TOWARD A FEASIBLE PROGRAM TO ALLEVIATE THE UNITED STATES' AGRICULTURAL SURPLUS AND INCOME PROBLEM

(Including a Consideration of the Role of Cropping Specialization in Promoting this Feasibility)

AN ABSTRACT

Submitted to the School for Advanced Graduate Studies
of Michigan State University of Agriculture and
Applied Science in partial fulfillment of
the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

by

Alan Ross Bird

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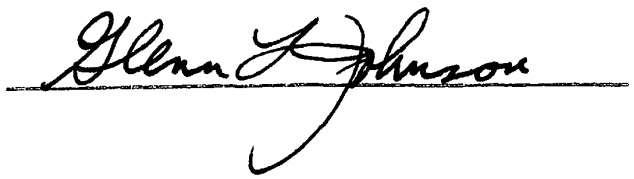
Approved by 

ABSTRACT

A feasible farm program to eliminate the U. S agricultural "surplus" will necessarily involve a co-ordinated set of measures directed at both agricultural product markets and the factor markets for farmers' main producer durables.

This exploratory study comprises a detailed development of this hypothesis to assist in devising such a feasible farm program and in determining the need for such a program. This development is guided by a field survey in the Saginaw Valley and Thumb Area of Michigan (called the Problem Area). The present effort is concentrated on developing a consistent theoretical framework. This effort includes reconciling a fragmentary extension of Glenn Johnson's "fixed assets" approach with the present analysis.

A feasible farm program is identified as one which reduces hardship to the remaining commercial farmers and agricultural emigrants, and reduces the cost to the taxpayer, compared with present programs. Reducing hardship to these farmers, and farm owners, means enabling them to increase both their net incomes and their net wealth. Reducing the cost to the taxpayer involves increasing the production efficiency of the remaining farm businesses.

Encouraging farm enlargement is held to be strategic to the development of such a program, since this measure would reduce hardship to remaining commercial farmers. In multi-product regions (such as the Problem Area), such farm enlargement, involving cropping specialization,

would reduce the likely cost of government compensation for capital losses due to over-investment in livestock equipment. In regions of virtual monoculture (which are thought to be also regions with less favorable off-farm employment opportunities) this increased cropping specialization would reduce the need for some farmers to find off-farm employment to maintain their incomes.

Other associated measures to deal with surplus elimination are suggested.

Overall, then, it is hypothesized that the U. S. agricultural surplus can be gradually eliminated by: (1) encouragement of cropping specialization, (2) government purchase and interim retirement of some 50 million acres of land, particularly in regions of virtual monoculture, and (3) provision of marketing legislation which would gradually enable payment to be refused on surplus production of any agricultural commodity.

To encourage cropping specialization, measures are suggested to facilitate land transfer and to induce efficient use of new field machinery. Suggestions to facilitate land transfer include some modifications of land tenure laws (where appropriate) and the provision of advice on investment possibilities outside agriculture to present farm owners. These owners might also be exempted from capital gains tax on land sales for farm consolidation, provided that any such proceeds are directly reinvested in non-agricultural industries.

The land bought by the government would be partly land from very large farms, to the extent that efficient use of large field machinery would not be unduly prejudiced; the remainder would be all land for sale (in lots deemed too small for efficient use of field machinery) which would not otherwise be used for farm consolidation.

As to the marketing legislation, a needed modification of a producers' co-operative is suggested to permit introduction of new members and to require that benefits, above a certain base level to all members, be contingent on increasing production efficiency.

Such an "efficient co-operative" would make two types of payments to members, *viz.*, "welfare payments" and "efficiency payments." The welfare payments would be paid on, say, half the total estimated sales and would be allocated on the basis of historical production. The efficiency payments would be paid on remaining sales and would be based on quotas allocated by public auction.

The measures suggested in this study are intended to help in evolving a feasible farm program. They are not a program.

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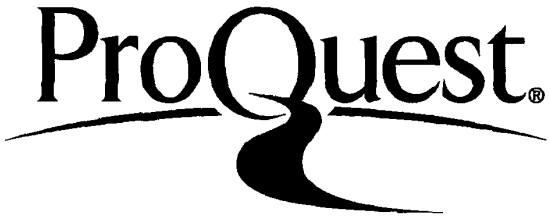

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Errors and omissions in this study are, of course, the responsibility of the author.

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CHAPTER I

INTRODUCTION

The major point of departure of this study is the following hypothesis: A feasible farm program to eliminate the U. S. agricultural "surplus" will necessarily involve a co-ordinated set of measures directed at both agricultural product markets and the factor markets for farmers' main producer durables.

The remainder of this exploratory study is devoted to a more detailed development of this hypothesis to assist in devising a feasible farm program and in assessing the need for such a program. This development is guided by a preliminary field survey in the Saginaw Valley and Thumb Area of Michigan (called the Problem Area). The present effort is concentrated on developing a consistent theoretical framework. To this end, a partial test of the consistency of the hypothesis is provided by a reconciliation of the suggested pressures toward livestock specialization, instead of cropping specialization, in the Problem Area with a fragmentary extension of Glenn Johnson's definition of "asset fixity."

An empirical test of the co-ordinated set of measures advanced in this study has not yet been made. Apart from the lack of necessary data, we contend that resort to such testing at this stage would be premature. Even at the end of this study, the hypothesis itself is judged to be in need of further independent criticism and modification. When the logic of this study has been subjected to such closer scrutiny and the hypothesis revised accordingly, it will be appropriate to consider further empirical tests.

The importance and complexity of the problem considered is the main justification for the method of approach we have thus chosen to adopt. Any testing of such a comprehensive hypothesis is, moreover, likely to be expensive. Our present approach is designed to reduce this expense.

An extreme illustration of how the expense of testing the hypothesis may thus be reduced is as follows: We submit that the very urgency with which U. S. citizens (through their representatives in Congress) view the need for eliminating the agricultural surplus is a function of their present knowledge of the problems involved. A more explicit consideration of measures likely to be involved in the elimination of this surplus, such as the set spelled out in this study, may even induce Congress to view surplus elimination as less urgent.

Alternatively, an examination of the hypothesis to be spelled out in this study may stimulate others to evolve a feasible farm program to eliminate the agricultural surplus.

The first development of our general hypothesis comprises the following suggestion: The modification of existing institutions to encourage cropping specialization on the part of some would-be livestock specialists is likely to contribute to the reduction of the U. S. agricultural income and/or surplus problem. We suggest some likely associated measures needed to attain this objective.

Encouragement of cropping specialization is not considered, by itself, to be a promising means of eliminating the agricultural surplus. Nor is any such claim made in this study. What is claimed of this measure is as follows: It will reduce the public cost of

compensation of former land owners who are induced to sell their land so that it can be retired from production; and it will reduce individual hardship to remaining commercial farmers as they seek to increase production efficiency to match rising urban incomes, since these farmers will still be able to receive an increase in income to match their increase in physical output. At the same time, other measures are suggested which are claimed to be consistent with a reduction in the U. S. agricultural surplus.

An adjustment which reduces hardship to the remaining commercial farmers is defined as one which enables these farmers to increase both their net incomes and their net wealth by increasing the production efficiency of their farm businesses.

If this reduction in hardship to individual commercial farmers can be achieved at a lower cost to the taxpayer than the present farm program, we contend that the political feasibility of the associated adjustment program outlined here will be enhanced.

This study represents an attempt to specify a possible set of measures consistent with such a program. These measures are not presented as an action program ready for immediate adoption. They are presented rather as a step in the development of research on such a program.

A farmer will be said to specialize in the production of a given commodity when he deliberately commits extra resources for more than one year to the production of that commodity with the intent of increasing the proportion of his gross receipts derived from that commodity. Resources so committed for more than one year will be called "durables".

Overall, then, we suggest that the U. S. agricultural income and/or surplus problem can be eventually eliminated by modifying existing institutions serving agriculture. These modifications include (1) encouragement of cropping specialization, in preference to livestock specialization, by adjusting tenure and tax legislation and some associated measures, (2) government purchase and interim retirement of land on large farms, in regions of virtual monoculture, to the extent that the area of any such farm exceeds an area, say, 20 percent more than that needed for the maximum annual use of the largest single piece of mechanical equipment presently used by such a farm, (3) government purchase and interim retirement of all land for sale (in lots deemed too small for efficient use of large field machinery) which would not otherwise be used for farm consolidation, and (4) provision of marketing legislation which would gradually enable payment to be refused on surplus production of any agricultural commodity.

We assume that farmers will continue to take advantage of new technologies to increase their net incomes through increased efficiency in production. Examples of such new technologies are improved seed, such as hybrid corn, artificial breeding, pesticides, fungicides, loose housing for dairy cows, herringbone milking and so on.

The Organization of This Study

We shall first review some recent proposals for eliminating the U. S. agricultural surplus. (Chapter II). This review gives a brief background to the generation of the hypothesis considered in this study.

We shall then describe briefly the Problem Area. (Chapter III). We shall cite some past work which shows that increased emphasis on

either cropping or livestock has been profitable for some men in the Problem Area. Some of this work suggests that considerable increases in area of farm would probably be profitable in the future. (Chapter IV).

We then list observed characteristics of specialists in the Problem Area. (Chapter V). The likely characteristics of forced livestock specialists are segregated.

We add some further empirical evidence which tends to refine our hypotheses concerning the likely reasons for forced livestock specialization instead of crop specialization. This evidence relates to important factor markets, viz., the land market (Chapter VI) and the farm machinery market (Chapter VII). In each case, we suggest modifications of these markets which could be expected to encourage further cropping specialization.

We present some extension of Glenn Johnson's treatment of "fixed assets" to enable a fuller explanation of the reasons for likely directions of adjustment on individual farms (Chapter VIII). This explanation appears to reinforce the plausibility of the characteristics of forced livestock specialists derived from our earlier listing.

We then suggest some institutional developments which could be expected to encourage increased efficiency on the part of small farmers and yet retard the rate of accumulation of the surplus (Chapter IX). These suggestions concern the mechanics of agricultural product markets and take account of the likely importance of the "specialization-integration interaction." As in the case of the above modifications of factor markets, these suggestions are meant primarily to facilitate further testing of our hypotheses by pointing to some likely observable

implications. We have chosen to emphasize those implications which could have the greatest practical relevance.

We conclude with a summary of the main arguments and a listing of the measures which we suggest could contribute to a permanent reduction in the U. S. agricultural surplus, including the strategic measures for inducing more farmers to turn to crop specialization instead of livestock production (Chapter X). We concentrate on measures which are likely to involve some legislative action. This conclusion includes an assessment of the likely incidence of costs of the measures we propose. There is also some consideration of the further tests likely to be needed to enable our hypothesis to be confirmed, refuted, or modified.

We turn now to a very brief look at some recent proposals for eliminating the U. S. agricultural surplus.

CHAPTER II

RECENTLY CONSIDERED MEASURES TO REDUCE THE U. S. AGRICULTURAL SURPLUS

We now give a brief review of some recently considered measures to reduce the U. S. agricultural surplus. This review points to the likely inefficacy of these measures and serves as background to our hypothesis.

Definition of "Surplus"

We shall take the term "surplus" to mean any production, in excess of reasonable stocks to assure continuity of supply, which cannot be sold at socially acceptable market prices. We assume that these product prices will be socially acceptable only if, inter alia, they are consistent with avoiding further hardship to the present farm population.

Output Measurement and the U. S. Agricultural Surplus

When there is no surplus, the estimation of the value of total agricultural production is relatively simple. We can estimate the quantity of each commodity sold, weight each quantity by its corresponding equilibrium price, and sum the resulting products in commensurate terms (dollars).

When there is a surplus, however, and especially when there is also some government regulation of markets, there is not likely to be general agreement on the value of this surplus. The reason is that there is no obvious criterion for weighting the quantities of individual products which is likely to be generally acceptable.

Yet some estimate of the size of the surplus is needed. Several economists have accordingly devised various subjective weighting systems to give a "workable" figure. In view of the necessarily subjective basis of such estimates, the best we can do to enhance their reliability is to consider several which could have been arrived at more or less independently.

A recent publication by Wetmore[1] and others claims that "it is widely held that excess production in agriculture in most recent peace-time years has amounted to at least 4 percent of total production." These workers conclude that "6 percent would seem to be a reasonable estimate of the surplus resources employed in agriculture, expressed as a percent of total resources in agriculture."

Bonnen[2] reported that, from 1949 through 1956, except for the period influenced by the Korean War, production averaged 8 percent more than consumption needs. In an earlier article[3] co-authored with John D. Black, Bonnen placed the size of the surplus at 4 to 6 percent of production at "generally accepted prices". Bressler[4] has estimated that agricultural surpluses in 1954 and 1955 were 5 percent of production.

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[1]Wetmore, John M., et al., "Policies for Expanding the Demand for Farm Food Products in the United States", Univ. of Minnesota, Agric. Expt. Sta., Tech. Bul. 231, Apr. 1959, p. 97.

[2]Bonnen, James T., "American Agriculture in 1965", Policy for Commercial Agriculture; Its Relation to Economic Growth and Stability, Joint Economic Committee, 85th Congress, 1st Session, 1957, p. 146.

[3]Black, John D., and Bonnen, James T., A Balanced United States Agriculture in 1965, Special Report No. 42, National Planning Association, Washington, D. C , 1956.

[4]Bressler, R. G., Jr., "Farm Technology and the Race with Population", Jour. Farm Econ., Nov. 1957, p. 851.

Koffsky[5] estimated surplus production in 1953 at 8 percent of total production.

In addition to the above estimates of economists, President Eisenhower's Economic Report (1960) gives further evidence of the seriousness of the surplus. For example, during the fiscal year 1960, Commodity Credit Corporation investment in inventory and loans may at times reach $10 billion, and by June 30, 1960, it is expected to be about $9 billion. Expenditures during the year for storage, transportation and interest are estimated to exceed $1.25 billion.[6]

Demand Expansion Not Enough to Eliminate Surplus

Demand expansion has been proposed as a method of reducing this surplus.

"Demand expansion" is defined by Wetmore[7] and others as having three features:

1. An increase in the consumption of food by consumers in the United States above some given level, which

2. Results from purposive action by society to realize some food consumption goal (e.g., improved nutrition, a more varied diet), and which

3. Involves an increased employment of farm resources to meet the food consumption goal.

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[5]Koffsky, Nathan, "The Long-Term Price Outlook and Its Impact on American Agriculture," Jour. Farm Econ., Dec. 1954, p. 797.

[6]Economic Report of the President, U. S. Government Printing Office, Washington, D. C., 1960, p. 101.

[7]Wetmore et al, op. cit., p. 4.

The main conclusion[8] of this recent study of demand expansion possibilities for farm products in the United States was as follows: "At realistic levels of achievement, the demand expansion approach would eliminate only a fraction of the production surplus--probably no more than a quarter, or one-third, of the annual rate of surplus in the late 1950's."

This study considered only demand expansion within the United States. Even so, unless we assume heroic possibilities for the further "dumping" of U. S. farm products overseas or the discovery of an important new use for these products, the main means of surplus elimination must apparently come from on-farm production adjustments. These latter adjustment possibilities depend on the removal of resources from U. S. agriculture.

Measures for Transferring Resources out of Agriculture

We have been led to a consideration of measures for transferring resources out of agriculture as the main means of eliminating the U. S. agricultural surplus. We shall assume that the main resources to be removed from agriculture are labor and durable production goods.

There is fair enough agreement on the need for off-farm employment opportunities to enable a reduction in the labor force committed to agriculture.[9] Knowledge of these off-farm job opportunities by farm people is also an obvious prerequisite to increased labor mobility.

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[8] Ibid., p. 101. See also: Cochrane, Willard W., "Demand Expansion--Opportunities and Limitations, I" and Southworth, Herman M., "Demand Expansion--Opportunities and Limitations, II", both appearing in Problems and Policies of American Agriculture, Iowa State University Center for Agricultural Adjustments, Iowa State University Press, Ames, Iowa, 1959 on pp. 272-291 and pp. 292-303, respectively.

[9] Various measures suggested to reduce rural poverty have been admirably summarized by W. H. Nicholls in "Low-Income Farm Families and

T. W Schultz[10] has suggested the need for some further financial assistance to farm people wishing to leave agriculture. He calls his proposal, "Homesteads in Reverse".

There is little agreement on just what measures are needed to induce a sufficient reduction in other resources on farms to eliminate the surplus. The measures suggested to reduce the stock of these other resources are of two main types. The first group consists of measures acting through agricultural product markets. The second group comprises measures directed toward agricultural factor markets.

In the case of advocated modifications of product markets, one extreme position in this controversy is that a general reduction in agricultural product prices (relative to the prices of other products) and the removal of all production controls will be enough to eliminate the surplus. The other extreme position is that recent continued price supports have encouraged farmers to invest in so many durable production goods with negligible resale value outside agriculture that such a general reduction in agricultural product prices would actually result in a continued surplus for several years ahead, or else excessive hardship to farmers. The former position is close to that espoused by Don Paarlberg[11] and Secretary of Agriculture Benson,[12] for example. The

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Economic Progress", Hearings on the Jan., 1955, Economic Rep. of the President, U. S. Govt. Printing Office, 1955, pp. 70-74.

[10]Schultz, T. W., "Homesteads in Reverse", Farm Policy Forum, Iowa State Coll. Press, Vol. 8, No. 5, 1956, pp. 14-15.

[11]Paarlberg, Don, Paper read at the 1959 AFEA Winter Meetings in Washington, D.C., to be printed in a forthcoming issue of the Jour. Farm Econ.

[12]Benson, E. T., "The Farm Dilemma", News Release from U. S. Department of Agriculture, Office of the Secretary, Washington, D. C., March 16, 1959.

latter possibility is closer to the thinking of Willard Cochrane[13] and, to a lesser extent, of Glenn L. Johnson,[14] for example. Cochrane, and later Robert Clodius,[15] have accordingly advocated the need for some continued marketing control program.

Reducing the total stock of durable resources committed to agriculture has two aspects. They are (1) reducing the rate of addition of non-farm produced durables to the farm sector, and (2) increasing the rate of transfer out of agriculture of durables now on the farm.

Both a general reduction in agricultural product prices alone (provided these lower price levels are expected to continue) and restrictions on the marketing of agricultural products can be expected to reduce the rate of addition of non-farm produced durables to the farm sector. Provided suitable off-farm employment is available, these measures could also be expected to induce some extra transfer of labor out of agriculture. This forced transfer of labor would occur because some men who could not make compensating production adjustments would otherwise suffer a lower net income, if they remained in agriculture.

Neither of these measures is likely to increase the rate of transfer of other durables out of agriculture and still reduce the agricultural surplus, however. The reasons are as follows:

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[13]Cochrane, Willard W., Farm Prices, Myth and Reality, Univ. of Minnesota Press, Minneapolis, 1958, and _____, "Some Further Reflections on Supply Control", Jour. Farm Econ., Nov. 1959, pp. 697-717.

[14]Johnson, Glenn L., "Supply Function--Some Facts and Notions", in Heady, Earl O., et al., Agricultural Adjustment Problems in a Growing Economy. Johnson regards price supports as but one of several causes of over-investment.

[15]Clodius, R. L., Paper read at the 1959 AFEA Winter Meetings in Washington, D. C., to be printed in a forthcoming issue of the Jour. Farm Econ., also _____, "Opportunities and Limitations in Improving the Bargaining Power of Farmers," in Problems and Policies of American Agriculture, op. cit., pp. 304-32.

Suppose all product prices are reduced. At least for the first few years of such a farm program, the total amount of land committed to agriculture is likely to be about the same. Non-agricultural users of land could be induced to buy more land, if these falling agricultural product prices resulted in a corresponding fall in land values. We could expect such a downward trend in land values to lag the corresponding trend in product prices, however. Moreover, the very emergence of a downward trend in land values would tend to discourage speculators from buying such land, thus damping this same trend.

The demand for land for non-agricultural uses, e.g., residential development, would also be governed by considerations other than price, such as the availability of labor and materials for building. These considerations would also tend to damp the increased demand due to lower land values.

In any case, farmers who were forced to sell land which had so fallen in value would suffer a capital loss as well as a reduction in income. Thus, either land will not be withdrawn from agriculture and/or, if it is, farmers formerly owning it will suffer hardship.

If all product prices fall low enough, some producers will no longer be able to run their durable farm equipment profitably. The returns from selling a unit of product would not be enough even to cover the variable cost of production represented by fuel and the like. Such a drastic general reduction in product prices would not even permit the sale of this equipment to other farmers, since these farmers would similarly be unable to use it profitably.

This reduction in product prices could thus result in a temporary elimination of the agricultural surplus. The cost would be extreme

hardship to many farmers from capital losses, even if they could find off-farm employment. Without off-farm employment, these farmers would, of course, suffer a severe income reduction as well.

If the general fall in farm product prices is less severe, farmers' production reactions are likely to depend on their expectations of future changes in these product prices and the relation of these prices to the prices of major purchased inputs.

Suppose farm product prices are expected to fall still further, relative to the prices of purchased farm inputs. Some farmers could be expected to use their present durables more intensively, thereby contributing to an increase in the surplus. They could be thought to be "making the most" of their existing resources in the hope that market conditions would improve.

Other farmers could be expected to buy the most advanced (i.e. most efficient) new durables in the hope that they would thus reduce variable unit costs of production enough to be able to continue producing at a profit under still more adverse price conditions.

Still other farmers could plan to use their present equipment at the same rate, but not replace it as it wears out. They could still plan to maintain the same output (in physical terms), however, by hiring services to substitute for their worn-out equipment.

When product prices for farm products fall somewhat, then, there are reasons enough to doubt that this simple price manipulation will be enough to eliminate the agricultural surplus, even if farmers expect further falls in product prices, relative to the prices of major farm inputs. Moreover, such a general fall in farm product prices will be socially unacceptable, unless it is accompanied by supplementary measures

which guarantee the avoidance of further hardship to the present farm population.

These doubts are reinforced by a recent survey by Gene McMurtry[16] and other Purdue workers which sought farmers' opinions on the importance of various proposed causes of the "low farm income problem." This survey was based on 472 personal interviews taken during 1957 in 8 different states on 7 different types of farms. All these groups of farmers reported that by far the most important cause of their "low incomes" was the "current high cost of production items."

In a recent (1959) survey by the writer of farmers in the Saginaw Valley and Thumb Area of Michigan (to be reported in Chapter IV), several farmers indicated that they felt it was important to "keep up" in the purchase of new machinery. They reported that machinery prices were rising so rapidly that they considered it was better to keep "up-to-date" so that they could continue to produce profitably under falling product prices.

There are grounds for doubting, then, that decreases in agricultural product prices will be sufficient, in themselves, to eliminate the agricultural surplus for several years. If they are effective in a shorter period, moreover, their effectiveness will result, at least in part, from imposing hardship on some of the present farmers by forcing them to sustain capital losses from the premature "junking" of some of their durable production goods. In other words, such price decreases would be socially unacceptable.

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[16] McMurtry, Gene, et al., "Farmers' Attitudes Toward the Income Problem and its Solutions," Purdue Univ., Agric. Expt. Sta., Lafayette, Indiana, Mimeo EC-157, Aug. 1958, p. 6.

It is easy to see, therefore, how dissatisfaction with the likely effects of such price manipulation of agricultural products could lead to the advocacy of a parallel introduction of further marketing controls. The introduction of such controls is likely to be accompanied by the emergence of further adjustment difficulties, however. It is not obvious, for example, that the hardship to present commercial farmers will thereby be relieved. Some illustration of these new difficulties follows.

Suppose marketing quotas were introduced to eliminate the surplus. The actual effects on the distribution of durable resources committed to agriculture would vary with the mechanics of the quota scheme. It is customary, however, for quotas to be allocated in proportion to previous levels of production. Suppose these quotas were assigned to each farm and were expressed in terms of physical units of product instead of, say, acres of land.[17] The land currently allotted to the production of agricultural products could thus be reduced. But the land transferred to non-agricultural uses would not necessarily be increased.

Such an increase in the supply of land for non-agricultural uses could again be expected only if there were a sufficient reduction in the price paid for the agricultural product, along with the introduction of the quota. A "sufficient reduction" would be one which resulted in a lower average income for farmers and a corresponding capital loss when their land was sold. In other words, as in the case of a direct price adjustment, the success of the quota system in removing land from agriculture would depend on increasing the hardship to its present owners.

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[17] If quotas were expressed in "acres", there would, of course, be an additional possibility of generating a surplus by more intensive use of the quota acres. Such a substitution of fertilizer for land was alleged to occur in the case of the Soil Bank. (See references in footnote 19, this Chapter.)

What would be the difference in the effects of these quotas if they were allocated to the farmer instead of the farm and could be sold by their owners? (Cochrane has recently advocated this measure.[18]) Land itself, as a factor of production in farming, would then have a greatly depreciated value. It is inconceivable that political complications would permit the introduction of such legislation for more than a trial period of, say, five years in the first instance. The actual duration of a scheme which involved such a radical revision of farmers' attitudes to land would be very suspect. We claim that one resultant tendency would be for farmers to adhere closely to former land values. In any case, there would be great transitional difficulties in establishing relative prices of quotas and land.

The farmer who sought to improve the efficiency of his business by expanding his acreage and producing a larger output at lower unit costs would probably be at an even greater disadvantage than under a price support program. To the extent that the price support program has been instrumental in raising land values, men so seeking to farm bigger acreages have had to pay more for renting in or buying land. (Men selling this land have benefited to the extent of the capital gains, net of taxes.)

If, as we allege, the introduction of negotiable quotas does not result in a sufficient fall in land values, men so wishing to expand will have to pay a greater sum yet (in land purchase price plus quota price) than they formerly paid for land alone. In addition, what will become of the whole farms thus left idle? Is it feasible to imagine that this

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[18]For example, Cochrane, Willard W., "Some Further Reflections on Supply Control", loc. cit.

land will be completely desolated when it is still under private title? Is it not possible that these owners of land now devoid of quotas would seek new quotas through political pressure rather than by purchase on the open market?

We cannot say, in advance, whether the introduction of such a negotiable quota scheme would cause extra capital losses of machinery and other equipment. The price of the marketing quota could conceivably be increased enough to cover any such possible losses. If this price were so inflated, however, the handicap to the small man who sought to become more efficient would be just so much greater.

The last two proposed remedies to the "surplus problem" involved modifications of agricultural product markets. One further notable attempt at a solution to the surplus problem has been concerned with modifying an important factor market. The so-called Soil Bank[19] has involved paying farmers for taking land out of crop production. So far, the Soil Bank has not succeeded in bringing about a sufficient reduction in agricultural output.

The case in favor of this scheme is that its former failure was due only to a failure to set compensation for foregone production high enough so that enough land would be taken out of production.

The case against the scheme includes the possibility that the cost of enough compensation to eliminate the agricultural surplus might

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[19]Bottum, J. Carroll, "Resource Adjustment Through Voluntary Land Retirement Programs", in Increasing Understanding of Public Problems and Policies, Farm Foundation, Chicago, in cooperation with the Center for Agricultural and Economic Adjustment, Ames, Iowa, 1959. _____, "The Soil Bank Approach", Farm Policy Forum, Iowa State Coll. Press, Vol. 8, No. 5, 1956, p. 19. The acreage reserve portion of the Soil Bank program is the main one likely to reduce the agricultural surplus. It is not currently (early 1960) operative. For further problems of Soil Bank administration, see Heisig, Carl P., "Current and Emerging Problems in Land Tenure Relating to Agricultural Programs and Policies", in Land Tenure Research Workshop, Interregional Land Tenure Research Committee, Farm Foundation, Chicago, Illinois, 1956, pp. 117-118.

be prohibitive, if enough good quality land is to be voluntarily removed from production. Past experience with the Soil Bank shows that poor land was first removed from production. (Compensation was in the form of acreage payments.) Moreover, only parts of individual farms were removed from production. Farmers then tended to use their remaining land more intensively. Removal of some land has also allegedly involved hardship to young small farmers who sought to rent in extra land to improve their production efficiency. Moreover, since land in the acreage reserve section of the Soil Bank (in contrast to the conservation reserve) was only temporarily removed from production and was still owned by the same farmers, the return of this land to production after a period of fallow could actually result in an increase in the total agricultural surplus. There are also possible overtones of "charity" associated with Soil Bank payments which could make them objectionable to many farmers.

Conclusion

Within the United States, demand expansion for U. S. farm products can allegedly reduce the U. S. agricultural surplus by only one-third or one-quarter. Assuming limited possibilities for overseas demand expansion for U. S. farm products, the removal of surplus resources from U. S. agriculture must account for the major share of the reduction in the agricultural surplus.

It is axiomatic that any program to bring about a sufficient reduction in total resources committed to agriculture to eliminate the agricultural surplus must be at least socially acceptable or politically feasible. We contend that this feasibility will be enhanced if the transitional hardship to individuals is reduced. In particular, we contend that the hardship to individual commercial farmers who seek

to improve their efficiency in production needs to be reduced.

We have briefly cited some programs directed toward the removal of surplus farm resources by acting either on agricultural product markets or on factor markets. None of these programs, if successful in eliminating the surplus, satisfies our subjective assessment of their feasibility because of the likely transitional hardships involved to individual farmers, particularly commercial farmers who seek to become more efficient.

Short of a full-scale adoption of any of these programs, our assessment of them must be subjectively based on a good deal of theoretical speculation. As an aid to this speculation, we shall explore the possibilities of devising an alternative program which is acceptable by our criteria.

As a first obvious attempt at enhancing the acceptability of such a program, we shall extend our analysis to include both measures concerned with agricultural product markets and measures directed at agricultural factor markets.[20]

Before any further development of our hypothesis, we now give a brief description of the Problem Area. Data from this area form a heuristic basis for our further speculation.

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[20]Apart from a consideration of the recent programs contained in this chapter, the writer has been further encouraged to extend his analysis by reading: Brinegar, George K., et al., "Reorientations in Research in Agricultural Economics", Jour. Farm Econ., Aug. 1959, pp. 600-619, and Schultz, T. W., "Omission of Variables, Weak Aggregates, and Fragmentation in Policy and Adjustment Studies," in Problems and Policies of American Agriculture, op. cit., pp. 189-203.

CHAPTER III

THE PROBLEM AREA AND THE SAMPLE

Most of the Problem Area is within commuting distance of some off-farm employment. Large cities such as Flint (1957 estimated population of 215,550) and Saginaw (1957 estimated population of 109,510) provide a range of local employment opportunities, including work in heavy industry. A great many small towns provide a variety of employment opportunities close to most farms. In addition, farmers get preferential treatment when seasonal workers are hired for local sugar factories.

The Problem Area is recognized as one of the leading agricultural areas of Michigan. Cash cropping of beans, sugar beets, wheat, some corn and canning crops, the growing of forage for livestock and the production of milk, beef, hogs, and eggs are the main enterprises. Broadly speaking, cash crops predominate in the west (i.e., Saginaw Valley) and extend throughout the area with a little more intrusion of livestock in the far north and southeast. Details of the number of farms in the four counties of Bay, Huron, Saginaw and Tuscola are given in TABLE I. The approximate land area they represent and some description of the frequency distribution of farms by size of farm (acres) are also given in this table. The data are derived from the 1954 and 1950 Censuses.

TABLE I

CENSUS DATA ON PROBLEM AREA: NUMBER OF FARMS, THEIR FREQUENCY DISTRIBUTION BY ACREAGE PER FARM, AND TOTAL LAND AREA

		Bay	Huron	Saginaw	Tuscola	Total
Farms Number	1954	2,349	2,349	4,250	3,781	13,904
	1950	2,842	3,716	4,496	3,911	14,965
Approximate land area (acres)		285,440	526,080	519,680	522,240	1,853,440
Proportion in farms (percent)		71.3	91.3	80.1	82.1	---
Land in farms (acres)	1954	203,381	480,086	416,387	428,610	1,528,464
	1950	230,983	481,418	424,248	431,030	1,567,679
Average size of farm	1954	86.6	136.2	98.0	113.4	---
	1950	81.3	129.6	94.4	110.2	---
Farms Reporting						
1 to 9 acres	1954	194	105	452	316	1,067
	1949	309	117	500	315	1,241
10 to 19 acres	1954	246	133	409	295	1,083
	1949	292	111	387	325	1,113
20 to 29 acres	1954	257	164	358	286	1,065
	1949	276	156	411	314	1,157
30 to 49 acres	1954	559	391	753	537	2,240
	1949	647	399	868	681	2,595
50 to 99 acres	1954	806	1,414	1,283	1,119	4,622
	1949	988	1,586	1,486	1,255	5,315
100 to 199 acres	1954	198	983	547	730	2,458
	1949	215	1,048	486	701	2,450
200 acres and over	1954	26	149	114	163	452
	1949	18	135	90	112	355

The Field Survey

The farms visited in the initial field study comprised 29 in the four counties[1] of Bay (4), Huron (8), Saginaw (11), and Tuscola (6). (See Map 1.) In accordance with the classification used in the Michigan State University farm accounting scheme, all farms were in Type-of-Farming Area 8. This classification means that all these farms derived at least 80 percent of their annual cash income from cash crops and dairying together.

A publication of Michigan State University, "Farming Today", Ag. Econ. 717, 1958 gives a more detailed description of Area 8.

The sample farms were purposively selected. Their relevant common characteristics are that they are all co-operators in the M.S.U. mail-in accounting project in these four counties during the calendar year 1957 who had been co-operating with the M.S.U. accounting projects for at least 4 consecutive years, including 1957. Detailed accounting records are available on individual farms for up to 30 consecutive years. (These details do not include dissection of specific cost items according to enterprises). Some supplementary data are also available, e.g., size of family.

In 1957, the sample farms showed a range of variation in some important characteristics. The area of farm (both in total acres and in tillable acres[2]) varied from under 100 acres to over 300

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[1] The survey was originally planned to include Sanilac County. The subsequent restriction to the above counties was to reduce "enumerator saturation" since Sanilac farmers had recently been interviewed for a "dairy credit" study.

[2] A somewhat arbitrary refinement of total area based on the potential usefulness of the land. The farmer's opinion is sought in making this adjustment.

MAP 1 MICHIGAN
(Showing Survey Counties)

acres. (See TABLE II). Eight of the twenty-nine farms are alleged to have rented some or all of their land. Four of the farms were in Census Class I, 16 in Class II and 9 in Classes III - V.[3]

TABLE II

29 SAMPLE FARMS CLASSIFIED BY TOTAL ACRES AND TILLABLE ACRES IN 1957

Area Class	Total acres per Farm (Number of Farms)	Tillable Acres Per Farm (Number of Farms)
0 - 49 acres	0	0
50 - 99 "	5	9
100 -149 "	7	8
150 -199 "	7	6
200 -249 "	5	3
250 -299 "	1	1
300 -acres and over	4	2

Source: M.S.U. Mail-In Accounting Project Records.

Let us designate the 9 farms in TABLE II with up to 99 tillable acres as small, the 8 with 100 - 149 acres as medium, and the 12 of 150 acres and over as large.

The distribution of gross income according to this size classification follows in TABLE III and a similar distribution of labor income in TABLE IV.

[3]For U. S. Census purposes, commercial farms are divided into 6 groups, on the basis of the total value of all farm products sold, as follows:

Class of farm	Value of products sold	Class of farm	Value of products sold
I	$25,000 or more	IV	$2,500 to $4,999
II	10,000 to $24,999	V	1,200 to 2,499
III	5,000 to 9,999	VI	250 to 1,199

TABLE III

DISTRIBUTION OF GROSS INCOME BY SIZE OF FARM
ON 29 SAMPLE FARMS IN 1957

Size of Farm	Gross Income		
	Average Value ($)	Maximum ($)	Minimum ($)
Large (12) (150 till. acres and over)	20,889.5	44,980	8,976
Medium (8) (100-149 till. acres)	12,451.3	25,386	5,183
Small (9) (99 till. acres and under)	10,318.4	19,682	2,712

Source: M.S.U. Main-In Accounting Project Records

TABLE IV

DISTRIBUTION OF LABOR INCOME BY SIZE OF FARM
ON 29 SAMPLE FARMS IN 1957

Size of Farm	Labor Income		
	Average Value ($)	Maximum ($)	Minimum ($)
Large (12) (150 till. acres and over)	1,697.4	6,824	-5,892
Medium (8) (100-149 till. acres)	1,675.2	5,720	- 785
Small (9) (99 till. acres and under)	973.9	2,653	-4,724

Source: M.S.U. Mail In Accounting Project Records

In 1957, 16 of the sample farms derived 80 percent of their cash income from dairying and cash cropping, or mainly from dairying. The other 13 were non-dairy farms, or mainly cash cropping. A comparison of values of attributes of these two groups is given in TABLE V. Average, maximum and minimum values are shown. Attention is drawn particularly to the fact that, on the average, there is no significant difference between the area of farm for the group in which dairying was a common

enterprise and the non-dairy group. This condition is consistent with a finding by Halter and Hubbard[4] that farm size (in acres) for a group of 163 farmers surveyed in the Interstate Managerial Survey was not "meaningfully" related to the way in which the individual farmer decides what products to produce. Further reference will be made to this finding later.

TABLE V

AREA OF FARM, GROSS AND LABOR INCOME RELATED TO PRESENCE OR ABSENCE OF DAIRY ENTERPRISE ON 29 SAMPLE FARMS IN 1957

Attribute (per farm)	Dairying and Cropping or Dairy Farms (16)	Non-Dairy Farms (13)
Average tillable acres	148.1	142.3
Maximum " "	268	309
Minimum " "	58	73
Average gross income ($)	16,078	14,300
Maximum " "	39,824	44,980
Minimum " "	3,964	2,712
Average labor income ($)	2,154.6	620.2
Maximum " "	6,824	7,094
Minimum " "	-5,892	-4,724

Source: M.S.U. Mail-In Accounting Project Records

There were several reasons for electing to survey this group initially. The counties were chosen because they were believed to contain some of the best farming country in the state and are adjacent to a considerable development of secondary industry. The farming conditions of this area, in short, could reasonably be thought to facilitate agricultural adjustments and to typify problems likely to emerge with increasing frequency in other areas in the future.

[4] Halter, A.N. and Hubbard, J.W., "Factors Influencing Farmers' Choices of Products," Dept. Agric. Econ., Univ. of Kentucky, Agric. Expt. Sta., Lexington, Progress Rep. 70 Sept., 1958, p. 6.

The availability of primary and secondary data for this area appeared to be at least as favorable as for other counties of the state. In particular, several other recent studies have been made which could be thought to assist in the formulation and the further pursuit of the present study.[5] The initial sample was chosen for two reasons, viz., because these farmers were all long-term cooperators in the M.S.U. Farm Accounting Project[6] and because they comprised a considerable range of

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[5]Some notable examples are:

Brooke, M. David, "Marginal Productivities of Inputs on Cash Crop Farms in the Thumb and Saginaw Valley Area of Michigan, 1957," unpublished M.S. Thesis, Michigan State University, East Lansing, 1958.

Dvorak, Frank Edward, "Programming the Organization and Capital Use for a Cash Crop Farm in the Saginaw Valley and Thumb Area of Michigan," unpublished M.S. Thesis, M.S.U., East Lansing, Michigan.

Forker, Dean Olan, "A Partial Evaluation of an Experiment Concerning the Possibility of Establishing a Farmers' Continuous System of Reporting Income, Expenditures and Related Data," unpublished M.S. Thesis, M.S.U., East Lansing, 1958.

Perreault, Roger P., "The Acreage Response of Michigan Farmers in East Central Counties to the Relative Prices of Sugar Beets and Field Beans," unpublished Ph.D. Thesis, M.S.U., East Lansing, 1956.

Sundquist, W.B., "An Economic Analysis of Some Controlled Fertilizer Input-Output Experiments," unpublished Ph.D. Thesis, M.S.U., 1957. (Also several published reports involving Sundquist, e.g., Knetsch, J.L., Robertson, L.S., and Sundquist, W.B., "Economic Considerations in Soil Fertility Research," Mich. Agric. Exp. Sta. Quart. Bul., Vol. 39, No. 1, pp. 10-16).

Trant, Gerald Ion, "Institutional Credit and the Efficiency of Selected Dairy Farms," unpublished Ph.D. Thesis, M.S.U., East Lansing, 1959. There are, of course, also studies of somewhat wider scope (with respect to physical area considered) which pay specific attention to some counties within or similar to the area of the present survey, e.g., Beer, Charles Louis, "Effect of Acreage Control Programs on Crop and Livestock Operations on Selected Michigan Farms," unpublished Ph.D. Thesis, M.S.U., East Lansing, 1957.

[6]For background on the M.S.U. Mail-In Accounting Project, see:

Vincent, Warren H., "A Farm Panel as a Source of Income and Expenditure Data," Agricultural Economics Research, U.S. Department of Agriculture, Washington, D.C., Vol. XI, No. 4, Oct. 1959, pp. 97-102.

Brake, John Ronald, "Financial Seasonality of Dairy Farming and its Relation to Risk and Uncertainty," unpublished M.S. Thesis, M.S.U., 1956, pp. 10, 15-19.

farm size (in terms of tillable acres) and enterprise combinations. Fortunately enough, the second requirement was incidentally satisfied. The very nature of the study, particularly its emphasis on the increasing specificity of large inputs of capital, necessitated an examination of records over a period of several years from farms with some differences in organization.

Farm Accounting Project cooperators were chosen, also, so that the supplementary questionnaire[7] for the present survey could be kept as small as possible and yet enable maximum attention to be paid to a discussion of the farmers' decision making processes. As it happened, the maximum interview time was $2\frac{1}{2}$ hours. All enumeration was done by the present writer during late winter, 1959.

To try to eliminate respondent bias in the direction of the analyst's major interest, establish quicker rapport and consolidate good relationships with the Experiment Station, the major purpose of the survey presented to the farmers was to get the benefit of their experienced criticism of the farm account keeping methods and to transmit to the University their suggestions for improvement in the services offered. This purpose has already been largely fulfilled on an informal basis, although it will be given further consideration later.

Information from the field survey has been (and will be) supplemented by data otherwise obtained. Apart from use of secondary sources, the present writer has interviewed farmers, county agents, other business men and officials outside the sample and obtained data by correspondence with producers' organizations, machinery companies and others.

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[7]For a copy of this questionnaire, please see Appendix B.

In the present instance, provision was made for a tentative extension to quantitative analysis later. The area chosen for the present study includes Huron County, for which a recent random sample of farmers (on an area basis) is available. Some attributes of this sample and the nature of the bias due to refusal of members of the original sample are also known.[8] As a result of the preliminary survey and the further development of the major hypothesis of this study, however, the data required for further testing of our analysis are likely to be much more extensive than could be provided from a mere sampling of Huron County. This result tends to support the initial decision to use a purposive sample in the exploratory study. A further consideration of the likely limitations of the sample follows.

Limitations of the Sample

The sample of the Problem Area used in the field survey was not a random one. Accordingly, direct quantitative inferences cannot be made from our sample to any larger population. Nor were such inferences intended at this stage. For this very reason, the following chapters do not contain detailed quantitative tables.

Reference to the sample is intended to be heuristic. In other words, by taking account of the farmers' responses to the questions they were asked, we hope to gain insights which will help to suggest fruitful directions for the more detailed development of our general hypothesis concerning a feasible farm program. The likely necessity of subsequent estimates is recognized. But we contend that the partially prior necessity of identifying feasible qualitative measures to eliminate the U.S. surplus has not yet been adequately met.

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[8] See Forker's Thesis, footnote 5.

We hypothesized the likelihood that a discrimination of the conditions leading to different types of specialization would assist in suggesting feasible measures for the elimination of the agricultural surplus. We accordingly stratified the sample to try to ensure that different types of specialization were represented. We observed that the sample farms were distributed throughout the Problem Area. We also asked farmers to comment on some conditions with respect to their district rather than just their own farms. Otherwise, our main concern with the sample was ensuring the ready cooperation of the respondents to reduce bias in enumeration.

The use of this purposive sample was partly an economy measure to enable a sharper definition of the major hypothesis. We by no means wish to claim that resort to this sample is enough, in itself, to substantiate the hypothesis.

We do not claim, moreover, that a random sample is devoid of heuristic value. Indeed, we can readily conceive of instances in which a random sample of the same size could bring to mind additional variables which would assist in the formulation of our hypothesis.

There was a more basic difficulty in even drawing a random sample in the present instance, however. Until our hypothesis could be more adequately formulated, we could not define the universe from which the sample or samples would be drawn. We know, of course, that the major universe is the whole U.S. farm sector. Within this universe, however, what stratification best serves the needs of our analysis?

In what ways can our purposive sample be claimed to have heuristic value? First, answers to open-ended questions can lead to a decision on what conditions relating to the surplus problem need further examination.

Secondly, reported instances which contradict our initial generalizations of these conditions can lead to the addition of further qualifications to the scope of the initial conditions.

As an example, from prior reading and observation, we held open the possibility that the level of education of farmers in the Problem Area was the major determinant of their off-farm employment opportunities. We observed instances which led us to discard this view without the need to resort to a random sample. These instances comprised (1) cases in which men with a relatively high level of formal education were working off the farm in rather mechanical jobs which offered little scope for the application of their formal training, and (2) cases in which men with little or no formal education and even handicapped by above average age were able to find adequate off-farm employment.

One basic economic difficulty associated with reducing the U.S. farm surplus in parallel with a reduction in the budgeted cost to the U.S. taxpayers in general is one of ensuring increasing rates of return to labor employed in commercial agriculture, in keeping with increased returns to labor in other industries. The Problem Area is one in which we could expect these difficulties to be minimized. There are considerable opportunities for off-farm employment throughout most of the area. The soil is quite good. A number of different crops are grown in the area. Advice from the Cooperative Extension Service and private sources is readily available. If the sample farms are a reliable enough guide to farming conditions in the area, there is quite a wide range in gross incomes from farming, at least from no more than some 2,700 dollars to about 45,000 dollars in 1957, for example.

There are, in short, both considerable incentives and considerable opportunities for profitable adjustments in farm organization. Moreover, we can expect that any analyses pertaining to this area will be increasingly relevant to other areas of commercial agriculture as new foci for the development of secondary industries emerge.

Our field sample is not a random one. This sample nonetheless appears adequate for our present purposes, in that resort to these data should help in a preliminary identification of some potentially feasible measures to reduce the U.S. agricultural surplus.

CHAPTER IV

PRODUCTION ADJUSTMENT POSSIBILITIES IN THE PROBLEM AREA

We now suggest that commercial farmers in the Problem Area are likely to be able to increase their incomes by adjusting the organization of their respective farm businesses in various ways. Specialization in cash cropping is shown to be a likely profitable possibility. The advantages for the small farmer of crop specialization over dairying are, however, not adequately established, at least if we assume a guaranteed market for dairy products. Some opportunities for profitable livestock specialization also appear feasible on larger farms, given the willingness and competence of the farmer to make these adjustments. It already looks probable that attempts to restrain the overall addition of non-farm produced durables to farms in the Problem Area and to reduce hardship to farmers in this area will need to be concerned largely with facilitating crop specialization through farm enlargement on the part of both present crop producers and some dairy farmers.

Our suggestions evolve from a review of some pertinent literature. The studies to be reviewed involve analyses of farm businesses typical of "good" farmers in the Problem Area. The techniques of analysis considered are budgeting, linear programming and the use of a Cobb-Douglas function.

Dvorak Shows Specialization in Cash Cropping to be A Profitable Adjustment

Dvorak[1] recently analyzed the organization and operation of a cash crop farm to determine the most profitable investments. He used the

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[1] Dvorak, op. cit., pp. iv-vi.

linear programming approach. The farm was similar in type to many in the Saginaw Valley and Thumb Area. Dvorak's major conclusion was that considerably more specialization in crop production would be profitable. A brief description of the farm, the analysis, and the major conclusions follows.

The farm originally comprised 160 acres with a total investment of $79,000, including $72,000 in land and $7,000 in machinery. The farmer carried a debt of $21,000. He therefore had a net worth of $58,000 (which, of course, served as collateral). Different types of credit were assumed to be available to the farmer, enabling loans with varying limits, interest rates and other terms of contract. The total labor force was the farmer himself and a son of high school age. The only other restrictions on adjustment were those imposed by the available credit contracts.[2]

The farm was considered to be above average. The programming was accordingly based on input-output data which conformed to currently recommended practices. Since the major concern was with capital intensive adjustments which were thought likely to enhance the productivity of family labor, the program was planned for the next five years. Present price trends for all inputs and outputs were generally expected to continue and were extrapolated for a further five years.

Alternatives considered in the program included: four crops, viz., sugar beets, wheat, navy beans, and corn; acreage restrictions on the first three crops; a 2-plow and/or a 3 to 4-plow tractor; 2, 4 and/or 6-row planters and cultivators; 6 and/or 10-foot combines; custom hiring

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[2]These restrictions are similar to the ones considered in our fragmentary extension of the "fixed assets" analysis in Chapter VIII.

of combining; 2-row pickers and/or picker-shellers; custom hiring of picker and/or picker-sheller services; three levels of fertilizer use; pre-emergence weed sprays for all crops except wheat; plow-plant for all crops except wheat; hand hoeing or mechanical thinning of sugar beets; and drying and storage of corn.

Adjustments suggested by Dvorak which would result in the most profitable operation of the farm over the next five years involved substantial reorganization of the farm. They included addition of a further 160 acres of land, a 6-row planter and a 6-row cultivator. Items of capital equipment sold included a 2-plow tractor, a 6-foot combine, a 4-row planter and a 4-row cultivator. The machinery associated with the "optimum" solution included a 2-plow tractor, a 3 to 4-plow tractor, a 2-bottom 14-inch plow, a 3-bottom 14-inch plow, a 6-row planter, a 6-row cultivator, a bean puller, an 8-foot disc, a rake, a 9-foot drill and two wagons. The corresponding crop rotation consisted of 32 acres of wheat, 136 acres of navy beans, 40 acres of sugar beets and 63 acres of corn. Weeds in corn were controlled with a pre-emergence spray. Sugar beets were cultivated and thinned mechanically. In addition to farming, the operator held a full-time job from July 1 until the middle of March. He hired the harvesting of corn, wheat, navy beans and sugar beets. The resulting labor income (excluding the off-farm job) was somewhat more than $8,000 per year.

Dvorak's major recommendation, in effect, was to increase the extent of cropping specialization. It was spelled out as follows: (1) use larger equipment, (2) enlarge farm size, (3) utilize credit to a greater degree, (4) double original fertilizer use, and (5) crop more intensively, (i.e., accentuate higher valued crops).

As far as we can judge from the material presented, the assumptions and data used in this study generally appear to be reasonable enough. Of particular significance is the projection of prices for the next five years.[3] These projected trends were (1) a decrease in crop prices (2) an increase in machinery prices and (3) an increase in labor prices. Perhaps the most crucial question, in view of the above recommendation for expanding acreage, is whether the initial valuation of land at $450 an acre is high enough. The present writer would suggest, say, $600 an acre to be a more realistic figure, on the basis of his recent survey observations and discussions with Myron E. Wirth, a U.S.D.A. agricultural economist working on data from the same area. This discrepancy in valuation could be accounted for by the cost of tiling, a particularly worth-while investment in the Problem Area.[4]

von Dewitz Shows Profitable Adjustment Possibilities Can Be Variously Ordered, Depending on Original Organization, But Probably Include Livestock Specialization and Crop Specialization

Wulf von Dewitz[5] a visiting German student, recently budgeted adjustment possibilities on two farms in the Saginaw Valley. These farms

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[3] Dvorak, op. cit., p. 24.

[4] C. R. Hoglund budgeted costs and benefits from tiling on a "typical" 150-acre level farm in the Saginaw-Thumb Area on Brookston loam and clay loam soil. He concluded that the tiling would pay for itself in 6 to 8 years. Such a practice could be expected to be worthwhile, then, even if product prices fall considerably. There is, of course, a subsidy available for tiling, too. See Hoglund, C. R., "Managerial Decisions in Organizing and Operating a Farm", Ag. Econ. No. 625, Dept. Agric. Econ., Michigan State University, East Lansing, Sept., 1955, pp. 5, 6. See also, Hoglund, C. R., "Investments in Drainage Pay Off", Sugar Beet Jour., Farmers and Manufacturers Beet Sugar Association, Saginaw, Michigan, June 1955, pp. 1 and 4.

[5] von Dewitz, Wulf-Dieter, "Net Income Results of Different Farming Practices on Two Michigan Farms", unpublished private paper prepared under the supervision of Dr. R. G. Wheeler, Michigan State University, East Lansing, 1959.

were selected from the present writer's sample in collaboration with R. G. Wheeler (of Michigan State University) and the writer. The basis of selection was that these men were considered to be among the most outstanding farmers in the district, with respect to net income over the last 10 years, and were markedly different from each other in their original business organization. Their assessment as "outstanding farmers" was due to a scrutiny of their accounts for the last 10 years and a comparison with other account keepers in the district, and the opinions of Extension personnel. Both farms grew sugar beets, a matter of prime interest to von Dewitz. No other criteria for the selection of these farms were used by von Dewitz.

von Dewitz's budgets indicate that several different types of specialization would be profitable and that the order of profitability of these adjustments (as reflected by net income) differs for the two farms. In both instances, average observed yields over several recent years were used in budgeting.[6]

Both farms have a dairy herd. Farm A of about 250 acres also has 7 different crops whereas Farm B of less than 100 acres has only 3 crops (see footnote 6).

Farm A has a family labor force of 2 men. They sell fluid milk, raising all herd replacements, keep poultry for egg production and raise the following crops: sugar beets, beans, wheat, oats, corn (for silage

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[6] The crop yields actually used were:

	Farm A	Farm B		Farm A	Farm B
Corn: silage	15 tons	-	Beans	22 bushels	22 bushels
Corn: grain	72 bushels	-	Sugar Beets	20 tons	20 tons
Oats	70 bushels	-	Alfalfa	3 tons	-
Wheat	55 bushels	60 bushels			

and grain) and alfalfa. The benchmark net income[7] was estimated at about $13,000 under this arrangement--call it Plan I.

Farm B is another well managed farm on heavy soil (Brookston Loam) showing good crop yields. The available family labor force is equivalent to 1.4 full-time workers. As the farm is now organized (the Benchmark Plan), dairying and cash crops are both important sources of income. Wheat, sugar beets and beans are grown on the entire farm. (There has been some measure of crop specialization.) All feed for the 20-cow herd is bought--silage, hay and corn as a rule. The net income amounts to about $8,000 per year.

Similar alternative farm organizations were budgeted for each farm. These alternatives involved three types of specialization in livestock production (viz., adding more dairy cows and two levels of expansion of a feeder cattle operation) and one type of adjustment toward crop specialization. The resultant assessed new levels of net income (after allowing a 5 percent deduction for interest on investment) are summarized in TABLE VI. It is assumed, in each case, that the farmer is willing to make the changes indicated in the budget.

It appears, from von Dewitz's study, that the farmer who originally owned the larger farm (250 acres) could profitably modify his farm organization toward either crop specialization or livestock specialization, provided some facilities for housing and feeding livestock are already available. We might expect the choice of the particular course of specialization to depend on personal characteristics of the farmer and special market advantages he may have, among other things. In

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[7]This figure is net after allowing interest of 5% on all investment. It is easy enough to assess likely changes in this net income for the respective plans due to a change in this interest rate.

case he should choose to adopt the type of extensive cropping specialization budgeted, we might expect that his most crucial problems would be associated with obtaining suitable land to expand. Obtaining the necessary credit, for a man with such substantial resources already at his command, is probably a minor problem. Recent studies tend to confirm this latter suspicion.[8]

TABLE VI

BUDGETED LEVELS OF EXPECTED NET INCOME FROM ALTERNATIVE FARM ORGANIZATIONS ON TWO "GOOD" FARMS IN THE PROBLEM AREA

	Farm Organization	Farm A	Farm B
I	Benchmark Plan	$13,000	$8,000
II	Increase dairy herd to 50 milkers and grow cash crops	14,000	13,000
IIIa	Substitute 200 feeder cattle and cash crops	18,500	7,000
IIIb	100 Feeder cattle and more cash crops	16,800	5,000
IV	Add 80 acres for $65,000 and specialize in cash crops	16,000	6,000

Source: von Dewitz, personal communication.

In the case of a man with only 80 acres (even if it is the best land), he can apparently profit more by intensive dairy specialization than the other adjustments examined, given adequate marketing facilities. He may wish or be forced to go out of dairying, however, and concentrate on cropping specialization. It is appropriate to consider other possible ways of crop specialization for this man. One way he might do so, if

[8]Myron E. Wirth's study of credit problems (publication forthcoming) suggests that men able to use credit have been able to get it and reap the benefits. Trant's work (op. cit., Chapter III, footnote 5) reaches a similar conclusion for an adjacent group of dairy farms.

personal difficulties did not supervene, would be to sell his entire farm, move elsewhere, say from Saginaw to Sanilac County, and buy a substantially larger acreage of lower priced land. At least two successful cases of such an adjustment in the last 10 years have been reported to the writer from within the Problem Area. The necessity of paying the capital gains tax on the original transaction is likely to discourage this type of adjustment, however, if farmers know about this law prior to the transaction. Where the transfer to another farming district has been made in this way, the lower priced land is apparently lower priced partly because of poorer drainage. (Obviously a fuller examination of both demand and supply functions in the two markets is needed to give even a first approximation to a full explanation of the price differential. It is at least likely that the demand for the lower priced land is not as high due, for example, to district differences in market access, ethnic composition, etc.) Any profitable expenditure to improve the new land, such as investment in drainage, can be made in installments, however, and may represent a less crippling overhead than the purchase of an adjacent 80 for $65,000, as suggested in von Dewitz's budget.

Family ties or just personal preference may cause the would-be crop specialist to remain on his original 80 acres and seek further alternative methods of expansion. Moving to another district is, of course, not without its risks. A man with such slender capital backing may fail because of an early succession of wet years causing bad crops on poorly drained land before he can make the farm productive enough to meet his annual fixed commitments. Moreover, his initial drainage improvement in an area so poorly drained generally could well involve a crippling external diseconomy, viz., the necessity of installing an expensive drainage outlet

before making any of the more directly productive investment represented by the tiling of fields. An analogous irrigation problem may occur in other areas.

Suppose that the farmer chooses to remain on his original 80. He might work off the farm part-time to build up his equity enough for further land purchases. Instead of electing part-time off-farm work, he might rent further land and/or acquire larger machinery in anticipation of such an expansion in area of farm. The machinery would be used first to do extra custom work. It is still conceivable, then, that some small farmers could profitably expand cropping operations. It is questionable, however, whether everyone so placed (i.e., confined to, say, 100 acres) would be best advised to undertake this specialization without the added security of some off-farm employment.

In summary, given equal security of markets, there appear to be a number of profitable opportunities for reorganization of production on the large farm considered by von Dewitz, including specialization in crop production. For the farmer owning only 80 acres in the same district under otherwise similar conditions, von Dewitz's study shows that further intensification of dairying is by far the most profitable alternative. There are apparently profitable opportunities for crop specialization, however. These opportunities would appear in an even more favorable light if the prices of dairy products relative to cash crops were to decline or if the land valuation used had been lower. Moreover, there are ways of changing to crop specialization, such as interim custom use of machinery and renting in suitable land, which could make the small farmer's relatively low present equity a less limiting factor than it appears to be in von Dewitz's analysis.

Brooke Points to Some Pressure Toward Acreage Expansion (With Cash Cropping), at Least to 130-150 Tillable Acres per Man

M. David Brooke[9] recently ran a Cobb-Douglas analysis of 31 cash crop farms in the Problem Area. All these farms grew white pea beans, wheat, sugar beets, and some minor crops. Livestock enterprises were of negligible importance. Farm size varied between 76 and 617 tillable acres, drainage investment between $9,000 and $77,000, and machinery investment per farm between some $5,000 and $49,000.

Brooke claimed that these farms "appeared to be fairly well adjusted to the conditions existing in 1957, but many were not fully tile drained." The only other alleged serious maladjustments were on the small farms which, Brooke claimed, tended to use too much machinery and labor. Brooke pointed to the resultant pressure for small farms to expand their acreage, at least until they reach 130-150 tillable acres per man. He added a further justifiable qualification that the extent of profitable adjustments would be dictated, to some extent, by the distribution of wheat and sugar beet allotments.

Trant Points to the Need for Acreage Expansion for a Group of Adjacent Dairy Specialists

Trant [10] recently budgeted adjustment possibilities for 31 dairy farmers in Sanilac County. This county is part of the Thumb Area and just east of the area surveyed by the present writer. Sanilac County is regarded as the leading dairy county in Michigan. This land is not

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[9]Brooke, M. David, "Returns to Inputs and Investments on Cash Crop Farms in Thumb and Saginaw Valley Area of Michigan, 1957," Quarterly Bul., Mich. Agr. Expt. Sta., Mich. State Univ., East Lansing, Vol. 42, No. 1, pp. 240-250, August 1959, based on his M.S. Thesis, op. cit.

[10]Trant, op. cit.

as well favored for crop production as the best land of the Problem Area in Saginaw and Tuscola Counties.

Trant assumed that all these farmers were interested in retaining the dairying enterprise. He accordingly budgeted ways of attaining a substantial increase in net income from adjustments in the dairy enterprise. In budgeting these adjustments, he was guided by a Cobb-Douglas function fitted to the same 31 farms.

Although his emphasis was on increasing the efficiency of the dairy enterprise, Trant concluded that 9 of these 31 farms could best increase their income by expanding their tillable acreage in conjunction with other adjustments. He budgeted the extent of the profitable increase in acreage for 8 of these farms accordingly. (On a further 3 farms, an increase in acreage was judged to be profitable if the land could be rented.)

The original or benchmark acreage for the 8 farms for which Trant budgeted a needed additional acreage was 172 tillable acres per farm or 97 acres per man-equivalent of available labor. This acreage was smaller than the average tillable acreage for the 22 farms on which no change in area was planned. The average area of this latter group was 246 tillable acres per farm or 175 acres per man equivalent of available labor.[11]

The final budgeted organization for the 8 farms where an increase in acreage was judged to be profitable included an average tillable acreage of 263 per farm or 153 per man equivalent of available labor.

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[11] "t" tests conducted by the present writer yielded the following significance levels:

Variable	8 Small Farms	22 Large Farms	Minimum Significance Level
Original tillable acres per man	97	175	0.1 percent
Final tillable acres per man	153	175	5 percent

This final acreage for these 8 farms was not so appreciably different from the corresponding averages for the 22 with unchanged areas.

Trant claimed to have used currently feasible land values in budgeting these acreage adjustments. He valued cows producing 10,000 pounds of milk at $250 per head. He also included the cost of the credit needed for the budgeted expansions. These expansions included some addition of field beans (assumed to yield a net return of $27 per acre) and sugar beets (similarly netting $54 per acre).

The farmers Trant studied were all co-operators in the Michigan State University Main-In Accounting Project. They could accordingly be expected to be above average farmers. We would expect, therefore, that the actual proportion of dairy farmers in Sanilac County (or similar areas) who could profit from similarly increasing their acreage would be greater than the 25 percent estimated from Trant's data.

Even if Trant's sample is only a very rough approximation, his conclusions will be enough of a guide to our present analysis.

The overall increase in milk production resulting from the increased output of just these 31 farms would be 93 percent from 8,811,000 lbs. to 17,036,000 lbs. per year. The associated decrease in cash crop production was estimated to be 36 percent and the increased land requirements for milk production was about 11 percent of the original area.

Obviously enough, the likely fall in milk prices and other adverse adjustments, such as increased input prices, would prevent all farmers in the district from increasing their net incomes by expanding milk production. Some of these farmers with otherwise unused barn space might find it profitable to turn to the production of other livestock.

There is, nonetheless, the strong possibility that some of these present dairy farmers would need to turn to specialized cash cropping (with some off-farm employment, if sufficient acreage expansion were not possible) before all these farmers could benefit from increased net incomes. Widespread encouragement of efficient adjustments toward dairy specialization could obviously result in hardship to individual farmers from subsequent capital losses.

On the other hand, facilitating an expansion in the average area of farm could apparently reduce hardship to both would-be cropping specialists and would-be livestock specialists. As far as the Problem Area is concerned, any measures to increase the average area of farm apparently need to be supplemented by other measures to encourage cropping specialization so that the risk of capital loss from over-investment by individuals in buildings and equipment for livestock can be reduced.

Conclusion

All four of the above studies do, of course, contain several possibilities of error. These studies were at least made independently of each other. We accordingly find some reassurance in the possible consistency of their conclusions. Brooke's study appears particularly vulnerable to error. It was based on survey data from only one year and that year (1957) was a poor crop year. We suspect that he may have accordingly underestimated the extent to which, on the average, farm acreage was out of adjustment. In any case, it scarcely seems appropriate to attempt to assess whether farms with important cash cropping enterprises are "in adjustment" on the basis of anything less than, say, 3 to 5 years' data.

We have examined evidence which is consistent with the finding that individual farmers in the Problem Area who have adequate equity are likely to be able to expand profitably in a number of different ways, including specialization in cash cropping. An increase in the average area of farm appears to be an obvious change likely to be associated with reduced hardship to would-be cropping specialists. A significant number of other farmers, notably some would-be dairy specialists, are also likely to seek to increase their farm acreages to increase their net incomes, if they choose to maintain the same labor force.

Since farm enlargement, involving cropping specialization, is likely to enable increased incomes on the part of livestock producers, as well as men concerned solely with cash cropping, the encouragement of farm consolidation to further such cropping specialization is a feasible measure likely to contribute to surplus reduction. These increases in income are consistent with increases in the efficiency of production on farms so adding to their cropping areas. This measure is in agreement with the late John D. Black's recommendation to "extensify the farming practiced, that is, reduce the total output per acre of the land in farms while increasing the net farm income, at least after a few years".[12]

Encouraging farm enlargement is obviously not enough in itself to ensure a reduction in the surplus. A farmer with adequate enough capital could still add to his livestock enterprise, even if an increase in the supply of land enables his efficient expansion of crop production. Moreover, even reorganization of present cropping enterprises, facilitated by larger average farm size, could result in an increase in the total

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[12] Black, John D., "Dear Lauren Soth: Must We So Nearly Despair?", Jour. Farm Econ., Nov., 1957, p. 911.

physical rate of crop output.

Some form of co-ordinated production controls would apparently still be needed to reduce the agricultural surplus. Farm enlargement alone cannot guarantee the removal of enough resources from agriculture to eliminate the surplus.

Marketing controls involving product price reductions would imply capital losses to farmers forced to retire durable production goods prematurely. Some compensation would be required for these capital losses, if transitional hardship to the owners of these resources were to be reduced. To the extent that farmers could be induced to expand the area of farm instead of adding more fixed equipment to the same area, the overall cost of such compensation could be reduced. Such a reduction in program cost would be consistent with increased income to remaining commercial farmers resulting from increased efficiency in production.

We need to pursue this tentative conclusion with a more specific identification of just which farmers turn to further livestock specialization (while maintaining the same cropping program). We need to identify, for example, which of these livestock specialists have turned to intensification of livestock production because of exogenous restrictions on further crop specialization. As a first step in this segregation of marginal livestock specialists, we turn now to a classification of specialists resulting from our survey of the Problem Area.

CHAPTER V

OBSERVED CHARACTERISTICS OF VARIOUS SPECIALISTS AND THE LIKELY DISCRIMINATORY FEATURES OF MARGINAL LIVESTOCK SPECIALISTS

The listing of observed characteristics of specialists which follows is given to aid in the identification of likely distinctive features of marginal livestock specialists. We give this listing to enable readers to analyze the likely importance of these features independently. For our purposes, however, we needed to reach some more specific judgment on what conditions are strategic to greater emphasis on livestock specialization. We give this tentative analysis at the end of the listing.

The Types of Specialists Described

We now list some of the observed characteristics of specialists in the Problem Area, based on our sample observations. The one specialist does not, of course, show all the characteristics listed in any particular group.

These characteristics are listed under five different enterprise specialties, viz.,

(1) cash crop production,

(2) dairying,

(3) beef breeding,

(4) beef fattening, and

(5) poultry production.

For specialization in cash crop production, further sub-classifications[1] are:

A. Simultaneous adoption of part-time farming,

B. Continued farming on a full-time basis,

(i) older managers with no sons interested in farming,

(ii) older managers with son(s) interested in farming, and

(iii) younger managers.

For each of the sub-classes of cash crop specialization and each of the other enterprise specialties, the characteristics of specialists are listed as

(a) mainly predispositional factors, and

(b) mainly immediate factors.

The prefacing of these last listings by "mainly" indicates that there is likely to be some overlap.

The order of the listing does not necessarily correspond with the relative importance of the factors concerned as discriminatory variables. Part of the purpose of the analysis following the listing is, in fact, to attempt further systematization of interrelationships among factors, so that the likely factors strategic to the inducement of further cropping specialization can be more readily identified.

List of Observed Characteristics of Specialists

(1) Specialization in Cash Crop Production

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[1]It will be obvious enough that, with an initial sample of only 29, our sub-classifications quickly lead us to a consideration of single cases. Instead of the customary presentation of data in tables with a weighting of characteristics by frequency of occurrence, we are concerned with the prior task of listing these characteristics. This listing is in conformity with our initial plan to use this survey as a heuristic device. Our examples are also restricted by the need to preserve the anonymity of individual respondents.

A. Simultaneous adoption of part-time farming.

(a) Mainly predispositional factors

Small quantity of resources at the disposal of the business as a whole. (4 reported instances, e.g., less than 80 acres of poorly drained land and run-down buildings.)

Physical resources may even appear "fairly generous," but may be associated with a large (inherited) debt, so that the farmer is prevented by a low level of net wealth from obtaining further credit for the business. (2 reported instances, e.g., medical bills exceeding $6,000 incurred while still trying to buy a farm on a land contract.)

Limited availability of further funds severe enough to prevent adequate intensification of use of family labor and present farm equipment through increased livestock production. (4 reported instances; the need for an extra $15,000 was enough to induce one operator to work elsewhere. He owned 80 acres already.)

Present owner mindful of past "chores" with animals and/or otherwise reluctant, for personal reasons, to commit himself to further livestock husbandry. (3 reported instances)

(b) Mainly immediate factors

Adoption of bulk milk tanks necessary, if milk market is to be retained. (3 reported instances)

New health and/or other production regulations considered an intolerable burden or a gross interference with "individual liberty." (2 such instances; on the other hand, several farmers who had complied with such regulations had expressed annoyance at them.)

Living expenses of family seen to be increasing rapidly. (4 reported instances)

Growing sons approaching working age forcing expansion of present business if they are to be retained on the farm. (3 instances)

Reluctance of owner to commit himself to a large debt and continued "chores" before he knows his sons' inclinations with respect to farm work. (3 instances)

Success of others in finding regular off-farm employment and improving the productive capacity of their farms by using savings from off-farm employment to improve their land, e.g., by drainage, encourages farmer to do likewise. (4 instances)

Owner fortunate enough to find regular off-farm employment.

Advent of a pension (e.g. social security). (2 instances)

Family all married and/or all settled in non-farm occupations. (2 instances)

Some actual illustrative remarks include the following:
"The hogs and chickens were a nuisance--anyway, dad couldn't look after them any longer."
"I hate hogs anyway."
"They didn't like it at work when I came in smelling of cows."

B. Continued farming on a full-time commercial basis.

(i) Older manager with no sons interested in farming

(a) Mainly predispositional factors

As production equipment wears out, it is not replaced. (Equipment for both crops and livestock is allowed tc run down; for example, tractors formerly replaced every 4 years now kept indefinitely.)

Lack of interest in livestock and/or no conscious emphasis on improving livestock yields. (2 instances)

Local contractors readily available to perform field work. (2 instances)

Maintenance expenditures on the farm largely directed towards repairing the house. (2 instances)

Previous success in cropping enterprises. (2 instances)

(b) Mainly immediate factors

Market differential for special type (grade) of milk formerly produced now eliminated. (2 instances)

Adoption of a bulk milk tank necessary now or in the forseeable future if milk market is to be retained. (2 instances)

Farm family labor no longer active enough to care for livestock formerly tended.

Family remaining on farm prepared to live on reduced income associated with cropping alone.

Restriction to crop production a prelude to retirement.

Disease, fire or other disaster eliminates former comparative advantage in livestock production. (Reported instances

included trouble with Bangs' disease and a barn fire.[2])

An illustrative remark is:
"I'm older now, with no one following. Why should I sweat?"

(ii) Older manager with son(s) interested in farming.

(a) Mainly predispositional factors

Son(s) with previous experience of livestock production but no further desire for doing "chores." (2 instances)

Farm family with a fairly high net worth. (Minimum of 2 instances of $60,000 net worth with virtually no debts.)

Cropping enterprises previously successful. (2 instances)

Own land fairly well improved by irrigation, drainage, etc. (2 instances)

(b) Mainly immediate factors

New technology has advanced far enough to eliminate problems formerly associated with some of the cropping enterprises, e.g., greater mechanization of sugar beet production reduces crucial dependence on seasonal labor. (2 cited this factor)

Opportunity occurs to buy more land or rent in more of suitable quality, suitably located and with reasonable security of tenure. (2 reported instances)

Opportunity occurs to get a "good deal" on some large capacity field machinery, e.g., at a closing-down sale. (one instance)

Son has opportunity to work elsewhere and plans to do so unless present business is expanded to allow greater scope for use of machinery. (2 instances)

Need emerges to buy a bulk tank or otherwise greatly modify production methods if dairying or other livestock enterprises are to be maintained, e.g., manager comes to appreciate need to exploit economies of scale if former dilettante hog or poultry enterprise is to be put on a commercial basis. (3 instances)

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[2] Some such disasters can actually encourage further livestock production. In one instance, for example, a farmer was running less than 25 milking cows prior to a fire. He subsequently increased his milking herd to about 40 because he was able to rebuild and install modern equipment.

(iii) Younger Managers

(a) Mainly predispositional factors

Farming on soil type which lends itself to cash cropping.

Climate, particularly growing season, favorable to crop production.

Knowledge of the technology of crop production.

Inherited farm or other capital resources (or "married money"); in any case, has substantial assets, even if restricted to goodwill. (3 reported instances)

(b) Mainly immediate factors

Just managed to pay off some previous debts and now feels liquid enough and/or otherwise has just established enough equity that he can invest in the machinery needed for an expanded operation.

Operating the same machinery as formerly but suddenly forced to increase his equity in this machinery by buying out a partner or taking over an estate; manager accordingly feels the need for an expanded scale of operation for this machinery. (One such observed instance was a direct result of the elimination of a milk route because of the adoption of bulk tanks. This milk route had been operated by a man who was a partner in a farm business.)

Irrespective of the machinery owned, the manager who owns his present farm has an opportunity of buying or renting in more land. (3 reported instances.)

There is an emergent likely necessity for bulk tank installation if milk production is continued. (2 instances)

Manager is given an increased allotment in the production of a lucrative cash crop, e g., sugar beet or a seed crop, or otherwise has some exogenously derived incentive to expand crop production. (2 instances)

The need arises to replace some existing machinery, perhaps obsolete inherited items or items subject to unexpectedly heavy breakages; the associated enforced reconsideration of the cropping program results in a decision to adopt larger capacity machinery for some enterprises and reorganize the cropping program.

Sudden and likely chronic labor difficulties associated particularly with animal enterprises occur. (3 instances)

Realization of the significance of newly advanced technologies, e.g., improved breeding of particular crop varieties, the greater flexibility of crop rotations consistent with maintenance of soil fertility (and, more pertinently, crop yields) induces a reorganization of the cropping program.

(2) Specialization in dairying

The relevant observed factors were:

(a) Mainly predispositional factors

Already producing milk and like to do so. (a general reaction.)

Poor cropping land or particularly good herd or abiding interest in dairying or 2 or 3 of these characteristics.

Adequate willing family labor force not otherwise employable on the farm. (3 instances of personal disabilities restricting the use of family labor were observed.)

Ability and willingness to reorganize cropping system to minimize competition for family labor between cropping and livestock programs.

Willingness to devote a lot of what some men would consider "spare time" to the animal enterprise.

Availability of suitable relief labor, if needed. (Only 3 out of the whole sample reported that they were unable to get this relief when needed.)

Value orientation, e.g., subscribing to the attitude that it is not right that a man should work only 6 months each year and spend the rest of the time hunting or in Florida. (3 instances)

Extra advantage in milk production due to goodwill associated with registered herd. (3 instances, including premiums on milk from Channel Island breeds, too.)

Present farm owned and/or substantial additional capital available.

The work imperative was most strongly illustrated in this group by such remarks as the following:
"A man wasn't meant to earn a living from working no more than 6 months each year. The men who are going out of livestock will regret it." "I guess I felt lost without cows--we'd always had 'em."

Some prudential motives (and even considerations of increased private consumption) seem to underlie the work imperative nonetheless.

(b) Mainly immediate factors

Introduction of bulk tank forces adoption of a larger scale of operation or elimination of the dairy enterprise. (8 such instances were observed, including 5 who had anticipated an otherwise forced adjustment to bulk tanks.)

Assessment of adequate opportunities for purchase of feed if the dairy enterprise is expanded. (The availability of hay from a nearby extensive farming operation was an observed example.)

Realization that extra barn space is available or new low-cost construction can be undertaken.

Elimination of "small animal" enterprise(s) due to age and/or sickness of family member and associated realization of need for extra income or availability of extra barn space. (6 instances of elimination of chickens and/or hogs, for example.)

New health regulations for milk production require elimination of "small animal" enterprise(s) formerly housed in the same barn. (3 reported instances.)

New health regulations require additional "expensive" reorganization of milk production which can only be undertaken if larger scale of production is adopted. (3 reported instances)

Increase in family labor force, such as a son returning from the services, where such labor is willing and able to take on more responsibility. (5 instances). In some instances, the son had been working on another farm prior to coming into partnership.

(3) Specialization in beef breeding

(a) Mainly predispositional factors

Already breeding beef and interested in continuing.

Family tradition

Relatively ample resources at the command of the manager.

Located in areas where crop production is relatively less promising.

(b) Mainly immediate factors

Desire to exploit further recognizable economies of scale in such aspects of the business as

(1) handling stock,

(2) breed improvement,

(3) feed production, storage, and utilization,

(4) labor use generally,

(5) established goodwill,

(6) extending markets,

(7) hedging against beef cycles.

Incentive given to production improvements by taking part in and/or observing competitive sales.

(4) Specialization in beef fattening

(a) Mainly predispositional factors

Already in dairying and/or beef production.

Relatively ample resources and/or a steady alternative source of income.

An interest in "dealing"--perhaps even a "dealing instinct."

An interest in livestock generally and a desire to maintain some on the farm.

Disinterested in "chores."

Availability of significant fixed inputs which would otherwise be idle, e.g., a large barn.

Access to market information.

(b) Mainly immediate factors

Variation in the availability, quality and/or general willingness of family labor.

The necessity to make drastic changes in the organization and/or operation of the dairy enterprise if milk production is to be continued, e.g., by installation of a bulk tank and generally expanded scale of the dairy enterprise.

(5) Specialization in poultry

(a) Mainly predispositional factors

An interest in poultry

Ability on an experimental basis to achieve and maintain high physical production standards, i.e., have a comparative advantage in poultry production.

Dissatisfaction with present income level and/or anticipation of greater family income needs in the future.

(b) Mainly immediate factors

A recognition that the farm family's comparative advantage lies in poultry production.

An appreciation of the relatively low standards of performance the family has achieved in other enterprises.

Sudden or imminent availability of extra family labor which would otherwise be underemployed.

The belief that capital required to utilize this extra family labor is less in poultry production than in otherwise seriously feasible alternative employment on the farm. (Say, $10,000 to $12,000 to employ an extra ½ man in poultry compared with $40,000 for the purchase of 80 acres.)

The appreciation or belief that expanded investment in this enterprise can be made in smaller discrete amounts than in the same seriously feasible alternatives.

Discovery of promising local marketing opportunities for eggs--or a fair expectation of underwriting contracts by vertical and horizontal integration.

Some Qualifications of the Listing

We have been concerned with setting out some "raw material" so that the reader can better assess and criticize our interpretations. Some background has already been given concerning the method of collection of this information. The further processing contained in the listing amounts to a very elementary classification only. Some nationally important specialized enterprises have been omitted altogether, e.g., hogs, sheep and wool production. These omissions are made necessary by the limitations of the data of this one field survey. It is hoped that further empirical work in other areas will follow.

Even a cursory examination of the factors listed will induce the reader to wonder at further omissions. Incentives or limitations listed above with respect to one product may seem just as plausible if listed under other products where they do not yet appear. We would consider that a fairly liberal use of the data, reinforced by such comparisons, is justified. No such "rounding out" of factors relevant to the one type of product specialization has been done above, however. The listings are direct interpretations of the questionnaires.

The Approach to Analysis of the Above Listing

The types of discriminatory characteristics of specialists listed above can be classified as follows:

(1) Antecedent farm organization, i.e., the elected enterprise combinations prior to specialization,

(2) Pricing and other features of the product markets,

(3) Pricing and other features of the factor markets,

(4) Personal characteristics of the farm managers, and

(5) Institutional factors.

In concerning ourselves with the differentiation of various types of product specialization, we are, in effect, concerned with the identification of forces responsible for various types of modification of factor mobility. Our particular emphasis is on factors likely to be used in the one business over more than one year.

We shall accordingly examine any special observed conditions likely to influence the direction of specialization by acting on the product markets. We shall then consider the factor markets similarly. In each instance, we shall take account of other characteristics, listed under types (1), (4) and (5) above, as necessary.

Product Markets and Specialization

Farmers in the Problem Area, in common with most other U. S. farmers, have recently enjoyed fairly widespread guarantees on product price levels. Moreover, it can scarcely be held that commodity differences in guaranteed price levels have favored livestock specialization at the expense of cropping specialization.

Other associated restrictions on the marketing of certain products can be held to have affected the direction of product specialization. The most notable observed instances were as follows:

(1) Marketing quotas on wheat and participating shares for sugar, imposed *via* acreage allotments, have allegedly been a force tending to discourage specialization in cash cropping. We do not seriously advocate their elimination as a means of encouraging cropping specialization, however. Instead, we assume that some such restrictions will very likely continue. (We shall later be concerned with the mechanics of such quota programs; however, when we examine the "specialization-integration interactions.")

(2) The necessity for some farmers to install bulk milk tanks, if they wanted to retain their same milk market, allegedly caused some small milk producers to adopt some other form of specialization, or else expand the scale of their dairying enterprise. The other elected specialities ranged from cropping (with or without part-time or full-time off-farm work) to other livestock enterprises. Of probably lesser importance to production responses is the reported claim of

some small milk producers that they eliminated the dairying enterprise because new health regulations governing milk production were a continual source of annoyance to them.

(3) Several livestock specialists (some of them farmers other than ones interviewed) were reported to have made contracts for the marketing of their products locally. This extra market security was reported to be an important feature leading to further local livestock specialization.

In summary, there is evidence of the effectiveness of a number of restrictions on the marketing of farm products in the Problem Area in introducing a change in the direction of specialization of a number of farmers. It can even be suggested, from the reported success of a number of livestock producers in arranging local marketing contracts, that there are at least some parts of Michigan where a further expansion of livestock may be justified. It may be that the actual livestock surpluses originate in some other states.

There can, at least, be little question of the dominant importance attached by all respondents to assured product markets. There was also some person-to-person contracting reported in livestock marketing arrangements. A positive suggestion for ensuring that farm surpluses are not further extended by the addition of more surplus livestock products appears to be as follows:

Any further organized marketing of livestock which enables co-ordination of local sector demand with the summation of local output resulting from individual production decisions would reduce the presently emerging risk of further capital losses to individual livestock specialists. While the need for a co-ordination of production decisions appears

great in the case of livestock products, any such modification of market structure would very likely be appropriate in crop markets too. We shall examine this problem further when we analyze the specialization-integration interaction.

We now turn to an examination of forces affecting factor markets which would be expected to encourage further livestock specialization and/or discourage cropping specialization by the individual farmer in the Problem Area.

We propose to determine, firstly, to what extent antecedent farm organization is related to the likely direction of subsequent specialization. We shall then seek to refine our discrimination of various types of specialization by considering the factor markets more explicitly.

Antecedent Farm Organization Related to Likely Direction of Specialization

From the above data, we derive the following tentative generalizations:

(1) The tendency to adopt livestock specialization is usually associated with the presence of at least one livestock enterprise on the farm in the past.

(2) Dairy specialization is usually associated with the past operation of a dairy enterprise.

(3) Further specialization in purebred herds is usually associated with the past possession of purebred herds.

(4) The presence of a livestock enterprise on the farm does not necessarily imply that the farmer in question is likely to adopt livestock specialization.

We observe, in fact, the possibility of an asymmetrical relationship between predispositional factors involving previous enterprises and the

resultant likely direction of specialization. For the same manager (and family) on the same farm, the previous presence of a livestock enterprise can be followed by either livestock specialization or cropping specialization. On the other hand, his previous adherence to cropping specialization is likely to denote an almost invariable continuation of cropping specialization, although the latter may be reduced to a part-time basis.

We have tentatively segregated the types of enterprise specialization, as far as we can, on the basis of the antecedent farm organization. We turn now to the more specific consideration of conditions of the factor markets associated with particular directions of specialization.

Factor Markets and Specialization

In considering the effects of various modifications of product markets on specialization, we have already noted that the necessity of introducing a bulk tank has usually resulted in some change in farm organization. This change may be either further specialization in dairying, or the elimination of the dairying enterprise. Cases in which the dairying enterprise was eliminated comprised simple cases of cropping specialization by default, and cases of active specialization in other livestock enterprises.

Cases of cropping specialization by default included instances of the concurrent adoption of part-time farming and instances of additional land being bought or rented to expand the use of larger field equipment.

Cases of specialization in other livestock enterprises included instances which allegedly arose from a desire to make use of barn space and family labor which would have otherwise been idle. Most new pig and poultry specialists also emphasized their past success at attending to

the technical aspects of the enterprise of their choice and their conviction of the likelihood of a continuation of the relevant product prices at a level high enough for them to be able to make a profitable living.

The introduction of a bulk tank represents a somewhat spectacular recent example of the adoption of a new technology requiring a higher minimum investment than previously. Many men anticipated its likely general introduction and allegedly received an extra innovator's reward from introducing it when discriminatory pricing first encouraged its adoption. We do not intend to center our attention on the degree of compulsion associated with the adoption of the bulk tank. We merely emphasize that the availability of this technology was not alone enough to guarantee its adoption by an individual farmer. We restrict our further consideration of the likely discriminatory effects on the direction of individual specialization of various features of important factor markets to men who have considered the adoption of a bulk tank. We do so because we consider that these likely features will thus be more readily identified.

What useful distinctions can be made about the various elected specializations of those farmers who would be required to introduce a bulk tank to retain their present milk market? Men who elected to eliminate their dairy herds and adopt cropping specialization were not exclusively men with poor yielding cows.

The Market for Farm Family Labor and Interrelationships with Other Factors

The direction of specialization depended quite heavily on the available alternative opportunities for employing the maximum available family labor force. Naturally enough, this labor force varied with the

age of the farm operator. A somewhat related variable was the size of his family. This latter variable was qualified by the education and net wealth of family members, reflecting their general employment opportunities. (This qualification is, again, partly an indirect function of the age of the operator.)

What modification of these opportunities for employment of family labor could be made which would encourage a further adoption of cropping specialization on the part of men with a dairy enterprise confronted with the necessity of adopting a bulk tank to stay in dairying?

Off-farm employment opportunities for all farmers in the Problem Area are already assessed to be considerable. True enough, we might all feel we could benefit from an improvement in these opportunities. It can scarcely be held, however, that a man in the Problem Area is likely to be forced into livestock specialization because he cannot find off-farm work. Instances have been observed in which even men over 50 in the sample have been able to find such off-farm jobs. These off-farm jobs have varied from jobs with minimum returns of 2 dollars an hour and $4,500 per annum (plus overtime) to variable income jobs (based on commission) from which the individuals concerned expected to receive a minimum of $5,000 per annum. In most instances, taking off-farm employment did not involve leaving the farm. However, it commonly involved eliminating one or more livestock enterprises.

The level of education of the farm manager has not generally been a crucial factor limiting the adjustment to specialized crop production by sufficiently restricting the farm manager's opportunities for off-farm employment. Once again, we might expect that, the higher the level of education of the farm operator, the greater his opportunities for off-farm

employment. Instances have been observed in the Problem Area, however, where men have been working off the farm in factories and businesses which demanded much less than their formal level of education. Farmers who have finished high school and even college have been observed in manual or relatively unskilled clerical jobs off the farm. Some such men would very likely be happier in other jobs. But these personal problems have not prevented the elimination of livestock enterprises in the instances observed.

The relatively low level of net wealth of the potential specialist was one reported factor leading to cropping specialization with off-farm employment. This factor only serves to emphasize the urgency of other more positive factors which might induce cropping specialization. At least some of these forced cropping specialists, if young enough to be planning any further adjustments, regard their present farm organization (i.e., cropping specialization) as temporary until they can accumulate enough equity from off-farm work to make other adjustments. These other adjustments are by no means confined to cropping specialization. Several respondents indicated that they were thinking of turning to livestock specialization when they had acquired enough funds.

The only readily identifiable restriction on the mobility of family labor which could be thought to favor cropping specialization over livestock specialization was the personal preference of the marginal family labor (the young son, as a rule.) Some of the men interviewed reported a strong and abiding interest in livestock. Others were anxious to eliminate the livestock enterprise, which represented continuous chores, and concentrate on attending to field machinery. Some reported instances of personal disability conditioned the various preferences.

The emphasis on personal preference of the farm family as a reason for livestock specialization points to the crucial role of a co-ordinated district marketing scheme for livestock products in reducing the risk of such livestock enthusiasts suffering heavy capital losses from imprudent investment.

This same emphasis on personal preference as a factor favoring expansion of investment in field machinery and a concurrent adoption of cropping specialization suggests the need to examine likely handicaps to the efficient use of such equipment. The most obvious such handicaps center on the likely lack of mobility of other factors used in conjunction with labor and machinery.

There is, of course, always the possibility that some change in pricing policies of machinery companies could influence the extent of cropping specialization. Apart from this possibility, there were no important instances in which some other feature of the machinery itself had discouraged crop specialization. Except for some very minor instances, all the farmers interviewed were well satisfied with the machinery they had bought. A few cited disappointment with the performance of a clod-buster, but suggested that their technique was still partly at fault. Some disappointment was expressed that an occasional dealer had gone out of business, thereby making it harder for them to get parts and reducing the resale value of the implement in question.

Most concern with field machinery was that the larger equipment they were now buying could easily be used to work more land than the machine owner was able to acquire. This extra land could be worked with little or no addition of other farm inputs and, notably, with the same family labor force.

Conclusion

The most promising scope for encouraging greater emphasis on cropping specialization in the Problem Area appears to lie in modifying the land market to increase the supply of land to would-be cropping specialists and in reducing the incentive to over-investment in livestock production by modifying the product markets to facilitate closer co-ordination of sector production of livestock and livestock products with the corresponding sector demand. Allowing that some other districts may have a greater comparative advantage in some facets of livestock production, we do not mean to imply that local livestock production need necessarily be planned to give a local supply equal to local demand. We merely suggest that increased local urbanization should enhance the comparative advantage of local livestock producers. Even given estimates of the demand for local livestock products, we submit that present marketing mechanisms may not be adequate to minimize the risk of heavy individual capital losses from over-investment in livestock production. We examine this possibility further in Chapter IX.

In examining the land market to determine how cropping specialization can be further encouraged, we also anticipate that some additional modification of other factor markets may assist, if only indirectly, in further enhancing the supply of land to the would-be cropping specialist. We therefore examine the land market further in Chapter VI. The machinery market is the one which appears to offer most scope for such complementary adjustments. We shall consider this possibility further in Chapter VII, although we regard it as of relatively minor importance.

Encouraging cropping specialization by further modification of the farm family labor market appears to offer little promise. Off-farm

employment opportunities already appear to be adequate. Perhaps a wider dissemination of information on job opportunities would help some individuals to favor cropping specialization over livestock specialization. This need appears to be a relatively minor one in the Problem Area.

We turn now to an examination of the land market.

CHAPTER VI

THE LAND MARKET RELATED TO INCREASED CROPPING SPECIALIZATION

In considering the market for land for farming purposes in the Problem Area, we shall first present some observed features of the demand for this land and then some observed features of the supply of this land. As far as the individual farmer who seeks to buy more land on the open market is concerned, we suggest that the demand for land is increasing.

Encouraging cropping specialization in preference to livestock specialization increases the demand of the would-be specialist for land. Unless this encouragement of cropping specialization involves a corresponding increase in the supply of land, the price of land would increase as a result of the increased demand. The funds needed to compensate land owners for land purchased by the government would, of course, increase as a result of such an increase in the price of land. To avoid such an increase in the price of land, we are accordingly led to examine possible measures for increasing the supply of land to the would-be cropping specialists. The most promising measures appear to involve a revision of tenure laws.

Reported Land Transactions and Recent Values

Over the whole of the sample, not more than a dozen parcels of land were reported as purchased from outside the family since 1930. Prices reported for such purchases by sample members and their neighbors within the last 5 years included 80 acres (untiled) for $36,000, 80 acres (almost untiled) for $40,000, 80 acres (partly tiled) for $65,000, 60 acres

for $46,000 (untiled land needed urgently for expansion by a neighbor), and an undisclosed area for $700 an acre. Some land close to the cities of Bay City and Saginaw is alleged to be worth $1,000 an acre at present. Recently reported cash rentals for partly tiled land on the better soils range from $900 for 50 acres to $2,600 for 80 acres. Some untiled land in areas of Bay County where drainage outlets are not available is reported to rent at $10 an acre. Some similarly poor land at the tip of Huron County (and not on the coast) is reported to sell for $125-150 an acre.

The only land sold by any of the sample members in the last 30 years has been 8 separate instances of very small lots (up to 10 acres) which were needed by public utilities or sold as urban building lots. Fifteen farmers volunteered that land throughout the district generally remained "in the family".

The Demand for Land in the Problem Area

Several conditions appear to be contributing to an increase in the demand for land for farming in the Problem Area.

All except three of the sample members reported they would buy or rent more land if they could get it. The exceptions, moreover, were exceptions by virtue of some special personal conditions, e.g., approaching retirement. A preference for buying over renting was indicated by all except one of these men. (The exception thought that renting would be cheaper). Buying was thought to be necessary to give security of tenure and to enable necessary improvements (notably, drainage) to be made.

Some further corroboration of the need for more land expressed by the sample members is given by the evidence of how intensively they are

using the land they already own. Only two farmers declared significantly large areas of owned land which still needed new tiling. Both of these men were very concerned about not "going into debt" and said they planned to complete tiling as "spare cash" became available from "good crop years". Most of the remainder mentioned the need for some further tiling "in-between". They indicated that all their farms had been drained, but that they were now putting in extra drains on some fields. The largest area reported to need this tiling in-between was an 80 acres which had been purchased within the last 5 years. Otherwise two 40's and one 20 acre field were reported to need drainage; but these fields could not be drained until further land was bought to enable the provision of outlets. We conclude that the extent to which drainage has been undertaken by sample members on their own land is consistent with other evidence of the urgency of their demand for extra land.

Moreover, only two of the sample indicated such an aversion to borrowing (by their hesitancy to complete drainage on property already owned) that they could be expected to forego any opportunities to buy land at a "reasonable price". Allowing for all exceptions, then, about 70 percent of the sample were anxious to buy more land and would probably bid on land which did come up for sale. If this sample does contain "above average" farmers (as is suspected) this figure of 70 percent would be higher than for the district as a whole.

Further evidence of the ability of some sample farmers to work more land then they now have were three notable instances (and several lesser instances) of contract work being done on other farms and of standing crops being purchased from neighbors and harvested and marketed with the farmer's normal labor force and equipment. This evidence is

consistent with Brooke's[1] findings that small farms in the area had "too much machinery" and Dvorak's[2] demonstration that a 160 acre farm in the Problem Area could profitably expand to 320 acres.

The general ability on the part of farmers to use existing field equipment to work a larger area of land (without the need for any other significant adjustments) is further confirmed by answers to the question, "How would you use more land, if you could get it?" All the respondents stated that they would use extra land to grow more cash crops or "fit it into the rotation". None of the farmers interviewed cited the need for more land to grow forage crops. In addition, five of the farmers volunteered the information that they were already cash cropping their present land as much as they could and buying in feed.

All farmers who volunteered an opinion considered that the "soil bank" had a negligible effect on their production plans on their present land. A specific objection was raised to the "soil bank" and acreage allotments for various crops. This objection was that these programs made it necessary to dissect large fields and grow two or more crops on them. This necessity prevented the "best use" of machinery and encouraged farmers to seek additional land. The presence of wheat allotments also encouraged them to look for more land to add to their farms.

Government programs were alleged to be encouraging the buying of land in preference to renting in. Several farmers alleged that there was less land available for renting now. Instances were cited of up to 120 acres being put in the "soil bank" by individual owners. The presence of the "soil bank" was alleged to be adding to the already considerable

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[1] op. cit., Chapter III, footnote 1.

[2] op. cit., Chapter III, footnote 8.

insecurity of tenure which almost all farmers remarked upon. (Two exceptions were operators with cash rental contracts extending over 2 or more years.)

We conclude that the demand for land for cash cropping in the Problem Area is high. Because of the likely continued availability of larger capacity field machinery, we conclude that this demand for land by would-be cropping specialists is likely to increase. A specific example of the potential for this increase is provided by the sugar industry. An industry source reported that almost the entire Michigan sugar beet crop was harvested with single-row machines in 1959. Machinery manufacturers have now marketed 2-, 3-, and 4-row harvesters. A 1959 price list[3] shows that these larger capacity machines have been priced low enough, relative to the single row harvester, to encourage the farmer to buy them. Even without the inducement of such general obsolescence in existing field machinery, however, farmers will have other inducements to adopt larger capacity machinery, if only they can control a large enough acreage to work this larger equipment.

The Supply of Land in the Problem Area

Given the above evidence of a strong demand for land for cash cropping in the Problem Area, any measures which would contribute to an increase in the supply of land for this purpose could be expected to encourage the further extension of cropping specialization in preference to livestock specialization. Increasing the supply of land is the same as decreasing the reservation demand of some of the present owners. We first need to identify the marginal suppliers of land for either renting or buying.

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[3]See Appendix A.

All the sample members (except at the tip of Huron County away from the coast) indicated that land was hard to get and tended to stay within the one family. The marginal suppliers of land are likely, therefore, to be drawn from owners who have no heirs wishing to farm their land. At least three instances of farm owners in this position are known within the sample. Several farmers (in different parts of the Problem Area) testified to the presence of widows in the immediate neighborhood who were renting out all their land outside the family or putting it in the soil bank. Data[4] based on a recent random sample of Michigan farms suggests that the prevalence of farm owners without heirs interested in farming is much greater than is indicated in the present writer's purposive sample.

Almost without exception, the men who were renting in land indicated that they rented it so that they could have first option on later purchase. Several sample members, who had previously bought land after renting it in this way, had been forced to rent for 10 or more years. Moreover, they complained that the land they had rented was in need of drainage and, prior to purchase, could only be used for relatively low valued crops which were less susceptible to poor drainage conditions.

In the best parts of the Problem Area, the minimum current cash rental reported was about $20 an acre and the minimum estimated sale price about $500 an acre. The maximum reported cash rental was about $32.50 an acre and the maximum estimated sale price about $800 an acre. (Some few cases of higher valuations were reported.) Even if we assume a perfect positive correlation between cash rental and sale value (no

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[4] McKee, Dean. Personal communication based on data from a U. S. Department of Agriculture Regional Dairy Adjustment Study. (McKee is employed by FERD, A.R.S., U.S. Dept. of Agriculture and stationed at East Lansing, Michigan.)

doubt a practical tendency, but unlikely to be a fully realized situation) the gross return on present value from cash renting is likely to vary around 4 percent per annum.

An important characteristic of the Problem Area is the relatively low rate of real estate taxes. For Type-of-Farming[5] Area 8 in 1958, for example, William Heneberry[6] reports that the average real estate taxes payable by a landlord were only about $1.77 an acre. Heneberry claims that comparable land in Illinois or Indiana would be assessed at $5 to $6 per acre, or even more. The above estimates of likely gross returns from renting of 4-5 percent on current value thus closely approximate net returns.

When we consider the likely general importance of farmers' expectations[7] of still further increases in land values in the Problem Area, it is not surprising that these widows continue to cash rent on an annual basis. The uncertainty of these widows concerning other sources of investment which yield comparable returns with no greater risk of capital depreciation is likely to be great enough to cause them to retain ownership of their farms.

Under a cash rental agreement where the rental includes a hidden advance purchase installment to foster and maintain goodwill, what incentive does a widow even without heirs have to sell instead of renting?

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[5]Briefly, the best land in the Problem Area. See "Farming Today", Agricultural Economics Publication 717, Michigan State University, East Lansing, 1958.

[6]Personal communication based on data from Michigan Dept. of Agriculture derived by a purposive sample collected by County Treasurers.

[7]"The Farm Real Estate Market" July-Nov. 1959, ARS 43-118 (CD-54), U.S Dept. of Agriculture, Washington, D.C., Feb. 1960, p. 9.

For a given farm, assume that most of the land can be sold and still leave the home lot intact. We thereby eliminate the possibility that a widow considers sale of the farm identical with sale of her home and the severing of connections with the local community. If a widow were to sell this land (exclusive of the home lot), she would very likely be advised to make the sale by land contract or, in any case, by arranging payment over a number of years to avoid heavy incidence of capital gains tax. Even if a widow does recognize the feasibility of reducing the tax liability from capital gains when she sells her property, it is quite possible that she has underassessed the current value of her property enough to consider that her income from renting is about the same as she could expect from sale of the property and reinvestment of the proceeds.

A substantial increase in local taxes might induce her to revise her decision to retain the property. Such an increase in taxes is, however, likely to reflect increased adjacent urbanization. If the widow is then induced to sell her property, the would-be cropping specialist who seeks to buy it faces the likelihood of increased competition from speculators and is likely to be no better off as a result of this "increased supply" of land.

Exemption of widows from payment of capital gains tax when they sell farms and reinvest the proceeds in non-farm securities would be one further way of encouraging these widows to sell their farms. So would the provision of further information on alternative investment opportunities by reputable authorities.

The main handicap of the low mobility of land to increased cropping specialization would not necessarily be eliminated by these measures,

however. This handicap (as it appears in the sample data) is that uncertainty of production on rented land because the lack of security of tenure prevents the carrying out of drainage improvements. Perhaps the most positive way that cropping specialization could be further encouraged would be by the revision of tenure laws to enable prospective tenants to rent for a sufficiently long time and/or with sufficient guarantee of compensation for productive improvements to enable them to make such improvements as drainage. If provision were made for periodic revision of rentals (say, every five years), the widows' interests would still be safeguarded by enabling rentals to be adjusted in conformity with changes in land values. Moreover, the tenant who was a prospective buyer would then be better able to buy the land when the sale was made. He would be able to improve the productive capacity of this land in relatively small installments prior to purchase. (Current drainage costs in the area are reported to be about $100-125 per acre.)

Measures proposed to encourage further cropping specialization cannot be considered in isolation. The proposed revisions of tenure laws emphasize this restriction. In the revisions which follow, we have explicitly specified adherence to the tenure laws as a necessary condition for the farm operator to receive the current benefits of guaranteed prices in his product markets. Otherwise, the land owner may not initially recognize the benefits of long-term rental agreements. Such agreements should, however, have more positive benefits to the landowner, too. These latter benefits derive from the likely increasing ability of the tenant who improves his land to pay higher rentals and still increase his net returns over the returns he would have received from land worked under an annual rental agreement.

Proposed Tenure Laws Needed To Encourage Cropping Specialization

The main revisions of tenure laws suggested are:

(1) That no contract be recognized by marketing agencies (government or private) for the purpose of any price guarantees unless it is written and for a minimum term of, say, five years;

(2) That a tenant be permitted to make such capital improvements as drainage which are deemed by a competent technical agency to be likely to increase the productivity and/or certainty of production from the rented land;

(3) That any such improvements be made at the tenant's expense (net of appropriate subsidies);

(4) That an owner who fails to renew a contract with a tenant who has so improved his land be required to make cash recompense to the tenant in accordance with a previously devised schedule, e.g., according to the remaining life of the improvement as specified in the income tax schedule;

(5) That the tenant be permitted to make such improvements unless the owner show cause to competent authorities why he should not;

(6) That the tenant who has entered such a rental contract be given first preference for renewal and that the only acceptable basis for rejecting his renewal, other than bad husbandry, be that he is outbid;

(7) That the original rental agreement be held to be transferred with the land in the case of sale, except that

the new owner can elect to farm the land himself at the end of the current five year contract, or its prior dissolution, with the consent of both interested parties, by means of a cash settlement;

(8) That sale of house and buildings (including, say, a maximum of a 5-acre lot) be conducted separately from the sale of the remaining land if the land is within, say, a 10-mile radius of an area of significant urban concentration, say, a town of 10,000 people or more.

Conclusion

An examination of the land market in the Problem Area shows that the would-be cropping specialist is severely handicapped in his efforts to work more good quality land. Few parcels of land are sold on the open market. The price of such parcels has recently increased considerably. The alternative supply of land for renting has allegedly been reduced by the Soil Bank. Moreover, much land for rent is alleged to need drainage. Yet tenants are forced to work this land in the hope of future purchase. A considerable revision of tenure laws has been suggested as the most promising means of encouraging cropping specialization in preference to livestock specialization. Perhaps some increased supply of land to cropping specialists would also result from other measures, too. For example, widows might be encouraged to sell if they were exempted from capital gains tax on any proceeds directly reinvested in non-agricultural industries, provided this exemption were granted only in the cases of sale for farm consolidation or to the government. Provision of advice to widows and older people without heirs interested in farming would be another method of getting underemployed capital out of agriculture,

improving the incomes of the owners of this capital and encouraging a further increase in the supply of land offered to would-be cropping specialists. Increasing the supply of land to would-be cropping specialists, as outlined above, would tend to reduce the cost of government compensation for farms purchased by the government. For the same reason, no expansion of present credit facilities available for farm purchases has been suggested.

CHAPTER VII

THE FARM MACHINERY MARKET RELATED TO INCREASED CROPPING SPECIALIZATION

Suppose the supply of land to would-be cropping specialists is increased. Are there any subsidiary modifications of the machinery market which could also be expected to reduce hardship to would-be cropping specialists? We shall present an extremely tentative examination of this question.

In Chapter VI, we suggested that the demand for land by would-be cropping specialists was increased by technological improvements resulting in larger capacity field machinery. A more detailed sketch of the relationship between land, technological improvements in machinery, and specialization in crop production will be given in Chapter VIII.

For the moment, we need to guard against the danger of increasing hardship to the original owners of capital assets other than land as a result of modifications of the land market aimed at promoting further cropping specialization. Specifically, we wish to reduce the danger of increasing hardship to owners of large, modern machinery because of a reduced demand for their services.

Assume that ample off-farm employment opportunities are available for family labor relased from crop production. And assume that a farmer who can buy or rent in more land can also hire efficient cultivating and harvesting services which involve the use of the most modern equipment.

We have already observed that any farmer is likely to control a limited amount of capital to finance his possible business expansion.

Furthermore, we assume that the farmer's initial equity in the business is likely to be a dominant factor determining the amount of capital he can obtain.

We can expect, then, that the man who originally owns a small area of land (say, 80 acres) and chooses to specialize in crop production will, ceteris paribus, have less funds available for investment in other needed forms of capital (say, larger machinery) than a similar specialist who originally owns, say, 120 acres or more. The smaller the original area of farm, then, the more likely is it that external capital rationing will require the would-be cropping specialist who buys extra land to continue using his original machinery and accept lower returns to the labor he uses with this machinery.

The greater the technological advances in machinery, the greater will be the disadvantage of the small farmer who is so forced to rely on obsolete equipment to work his larger cropping area.

One might say, then, that a case has been presented for the expansion of credit facilities (particularly "intermediate credit") to farmers with a relatively small equity in land. Such a conclusion is objectionable on at least two scores, however.

In the first place, such an expansion of credit facilities could encourage a still greater total allocation of capital to agriculture. We have already concluded, however, that the likely continuation of the U.S. agricultural surplus, in spite of "demand expansion", points to the need for a reduction in the total resources committed to agriculture.

In the second place, facilitating the addition of more efficient machinery to men who are able to buy extra land could engender hardship to other farmers who already have the most modern equipment and can only

use it efficiently by hiring out their services to neighbors. This latter group comprises farmers who have not been fortunate enough to gain control of extra land.

Instead of advocating the need for improved credit facilities for machinery purchase, therefore, we turn to an examination of possible modifications of the machinery market which will facilitate further cropping specialization. We seek modifications which will enable transitional hardships to be shared among various types of farmers. Notably, we seek to avoid encouraging further cropping specialization by large land owners at the expense of small land owners and tenants.

After examining some likely features of the farm machinery market in the Problem Area, we advance some minor modifications of this market which we claim would assist in such further encouragement of cropping specialization. In addition, these measures could reduce hardship to older men and widows who are handicapped by obsolete equipment, but reluctant to replace it with more modern tools.

Several sub-classifications of the market for farm machinery and equipment could be made. For the moment, it will be convenient to think of this market as comprising two interrelated markets, viz., the market for new machinery (and equipment) and the market for used machinery (and equipment). For each of these markets, we shall examine briefly the likely conditions of supply and the likely conditions of demand.

Marketing Policies of Farm Machinery Manufacturers Likely to Foster New Technologies and Promote Specialization Throughout Agriculture

We can reasonably expect that manufacturers of new machinery and equipment will have to decide well in advance the approximate number of

machines they will make in a given year. Their production decisions will naturally take into account the likely demand for this machinery. They cannot, in turn, estimate this expected demand in any meaningful way unless they refer it to a pricing policy. Cromarty has suggested how manufacturers, in general, appear to arrive at their likely sale prices as follows:

> "A first estimate of price is made on the basis of costs of materials, labor and and expected profits. The first revision is made by comparing this figure with prices of competitive implements and a final revision is made based on technological improvements and the level of sales."[1]

Manufacturers of farm machinery and equipment have a stake, then, in promoting specialization of production on individual farms. This interest in specialization occurs because one of the most promising ways ofincreasing sales would be to increase the demand for this machinery by adding more technological improvements.[2] The demand for farm machinery is, moreover, a derived demand. We can, perhaps, think of some likely examples of farmers buying new equipment just because they like to have it, or they can "afford" to have it and wish everyone to know it. For the most part, however, we can expect that the demand for new farm machinery will increase when this machinery enables a farmer to produce more cheaply. Farm machinery manufacturers have an incentive[3] to price

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[1] Cromarty, William A., "The Demand for Tractors and Farm Machinery", Tech. Bul. of Michigan Agric. Expt. Sta. in process.

[2] To be pedantic, making such improvements to a given machine could be considered as developing a new machine. We would then need to consider that these improvements had opened up a new market in which a new commodity was being traded. It seems more convenient, however, to consider the effect of these improvements indirectly. We accordingly think of their effect as being more or less equivalent to a shift to the right of the original demand curve.

[3] For an example of how they react to this incentive with sugar beet harvesting machinery, see Appendix A.

machines of new design cheaply enough so that the farmer buying a new machine really will benefit through reduced unit costs of production. If there really is competition among machinery manufacturers, the incentive to make these improvements will be strong. Otherwise, a manufacturer may lose sales to a competitor.

Even if there were complete collusion in price policy among farm machinery manufacturers, however, there would still be an incentive for them to promote new technologies. The reason is that all these manufacturers face additional competition for sales from the used machinery market. When farm machinery dealers take trade-ins to increase sales of new machines, they are, in effect, increasing the quantity of new machinery demanded by shifting down the demand curve, i.e., by offering the new machinery at what the farmers who buy it consider to be a lower price. At the same time, these dealers are increasing the supply of used farm machinery, i.e., they are increasing the amount of used machinery offered at any given price. At least from the writer's very limited field observations, it is doubtful if much of this present increase in the number of new machines demanded by men who trade-in old machines results in a corresponding decrease in the number of used machines demanded. The men who are buying the larger new machines appear to be men who are already well provided with relatively new machinery and who have been persuaded to trade largely because of technological improvements in the new equipment and a desire to "keep up". Were it not for technological improvements, many of the farmers interviewed could apparently work their present machines several more years.

On the other hand, if we really can assume that the demand for used machines is likely to be much the same for, say, three to five years,

as it would be if no appreciable technological advances were made, dealers can only be expected to reduce their inventories of used machines if they reduce their prices. In other words, we have a shift to the right in the supply schedule of used machines as a result of trade-ins, or more used machines offered at a given price; we can only expect an increase in the number of used machines sold (as dealers "trim" their inventories) if dealers reduce their prices. The presence of used machines thus sets a limit to the possible increase in sales of new machines. The greater the technological advances offered in the new machines for a given price, the less severely will the used market restrict sales of new machines, since the dealers will be able to discount the trade-in value of used equipment more or less in proportion to its degree of obsolescence.

We conclude that manufacturers of farm machinery and equipment are likely to follow production and pricing policies which will foster the development of product specialization throughout U.S. agriculture. We suggest, moreover, that this emphasis on improved technology may suit the larger farmers very well. Men who have adequate command over other resources, such as a large tillable acreage of "good" land or a large high-yielding dairy herd, may benefit from reduced unit costs of production and suffer no further handicap from the extra "lumpiness" of the machinery and equipment input. On the other hand, the "small" man who buys used machinery and equipment is very likely just so much nearer to reducing his chances of increasing his annual net income. The very fact that the used equipment represents an earlier stage of technology suggests that the ratio of output to input (in dollar terms) will be lower for the "small" man with a given labor input than it would be for the "larger" man with the same labor input.

Possible Modifications of the Farm Machinery Market to Encourage Cropping Specialization

If any measures are desired to control the direction of product specialization engendered by this concentration on improved technology by farm machinery manufacturers, the most promising might include a means of raising the price of used farm machinery and equipment specific to the type of product we wish to favor. This increase in price could be brought about by reducing the supply of the used items (and encouraging some increase in the demand for new machines). We would expect any such increase in the price of used machines to enable an increase in the gross price of the (substitute) new machines. How could the demand for new machines then be increased? We envisage the possibility of such an increase in the demand for new machines because dealers would now have more scope to allow liberal trade-in terms, thereby actually reducing the price of the new machine relative to the trade-in.

For young men who plan to farm full-time for a living, funds available for investment in capital goods are likely to be very limited indeed. With the present market structure for farm machinery, these men will normally be tempted to buy used machines. Any measures (such as that suggeeted above) which tend to bring the price of the used machine closer to that of the present corresponding new machine will have one of two desirable effects. (a) They may induce him to buy the new machine instead but, because of the higher required installments, they will concurrently force him to consider and adopt further reorganization of his farm business to increase his ability to repay this money with earnings from this machinery. (In the case of purchase of a new, larger combine, for example, the farmer may need to add to his acreage.)

(b) They may induce him to do without the machinery altogether for the time being. He may continue farming and hire the work done for which he originally planned to use this machine (thereby enabling another man to use a new machine enough to "pay" for it in, say, three years). Meanwhile, he may invest the money he would have otherwise spent on the used machine in renting in more land or otherwise reorganizing the business for greater profit. Measures to enhance his chances of gaining control over this extra land have already been suggested. Alternatively, the higher price of the used machine may induce him to revise his assessment of his chances of making a "good living" by farming enough to "quit farming".

An older man who sees the possibility of selling used machines at a higher price than hitherto may be tempted to "unload" and hire work done from a young man with a new machine. A widow may be induced to do likewise.

The young man still lacking the opportunity and/or resources to buy or rent more would thus still be assisted to gain control of land in the future. He would be able to increase his income by buying and working large modern field machinery, instead of under-employing his labor by operating smaller capacity used equipment.

If our concern is with encouraging cropping specialization in preference to livestock specialization, we would restrict machinery price manipulation to field machinery only. This restriction would conversely encourage a would-be livestock specialist to review more closely any contemplated investment in livestock, since the risk of capital loss in this type of investment would not be underwritten to the same extent as the corresponding risk for the cropping specialist.

How could such an increase in the price of used field machinery be brought about? The method suggested is one which would, in itself, further assist in relieving hardship due to the development of better machinery, viz., the payment of "obsolescence compensation" by some government agency to specific groups of used machinery owners in exchange for used farm machinery which would be "junked". The funds for these payments could be derived from a tax on all new machinery, since machinery manufacturers would otherwise stand to benefit from general increases in machinery prices anyway. Taxing all new machinery would be necessary to preserve the advantage of the cropping specialist over the livestock specialist. This "obsolescence compensation" could be regarded as a more specific form of Schultz's "homesteads in reverse"[4] which would further encourage transfer of land ownership. The "specific groups" from which the purchases would be made could be, say, widows in the first instance. If such a pilot scheme proved feasible, it might be extended, as funds permitted, to older farmers, particularly in areas where the modal farm size is small.

Conclusion

As means of encouraging individual farmers to adopt cropping specialization in preference to livestock specialization, the above measures suggested for the machinery market appear quite minor compared to those already suggested for product markets and the land market. We have been concerned mainly with pointing to types of measures which would be consistent with the main objective of adjusting U.S. agriculture to general economic growth. We sought particularly to derive modifications of the machinery market which would encourage cropping specialization by the

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[4] Schultz, T.W., loc. cit.

small land owner and thus offset any differential advantage accruing to the large landowner from previously suggested modifications of the land market.

Before our final exploration of possible modifications of the mechanics of livestock marketing through integration to discourage over-expansion of livestock production, we turn now to a further examination of the consistency of the measures we have suggested for the land and machinery markets. This examination involves an extension of former analyses of problems of "asset fixity".

CHAPTER VIII

AN EXPLORATION OF PROBLEMS OF SPECIALISTS BASED ON AN EXTENSION OF "FIXED ASSET" ANALYSIS

The following discussion involves an extension of the application of Glenn Johnson's definition[1] of "asset fixity". This extension comprises further qualifications of the conditions of "asset fixity" found necessary in attempting to define problems of the individual farmer seeking to specialize by use of more capital intensive methods. An illustration is given of the possible relevance of the extended conditions of "asset fixity" to the explanation of how a man wishing to expand his cropping program could be compelled to restrict further the number of his cropping enterprises and ultimately resort to further livestock production, in an effort to increase net income.

Problems involving "asset fixity", or the use of capital goods in production, involve all the complexities of the relationship of capital to interest.[2] An outstanding impediment to a completely adequate formulation either of how investments in a particular business will be

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[1]For a detailed development of this material see, for example, Johnson, Glenn L. and Hardin, Lowell S., "Economics of Forage Evaluation," Purdue Agr. Exp. Sta. Bul. 623, April, 1955; Johnson, Glenn L., "Supply Function--Some Facts and Notions," in Heady, Earl O., et al, Agricultural Adjustment Problems in a Growing Economy, Iowa State College Press, Ames, 1959, pp. 74-93, and Edwards, Clark, "Resource Fixity and Farm Organization," Jour. Farm Econ., Nov. 1959, pp. 747 f.

[2]For some illustration of these complexities, see, for example: Knight, F.H., "Capital and Interest", Encyclopaedia Brittanica, Vol. IV, 1946, pp. 779-801, as reprinted in Readings in the Theory of Income Distribution, Fellner and Haley, ed., Blakiston, Philadelphia, 1951, pp. 384-409.

or should be made is the determination of the "correct" future rate of return on capital. Knight claims that all capitalization is inherently a matter of forecasting, not to say prophecy, rather than of calculation from current or past objective data.[3]

In the following discussion, both the "outlay", or cost of an asset, and the "returns" to that asset implicitly involve the determination of such "discount rates". We are accordingly presenting only explanatory fragments and not even an explanation sketch.

Our extension of Johnson's approach to "asset fixity" does at least give prominence to the "time" variable. To say that our extension can be reconciled with our foregoing analysis is to offer little more than a plea for the further development of this extension.

As far as our explanation goes, it appears to be consistent with the findings of Dvorak and Trant in Chapter IV, our conclusions concerning the strategic importance of the land market to the further encouragement of cropping specialization in Chapter V, and the importance of co-ordinating product market integration with specialized production to be considered in Chapter IX.

Could we have carried out the analysis of these other chapters without the development to follow? Probably we could have--at least, except for Chapter IX. Why, then, are we justified in including this treatment? The inclusion of this section is meant to be a partly independent test of the consistency of our other arguments. Glenn Johnson has also used the "asset fixity" approach to explain the differential behavior of agricultural supply responses over the business

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[3] Ibid, p. 404.

cycle.[4] While the business cycle has not been given explicit attention in this study (and, indeed, we assume "full employment" conditions throughout) we nonetheless deem it important to provide an explicit linkage with Johnson's work to facilitate or encourage this attention on the part of others.

Glenn Johnson states that "an asset will be defined as fixed (with respect to an industry, firm or enterprise) as long as its marginal value productivity in its present use neither justifies acquisition of more of it nor its disposition." We shall attempt to reformulate[5] this definition. We shall be concerned with "asset fixity" with respect to the individual firm.

We shall specify an "outlay curve" and a "returns curve" for any production good. By a "production good" or "factor of production" we merely mean a good used by an entrepreneur in the production of a good or service he plans to sell.

The following model is developed as a necessary step in the more explicit examination of the flow-stock interdependencies which have so far been held to a one-to-one relationship by Johnson and others.[6]

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[4]Johnson, op. cit., footnote 1, this Chapter.

[5]This reformulation and extension will be essentially normative. We are content to consider the implications in cases where farmers behave as if the model described their behavior when they were concerned with the maximization of certain variables and the minimization of others. When we say, as we shall say, that the farmer "has in mind some approximate number of hours" which he plans to use a macnine, or "the farmer is unlikely to consider a complete range of installment sizes", for example, we use this form of expression as an expositional device. We seek to simplify our presentation. The reader who wishes to verify all such statements could well spend his lifetime doing it. We are yet concerned with the prior determination of whether any such efforts are worthwhile.

[6]For example, Edwards, Clark, "Resource Fixity, Credit Availability and Agricultural Organization," unpublished Ph. D. Thesis, Michigan State University, East Lansing, 1958. Hildebrand, P.E., "Farm Organization and Resource Fixity; Modifications of the Linear Programming Model," unpublished Ph. D. Thesis, Michigan State University, East Lansing, 1959.

These flow-stock relationships are, in turn used in the further analysis.

We shall first begin an example[7] which we shall use throughout the development of the model to facilitate our explanation.

Suppose a farmer is thinking of buying a 6 foot combine. We shall regard that combine as representing a stock of "combining services". We know that the farmer can make more or less major repairs to the combine to keep it going almost indefinitely. We shall consider the stock of services represented by the combine to be only those maintained with "normal wear and tear and standard maintenance".

There is an element of arbitrariness about any such definition of a stock. We nonetheless consider that some fairly generally acceptable concensus of opinion can be achieved on what can be legitimately regarded as the same stock and when the repairs become so major that they are more properly regarded as additional durable production goods.[8]

When the farmer decides on the purchase of the combine, he has in mind some approximate number of hours which he plans to use this machine each year. (He may, alternatively or in addition, think of using this machine for a certain number of acres each year, on the average.) He

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[7] Giving an example to parallel this theory is a dangerous procedure rather analogous to making one arithmetic substitution in an algebraic formula. Indeed, our first sortie toward the development of an alternative formulation of Glenn Johnson's definition resulted from an intuitive dissatisfaction with Johnson and Hardin's exclusive concern with forage evaluation in their study cited in footnote 1. Keeping in mind our reservations on the use of this example, we nonetheless consider its use may be justified by an improvement in the exposition, particularly in helping our further analysis of problems of specialization.

[8] The farmer's trusty axe which is as good as new after only 7 new handles and 3 new heads would be an obvious instance involving addition of some new stock. We may agree that the original stock includes, say, one extra handle. (Mr. William Heneberry was understanding enough to provide this illustration.)

has, in fact, a given expectation of the relationship between the total stock of services represented by the combine and the number of years he may expect to use it, in view of the number of acres of various crops he plans to combine each year.

If he expected to combine double that number of acres, for example, he would expect the useful life of the combine to be halved, more or less, unless drastic repairs were undertaken.

This example illustrates some of the thinking behind the development of the following model. We shall now outline some of the main features of the model. Further reference to the example of the combine will be interspersed.

The Outlay Curve

We shall assume that the purchase plan a farmer selects for a given production good is the one which minimizes the present value of the total anticipated expenditure on this good. We expand this assumption in terms of Figure 1 so that we can later treat "costs" and "returns" on the same diagram.

Suppose an entrepreneur (say, a farmer) is thinking of buying more of a production good. Suppose that the price of this good is high enough to necessitate some use of borrowed funds to make the purchase. Consider only cases in which the present value of all expected repayment installments is the same. "One installment" is deemed to be all the payments made within the one year.

The farmer is unlikely to consider a complete range of installment sizes from purchase by a single installment to purchase by installments just greater than the interest charge. We shall assume that a given farmer considers only a sector of possible repayment plans. The sector

he considers will depend, among other things, on the repayment commitments he has already made and the other uses of funds he anticipates for both production and consumption. There may be other outside (institutional) restrictions on this sector. For example, lending agencies may prescribe a certain minimum installment size. When land is being transferred, some maximum installment size may also be given.

We assume (in accordance with observed conditions in the Problem Area) that these outside restrictions do not preclude the farmer's consideration of all repayment schemes, i.e., the sector of repayments considered may thereby be more closely defined, but not eliminated.

We can graph the relationship between present value of average annual expected installment size and the number of years over which the purchase is planned. Let us call the resulting curve an "outlay curve". (See Figure 1) The farmer seeking to minimize the present value of expected total outlay would elect installment sizes of present value averaging Y_e to be paid for T_e years. (Figure 1) In the case of the combine, for example, payments may be planned over three years. The downpayment may be substantial--the result of a good crop year. We would take T_e to be 3 and would consider that the purchase plan was equivalent to some average present value of installment size (Y_3 dollars) spread over 3 years. This minimum purchase price would be represented by rectangle EO in Figure 1.

The Returns Curve

Conceive of a business (say, a farm business) which is planned to operate with certain resources, the rate of disappearance of which as services can be varied within certain limits in the production of a given

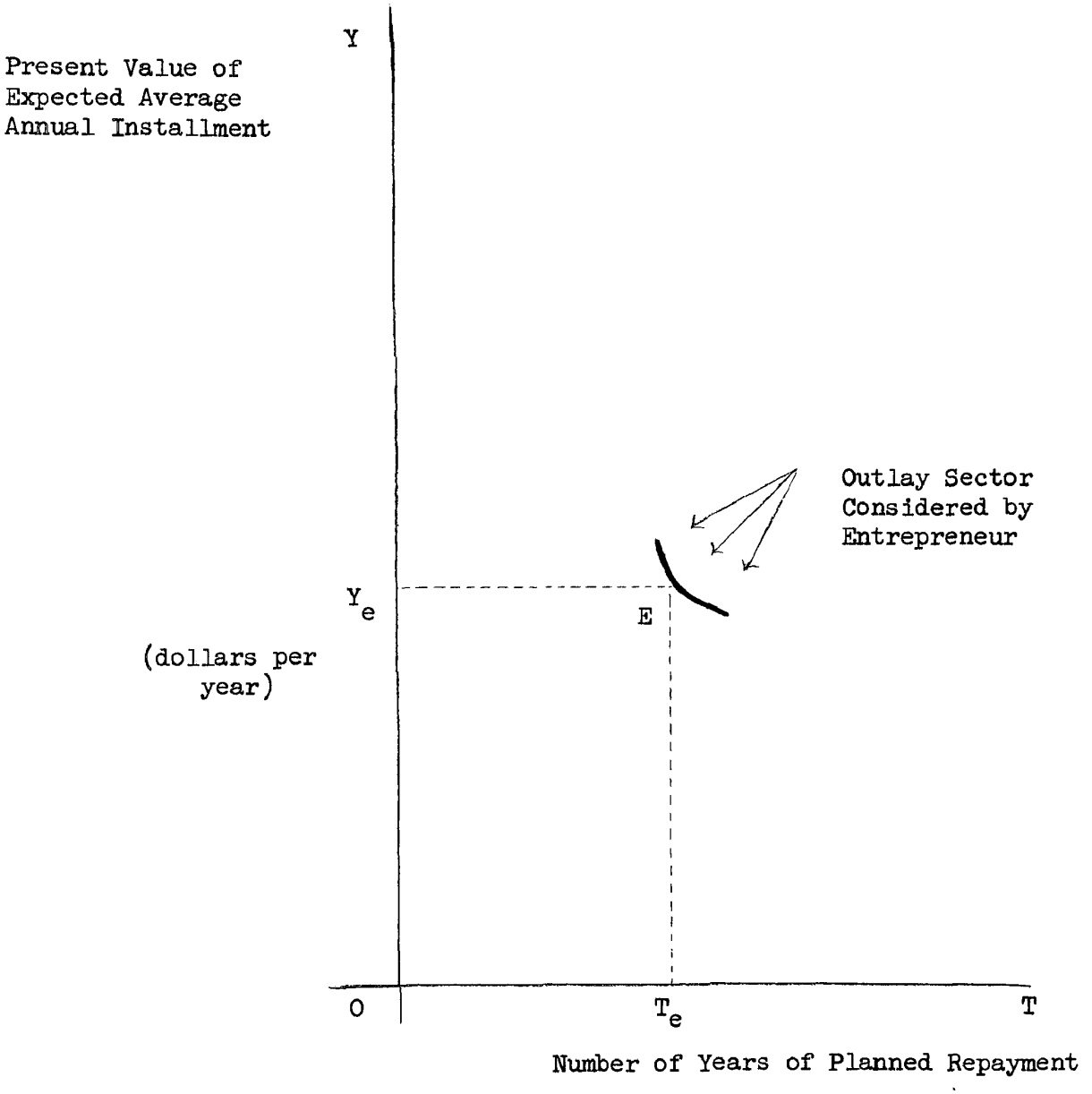

Figure 1. The Outlay Curve.

commodity. The stock of each production good can be thought to generate a certain maximum flow of services during time period $\underline{t}$ and other maxima for various other time periods.

Let time period $\underline{t}$ be one year. Assume certain maximum annual flows of services from all production goods but one in the given business for one year.

Then variation in the rate of flow of services from this one remaining production good for one year can be thought to be associated with a variation in the net average value product per unit of these services.

The maximum present value of this expected net average value product will be associated with a certain expected number of years of life of the stock from which the corresponding production services are generated.

This number of years (or multiple of $\underline{t}$) is not necessarily an integer. Indeed, such an exact exhaustion of the stock in a whole number of years would be a special case. Whatever this multiple of $\underline{t}$ is, the average value product (per unit of service generated in $\underline{t}$) is weighted by this number to give point M in Figure 2B.

We assume that, in thinking of using the services of the production good in question, the entrepreneur has in mind an annual rate of X_m in Figure 2B. This rate will maximize the total present value of expected future returns from using this stock of production good in the business.

We can derive other points on the function about M in Figure 2B. For example, use of only X_r units of service per year instead of X_m will result in a lower average value product per unit of service per year. The corresponding life of the stock will be prolonged, however. Weighting the lower average expected value product corresponding to X_r by this

greater expected number of years of "life" of the stock enables us to derive point R on the weighted average product curve per period T, where T is the total "life" of the stock. By repeating this procedure, we can derive weighted average product curve PMQ in Figure 2B.

We can envisage instances in which the planned annual rate of generation of productive services from a given stock in a business varies from year to year. This variation may also show a trend.

We ignore these complications for the moment. We restrict our attention to cases in which the business is thought to be organized as if the same rate of generation of productive services from a given stock were contemplated throughout the "life" of the stock.

In Figure 2B, then, the rectangle MO represents the maximum total present dollar value of future expected net returns from exhausting a given unit of stock in the business. We assume a constant maximum rate of generation of each of the other productive services. This maximum value of MO will be called the "optimum value". The corresponding ordinate (Y_m) represents the optimum average present value of the future expected net returns over the "life" of the stock per unit of service used each year.

A 6 foot combine would be an example of such a unit of stock. This stock could generate "crop harvesting services" variously measured. One standard measure, for example, could be acres of 40 bushel wheat under "average" harvesting conditions. Another might be foot-hours of cut under "average" conditions for hard red winter wheat.

In general, then, we conceive of a more or less finite (but far from unchangeable) number of units of service flowing from a particular stock of a production good just added to a business, such as will exactly

Figure 2A

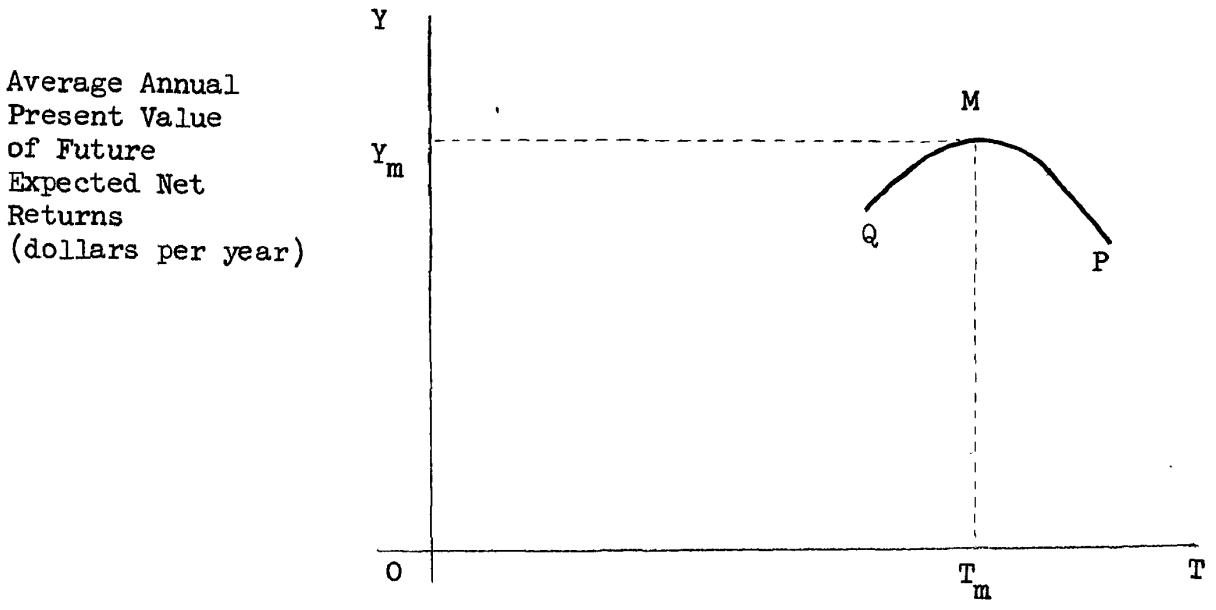

Figure 2B

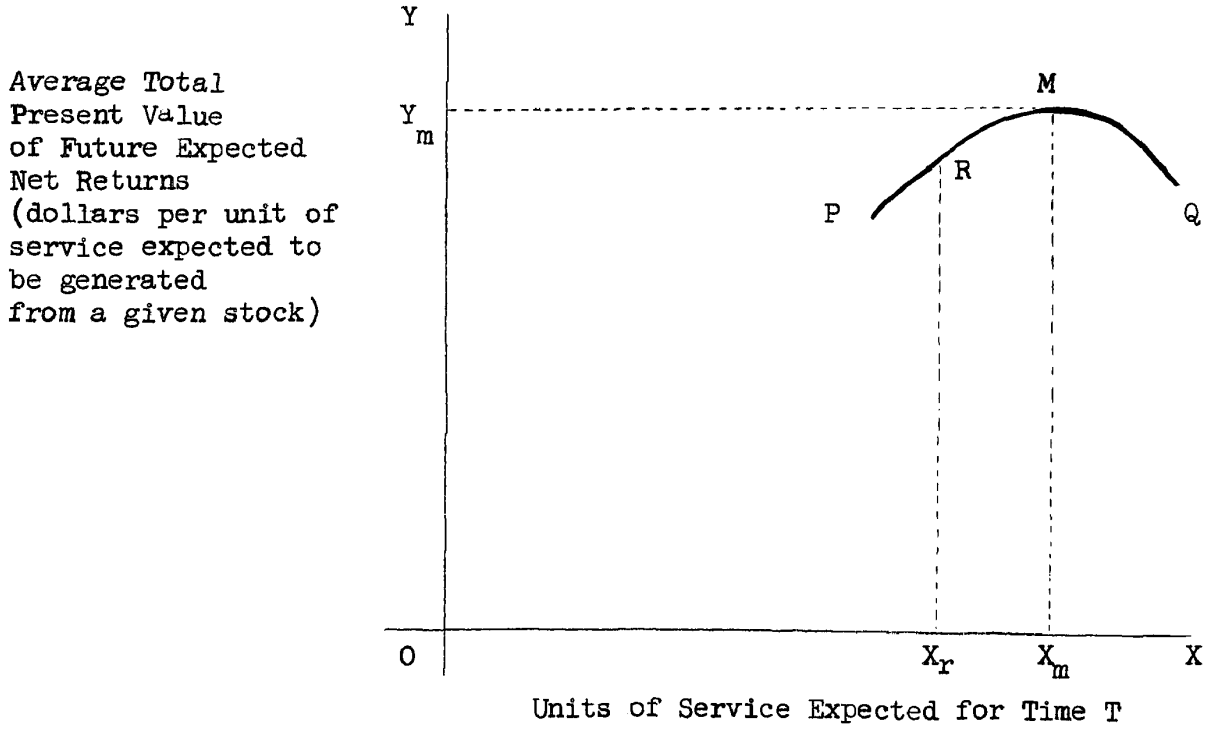

Figure 2. The Returns Curve

exhaust it in period T . This period T is the sum of the periods we call t. Such an assumption is equivalent to assuming an approximate inverse correlation between the number of hours per year for which the equipment (or stock of production good) is used and the total life of that equipment (in years). This assumption was illustrated in our earlier reference to a combine.

Curve PMQ in Figure 2B was derived from the average value product curve normally associated with the law of diminishing returns by weighting each point on such a product curve by the associated expected "life" of the relevant stock.

We now take curve QMP in Figure 2A to represent a transformation of the curve PMQ. Curve QMP represents the average present value of the expected future annual net returns, over the life of the stock, for these same services.

We are merely looking at the same relationship in a different way. This transformation is simply a general formulation of our previous example of the combine, viz., that a man who expected to use the same type of combine on double his former acreage would now expect his combine to last only half as long, short of major overhauls.

The technique used above is similar to the standard transposition of the production function to yield a cost function.[9] The value of Y_m

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[9] A convenient graphic illustration of this transposition is given in Bradford, Lawrence A. and Johnson, Glenn L., Farm Management Analysis, Wiley, New York, 1953, pp. 180, 181. Place a transparent sheet over Figure 12.1 and trace out the axes and the TPP curve. Turn the sheet over, left to right. Then rotate the sheet clockwise through 90 degrees. Superimpose the axes of the transparency on the axes of Figure 12.2. The curve on the transparent paper should coincide with the TVC curve of Figure 12.2. For an arithmetic treatment of a similar transformation, see, for example, Boulding, K.E., Economic Analysis, Third Ed. Harper, New York, 1955, pp. 587-591, especially Tables 57 and 59.

in Figure 2A will usually differ from the value of Y_m in Figure 2B, however. The value represented by the rectangle MO is the same in both figures. Dividing rectangle MO by X_m in Figure 2B gives Y_m; dividing rectangle MO by T_m in Figure 2A gives Y_m.

We shall term the QMP curve in Figure 2A a "returns curve". As in the case of the corresponding curve in Figure 2B, point M on the returns curve represents the optimum rate of use of the given increment of stock, i.e., point M corresponds to a rate of use of services which is associated with the maximum total present dollar value of future expected net returns from exhausting the incremental unit of stock in the business. All positions on the returns curve are conceivably attainable. Otherwise, they could not be legitimately associated with "expected" returns.

In deriving the PMQ curve in Figure 2B (and, accordingly, the returns curve in Figure 2A), we used the average value product curve for services generated from a given stock. Why did we use this average value product[10] curve rather than the corresponding marginal value product curve? We used the average value product curve for services generated because the entrepreneur's only present concern is with getting the greatest return from an increment of stock of predetermined minimum size. The increment <u>is</u> this stock. There is no question of adding a fraction of this stock.

The basic average value product curve we used really refers to the services generated by the increment of stock under consideration.

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[10]The maximum value of the average value product curve of the services of a given stock (which corresponds to the rate of use of services which is termed "optimum" in this analysis) is equal to the corresponding average value product at this point only.

The units of these services are deemed homogeneous. Once the increment of stock is added to the business, any returns from its use are attributed to that increment as a whole, or to the sum of the units of services it is expected to generate over its life-time.

When our farmer considers buying his combine, for example, we assume that he projects the availability of certain maximum quantities of services of associated production goods each year, on the average, over the number of years he plans to use the combine. He makes a simultaneous estimate of (1) the expected annual rate of generation of services from the combine and (2) the expected life of that combine. These estimates are estimates of the optimum rates, i.e., those conforming to point M on the returns curve in Figure 2A.

Deciding on which unit of stock is marginal depends on determining the rate of use of that stock. Johnson assumes that only one rate of use is sought, viz., the optimum rate. Hence we can explain Glenn Johnson's restriction of the applicability of his definition of "asset fixity" to cases involving a one-to-one relationship between "stocks" and "flows".[11] The relationship he considers is that corresponding to the optimum point M on the returns curve in Figure 2A. This relationship is the same as that considered also by Edwards and Hildebrand in the studies already cited.

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[11] Johnson, Glenn L., "The State of Agricultural Supply Analysis", Jour. Farm Econ., forthcoming issue reporting proceedings of A.F.E.A. Winter Meetings, Washington, D.C., December 1959. Johnson has, of course, added this restriction before. We merely give an accessible reference. Each year, the entrepreneur will revise his assessment of this optimum rate of use. Each year, then, he will reconsider whether or not to retain the remaining stock of a particular asset and he will be guided in this decision by his assessment of changes in the optimum rate of use of that asset.

Reconciliation of Present Terminology with Johnson's "Fixed Assets" Definition

Johnson's "marginal value product" of an increment of stock is the same as our "total present value of expected future returns of the services generated from that increment of stock over its life-time". We shall henceforth speak of this value as "total returns".

When Glenn Johnson considers the "fixity" of a "stock", his "acquisition price" of an increment of stock is the same as our "minimum total outlay".

Johnson asserts, in his analysis of stocks, that an asset is "fixed" for a business if the acquisition price of (one more unit of stock of) that asset is greater than the corresponding marginal value productivity of that asset when used in the business which, in turn, is greater than the corresponding salvage value of a unit of that asset removed from the business (or the greatest total return from its alternative use outside the business).

Our analogous definition would be that a given stock of a production good is "fixed" for a business if the minimum total outlay required for the addition of one more unit of stock is greater than the maximum present value of future expected total returns which could be generated from that proposed increment of stock in the business; and this maximum present value is, in turn, greater than the maximum present value of the corresponding (future) expected total returns which could be generated from the most productive alternative use (particularly sale) of that marginal increment of stock outside the business. Under these conditions, none of this "fixed" stock will be sold as such; nor will another unit of the closest substitute be added to the business.

So far, we are merely saying the same as Johnson, viz., we assume that a farmer, or any other businessman, will only commit a dollar to future use in a business if its uncommitted present value is less than the present value to him of the returns he expects it to generate in the business.

No one is likely to deny the plausibility of this statement. We need to develop this analysis further, however, to explain how a farmer comes to favor livestock specialization over cropping specialization.

Let us assume that the most profitable alternative to the use of a certain stock in the business is the sale of that stock. The returns from this sale are represented in Figure 3 by rectangle SO. The value of T_s is one year. (This value is the shortest production period we are considering.) The value Y_s represents the corresponding present value of the expected returns from the sale of the remaining stock of the production good under consideration. In conformity with Johnson's terminology, we shall call this value the "salvage value" of the remaining stock.

We also show an outlay curve (E) and a returns curve (M) on the same diagram (Figure 3). Curve E is transferred from Figure 1 and curve M from Figure 2A.

In terms of Figure 3, we can now state that if a given stock of a production good is bought by a commercial farmer to use in his business, that stock will be described by the following ordering of values:

Rectangle MO $>$ Rectangle EO $>$ Rectangle SO

Moreover, further units of that stock will be bought until, for one more unit, the value corresponding to rectangle MO is less than the value corresponding to rectangle EO.

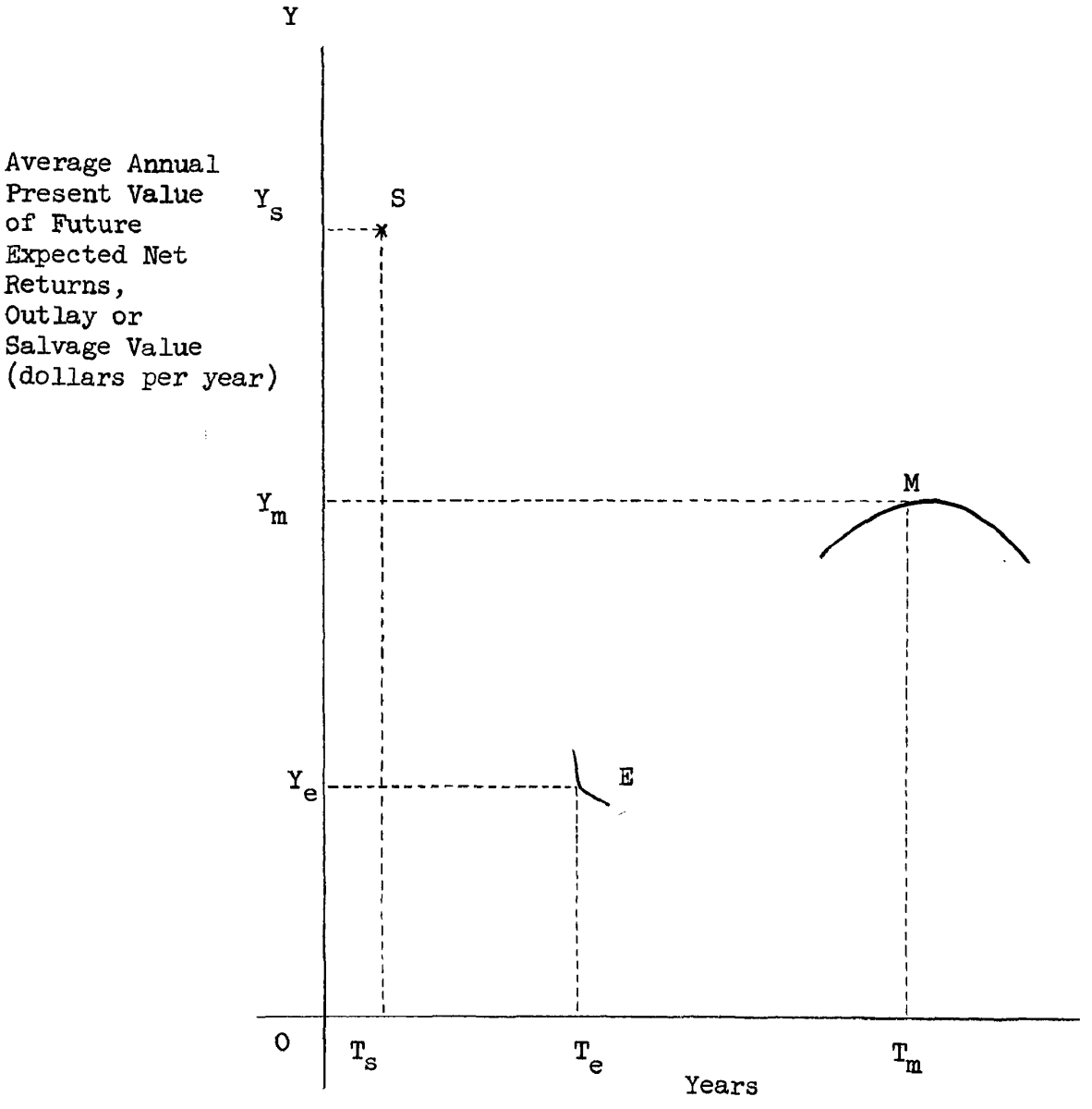

Figure 3. Outlay Curve, Returns Curve and Salvage Value

We can reasonably expect that, at the time the purchase of any of these increments of stock is considered, rectangle EO represents a greater value than rectangle SO. Otherwise, the farmer in question (and other businessmen) could make a profit by the mere transfer of resources to remove market imperfections.

The Replacement of an Initially "Fixed" Stock Under Conditions of Perfect Knowledge and Fixed Technology

Suppose a farmer has now continued to add units of stock until he reaches the unit which is fixed for the business, i.e., until MO for the next unit is less than EO. Each of these units of stock would be, say, a combine or a tractor, or perhaps a bulk load of fertilizer. How can conditions for the replacement of this stock be specified?

Assume, tentatively, a fixed level of technology and the farmer's ability to estimate the values corresponding to the various rectangles in Figure 3 accurately.

Now that the farmer has added the optimum quantity of production goods to the business (with respect to the particular services of present interest) his only concern will be with maintaining this stock in such a way as to maximize his expected annual excess of total returns over total outlay. He will be solely concerned with replacing these units of stock with identical units which he will use at the same rate as before.

The criteria he will use for judging the addition of these new units will be exactly the same as those already specified with reference to Figure 3. But, if he has already added all the units it was profitable to add, how does use of this stock induce him to add more units later?

To answer this question, we begin with a further examination of the conditions of use of the stock originally fixed in the business. This examination will be made in terms of Figure 4 as follows:

Assume that, at the time of purchase of the original stock, the marginal increment of stock is described by rectangle MO (the present value of total future net expected returns) and rectangle SO (the present expected salvage value).

Each successive year, the farmer will revise his assessment of the values corresponding to both MO and SO. The returns curve will gradually be displaced horizontally to the left and downwards in accordance with his revised assessment of the efficiency of the good in question. In other words, the farmer will revise downwards his estimate of the present value of total net expected returns from the stock remaining each year. The ordinate Y_s will decrease at a decreasing rate each year and so will the value represented by the rectangle SO. In other words, the salvage value of the remaining stock will so gradually decrease. (The "stock" is continually redefined to include a lesser equivalent total of services as each unit of services is generated.)

Let T_s represent a period of one year. (We are considering a minimum production period of one year.) Point M will accordingly move to the left only as far as D. Any stock represented by a returns curve to the right of D is a durable. And any stock with optimum returns corresponding to D is an expendable. (An expendable is obviously a special case of a durable.)

Eventually, then, any stock will change over time from a durable to an expendable, under the conditions we have so far specified. In the year that a good comes to be an expendable, the decision to replace it

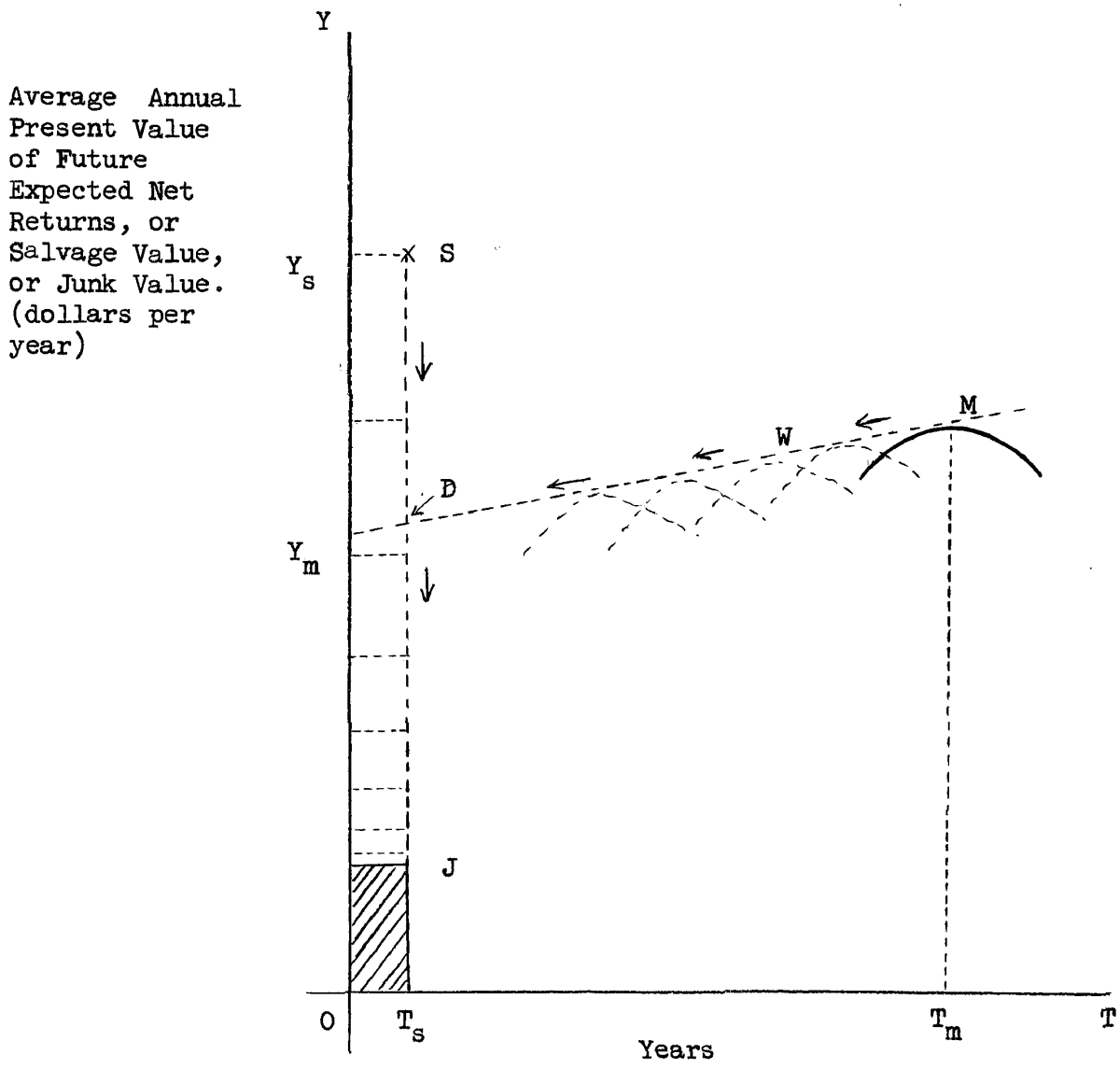

Figure 4. Hypothesized Changes in Returns Curve and Salvage Value of a Given Stock Prior to its Replacement in a Business.

at the end of that year is already made.

If the stock is so "completely used" in the business, it will be sold off for junk at the end of its "useful life", if the "net junk value" (corresponding to rectangle JO) is positive. This net junk value is a common component of both rectangles SO and MO. The junk value was taken into account in the original estimate of the value corresponding to MO. This junk value (JO) also specifies the minimum present value of the expected salvage value (SO).

Suppose the value corresponding to SO exceeds the remaining value corresponding to MO after the stock has been used for at least one year. Then we assume that this remaining stock will be sold at that time.

Consider now the replacement of the original stock by a new stock of the same kind. With the assumptions we have so far included, notably perfect knowledge and a constant level of technology, the entrepreneur will have already taken into account the appropriate salvage value (including the special case of junk value) in assessing the expected present value of expected total outlay for the replacement stock. Since he would thus be merely repeating the same cycle of investment, the replacement stock would comprise the same number of the same kind of units as the original stock.

Obviously enough, the interesting and important resource allocation problems of the modern business do not hinge on the perpetuation of such a standard production cycle.

The above static procedure provides only the beginnings of a description of when a farmer can be expected to buy and sell stocks of a particular asset. We need to examine further the conditions under which a farmer will plan to change the rate of use of an asset already acquired

and, accordingly, change the planned time for which he expects to retain that asset.

Three inter-related shortcomings of the present model in explaining the conditions leading to such a change in asset ownership are as follows:

(1) The model involves the tacit assumption that the farmer has already taken into account the likely future associated changes in stocks of other inputs used in the business when he originally bought a given asset.

(2) The model makes no explicit allowance for a revision of errors in the farmer's estimates over time. We refer particularly to estimates used as a basis for decisions relating to the purchase of durables.

(3) The model takes no explicit account of improved technology on the revision of the farmer's decisions. We refer particularly to "labor-saving" technologies such that, with the same quantity of labor, a greater associated use of producer durables enables a more than compensatory increase in total returns. Such new technologies may include the development of larger units of stock, generating the same type of services, and the development of qualitatively different services.

We shall now give some brief consideration to these shortcomings.

How Can Changes in Business Organization Affect the "Fixity" of a Particular Asset?

We assume that the individual commercial farmer is interested in increasing his net income by using more capital goods in production with no more than the original quantity of labor. (All farmers cannot remain in agriculture and so expand output to increase income, of course.

Moreover, the possibility of some group action to raise farm product prices is not precluded.)

The addition of some of these extra production goods during the one year can be expected to increase the scope for using the stock of the original asset in question, say, a combine. This increased scope for use of the combine results because the optimum point originally predicted for the returns curve representing the use of the remaining stock is now higher and to the left of the original M point.

The more intensive rate of use of the asset presently in the business (the combine) becomes profitable for two reasons. They are: (1) The total present value of future expected net returns is increased and the risk of capital loss through obsolescence is decreased. (2) The estimated excess of total returns over total costs for the next largest available stock of substitute services is increased and the estimated number of years required for the profitable exhaustion of this substitute stock is decreased.

The increased rate of utilization of the present stock of a given type of service gives the entrepreneur additional means (in the form of income) to purchase the larger substitute stock and the incentive to make this purchase (in the form of still greater possible income from the substitute stock).

The Likely Effect of the Farmer's Errors of Estimation on his Replacement Strategy

There are many possible ways in which the entrepreneur could err in his estimates of values corresponding to rectangles MO, EO, and SO respectively in Figure 3. Some of these errors will tend to be reduced as the entrepreneur gains further experience of managing the business.

Others can be reduced by an improved provision of information of actual likely conditions. Some possibilities for errors are likely to depend on the personal attributes of individual managers.

The errors we take to be most crucial to the individual businessman are those the correction of which is beyond his control, as an individual. Those errors we wish to give specific attention are the errors in predicting changes in future prices of the product he plans to produce and changes in future prices of the inputs he plans to use in association with the durable of current interest in producing this product.

Both types of error in price estimation just cited will be reflected in a displacement of the returns curve for the durable of current interest. If he plans to buy a combine, for example, and use it exclusively for harvesting wheat, his decision to buy will depend on his expectation of the price of wheat and the prices of fuel, hired labor, and various other inputs. (Expected changes in the price of the combine itself and changes in the interest rate will be reflected in his assessment of the outlay curve, of course.)

Suppose product prices and associated factor prices change in such a way that the present value of total expected future net returns for the remaining stock of a production good is revised downward. The farmer now considers a lower returns curve as a basis for his production decisions.

If the durable production good in question is used by potential buyers in the same way as it is used by the present owner, the salvage value can be expected to drop more or less proportionately to the drop in the value of total expected returns. Any such tendency to a corresponding adjustment in salvage value will tend to maintain the "fixity" of the

remaining stock in the business.

With reference to Figure 3, the greater the value of T_m and the greater the remaining quantity of stock when the downward revision of the returns curve takes place, the greater will be the reduction in the entrepreneur's "profits". (We use the excess of total returns over total outlay for a durable production good as an index of "profits".)

Other things being equal, an entrepreneur faced with such price uncertainty will obviously prefer to use expendable production goods rather than durables. But "other things" are, of course, far from equal. In particular, at least some new technology such as will raise the returns curve is dependent on obtaining larger stocks of production goods. At least during the development phases of a business, the entrepreneur may very well need to plan to use his new (technologically superior) stock of services over a longer period than the stock they replace.

A farmer wanting to adopt new technologies which involve such an addition of a larger stock of durables to the business will accordingly be more concerned with the accuracy of his pricing estimates. The analysis of the "specialization-integration interaction" which we sketch in the next chapter is meant to explore the feasibility of an orderly introduction of such new technologies by co-ordinating them with market structure and organization.

We originally listed separately the necessity of modifying our model to allow for price changes and the necessity of allowing for changes in technology. We have now developed our consideration of price changes to the point that they are, in part, dependent on changes in "technology".

Before we give further attention to the relationship of specialization to advancing "technology", we interrupt our analysis to add further definitions.

Further Definitions and Assumptions Needed for an Extension of Johnson's "Fixed Asset" Material

We seek to apply Johnson's "fixed assets" material to an analysis of a farmer's production decisions. Our present model does not yet give explicit enough help in making this analysis. We accordingly list more definitions to assist in a further clarification of the processes leading to Johnson's conditions of "asset fixity" for a given stock.

We first define the "limiting flow-stock ratio" for a given production good as the maximum total quantity of services which can be generated each year from a given stock of that good, because of special qualities of the good itself, relevant to its use in a particular business, expressed as a proportion of the total quantity of services which could be generated from that same stock over its life-time. We assume normal wear and tear and standard maintenance of the stock.

We might agree, for example, that the total stock of "combining services" represented by two 6 foot combines is about the same as that represented by one 12 foot combine. Yet, if these alternative stocks of services were to be used in the same business with the same associated stocks of other production goods, we could easily conceive of instances when the respective limiting flow-stock ratios for these two stocks would differ.

Whatever the intrinsic qualities of a given stock of services, moreover, the maximum value of the flow-stock ratio will be 1. Only goods with a limiting flow-stock ratio of 1 can be used in any business as "expendables", if we adhere to our previously elected arbitrary distinction between "durables" and "expendables." But all goods with a limiting flow-stock ratio of 1 will not necessarily be used as expendables. As to the

other likely limiting value of the flow-stock ratio, we are concerned only with goods having flow-stock ratios greater than zero.

We define a "permissible flow-stock ratio" for a given production good in a given business as a quantity of services which an entrepreneur recognizes can be generated each year, on the average for the remaining "life" of that good, expressed as a proportion of the same man's estimate of the maximum total quantity of services which are still contained in the given stock.

There will be a point in the returns curve for a given stock corresponding to each permissible flow-stock ratio. We assume that the limiting flow-stock ratio for a given production good is one permissible flow-stock ratio and that other permissible flow-stock ratio(s) will commonly apply to the same good. (There will always be at least the second trivial flow-stock ratio of zero.)

We define "optimum flow-stock ratio" for a given stock of services as that rate of flow of services of this kind corresponding to the maximum total present value of future expected net returns from exhausting this stock of services in the business. In the case of Figure 3, the optimum flow-stock ratio corresponds to point M in the returns curve.

We define "elected flow-stock ratio" for a given production good as the total quantity of services which the entrepreneur elects to generate, on the average, each year of the remaining "life" of that good, expressed as a proportion of the same man's estimate of the maximum total quantity of services still contained in the given stock.

We define a "type 1" use of a production good as a rate of use of the stock of that good in the business such that the elected flow-stock ratio is less than the optimum flow-stock ratio (i.e., with reference to

Figure 3, the elected ratio corresponds to some point in the returns curve to the right of M.) We can alternatively think of a type 1 use as representing "under-utilization" of a given stock.

A "type 2" use of a production good in a business is similarly defined as a rate of use involving an elected flow-stock ratio greater than the optimum ratio. We can alternatively think of a type 2 use as representing "over-utilization" of a given stock.

We have thus far considered only segments of returns curves wherein each point corresponded to a permissible flow-stock ratio. The shapes of returns curves could still be conceived to vary with the characteristics of the particular stock, even if the services generated from different stocks should comprise indistinguishable units. Yet, irrespective of its special characteristics and any associated peculiarity of its returns curve, each stock could be used in accordance with its optimum flow-stock ratio in a given business.

We now introduce the concept of an "envelope returns curve". This curve is somewhat loosely analogous to the traditional envelope cost curve. (The latter curve is represented as a "longer run" cost curve encompassing numerous "short run" curves.) The envelope returns curve is a hypothetical curve corresponding to the "ideal stock" of a given type of services used in a particular business. (See Figure 5)

There may or may not be a stock available which can be so used in the business that the associated optimum flow-stock ratio corresponds to the optimum flow-stock ratio of the envelope returns curve.

We can conceive of various segments of returns curves of stocks actually available to generate the services in question. The point of optimum returns of each of these segments can be thought to be identical

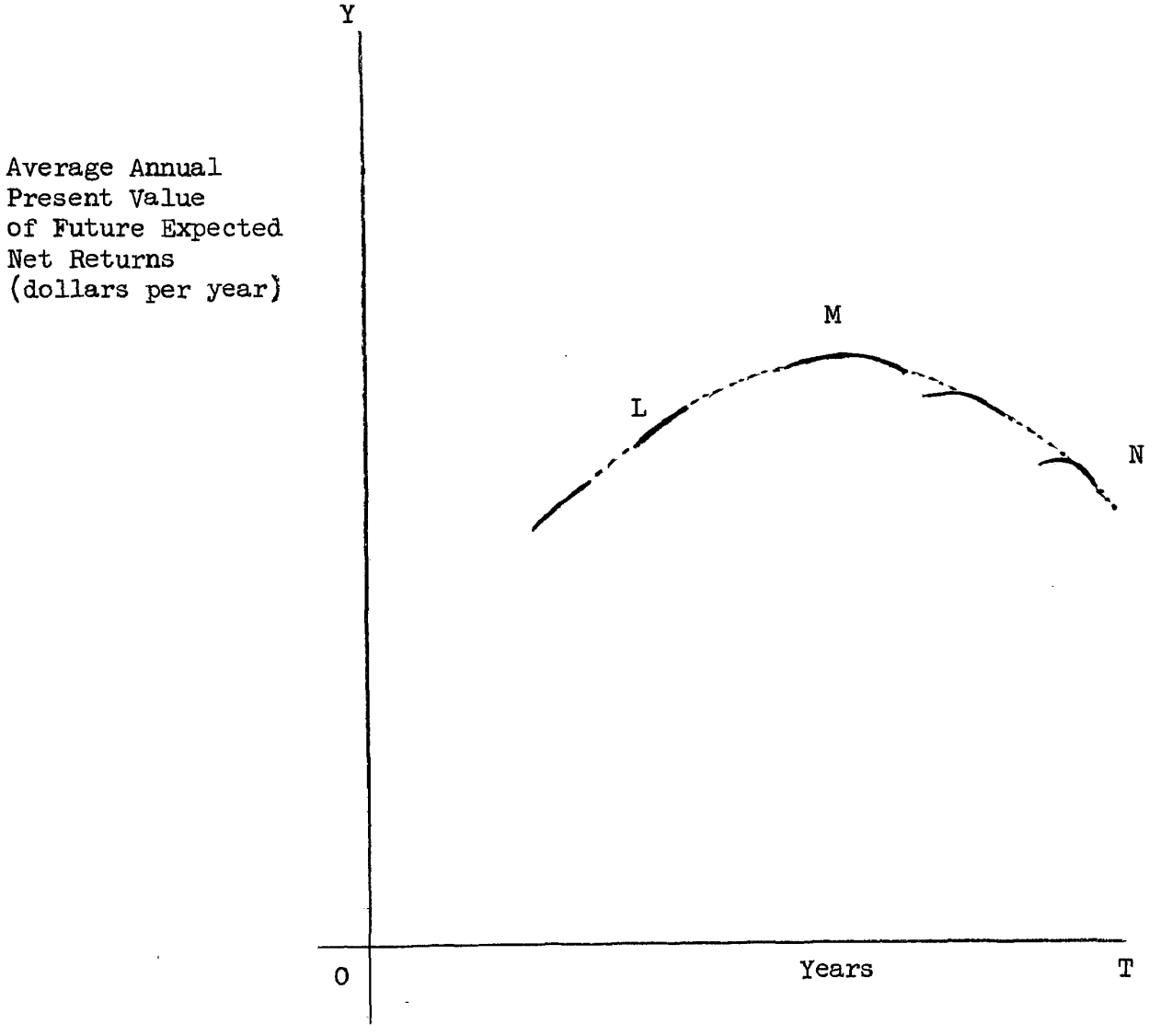

Figure 5. The Envelope Returns Curve.

with one point in the envelope returns curve for these same services in the business with an otherwise given organization. Moreover, either the segment representing type 1 use or the segment representing type 2 use of each of these returns curves (but generally not both) will coincide with part of the same use type segment of the envelope returns curve.

The only instance in which both use type segments of the returns curve coincide with similar segments of the envelope returns curve will, of course, be the instance in which the optimum flow-stock ratio corresponding to this envelope curve is a currently permissible one in the business. An example may help to clarify our presentation of the envelope returns curve and the associated subsidiary, partly coincidental, returns curves. We revert to a consideration of the combine. We have already suggested that two 6 foot combines might be thought to embody more or less the same total quantity of services as one 12 foot combine. We have also suggested the possibility that the limiting flow-stock ratios for these different stocks of the same total quantity of services used in otherwise identical businesses would differ.

The total quantity of harvesting services represented by either of these stocks could be thought to be associated with the one envelope returns curve. The optimum point in this envelope returns curve would represent that rate of use of the above stock of combining services which he would elect, if the stock were available in such a form as would be consistent with that rate of use.

It may be, for example, that the special business organization now open to the farmer is such that the optimum point on the returns curve of an actual stock-form would only correspond with the optimum of the envelope returns curve if the farmer had these services stored in one 8 3/4 foot

combine and one $3\frac{1}{4}$ foot combine. Point M in Figure 5 would represent such an optimum. The optimum for otherwise similar use of a 12 foot combine could be L and that for two 6 foot combines could be N--all points on the one envelope returns curve.

We shall call the 12 foot combine a "stock-form". The two 6 foot combines together or the 8 3/4 foot and $3\frac{1}{4}$ foot combine together are two alternative stock-forms corresponding to the same stock and the same envelope returns curve.

Any entrepreneur can be reasonably thought to use the particular stock of a given type of service he has available in the business at what he thinks to be the optimum rate. (We can concede the relatively minor qualification that this optimum rate will be found by trial and error.)

Allowing For Choice Of The Stock-Form As Well As The Stock As New "Technologies" Emerge

The envelope returns curve provides part of the rationale for the choice of the optimum stock-form for a particular quantity of services as follows:

Suppose that, in its present stock-form, a good is "variable" for a business, since total returns from use of that good exceed total outlay. Let the current use of this good, with respect to the envelope returns curve, be type 1. Assume that the good is used at the optimum rate for its present stock-form.

If the optimum flow-stock ratio of the envelope returns curve is a permissible one, the farmer seeking to increase net income will substitute other stock-forms with higher permissible flow-stock ratios until he elects the optimum flow-stock ratio of the envelope returns curve.

Under the original conditions, then, the stock of services is not variable in that an entrepreneur will be induced to add more units of the same type of stock. Instead, since we are considering only the one envelope returns curve and hence the same total quantity of services, the entrepreneur will be induced to substitute another stock-form for his original one.

Suppose that, for the given total quantity of services we are considering, the optimum flow-stock ratio of the envelope returns curve is not a permissible one. There is not a suitable stock-form which enables attainment of this optimum.

Then the entrepreneur would have an incentive to exchange permissible flow-stock ratios, some corresponding to different stock-forms, until he has attained that point on the envelope returns curve which yields him the greatest excess of total returns over total outlay. The final elected flow-stock ratio could then conform to either a type 1 or a type 2 use, with respect to the envelope returns curve.

Suppose that, in either case, the good is still "variable" by Johnson's criterion in that total returns exceed total outlay. We know that it is not profitable to increase the flow-stock ratio of this good further. Is the good in question then really "fixed" for the business because the excess of total returns over total outlay for any higher permissible flow-stock ratio with respect to the envelope returns curve would be less than for the elected ratio?

We have so far emphasized the consideration of possible changes in stocks to the different stock-forms embodying the same total quantity of services. It is common enough, however, for the various stock-forms of a given type of service to be identified also with different quantities of

services. Moreover, there are situations in which an entrepreneur could be expected to change the total quantity of services of a given type at the same time as he changes the stock-form of these services. Such an instance would be, say, the replacement of a 6 foot combine by a 10 foot combine.

Assume that such a substitution of a larger stock of services is made. If the rest of the business organization remains the same, the new stock of services of the same type will conform to a new envelope returns curve. This new envelope returns curve will be related to the former such curve in about the way returns curve W in Figure 4 is related to returns curve M. In this instance, the addition of the stock-form comprising a larger stock of services would result in a shift to the right in the optimum position on the envelope returns curve from point W to point M.

There will be no point in generating services from the new stock-form at a rate greater than the optimum rate corresponding to W, if the rest of the business remains the same.

Suppose that, with respect to the original envelope returns curve, there was no stock-form with a permissible flow-stock ratio corresponding to the optimum. Let returns curve A in Figure 6 represent the optimum flow-stock ratio of available stock-forms generating the quantity of services corresponding to the lower envelope returns curve AL. (Some of the remaining outline of this lower envelope returns curve is dotted in Figure 6 as a continuation of the attainable curve A.)

Since A represents the attainable optimum flow-stock ratio on the lower envelope returns curve, the only way that "total returns" to services of this type can be increased without changing the rest of the business

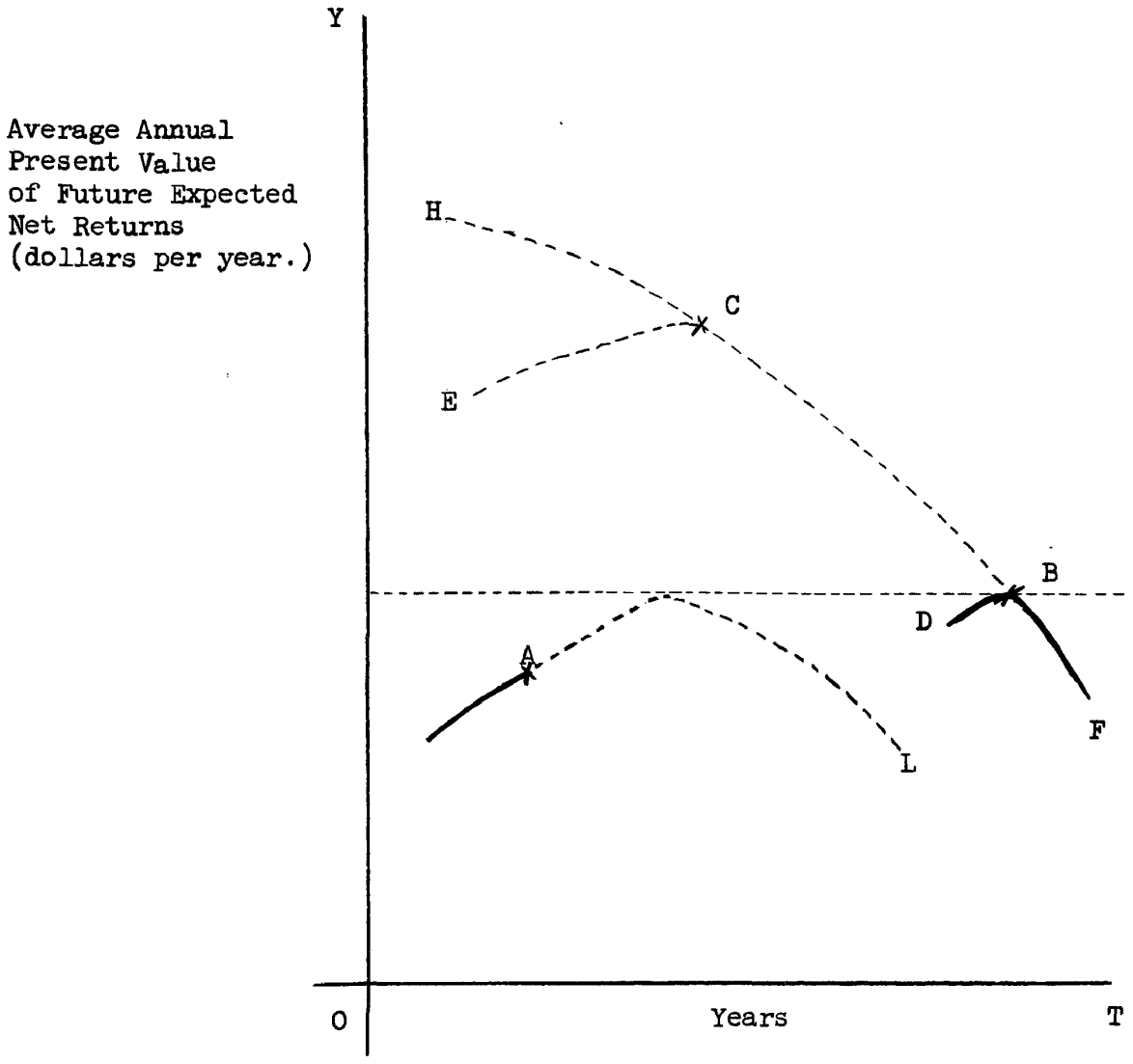

Figure 6. Envelope Returns Curves for Two Different Stocks of the Same Type of Services in the One Business.

organization is to substitute another stock-form embodying a different total quantity of services. Position A could correspond to the use of a 10 foot combine in the business. An alternative substitution would be a 12 foot combine. Use of this latter machine in an otherwise similar business might correspond to position B, for example.

Returns curve DBF is meant to represent the returns to use of a 12 foot combine, as just suggested. This curve partly coincides with the type 1 use sector of the new envelope returns curve. The optimum corresponding to B is limited by the associated business organization rather than the stock-form of the combining services.

Part of the envelope returns curve for the new stock-form (i.e., the 12 foot combine) is represented in Figure 6 by ECBF. Part of the general envelope curve for combining services in the business is represented by curve HCBF.

In Figure 6 then, curves with optima at A and C respectively represent returns curves with optima limited by the stock-form of a particular stock of service. The total stock of the service in question is greater for the curve with the optimum at C than for the curve with the optimum at A.

On the other hand, the curve with the optimum at B represents returns associated with a stock-form which is not itself limiting this optimum. If more complementary associated services were available in this business, the returns curve from this same stock-form would conform to part of BC instead of BD. Only if sufficient complementary services were available to extend the returns curve as far as C would the stock-form again be limiting the returns from the corresponding type and quantity of services represented by envelope returns curve segment HCBF.

We now attempt a somewhat fuller identification of our combine example with points in Figure 6. We already suggested that point A could correspond to the optimum use of a 10 foot combine and the point B could correspond to the optimum returns from a 12 foot combine in the same business.

At the level of associated inputs represented by B, land could well emerge as a factor limiting the optimum to B. Addition of, say, an extra 80 acres to the farm (by rental with adequate security of tenure, or purchase) could enable the attainment of the optimum C for the 12 foot combine stock-form.

Attainment of any higher position on the same envelope returns curve, any position in HC for example, would depend on further modification of the same stock-form. A modification which might enable a partial extension along CH could be the adoption of a self-propelled 12-foot combine instead of a trailer type.

Point F could be envisaged as the maximum of another stock form. This form could be, for example, two 6 foot combines. The optimum could be limited to F (a lower rate of present value of average annual return than A) because labor became a limiting factor in the use of this equipment before it so limited the use of the 10 foot combine.

The Decision to Specialize in Crop Production Related to the Above Extension of "Fixed Assets" Analyses

What can we say about the particular direction of adjustment of a would-be specialist? Can various conditions of the above model be identified with our previously suggested conditions leading to increased cropping specialization? In view of the different approach represented by the "fixed assets" analysis, any such success in identification will

reinforce the plausibility of our previous analysis. We accordingly give a brief sketch of some of the likely conditions pertinent to the decision to adopt cropping specialization.

The crucial case of the forced livestock specialist who would otherwise be a cropping specialist can be identified thus.

This man has a stock of field machinery which he is operating at the permissible flow-stock ratio which results in the maximum excess of total returns over total outlay. (Operating his machinery in this way is consistent with maximizing the excess of total returns over total outlay for the business as a whole.) This optimum position with respect to the currently owned stock-form of this machinery may correspond to either a type 1 or a type 2 use of the total stock of services relevant to the associated envelope returns curve.

He wishes to increase his excess of total returns over total outlay for the whole business. As far as field machinery is concerned, he considers two possibilities. Either he adds to his stock of services used in association with this machinery (including major repairs) or he substitutes another stock of machinery.

Suppose the farmer does elect to substitute machinery. Now suppose the minimum attainable stock of the substitute machinery is considerably larger than the corresponding stock of the original machinery. With the same complex of other production goods in the business, the optimum flow-stock ratio for the substitute machinery will now be considerably lower than in the case of the original machinery. If each group of machinery were used at its most profitable rate, it would take much longer to wear out the substitute machinery.

Such a substitution could correspond to an exchange of position A for position B in Figure 6. In assessing the likely profitability of such an exchange, we have so far suppressed explicit consideration of the likely associated changes in total outlay. We assume that the "technologically superior" larger machine is priced to induce its purchase by commercial farmers who can use it to a sufficient extent.

We have already specified C as the optimum returns for the new stock-form. When commercial farmers are generally attuned to the adoption of new technology (as we maintain U.S. farmers now are), the pricing of the new stock-form is only likely to increase the excess of total returns over total outlay (compared with the excess at point A) if the farmer is so organized that point B (in Figure 6) is not far removed from point C.

Moreover, since we assume that the farmer is persuaded to substitute machinery in the first place because he recognizes that the improved technology incorporated in the newer machines enables him to produce more with one unit of the new equipment and no more than the same quantity of other goods, he is likely to appreciate the probability of further advances in technology. Such a farmer is, then, likely to be anxious to reorganize his business so that the optimum flow-stock ratio for the substitute machinery is as high as possible (except, perhaps, in the time of general economic depression). Otherwise, he would expect to be handicapped in further substitutions because his future outlay curve for machinery would be raised as a result of obsolescence of the equipment he sought to trade.

A farmer buying such large substitute machinery would then be anxious to reorganize his business so that the optimum flow-stock ratio conformed to a smaller number of years of use than before. (i.e., he

would like to shift from point B in Figure 6 to point C.) One obvious way to do this is to increase the use of services of complementary production goods. Increased fertilizer applications, for example, could raise the whole returns curve and perhaps induce some displacement of M to the left. Renting or buying extra land would be another way to induce similar changes.

The availability of services from complementary production goods could be sufficiently restrictive and the required outlay for the substitute machinery so much greater that the excess of total returns over total outlay corresponding to the new optimum could be less than that resulting from the use of the original machinery in the business. In this last instance, the reorganization of the business to increase the availability of services from complementary production goods would be mandatory, if the substitute machinery were to be profitably adopted.

For the above reasons, the farmer seeking to specialize in crop production by adopting larger substitute machinery is likely, sooner or later, to seek to increase the rate of generation of services of complementary production goods, including land. As the minimum required stock of substitute machinery increases, we can expect the need for complementary production goods to increase.

Farmers who are then discouraged from further cropping specialization by uncertainty with respect to possible shifts in the returns curve for substitute machinery due to quality variations in complementary production goods are increasingly likely to have adequate enough equity to turn to alternative enterprises. Moreover, our earlier analysis led us to conclude that increased uncertainty with respect to product prices and prices of associated inputs would tend to discourage substitution

of larger machinery, unless this new machinery would be utilized to its optimum extent.

Conclusion

The above discussion may well appear, in retrospect, as a laborious analysis of the obvious. We felt obliged to make this analysis for several reasons, however. The integration of Glenn Johnson's original "fixed assets" material with our present problem was not immediately obvious. We felt obliged to test the consistency of the two approaches. We felt particularly obliged to make this test because of the paucity of our empirical data. And we sought to test the completeness of our own analysis. We yet consider that the changes in asset fixity over the business cycle due to changes in interest rate and other conditions outside the control of the individual business warrant much more systematic attention in this analysis. Other possible extensions of our model will very likely occur to the reader.

We now suspend further consideration of "fixed assets" and turn to an examination of the mechanics of the product market. We hope to identify needed modifications of the functioning of such a market which will enable production adjustments to be made in agriculture with less danger of hardship from individual capital losses. We also hope to point to the nature of the emphasis needed in product market regulation to encourage further cropping specialization.

CHAPTER IX

A TENTATIVE SKETCH OF THE SPECIALIZATION--INTEGRATION INTER-ACTION IN AMERICAN AGRICULTURE

Any U. S. farmer who plans to specialize by allocating more durable resources to a particular enterprise (to broaden the "extent of the market"[1] by reducing long-run unit costs of production) would be expected to place a correspondingly higher premium on the stability of his markets. We would expect, therefore, to see a complementary development of "vertical integration" associated with such increased product specialization in agriculture.[2]

We assume, in accordance with the arguments of Chapter VIII, that a farmer considers his possible returns from using a durable over more than one production period before he makes the decision to buy it. Any modification of his conditions of production which increases the certainty with which he predicts product prices, ceteris paribus, can be expected to encourage him to buy the corresponding durable production good(s).

Writing in 1947, D. Gale Johnson[3] claimed that "not very much importance can be attached to any reduction in costs that might result from somewhat less emphasis on diversification." He discounted the value

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[1] Adam Smith, The Wealth of Nations, The Modern Library, Random House, Inc., N. Y., 1937, lx plus 976 pp., particularly Chap. III, pp. 17-21.

[2] In the context of problems involved in organizing economic research, Harry C. Trelogan recently voiced a similar view thus: "Integration is required to gain full advantage of specialization." (Jour. Farm Econ., Dec. 1954, p. 841.)

[3] Johnson, D. Gale, Forward Prices for Agriculture, Univ. of Chicago Press, Chicago, Ill., 1947, p. 134.

of reduced diversification of enterprises because of "the complementarity in production that actually exists among most farm enterprises: and because "crop diversification, in so far as it is the result of uncertainty, is probably due as much or more to technological uncertainty as to price uncertainty."

We contend that conditions of agricultural production are changing to reduce the yield uncertainty or "technological uncertainty" cited by D. Gale Johnson. We submit that the likely future trend will be toward still further reductions in yield uncertainty and decreasing complementarity in the production of various agricultural commodities. Developments such as minimum tillage and techniques to permit maintenance of soil fertility and structure with more flexible rotations are examples of this trend.

Under a system of perfect markets, D. Gale Johnson could very well point to yield uncertainty as the basic determinant of income uncertainty for a group of farmers in the one district. Variation in yield could be thought to be negatively correlated with the corresponding market price.

Under a system of administered prices such as agriculture now has, and with a large current surplus of agricultural commodities, immediate adoption of "perfect markets" is inconceivable. The very lack of concensus of opinion on desirable agricultural market legislation is enough in itself to engender considerable product price uncertainty in the farmer.

The farmer's price uncertainty is and is likely to be compounded by product quota uncertainty. Yet this farmer is required to adopt increasingly capital intensive methods of production which result in lower unit costs only if an adequate volume of physical output can be marketed.

Any farmer can be expected to have limited resources at his disposal. Even if he can still retain the same number of enterprises, he is likely to make increasing capital investments in only some of these enterprises in the one year (and has been observed to do so in the Problem Area). His current equity position can be expected to limit his ability to shift to higher (more profitable) returns curves such as shown in Chapter VIII.

One of the features of any program designed to reduce the U. S. agricultural surplus is likely to be the differential price and quota uncertainty for various agricultural products. Such differentials are likely to increase the danger of capital losses to individual farmers from imprudent investment in durables specific to the production of some of these commodities and/or reduce the incomes of these farmers.

Any measures designed to reduce the cost of the U. S. agricultural surplus and minimize corresponding transitional capital and income losses to commercial farmers seeking to increase their efficiency in production will accordingly need to include provision for a co-ordination of investment in producer durables with changing conditions in the corresponding product markets.

Whether widespread adoption of vertical integration with each farmer specialist acting in what he thinks to be his own best interests is, in fact, enough to reduce the U. S. agricultural surplus and reduce the frequency and size of individual capital losses by stabilizing markets is not so obvious, however. Even if we ignore the short-term adjustment problems of American agriculture, extensive vertical integration alone is unlikely to be an adequate enough supplement to government price regulation and production controls to eliminate the U. S. farm surplus. Indeed, the development of this integration could even add to the severity of the

adjustment problems of U. S. agriculture by making further capital losses to individual commercial farmers more likely.

We spell out this danger and an hypothesized remedy by suggesting that the "large scale" specialist farmer could very well initiate vertical integration on his own and profit from it; but that such a scale of production probably occurs rarely, if at all, in agriculture; that the "smaller" specialist or typical farmer, even if he enters willingly into market integration, could well be liquidated by the vagaries of the market, unless some further co-ordination of vertical and horizontal integration is developed; that the development of this co-ordination hinges on the modification of the type of contract used by co-operatives and the provision of competent advice on market outlook to their managers; and that suitably modified contracts could be devised. (We assume that the "competent advice" on market outlook is available.) An example is given of a type of modified contract which could assist the "small" specialist to undertake "efficient" adjustments by aligning his marketing possibilities more directly with his attempts to produce at lower long-run unit costs.

We suggest, in short, that the small farmer has grounds enough for regarding "integration" as a bogey, but that he could find it a boon if suitable contracts were drawn up.

Definitions

"Integration" is a widely and variously used term both among agricultural economists[4] and numerous other groups, including processors

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[4] A small sample of the range of viewpoints is given in the following: Davis, John H., "Policy Implications of Vertical Integration in United States Agriculture", Jour. Farm Econ. May, 1957, pp. 300-312; Capron, William M., Discussion on above paper, Jour. Farm Econ., May, 1957, pp. 317-322;

and farmers. The definition of "integration" is, therefore, of particular importance. Price (as an index of value in exchange) is the integrating medium of all inter-firm economic activity under a modern capitalistic system. In a broad sense, the whole of any such commercial economy is integrated. What special significance do we rather wish to attach to the term? Integration will be said to occur when two or more firms enter upon a formal agreement involving the exchange of a quantity of one or more goods greater than the quantity which would be produced by one of these firms in one production period. We shall take the length of this production period to be one year. The degree of homogeneity of the good(s) will commonly be specified, i.e., some quality control will be exercised. The firms which are parties to such a process of integration will be known as integrated firms; those which initiate the integration will be termed integrators; those which interact with the integrators in the process of integration will be termed integrands. (In most of the following discussion, the farmer will be identified as the integrand and the retailer-processor as the integrator.) A good involved in such an integration process will be known as an integrated good. A good which is sold in a retail market and which is manufactured from one or more integrated goods will be termed a derivative good, with respect to the essentially involved integrated good(s).

The Motives for Integration

The one integrated firm may, of course, expect to gain more than one advantage from integration. A firm's most likely motives are now

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Mueller, Willard F. and Collins, Norman R., "Grower-Processor Integration in Fruit and Vegetable Marketing," Jour. Farm Econ., Dec., 1957, pp. 1471-1483; Leckie, H. K., "Whither Integration?" Canadian Jour. Agricultural Econ., Vol. VII, No. 1, 1959, pp. 53-65.

listed. The first two refer to the seller's motives in a product market (not necessarily a retail market); the third refers to the buyer's motive in a factor market; the fourth takes account of the likely importance of innovations. They are:

(1) To increase the certainty of marketing a given quantity of a good at a given price over a given time period.

(2) To expand the market for a given good (or ensure a certain minimum market) by attempts to sell a larger quantity at the same price or the same quantity at a higher price or some combination of these objectives over a given period.

(3) To achieve and/or maintain a lower level of "unit costs" for a given quantity and quality of good produced in a given period by ensuring an adequate supply and suitable conditions of supply of factors used in the production of that commodity.

(4) To expand the scale of operation and/or otherwise reorganize the business so that new products and/or services can be marketed. An important aim of such a reorganization could be improved quality control of the integrated goods, thereby enabling the production of new derivative goods. These new derivative goods would typically involve, as integrated goods, some goods originally marketed as derivative goods themselves. In some instances, the most potent intermediate motive for integration could be to enable the production of the newly differentiated goods on a sufficient scale to reduce "unit costs" to a level comparable with those of competitive or likely competitive firms. It is in these cases that the interacting effects of the specialization process are thought to be of most likely importance. We shall identify the two

intermediate motives just cited as the "quality control" and the "cost control" or "efficiency" approaches to market expansion.

The Vertical Integration Model

Consider now a case of vertical integration in agriculture. Two "representative" firms[5] will suffice for our initial model. Assume firm R (the retailer) engages in one or more processes with respect to the integrated good, culminating in direct sale on the retail market. R competes for these sales under typically oligopolistic conditions with other firms, R^{1}, R^{11}, ...etc. And assume firm F (the farmer) undertakes the remaining production processes. In each of his product markets, farmer F also competes with other firms F^{1}, F^{11},...etc., but under conditions more closely approximating "perfect competition." With the advent of vertical integration, R becomes the integrator and F's product is now an integrated good. F still has a large number of competitors, but less knowledge of the product market conditions than R. On the other hand, R's factor market (which is F's product market) with respect to the integrated good(s) is now oligopolistic.

Irrespective of any "blanket" elasticity values attributable to "food" or a given derivative good, the demand curve facing R when he tries to sell a derivative good is very probably "kinked" and will be assumed so in this discussion. Even casual observation of the marketing behavior of supermarkets suggests the plausibility of this assumption.[6]

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[5] We use the term "representative" here (and in the rest of the analysis) to denote behavior which occurs "on the average".

[6] For some substantive confirmation, please see: Federal Trade Commission, Economic Inquiry into Food Marketing, June 30, 1959, Washington, D.C.

In conformity with such a kinked demand curve, the extent to which R will engage in direct price competition in the retail market will be very circumscribed indeed. He will be encouraged to exploit non-price competition in the hope of attaining to a more favorable average revenue or demand curve, thereby increasing his total revenue. His main motives for integration will most likely be those listed under (4) above. The "representative" integrand could thus be induced to supply the integrated good because the issuing of a contract would satisfy motive (1) above and probably satisfy motive (2). The extent to which motive (2) was satisfied would depend heavily on the emphasis R gave to "quality control" and the interacting effect of the length of time for which the contract was issued.

At least within the one production season, both R and F could thus gain from vertical integration. R and F nonetheless have directly opposed interests in the price negotiations concerning the integrated good. The likely extent to which the individual commercial farmer is at a disadvantage in this conflict situation will now be examined by considering (1) the farmer's freedom of entry into the market and (2) the retailer-processor's propensity to consolidate.

The Farmer's Freedom of Entry

In our earlier explication of the conflict between the retailer and the farmer, it was suggested that the one retailer (R) can and does deal with many different farmers (F's). There is, moreover, no economic necessity for R to deal with any one F in consecutive seasons. And R's own economic circumstances may cause him to discount any moral obligation he otherwise feels toward a given F. Even if R does choose to deal

repeatedly with the same F, he could choose to offer this F successively lower contract prices for the integrated good. The farmer (F) would be forced to lower his reservation demand because of increased competition arising in one or more of a number of possible ways.

Firstly, some F's who recently benefited from an assured intra-seasonal market for the integrated good in question could thus be induced to expand their long-run scale of operations. While a particular F who has so expanded may, ceteris paribus, be hurt most through inability to renew his contract, subsequent integration of R with a number of such larger F's (farmer integrands) may reduce the number of representative integrands due to local market saturation.

Secondly, a number of new (part-time) F's could have entered the industry because of the promise of a guaranteed price. These "inners-and-outers" could be men with regular off-farm employment who have already made an imprudent investment in capital goods specific to the production of the integrated good in question. They may discount the value of their part-time labor heavily enough to accept contract prices low enough to crowd out some "commercial" F's. Moreover, ignorance or optimism on the part of the would-be part-time F's could be persistent enough and general enough to make further such entrants a constant threat to the representative F. Such a situation is thought to be a reasonable approximation to the conditions of poultry and egg production in some of southeastern U.S.A., for example.

Thirdly, the representative F may be forced to compete with F's who have been deprived of anticipated integration opportunities with other R's through much the same reasons as our original representative F had been deprived of the opportunity to integrate with the original

representative R. Fourthly, the representative F's opportunity for dealing with several R's could be quite limited and has been observed to be so in some instances.[7]

The Retailer-Processor's Propensity to Consolidate

Whether or not all the R's of significance to our representative F are induced to collude, a given R would wish to improve his competitive position (or increase his efficiency) with respect to other R's by reducing his unit costs where possible. Such a possibility could well be the adoption of economies in, say, transportation and processing of the integrated good, involving restriction of the number of F's from whom collections were made. The introduction of bulk handling of milk would be such an example. Some F's could thereby be deprived of a market, or else committed to a reorganization more costly than the benefits they could hope to receive from their very adoption of vertical integration in the first place.

Especially in areas with fairly limited market expansion possibilities for a particular derivative good (a situation which we take to apply to most of the present U. S. domestic food market), competition among R's could be expected to become increasingly severe. While this severity could be considerably mitigated by collusion among R's, at least some price cutting or other equivalent forms of competition would probably precede such an agreement. This price-cutting could result in some casualties among the R's. Even if he is otherwise assured a long-term

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[7] Kampe, Ronald E., "Factors Influencing the Decision of Milk Producers Who Entered and Left the Detroit, Cleveland and Toledo Milk Markets," unpublished M.S. Thesis, Michigan State University, East Lansing, 1959, p. 164.

contract by a given R, then, our representative F faces the constant possibility of greater market uncertainty through the very elimination of his corresponding integrator (R).

A further obvious extension of general collusion is the consolidation of the oligopsonists significant to a particular F into a monopsonist. The U. S. Government, through anti-trust policy, is committed to curbing the development of monopolies (and monopsonies). Accordingly, it appears unrealistic to assume the development of such a monopsony in the United States. Except through the intervention of such official legislative restraints, such an integrator would have no inducement to pass on to the representative integrand any of the benefits of his market expansion program. Moreover, still more F's may then be unable to find a market for their would-be integrated goods. Even if the average revenue curve facing the monopolist is not greatly different from the immediately prior equivalent conditions for oligopolists, the possibility of aggregate inventory reduction alone could tend to reduce the required number of integrand F's. (This reduction may be of only slight practical significance, however, since the primary adoption of vertical integration would probably have enabled the major profitable inventory adjustments among R's to be made already.)

Possible Measures to Strengthen the Individual Farmer's Bargaining Position

If vertical integration occurs in accordance with the above model, any additional intra-seasonal advantages accruing to a representative integrand (or farmer specialist F) could be more than neutralized by the greater inter-seasonal instability to which this F was exposed. We have already suggested that government intervention might enable these

inter-seasonal hardships to be minimized. We now wish to examine the possibilities of countering F's emerging difficulties in other ways. In any case, a government agency seeking to undertake this very relief of hardship would need still further understanding of the adjustment possibilities open to an individual F. And we assume that the representative F would prefer to avoid further involvement with government agencies, provided alternative means of alleviating his hardship, apparently more consistent with "private enterprise", are available.

Assume that the customary freedom of entry for F's is maintained and that we can expect the continued occurrence of some casualties among R's. One possible way our representative F could then protect himself against inter-seasonal price uncertainty would be to hedge his contracts among two or three R's. If these R's were selling in significantly different markets (particularly markets with different competing R's) so much the better. This procedure would ensure the greater independence of the risks involved in the individual contracts. The use of this method of reducing market uncertainty would be most easily adopted by the specialist farmer F who was concentrating his efforts increasingly on the production of one, or at most a few, integrated goods. Such a specialist would be best able to satisfy both the quantity and quality requirements of R's operating in different markets.

It is unlikely that an <u>individual</u> farmer could, in practice, be identified as such an F, although a <u>group</u> of farmers might be.[8] As with any other F, if the specialist farmer F could get contracts from various R's arranged over <u>several</u> seasons in advance, his market uncertainty

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[8] Hence our subsequent emphasis on co-operatives.

would be still further reduced. R's are not likely to be interested in such long-term contracts, however, unless they anticipate a stable state of future technology and a trend toward significant price increases in the otherwise unintegrated good. Neither of these conditions are very likely to occur in food production and retailing. (Possible price increases for additional retailing services are unlikely to benefit the farmer.)

What if the expanding specialist farmer F comes to be a local oligopolist[9] with respect to the particular integrated good? F's disadvantage in bargaining with oligopsonist R, as specified earlier, would now be reduced. But the uncertainty of F's marketing possibilities could well be increased. If F had developed thus far, he could find collusion with fellow oligopolist F's necessary for survival.

Colluding oligopolists are commonly accused of inefficient use of resources. In cases where the allocation of the total market is made on the basis of the volume of past production, so the accusation goes, the tendency is to prevent the adoption of more efficient production methods. Our specialist is unlikely to be harmed by such collusion, however, unless he suffers a severe enough quota reduction to undermine the cost efficiencies he would otherwise achieve from the larger scale production. A reduction of such a size would be unlikely to occur in agriculture without considerable warning. The possibility is there nonetheless.

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[9]The possibility that a specialist farmer would expand far enough to gain a monopoly position in the production of a particular integrated good may be of little immediate practical consequence. To the extent that such a possibility is present, however, a representative F who expands while hedging his marketing among several R's appears to run even less risk of later capital loss by adopting such a specialization program than has been indicated above.

A more potent form of reassurance can be offered the would-be specialist farmer F in agricultural production, however. Any quota allocation is most likely to be based on the previous volume of production. And we would expect that the specialist farmer who has expanded operations sufficiently to classify as an oligopolist would be able to eliminate whole productive units to conform to a quota and still maintain substantially the same degree of economic efficiency. In short, the most appreciable economies due to business reorganization in agricultural production (for example, opportunities for circumventing handicaps due to "lumpiness")[10] are likely to be achieved in the early stages of expansion.

We suggest, then, that a producer F who seeks to gain a permanent advantage from entering into vertical integration can reasonably expect to do so, if he hedges his contracts with a number of different R's. Provided he does hedge his marketing in this way and provided his associated production adjustments are consistent with increased economic efficiency, he probably stands to gain from specialization and expanded scale of operation. Since we have already suggested a desire to achieve this very efficiency as one of the main incentives to specialization, such a would-be specialist should welcome the opportunity to engage in vertical integration. Even if the very adoption of specialization alters F's market status from something approximating a perfect competitor to an oligopolist, he will not necessarily be penalized for undertaking this specialization to improve his economic efficiency.

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[10] By "lumpiness" of an input we mean intrinsic features of that input which permit the generation of services from a given stock of that input at only a few different rates, thereby predetermining a certain minimum necessary increment of stock (larger than would otherwise be expected) for the generation of further substitute services at a certain higher rate in a given business.

The most crucial problem of survival facing the farmer who is a would-be specialist has so far been overlooked, however. What is the most prudent strategy for the F who must face inter-seasonal market uncertainty during the very process of efficient specialization? This farmer is commonly operating on a scale too small to make hedging of contracts with a number of different R's a practical matter. Yet he is the very man who stands to gain most from specialization, if only he can retain his market. This gain will accrue to him because he can achieve the greatest reduction in unit costs from circumventing "lumpiness" in specialized inputs. Moreover, because of the limited rate of capital availability for his expansion program, he will be exposed to this inter-personal market uncertainty for several years.

Could this man benefit from a parallel development of horizontal integration?[11] By entering some form of co-operative agreement with other F's could he then get his share of the benefit from a pooled hedging of contracts with a number of R's? Such a procedure may at least give F some short-term benefit. Such producer co-operatives have rather tended to become aligned with one particular R, however. Unless this R is a monopolist (an unlikely general case, although some instances could be quoted) the entering of a co-operative would then be likely to increase the marketing risks of the individual integrand farmer as the severity of competition among R's increased. Suppose that co-operatives are endowed with top quality management and do manage to hedge with a number of R's operating in different retail markets. Even then,

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[11] The likely importance of horizontal integration as a complement to vertical integration has been stressed, for example, by W. M. Capron, op. cit., p. 318. For the present discussion, "horizontal integration" will be identified with co-operatives.

some modification of their customary methods of quota allocation will now be needed if their individual farmer members are to be guaranteed any long-term market security. (And the would-be specialist, after all, needs such long-term security.)

The crux of the problem posed for the members of a typical farmers' co-operative, we suggest, is that the basis of their present organization involves an attempt to conform to two paradoxical objectives. Despite school lunch programs, development of new products, overseas "dumping" and innumerable other attempts to increase the demand for U.S. farm products, the practicable increase in the demand for these products as a whole appears to depend almost entirely on the rate of population increase. (Even consumer income changes can be thought to be of relatively negligible importance.) Taken in conjunction with the observed accumulation of surpluses, any increase in the efficiency of agricultural production, consistent with higher net incomes for remaining farmers, is likely to involve the elimination of a great number of producers. The mere organization of all producers into co-operatives who assume the functions of R's (i.e., sell on the retail market) and whose members all continue to maintain or expand production is not, of itself, a reasonable solution to this surplus problem.

Attempts on the part of all co-operatives to advance the interests of all members (i.e., F's) in this way, in the absence of government intervention, can be expected to result in the elimination of some such co-operatives (R's) en bloc. How are these co-operatives(and co-operatives yet to be established) to guarantee their farmer members the market stability necessary to induce such specialization as is consistent with increased economic efficiency and yet facilitate the changes in membership

which are equally necessary for economic efficiency? These co-operatives acting as R's can scarcely avoid the endorsement of more efficient production and yet survive in competition with other R's.

One recent proposed solution[12] is to offer individual farmers decreasing prices for successive units produced above their base allocation. Campbell claims that such an offer "would make it possible to establish bases mathematically and mechanically without fear of favouritism."[13] Such a system, he alleges, "would permit a young and aggressive producer to expand his base each year if he were prepared to produce additional units at lower prices."

If a co-operative is to survive long-run oligopolistic competition, it must match its competitors in adjusting supply to demand and increasing the efficiency of production. Leckie has stated this necessity thus:

> "Producing what the market wants, and will absorb, at prices in line with production costs, is still one of agriculture's basic problems. Integration should be judged on the basis of its ability to contribute to a solution.[14]

We would question whether the criterion of "prices in line with production costs" is an adequate one for stating agriculture's "problem" and would prefer to substitute "socially acceptable" prices in the above quotation. In other words, we emphasize the problem of the mechanics of the transition toward "prices in line with production costs" attributable to the individual farmer as the problem. How much of these transitional costs should be borne by the farmer?

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[12] Campbell, D. R., "Toward a New Policy for Agriculture", Canadian Jour. of Agric. Econ., Vol. VII, No. 1, 1959, pp. 66-74.

[13] Ibid, p. 73.

[14] Leckie, H. K., op. cit., p. 65.

The forms of integration represented by the usual producers' co-operative are inadequate to underwrite the risks of what Campbell calls "a young and aggressive producer" in his transition from a small, inefficient operation, producing several products, to a specialized undertaking with appreciably lower long-run unit costs of production. Until forms of integration are devised which do enable such an orderly improvement in production efficiency, the would-be specialist who necessarily expands in stages which are too small to enable him to hedge his vertical integration contracts adequately with several retailer-processors will be vulnerable to capital losses.

Below, we suggest one way[15] of encouraging some members of co-operatives to cease production and at the same time facilitating the efficient expansion of others. We term this modified organization an "efficient co-operative."

(a) Payments to members of an efficient co-operative would be of two kinds, viz., "welfare payments" and "efficiency payments". At the beginning of the season, officers of the efficient co-operative, in conjunction with their economic advisors, would assess the likely demand for their product for the coming year. (They would also give members market outlook for, say, 5 years ahead). They may sign a firm contract--

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[15]There is no intended implication that the present writer had just discovered the problems of co-operatives or that others are unaware of these problems. The suggested "way" is given merely as a more concrete approach to co-ordinating the problems of co-operatives with the emerging problems associated with the specialization process in general. Our suggestions are not even justified in detail--for that would take another book. A notable recent study addressed to the same basic problem is Cochrane, Willard W., "Some Further Reflections on Supply Control", Jour. Farm Econ., Nov. 1959, pp. 697-717.

or they may use estimates based largely on previous years' sales data and their knowledge of the likely changing structure of the market. Annual quotas could accordingly be offered to individual members in the customary manner, on the basis of historical production records. The quotas so allocated would not exceed, say, half the total estimated sales of the efficient co-operative. The extent to which quotas were further reduced would be increased as the uncertainty with respect to the estimate of total sales increased. Payments made to individual producers according to these quotas would be the welfare payments.

The remaining estimated demand would be allocated by public auction to both present co-operative members and prospective members. The number of individual parcels to be offered would be decided by the officers and announced before the auction. (This number may, for example, be smaller than the total number of members, but would usually be at least equal to this latter number). The auction would be a modified form of Dutch auction wherein the quota would be given to the man who made the lowest bid, i.e., agreed to accept the lowest price. (The one man could, of course, bid on all parcels.) The bids thus made would be used as a basis for weighting payments to individual producers for production contracted above their basic quota. (No payments would be made, of course, for non-contracted production above quota levels.) The size of the actual payments would depend on the ability of the co-operative to market this further production. These payments would be the efficiency payments.

(b) For the Problem Area, the development of efficient co-operatives would enable local production adjustments to be geared more closely to changes in local demand. This general co-ordinating mechanism appears

particularly necessary in such an area of urban growth since, even though increased local population may make some further livestock specialization profitable, the success of a few such individuals could easily encourage other farmers, ignorant of local market conditions, to over-expand livestock production, to the detriment of all local producers.

(c) Particularly for areas other than the Problem Area (and notably the cotton and western grain regions), the efficient co-operative could be further modified by placing an arbitrary upper limit on the maximum quota which could be allotted to the one man. This limit would include the production of other men renting from this one man on a share basis. This measure should partly increase the supply of land to would-be cropping specialists who would otherwise be unable to improve the efficiency of their production in accordance with the requirements of the efficient co-operative. Other associated qualifications of this measure will be made later to make it one of the main features involved in the total reduction in land resources.

(d) For all U.S. agriculture, the present limit of $50,000 as the maximum price support payment to an individual could be gradually reduced to, say, $5,000, and finally eliminated for the same reasons. The cost of the price support program to the taxpayers could thus be gradually reduced.

(e) Efficient co-operatives could be licensed. Sale of all agricultural commodities at the farm level through any other channels, except to immediate neighbors, could then be made illegal.

The above illustration is put forward as an example of the type of modified organization a co-operative may need to consider to ensure its long-term survival independent of government agencies, in view of the

likely effects of unguided specialization. If private enterprise is unable to achieve some such form of organization, it may be that government agencies will be forced to intervene further to try to avoid the increased frequency of capital losses by would-be specialists.

Conclusion

If the above analysis is relevant enough to the problems of present and future American agriculture, it can be suggested that the specialist farmer who has capital and enough other facilities to avoid major transitional inefficiencies, notably those associated with "lumpiness" and consequent fixity of strategic inputs, can devise adequate enough complementary hedging procedures to underwrite the risks of market instability. But such a specialist would need to be very large indeed.

The typical farmer (the smaller producer who is more seriously handicapped by inefficiencies due to input fixities as he specializes) is also likely to be more vulnerable to market instability. Horizontal integration in conjunction with vertical integration, as represented by the typical organization of a producers' co-operative, cannot yet be said to eliminate this vulnerability, since there is inadequate provision for changes in membership as improved technology and the resultant pressure toward specialized production tends to promote the production of further surpluses.

Modification of the organization of producers' co-operatives may be needed to enable the co-operatives themselves to survive by assuring their would-be specialist members that measure of market stability which they will very likely need to enable them to bring about sufficient sustained improvements in their productive efficiency. As an aid to

testing this suggestion, an example has been given to illustrate the types of modification which may give farmers this encouragement and also channel their adjustments toward a reduction of the U.S agricultural surplus. These suggestions are meant to be considered in conjunction with our analyses of factor markets.

CHAPTER X

SUMMARY, SOME SUGGESTED PROBLEMS AND TENTATIVE PARTIAL REMEDIES

A feasible farm program to eliminate the U.S. agricultural surplus will necessarily involve a co-ordinated set of measures directed at both agricultural product markets and the markets for the main producer durables. We began our study by advancing this hypothesis. The remainder of this study has been devoted to its development. As a preliminary step in the testing of this hypothesis, we have further specified such a set of measures. These measures have been stated in terms of modifications of existing institutions.

This development was guided by a preliminary field survey in the Saginaw Valley and Thumb Area of Michigan (called the Problem Area). Effort has been concentrated on developing a consistent theoretical framework. This framework includes a reconciliation of a fragmentary extension of Glenn Johnson's analyses of "asset fixity" with the suggested encouragement of cropping specialization as a means of enhancing the feasibility of a U.S. farm program.

A farmer is said to specialize in the production of a given commodity when he deliberately commits extra resources for more than one year to the production of that commodity with the intent of increasing the proportion of his gross receipts derived from that commodity.

Encouragement of cropping specialization is not considered, by itself, to be a promising means of eliminating the agricultural surplus.

Nor has any such claim been made in this study. Instead, we suggested that the strategic role of this measure would be as follows. It would reduce the public cost of compensation of former land owners who are induced to sell their land so that this land can be retired from production; and it would reduce hardship to remaining commercial farmers as they seek to increase production efficiency to match rising urban incomes by increasing physical output. At the same time, other measures have been suggested which are claimed to be likely to reduce the U. S. agricultural surplus by more direct restriction of production.

As background to our hypothesis, we first pointed to some recent proposals for eliminating the U. S. agricultural surplus. Demand expansion in the U. S. domestic market can allegedly be expected to reduce this surplus by no more than one-quarter to one-third of recent rates of accumulation. Short of the discovery of important new uses for U.S. farm products, or a greatly expanded dumping program for these products overseas, removal of at least some 4-6 percent of current resources from agriculture is accordingly needed to eliminate the U.S. agricultural surplus.

Programs recently suggested to remove these surplus resources from agriculture have tended to concentrate on either product markets or important factor markets. Our assessment of these programs necessarily involved some speculation, since the programs themselves have been only partially tried, if at all. We concluded that each of these programs is alone either unlikely to reduce the surplus or, if effective in surplus elimination, is likely to involve hardship to individual commercial farmers by exposing them to severe capital losses. These capital losses would result from an over-investment in durable production goods

(i.e., goods used in production for more than one year). We were accordingly led to suggest the possible fruitfulness of a more co-ordinated consideration of measures directed at eliminating the U.S. agricultural surplus by acting through both product and factor markets.

As an aid to the derivation of such a co-ordinated set of measures, we drew on data from the Problem Area. This Problem Area is one in which there are judged to be numerous local off-farm employment opportunities. The soil is quite good. Several different crops are grown and some livestock enterprises occur. There are judged to be both considerable incentives and considerable opportunities for various profitable adjustments in the farm organization. Our purposive sample of 29 farmers, in conjunction with secondary data, was held to be adequate for the preliminary identification of potentially feasible measures to reduce the U.S. agricultural surplus. This sample was intended as a heuristic aid only.

For the Problem Area, the funds used by the marginal livestock specialist to expand his livestock enterprises by modifying buildings and adding machinery and equipment to the same acreage were reported to be funds which could have been otherwise used to buy or rent more land. At least some of the resources transferred to the marginal livestock specialist from outside agriculture could have been replaced by a redistribution of resources already in agriculture (notably land), if this same farmer had elected cropping specialization instead. Moreover, the previous owners of land sold to such a would-be cropping specialist could reinvest the proceeds outside agriculture, thus further ensuring a net reduction in the total resources committed to agricultural production. (We assume no additional aid from outside agriculture to finance these land purchases).

At least for the purposive sample of 29 farm account keepers we surveyed in 1959, livestock specialization on the part of men who were prevented from adopting further crop specialization was reported to be undertaken by expanding the livestock enterprise while still maintaining about the same crop rotation. The only significant exceptions were livestock specialists who had substituted some (higher valued) grain production for part of their hay acreage.

Encouraging further cropping specialization in areas such as the Problem Area is likely to reduce hardship in these areas, we concluded, both by enabling commercial farmers to take advantage of the plentiful off-farm employment and by reducing likely capital losses from over-expansion in livestock production. This encouragement of cropping specialization would also reduce the public cost of elimination of the U.S agricultural surplus, since it would reduce the extent of necessary government compensation of land owners in areas with multiple product possibilities. This lower compensation would result because these land owners would suffer capital losses (due to product market reorganization) on land with fewer fixed improvements than otherwise.

In multiple product areas without adequate off-farm employment opportunities, some supplementary measures to reduce hardship to farm families during the adjustment process would be needed. T. W. Schultz's "homesteads in reverse" (a plan to subsidize farm families leaving agriculture) is a notable sketch exemplifying such measures.

As a result of a general encouragement of increased cropping specialization, the U.S. agricultural surplus would then be concentrated, perhaps more than before, in the areas of virtual monoculture. Encouraging further cropping specialization in these latter areas would contribute

further to a reduction in individual hardship to local commercial farmers, since it would reduce the necessity for off-farm employment.

The reduction of the surplus in such areas of monoculture could be achieved gradually by a co-ordinated product marketing program and land and field machinery retirement programs. Farmers would be free to bid for increased marketing quotas in accordance with their estimated capacity to improve their production efficiency.

The very large producers would be compensated for land purchased in excess of an area, say, 20 percent more than that needed for the maximum annual use of the largest single piece of mechanical equipment presently used by such a farm.[1]

Public agencies would also buy other rural land offered for sale which would not otherwise be purchased for farm consolidation or non-farm uses. An exception could be made in the cases of parcels judged to be large enough for efficient use as separate units.

Retirement of the land from these two groups of land owners, particularly in regions of virtual monoculture would be the main measure which, of itself, would be concerned solely with the reduction of the U. S. surplus. Such land owners would be given the incentive to sell land both by a ceiling on individual product market quotas and exemption of such sales from capital gains tax, provided the proceeds were reinvested outside agriculture. The "20 percent margin" over present use of equipment is meant to allow for some further technological advances. The main measures of the co-ordinated program which comprise the hypothesis spelled out in this study are as follows:

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[1]This measure does not involve the placing of a permanent ceiling on the extent of future increases in the efficiency of agricultural production. After all, the government will be building up a substantial reserve of public land which can later be used to regulate the rate of adoption of new technologies and alleviate hardship to remaining commercial farmers.

Measures to Improve Contracts in Product Markets

(a) Reducing the likelihood of heavy capital losses on the part of specialists who attempt to maintain or increase their labor earnings from farming, with at least a constant level of return on capital, is likely to depend increasingly on the development of suitable contracts for participants in vertical integration. The danger of capital losses on the part of specialists in general appears to be most severe in the case of farm operators with too small a volume of production in the specialized product to enable adequate hedging by contracting in different markets.

Horizontal integration in conjunction with vertical integration, as represented by the typical organization of a producers' co-operative, cannot yet be said to eliminate this vulnerability. We suggest a needed modification of a producers' co-operative to permit introduction of new members and to require new and continued membership to be contingent on increasing production efficiency, in conformity with increases of other members of the same co-operative and competing co-operatives. Such a modified organization could be called an "efficient co-operative." This modification might be implemented as follows for each of the major farm commodities:

Payments to members would be of two kinds, viz., "welfare payments" and "efficiency payments." At the beginning of the season, officers of the efficient co-operative, in conjunction with their economic advisers, would assess the likely demand for their product for the coming year. (They would also give members market outlook for, say, 5 years ahead.) They may sign a firm contract--or they may use estimates based

largely on previous years' sales data and their knowledge of the likely changing structure of the market. Annual quotas could accordingly be offered to individual members in the customary manner, on the basis of historical production records. But the quotas so allocated would not exceed, say, half the total estimated sales of the efficient co-operative. The extent to which these quotas were further reduced would be increased as the uncertainty with respect to the estimate of total sales increased. Payments made to individual producers according to these quotas would be the welfare payments.

The remaining estimated demand would be allocated by public auction to both present co-operative members and prospective members. The number of individual parcels to be offered would be decided by the officers and announced before the auction. (This number may, for example, be smaller than the total number of members, but would usually be at least equal to this latter number. Perhaps some temporary government intrusion would be needed here--if government supports were still provided.) The auction would be a modified form of Dutch auction wherein the quota would be given to the man who made the lowest bid, i.e., agreed to accept the lowest price. (The one man could, of course, bid on all parcels.) The bids thus made would be used as a basis for weighting payments to individual producers for production contracted above their basic quota. (No payments would be made, of course, for non-contracted production above quota levels.) The size of the actual payments would depend, at least, on the ability of the efficient co-operative to market this further production. These latter payments would be the efficiency payments.

(b) For the Problem Area and areas with similar characteristics, the development of efficient co-operatives would enable local production

adjustments to be geared more closely to changes in local demand. This general co-ordinating mechanism appears particularly necessary in such an area of urban growth since, even though encouragement of cropping specialization in preference to livestock specialization appears generally desirable to restrict the rate of surplus accumulation and reduce the risk of capital losses, one can always expect the comparative advantage of some individual business to change in atypical ways in response to changes in local population intensity and average income.

(c) Particularly for areas other than the Problem Area (and notably the cotton and western grain regions) the efficient co-operatives could be further modified by placing an arbitrary upper limit on the maximum quota which could be allotted to the one man. This limit would include the production of other men renting from this one man on a share basis. This measure should partly increase the supply of land to would-be cropping specialists who would otherwise be unable to improve the efficiency of their production in accordance with the requirements of the efficient co-operative. The measures suggested below for facilitating land transfer are, however, the measures designated mainly to increase the supply of land to would-be cropping specialists. The present measure suggested below for facilitating land transfer are, however, the measures designated mainly to increase the supply of land to would-be cropping specialists. The present measure is concerned mainly with reducing the total land resources committed to agriculture. To this end, the associated provision for the government purchase of this excess land, over a period of years on an installment basis, is made, as already suggested.

(d) For all U. S. agriculture, the present limit of $50,000 as the maximum price support payment to an individual could be gradually reduced to, say, $5,000 and finally eliminated to reinforce the efficacy of measures suggested under (c) above. The cost of the price support program to the taxpayers could thus be gradually reduced.

(e) Efficient co-operatives could be licensed. Sale of all agricultural commodities at the farm level through any other channels, except to immediate neighbors, could then be made illegal.

Measures to Facilitate Land Transfer

At least as far as can be judged from the purposive sample distributed throughout the Problem Area, there appears to be a concurrent, urgent need to develop measures to facilitate the transfer of land to smaller commercial farmers without a prolonged interim period of inefficient use by them. Otherwise, such inefficient use is likely to involve hardship both to the original owner and to the would-be cropping specialist and force the latter to adopt livestock specialization as his family labor force increases. Suggested partial remedies to restrain imprudent investment in livestock include (a) modification of land tenure laws and (b) provision of advice on investment possibilities outside agriculture to widows and other farm owners without heirs wishing to farm.

Under (a), the main suggested revisions are:

(i) That no contract be recognized by marketing agencies (government or private) for the purpose of any price guarantees unless it is written, and for a minimum term of, say, five years;

(ii) That a tenant be permitted to make such capital improvements as drainage which are deemed by a competent technical

agency to be likely to increase the productivity and/or certainty of production from the rented land;

(iii) That any such improvements be made at the tenant's expense (net of appropriate subsidies);

(iv) That an owner who fails to renew a contract with a tenant who has so improved his land be required to make cash recompense to the tenant in accordance with a previously devised schedule, e.g., according to the remaining life of the improvement as specified in an income tax schedule;

(v) That the tenant be permitted to make such improvements unless the owner show cause to competent authorities why he should not;

(vi) That a tenant who has entered such a rental contract be given first preference for renewal and that the only acceptable basis for rejecting his renewal, other than bad husbandry, be that he is outbid;

(vii) That the original rental agreement be held to be transferred with the land in the case of sale, except that the new owner can elect to farm the land himself at the end of the current five year contract, or prior dissolution with the consent of both interested parties, by means of a cash settlement;

(viii) That sale of buildings (including, say, a maximum of a 5-acre lot) be conducted separately from the sale of the remaining land if the land is within, say, a 10-mile radius of an area of significant urban concentration, say, a town of 10,000 people or more.

The above tenure provisions should, among other things, enable older people to keep their "homes" and yet permit them to enhance their possibilities of increasing returns by more profitable investment of their remaining capital.

(b) Provision of advice to widows and older people on these further investment opportunities from a source they recognize as respectable and trustworthy would be another method of getting underemployed capital out of agriculture, improving the incomes of the owners of this capital and encouraging further increase in the supply of land offered to would-be cropping specialists. Widows might also be encouraged to sell their land if they were exempted from capital gains tax on any proceeds directly re-invested in non-agricultural industries.

Measures to Modify Other Important Factor Markets

Some government involvement in other factor markets, notably, the farm machinery market, could apparently assist in the adjustment of individual farm businesses toward a general and likely continued reduction in agricultural surpluses by guiding some would-be livestock specialists toward cropping specialization and controlling the production from extremely large units. To this point, we suggested that, if public agencies would send representatives to bid at public auctions of farm machinery and equipment used in cash crop production, they would encourage older men to dispose of obsolete equipment and hire young would-be cropping specialists with modern equipment to do their field work.

There would probably be some inducement to increase the price of this new machinery. Any such tendency would help to prevent would-be cropping specialists from investing in this machinery unless they were

fully satisfied that they would have an adequate volume of work for it. Some possibilities of capital losses might thereby be eliminated.

Any advantage thus otherwise accruing to machinery companies could be "taxed off"--except that the position of individual dealers in the market who had previously been handicapped by a severe asymmetry in potential volume of trade in new and used machinery would probably be improved. Such a tax could be levied on all new machinery (including equipment for livestock) to prevent encouragement of livestock production by default.

The used machinery so acquired by public agencies could be "junked" or sent to underdeveloped countries in accordance with political expediency.

The Likely Incidence of Costs Associated with the Above Measures

We suggest that the very heart of the political difficulties in current agricultural legislation in the United States could well lie in the doubt or dissatisfaction which special interest groups have of the likely incidence of the costs of any alternative program. Some preliminary estimate of the likely incidence of costs of the measures suggested in the course of the above study is accordingly given.

For the United States as a whole, who is likely to gain and who is likely to lose from the elimination of agricultural surpluses by the adoption of the above measures? We have stressed, so far, the need to avoid extra transitional capital losses to commercial farmers who are striving to become more efficient and we have suggested some measures which we claim can feasibly meet this need. We have included welfare provisions for inefficient co-operative members. Widows and farm

owners without heirs should benefit from provisions to transfer their funds out of agriculture. The industries in which these people invest should likewise benefit from an increased supply of capital. Except for the compulsory restriction on their direction of investment, large landowners who would be forced to sell land or leave it idle because their maximum marketing quota falls far short of their historical volume of production should also benefit. Sale of their land under such forced circumstances would exempt them from capital gains tax and would enable them to invest the entire proceeds in other industries. Manufacturers of field machinery would very likely gain from increased sales. Dealers in this machinery could gain similarly from the easier disposal of used machinery.

The only specially identifiable groups who are likely to suffer reduced sales are the manufacturers of special machinery and equipment for livestock and livestock feed processors.

The cost to the taxpayer could be gradually eliminated altogether (except for administrative costs of supervision). These costs of administration could probably have a reasonable ceiling about equal to the cost of the Soil Conservation Service, even if the government maintained some active representation in efficient co-operatives. (And such representation seems only a prudent underwriting of the extent of maximum government expenditure.) The establishment and observation of pilot programs would be necessary before any pretence at estimation of these administration costs could be made, however.

When we say that the cost to the taxpayer could be eliminated, we apparently overlook the interim loss in revenue from foregoing some capital gains tax. Some price must be paid for the removal of marginal

resources from agriculture to more productive uses elsewhere. And this loss in revenue appears to be part of it. The net cost of this lost tax revenue is, however, likely to be much less than the gross value of any capital gains tax apparently foregone. In the first place, without the adjustment measures suggested above, much of this land would possibly never have been sold on the open market. In the second place, whatever the funds which are transferred out of agriculture into more productive uses in industry, the income tax on these newly invested funds would gradually recoup any apparently foregone tax associated with the initial transfer of these funds out of agriculture.

Some assessment can be made of the likely cost of the required land purchases we have specified. This assessment, which follows immediately, compares more than favorably with the extent of recent Commodity Credit Corporation investments.

The Ellender Report[2] recently assessed the probable market supplies and prices for the major U. S. farm products, and the probable aggregate farm output and level of farm prices for the period 1960-65. This report was made with the following assumptions: (1) that all production controls except those on tobacco were removed, and (2) that price supports were maintained at levels which would permit an orderly reduction, over a 7 to 10 year period, in the "current excessive stocks of storable farm products."

The types of production adjustments consistent with the Ellender Report are the same as those envisaged in the present study. The extent of acreage retirement assumed in the Ellender Report should then give an

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[2]"Farm Price and Income Projections, 1960-65", 86th Congress, 2nd Session, Senate Document No. 77, Washington D. C., January 20, 1960. The Ellender Report is thought by some economists to give a conservative estimate of the extent of agricultural adjustments required to eliminate the agricultural surplus.

indication of required extent of land purchase by public agencies in accordance with the present hypothesis. The Ellender Report assumes that some 36 million acres of potential cropland will be held out of production by 1965. This 36 million acres includes a projected 30 million acres in the Soil Bank. Some associated assumptions need to be considered as follows:

There is a projected withdrawal of 7 million tons of excessive feed grain stocks annually throughout the projection period. In addition, by 1965, it would allegedly be necessary to feed about 9.8 million tons of wheat more than current rates of wheat feeding.

In view of the emphasis we place on increasing the efficiency of the remaining commercial farmers, we now inflate the Ellender estimate of needed land retirement from 36 to 50 million acres. We do so to get an estimate of the likely maximum cost of land purchase.

The figure of 50 million acres is J. Carroll Bottum's reported estimate[3] of the needed land retirement to eliminate the surplus by means of the conservation reserve. Bottum's estimate reportedly might vary as much as 20 percent up or down, depending on the type of land taken out and the type of program used.

Since we are assuming that the bulk of land purchase will be concentrated on cash-grain and cottom farms (in accordance with the 1954 census definition), the ceiling of 50 million acres appears acceptable, even with considerable increases in production efficiency.

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[3]Bottum, J. Carroll, "The Conservation Reserve", Proc. of Iowa State College Feed Livestock Workshop, Special Report 24, Center for Agricultural Adjustment, Iowa State College, Ames, Iowa, 1959 as quoted in the Ellender Report, op. cit., p. 18.

Assuming an average land valuation of 150 dollars per acre,[4] the total cost of the land purchase program would then be $7.5 billion. Even allowing interest payments on the outstanding balances of land contracts spread over, say, 5 years at 5 per cent, the total cost of the land purchase program should not exceed $10 billion, or $2 billion per year for about 5 years.[5] This cost compares more than favorably with the current estimate of the annual cost of Commodity Credit Corporation operations of some $11 billion (See Chapter II). Moreover, the cost of the land purchase program needs to be deflated to the extent of the parallel reduction it induces in the cost of the Commodity Credit Corporation operations and other reductions in program costs.

Perhaps it will be held, then, that the above examination of the importance of specialization as an agricultural adjustment has led us to suggest a first approximation to measures for the elimination of U. S. agricultural surpluses. Perhaps these measures will be held to involve changes which are close enough to Pareto-better to be politically feasible. Whatever the measures under consideration, some men are very likely to be worse off as a result of their adoption. The measures sketched above appear to enable most interested parties to be better off. We have not, however, given explicit attention to some of the social costs involved

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[4] See "Current Developments in The Farm Real Estate Market Nov. 1958-March 1959", ARS 43-101 (CD-52) U.S. Department of Agriculture, May, 1959 pp. 24-25.

Some examples of average land values ($ per acre) for 1959 are: Illinois 294.19, Missouri 106.95, Corn Belt 219.71, Mississippi 101.07, Delta States 112.91, Southern Plains (Oklahoma & Texas) 77.49, Northern Plains 71.67, Washington State 141.25, United States 108.11. Estimates based on projections of 1954 census data.

[5] Compare an independently developed suggestion of a land purchase program in: Kaldor, Don, "Adjusting Resource Organization and Allocation", in Problems and Policies of American Agriculture, op. cit., pp. 322-337.

in this surplus elimination. Our measures to promote cropping specialization by small, young producers in areas of virtual monoculture are meant to reduce the incidence of "ghost towns", for example. There is still a need for a more systematic consideration of these social costs.

Testing the Hypothesis

The general hypothesis advanced in this study is that a co-ordinated set of measures of very broad scope will be needed to eliminate the U. S. agricultural surplus. As a further illustration of this hypothesis, a specific set of such measures has been outlined. Establishment of the inefficacy of the particular set of measures we have suggested will not refute the general hypothesis. We could merely conclude that the set of measures we have specified was an inappropriate set for removing such a surplus.

No special mandate is held for the set of measures we have used to illustrate this general hypothesis. We present these measures as a "talking point." We regard their presentation as a necessary step in the derivation of a set of measures which may be worth testing--a largely dialectic prelude.

As a further step in the derivation of such a set of measures, we need to detect and eliminate possible contradictions in our detailed formulation of the hypothesis before any further testing is worth-while. This study has so far been directed primarily to the satisfaction of this need. We now suspend further analysis so that the help of others may be enlisted in meeting this need and deriving potentially more fruitful formulations of the general hypothesis.

Suppose that competent critics scrutinize the foregoing arguments. And suppose that these arguments are upheld or consolidated into an

improved framework. What further tests can be undertaken prior to any direct experimentation?

The need for a more minute specification of the mechanical details of a proposed program embodying any such measures as outlined above is obvious enough. Further recourse to data in an assessment of likely transfers of costs and benefits can be profitably envisaged. Estimates of several independent analysts would be required.

Preliminary national stratification of farming regions for such estimates would involve the segregation of areas of virtual monoculture from areas with several enterprise adjustment possibilities and, notably, areas with possibilities for specialization in livestock production. A cross-stratification would involve the separation of areas with adequate local off-farm employment opportunities from other areas.

For each sub-region so derived, a more closely defined estimate of the likely net costs of an agreed specific program involving such measures as the above could be evolved. There would be room for the application of several approaches in arriving at these estimates. Budgeting or linear programming could be used in assessing likely needed expansions in farm size to facilitate use of the available field machinery, for example. The analysis would project the likely efficient production adjustments. Surveys of subsamples within each sub-region would be concerned with assessing likely reactions of farmers to proposed measures.

When agreement is reached on likely promising measures, however, (or the extent of disagreement appears to be minimized) only the implementation of such measures can provide a real test of the hypothesis. Survey reports of what farmers "would" do under certain conditions may be found to bear little resemblance to what they actually do.

What Does the Commercial Farmer Do Now?

The above analysis has been oriented toward suggesting possible modifications of the U.S. agricultural policy which are feasible and likely to reduce the national agricultural surplus. In view of the hypotheses advanced and the seemingly consistent empirical data and theoretical analyses, what interim advice can be given to the individual farmer who is now faced with the necessary choice of livestock or cropping specialization?

If the present farm program continues, or if product prices are gradually reduced, or if some such measures as those given above are adopted, the farmer who has above average yields for his crops and livestock (without unusually high expenditure) has little to fear. He can probably make a success of either cropping or livestock specialization, provided he expands in units large enough to keep his family labor force fully employed. In any case, he would be well advised to get a firm marketing contract for as long ahead as possible. This procedure appears to be particularly desirable for livestock specialists who need to invest large sums in equipment which will not be easily sold off the farm.

With either a gradual reduction in product prices or some such measures as suggested above, the man with below average yields would need to hesitate before making large investments in any farm business expansion program. If he does specialize, he would best follow a similar course to that already indicated for the man with high yields. He will run less risk of capital loss if he refrains from investing in goods which cannot be readily sold off the farm. If off-farm employment is available, he could well be advised to take advantage of it and resort

to part-time crop production from the farm until he can improve his yields.

Conclusion

The apparent vagueness of these recommendations at the farm level serves to point to the dominant importance, for individual farmers, of a prior resolution of the national policy issues regarding agricultural production. We revert then to the major emphasis of this study. At least we are confident that others will find plenty of scope for improvement in it. We can only hope that they have the incentive to make these improvements. Meanwhile, we stress that we have merely sketched an hypothesis. We have not presented an action program ready for immediate adoption. Even so, one of the very outcomes of a further discussion of such a set of measures could well be a deflated sense of urgency concerning the need for alternative farm programs in the United States.

APPENDIX A

1959 COMPARATIVE LIST PRICES AND SPECIFICATIONS OF SUGAR BEET HARVESTERS

Make	Model	No. of Rows	Row Spacing	Cart or Tank	Weight (lbs.)	List Price
McCormick	11-B	1	18" up	Cart	4740	$3745
McCormick	22	2	20" to 24"		3213	2804
McCormick	32	2	26" to 36"		3582	3159
McCormick	32	3	20" to 24"		3837	3471
Farmhand	250	1	20" to 22"	Tank	4625	3656
Farmhand	250	2	20" to 22"	Tank	4843	4027
Farmhand	300	2	20" to 42"		4165	3448
Farmhand	350	2	24" to 42"	Tank	5558	4565
Farmhand	300	3	20" to 22"		4383	3819
Farmhand	350	3	20" to 22"	Tank	5776	4936
Farmhand	400	4	22" to 24"		4792	4706
Gemco	Std.	2				2696
Gemco	Super	2				2935
Gemco	Std.	3				3357
Gemco	Super	3				3797
McCollum		2				2725
McCollum		3				3360
John Deere	100-A	1		Cart	5597	3646
John Deere	200-A	2	20" to 22"		6583	3925
Marbeet	59E22	1		Cart	3740	3580

Source: International Harvester Company, 180 North Michigan Avenue, Chicago 1, Illinois (Farm Equipment Sales Department)

APPENDIX B

SURVEY QUESTIONNAIRE

CONFIDENTIAL FARM NO. _____

Budget Bureau No. 40-5943
Approval expires
August 31, 1959

Date:
Time begun:
Time ended:

MICHIGAN AGRICULTURAL EXPERIMENT STATION IN
COOPERATION WITH FERD, ARS, USDA
1959 Special Farm Management Survey
of Account Co-operators

1. Good (morning) Mr..... My name's Bird--Al Bird.
(afternoon)
(evening)

You probably had a letter from Warren Vincent ... a few days ago telling of my visit. I called you about the MSU accounting project. As you know, we've been wondering whether you had found these accounts useful and whether you had any criticism and suggestions which would make the service more useful to you. If you could give us some more detailed information about the 'snags' you've found in using them, we may be able to improve our service to you--and all the other co-operators, too. I'll try to make the interview as short as I can and, of course, any information you give will be treated as strictly confidential.

Do you have any particular criticism you'd like to give me?

Would you mind giving me a little background information first?

2. When did you first take over control of this farm? (Specify means of acquisition)

3. Was this your first farm? (Specify previous history)

4. What do you consider to be your main enterprise?

5. Have you added or dropped any crops or any lines of livestock over, say, the last 10 years?

6. Would you mind telling me why you made these changes?

7. What crop rotation do you use?

8. What do you consider to be the main value in keeping these accounts?

   (a) Helps plan farming operations
   (b) Tax purposes
   (c) Other (specify)

9. Can you think of any other ways in which you've found these accounts useful?

   (a) Helps plan farming operations
   (b) Tax purposes
   (c) Other (specify)

10. One way we've found the accounts useful in adjusting farm plans is to go through the inventory sheets and list for <u>each year</u>, all the big items of machinery bought, all the big changes in buildings and equipment and amount of land farmed and in the livestock carried. I've done that for your farm--here's a copy for you. But there are a few gaps in dates of purchases. I wonder if you'd mind going through the sheet with me and patching up the gaps? (Go through sheet systematically) Probably the first thing you notice about that sheet is the really big amount it's cost you to keep this place going. Maybe we can get a little more use than that from it though.

<u>IF LAND BOUGHT OR LEASED, ASK ALL 11- Otherwise start at 11H</u>

11.A How did you come to (buy / rent) that acres just when you did and not some other time?

Bought / Rented) from

   (a) Friend or neighbor (not relative) who still farms remainder
   (b) Friend or neighbor who quit farming and sold out
   (c) Estate of friend or neighbor per private sale
   (d) Estate of friend or neighbor per public sale
   (e) Relative who still farms remainder
   (f) Relative who quit farming and sold out
   (g) Estate of relative per inheritance
   (h) Estate of relative per inheritance plus buying out shares
   (i) Other (specify)

Purchases Leases

B. What method of figuring did you use to decide that you needed that land?

C. Did you look at any records? If so, what?

D. What was the land used for before you took it over?

E. What sort of yields do you think it was giving?

F. (If not already volunteered) What do you use it for now?

G. If any more land around here came up for sale, would you be interested in buying it? (a) yes
(b) no
(c) D.K.

H. "If 'yes' or 'D.K.' to G) How much more land do you think you need? acres What would you grow on it?

I. (If 'no' to G) Are you interested in selling any then? (If yes, specify acres)

J. Can you think of any land around here that is likely to come up for sale in, say, the next 5 years?

K. Have you ever had any choice of buying or renting the same piece of land?
(a) yes
(b) no

L. (If 'yes' to K) Which did you do? (a) Buy
(b) Rent
(c) no transaction

M. Was this just a special case or would you always act this way?
(a) Always buy
(b) Always rent
(c) Other (Specify qualifications e.g. desire to avoid property tax)

N. Just before you bought that land, did you have any other particular plans to use this money which made you hesitate to make the purchase?

(a) yes
(b) no
(c) D.K.

O. (If yes or D.K. to N) Was there some really big thing that happened to make you finally decide to buy the land anyway? (If yes, specify)

P. Which is easier to do around here ... rent or buy land?

(a) rent
(b) buy

12. Have you ever felt that the limitation on your acreage here was severe enough to consider selling up and moving to another district? (Note qualifying remarks)

13. Do you know of any people around here who have?

14. Do you know of any other reasons besides not having enough land which would make you want to sell up and move somewhere else? (Note effects of taxes)

15. Have there been any times when you've tried to get more land--either to buy or rent--but couldn't?

(a) yes
(b) no
(c) D.K.

16. When was it and what prevented you? (Was this land sold or leased, left idle or put in soil bank, etc.?)

17. Do you think you could add to your acreage easily now if you wanted to?

18. How much of your land still needs tiling? acres

19. When do you plan to finish your tiling?

20. Are there any particular reasons why you can't finish it? (Note effects of rotation, availability of outlets, income, etc.)

(PROBE:
(Can you think of any particular years when you'd planned to do tiling but couldn't because of lack of funds? (If yes, specify cost details.)

Now let's look at those summary sheets some more and see if we can find anything useful from your pattern of machinery purchases.

There looks to be some grouping. (Point out years)

21. When you went to buy any of these tractors, did you just think of buying the tractor alone or did you have some particular items you intended to buy with it?

22. Do you always trade at the same dealers? (Specify reasons for 'yes' or 'no')

23. Are you fully satisfied with the after-sales service you get?
(a) yes, fully
(b) suppose so
(c) D.K.
(d) disappointed
(e) very disappointed
(Specify separately for different implement groups or dealers)

24. Are you satisfied you get all the information you need to help you decide what machinery to buy and when to buy it? (Specify reasons for times of purchases)

25. Where <u>do</u> you get your information you need to decide on buying an implement? (Work through particular implements)

26. Do you have any preferences for particular brands of machinery? (Tractors, other, specify) (Note emphasis on dealers rather than machinery)

27. Can you give me any experiences you've had (or that your neighbors have had) that have helped to make you form these opinions? (Note e.g. whether same or similar implement has already been tried and/or observed at a neighboring farm.)

28. Some of this machinery is very expensive. Have you ever needed to get credit to buy any items? If so, from whom, how much, when, terms?

29. Have there been any times when you've bought a tractor or an implement and, after you've tried it a while you wished you'd never bought it? (Specify times, implements, reasons)

30. Have you ever sold or traded any fairly new implements because you were disgusted with them? (Give details)

31. Do you have any regular number of years you aim to keep a car, truck or tractor before you trade? If so, would you mind telling me what? (If claims to keep long time, ask about advantages of technical improvements and writing off against income tax.)

32. Have there been any changes in the family ages and members who stay at home which have influenced you in deciding whether to buy more land, machinery, or maybe make some domestic expenditure which you'd otherwise have used on the farm?

33. Now let's look at any big expenditures on buildings and maintenance. How do you go about deciding what improvements to make to the land and buildings and when to make them?

(Point to periods of regular total investment--determine extent to which expenditure in improvements is a residual expenditure.)

34. Have you ever used any credit to finance additions to buildings? (Specify)

35. Do you have any complaints about credit agencies? (Specify sources of credit used.)

36. Do you have any objections to using credit or do you use it only for particular items? (Specify uses and attitude to credit)

37. In looking at farm accounting results supplied to you by MSU, have you ever been led to do anything about changing your farming by comparing your records with those of similar farms in the same year?

Changes in cropping and livestock systems (Specify)

Changes in day-to-day running, e.g. fertilizer, feeding rates

Changes in other inputs, e.g. amount of hired help

38. Do you have any difficulty getting hired help when you need it?
    (a) yes
    (b) no
    (c) D.K.

39.A Have there been any times when you've made big changes in your farming operations because of dissatisfaction with hired help? (Specify)

39.B What about changes you've made in, say, machinery and farm organization to cut down on your own chores? Have you made many changes to make your own labor go further?

39.C Can you think of how many days in the last 5 years you've had off the farm in which you had someone else to take care of the livestock?

39.D At least one farm machinery dealer in another district has started a "cow sitter" service so that farmers can take an occasional day off. If you thought that a reliable man was available on a daily or weekly basis, how much do you think you'd use the service and how much per day would you be willing to pay? (Specify number of days or weeks and month of year or relation to family sickness, etc.)

40.A Have government support programs on corn and wheat or the soil bank forced or induced you to make any big changes in your farming operations?

40.B Would you change back if these government programs were removed? Specify.

41. Have you had any other big changes in operations forced upon you, e.g. bulk milk tank? If so, when, by whom, how much did it cost, nature of change and subsequent further changes you made in your organization?

Change	Year	Instrument	Cost	Remarks on further changes

42.A Do you expect to make any big changes in your farming operation in the next five years? If so, what, when, at what cost? (If no to 42A, ask 42B)

42.B What effect will price changes have on your decisions? (Note which prices are considered e.g. input prices of factors from outside agric. farm product prices etc.)

43.A Has there been any time when big household expenses have prevented you from doing what you want to do in your farming operation?
(a) yes
(b) no
If 'yes' tabulate examples:

Nature of household expense	Size ($'s)	Farm op. prevented

43.B Do you expect to have more trouble in the next five years fitting in your household expenses with farming expenses?
Yes No (Specify)

44.A Do you plant hybrid corn?

44.B Do you plant more than one variety?

44.C When did you first use hybrid corn?

45.A What is your fertilization program for say, corn, wheat, beets, and beans?

45.B Can you think of any times you've changed this program and how you came to make the changes?

45.C Do you use the same fertilization program on rented land? (Specify differences)

46.A Do you use artificial breeding? Yes No

46.B When did you first use it?

47.A Are you under some milk testing program e.g. DHIA? Yes No

47.B When did you first get in this program?

48. Have there been any times when family sickness has interfered seriously with your farming operations? (Specify)

49.A Number of children at home?

49.B Age of eldest child?

50. Enumerator estimate age of operator.

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