a strong plea for objectivity. I suspect a large proportion of us are "displaced" farmers and have been influenced by the traditional values. If this is true, have we as agricultural economists been so closely tied to the values held by the agricultural establishment that we have failed to consider relevant economic organizations for agriculture? Although Kellogg has not been the first to raise this issue, he has again called it to our attention. We are all familiar to some extent with all the arguments put forth in justification of the family farm. How relevant are these arguments today? Are they really just rationalizations of what has been?

Suppose, for the sake of discussion, we consider input suppliers as they drive toward dealing more directly with farm operating units as becoming more oligopolistic in character and conduct. Further, suppose product markets do become more oligopsonistic in character. Then presume that between these two groups there exists only 100,000 to 150,000 farms producing the bulk of farm commodities and that agricultural labor does become unionized with monopoly characteristics and has power in dealing with employers. Given this situation, what kind of commodity or producer organizations will be required to deal with input suppliers and purchasers of products? Or will the farms become merely an extension of the marketing agencies?
These speculations may pertain to conditions so far in error or so many years in advance that they are not worthy of our consideration here. Yet, our adherence to traditional value positions may be keeping us from examining some of the relevant issues of the day.