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"THE ECONOMIC, SOCIAL, AND POLITICAL FORCES THAT WILL BEAR UPON U.S. AGRICULTURE AND THE WELFARE OF FARMERS IN YEARS AHEAD"

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"The Economic, Social, and Political Forces That Will Bear Upon U.S. Agriculture and the Welfare of Farmers in Years Ahead"

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"The Economic, Social, and Political
Forces That Will Bear Upon U. S. Agriculture
and the Welfare of Farmers in Years Ahead"*

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Farmers in the United States and in most developed countries have been forced to recognize since the mid-Twentieth Century that they are a minority group. Their statistical position had been clear at least a generation earlier but in economic, social, and certainly in political dimensions, statistics did not tell the full story. Recognition of the minority status of farming has been variously resisted, and has forced itself upon industrialized countries at critical moments in their histories, going far back into the Nineteenth Century in the case of England and several smaller countries (Switzerland, Belgium, Luxemburg). In the United States, farming, forestry and fishing employed half the labor force as late as 1880, and it was 1920 before employed workers in manufacturing and the building trades outnumbered those in agriculture. The percentage of the U.S. population employed in agriculture in 1940 was approximately the same as it had been in Great Britain one hundred years earlier (22.7 per cent, in 1841).[1/]

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* Address at Seminar on Agricultural Marketing and Policy, Sponsored by the University of Missouri and the M. G. and Johnnye D. Perry Foundation of Robstown, Texas, held at Columbia, Missouri, October 8-9, 1973.

1/ Colin Clark, The Conditions of Economic Progress, London, Macmillan, 1940, pp. 185, 187.

Acceptance of minority status has been much easier for farmers in densely settled countries dependent upon imports for a major share of their food supply. The strategic value of a domestic food supply in wartime guaranteed economic support for Twentieth Century agriculture in the United Kingdom, Germany, and Switzerland far beyond any attention their farmers could command by weight of numbers or voting strength. And minority status in a political and social sense has been moderated by a knowledge that they were an essential element in national survival through two World Wars.

The situation in the United States is sharply different. Here the implications of minority status have been forced to the attention of a farm population that not only maintained the position of the United States as a net agricultural exporter, but increased it after the farm labor force had fallen below five per cent of the gainfully employed. The United States is the first major food exporting country to face the adaptations required of a nation in which farmers are no longer a major political force.

This is a necessary prelude to an understanding of many of the economic, social and political forces that will shape U. S. agriculture in the years ahead. In examining these forces in this Seminar, it is important to remember that my crystal ball is no clearer than yours. The points I will make are advanced with much uncertainty. I will raise more questions that I can answer. They will be designed to stimulate discussion, and to provide an outline that can focus that discussion on at least some of the critical issues.

I propose to look first at some elements of change that have direct effects on the farming business. In terms of both immediate impacts and long run implications, the most insistent issue concerns the question of energy.

We practice "cheap fuel" farming in the United States, and have done so throughout our history of agricultural mechanization. This is a reflection of our resource endowment, and the geographic accident that has located petroleum supplies in proximity to major farming regions. It is also a reflection of our institutional structure, and especially our tax system.

To the extent that state and federal taxes have raised the price of non-farm motor fuels there has been some price-induced restraint in their use. This restraint is lacking for fuels used in farming.

Most of our states have constitutional or legislative prohibitions on the use of motor vehicle taxes for any purpose other than highway building, policing, and maintenance. This applies especially to taxes on motor fuels. One consequence has been to inhibit any taxation of motor fuels used in farming. To do so would raise serious questions about the propriety of taxing farm fuels for general revenue purposes, while motor fuels used in highway travel are taxed only for highway purposes. As a result, farm fuels go untaxed.

The dedication of all highway fuel taxes to highway purposes has thus worked to insulate farm fuels from any cost increases reflecting higher rates of taxation. The cost ratio of farm fuels to non-farm motor fuels has fallen steadily over the past half century, reflecting the rise in highway motor fuel taxes. The decline was especially marked after the introduction of federal taxes to finance the interstate highway program in 1956.

For example, from 1940 to 1960 the composite average state and federal gasoline tax doubled, from approximately .05¢ to .10¢ per gallon.[2/] This had no effect upon the price of farm fuels, except

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2/ Statistical Abstract of the United States, 1961, p. 554.

to make them cheaper relative to non-farm fuels.

Farm fuels have not only been cheap relative to non-farm motor fuels, but their relative share in farm production costs has been falling. This has undoubtedly influenced farmer decisions regarding mechanization, the number of motors used, size of motors, and intensity of use.

Total expenditures on farm fuels have also declined as a fraction of total cash farm operating expenses, and especially so in recent years. Cash outlays on gas, oil, and grease in the Southeast Farm Management Association farms in Minnesota, for example, were 7.4 percent of total cash operating expense in 1960, 6.2 per cent in 1965 and 4.7 per cent in 1972. In the Southwest Association, the comparable percentages were 4.5 in 1960, 4.4 in 1965 and 2.7 in 1972.[3/]

For many farms, fuel has become a minor cost item. Its decline in relative cost outlay has fostered a cheap fuel image. We have as a result an agricultural production structure that is based on the relatively lavish use of fuel, and in which cash outlays for fuel have been overwhelmed by the rapid expansion in other cash farm operating expenses.

United States agriculture is thus ill-equipped to face petroleum fuel shortages. Because farm fuel prices have not included the substantial taxes dedicated to highway expenditures, any increase in basic fuel costs will have a larger percentage impact on farmers than on highway users. It seems probable that the half-century decline in the relative cost of petroleum fuels in agriculture will be reversed.

If this occurs, we can expect a continuing farm fuel problem, and especially in the political arena. Price rises in fuel costs will be painful, but relative farm outlays for fuel are not large enough to insure that price increases will achieve economy in fuel use. If farm fuel prices had been doubled in Southern Minnesota in 1972, for example, fuel expenditures would still have been only about 7 per cent of total cash farm operating expenses.

3/ Annual Reports, Southeast and Southwest Farm Management Associations, 1960-1972, Department of Agricultural and Applied Economics, University of Minnesota. The lower percentages in the Southwest are due to the larger role played by feeder cattle purchases in total farm operating expenses in that region.

This suggests that price policy alone may be inadequate to deal with a shortage of petroleum fuels for farming. It must be reckoned a possibility that widespread fuel rationing for agriculture may be needed in the years immediately ahead.

This is the short-run prospect. The longer run agricultural prospect raises issues that go to the heart of the world wide energy problem. There are farmers alive and farming today who have witnessed in their lifetimes the conversion of agriculture from an activity based on a flow of solar energy converted through crops and animals to one based on a stock of fossil fuels. This is true both for energy used for motive power and energy in the form of fertilizer and agricultural chemicals. We have an agricultural production plant that is almost wholly dependent on an exhaustible resource.

This may only be a transitional phenomenon. Although world wide stocks of fossil fuels are large and many more may be discovered, the international movement of these fuels raises problems of national dependence on trade, balance of payments, and monetary policy that are new in history. In the past, some nations could fear for their food supplies in time of war or blockade. But even England in the darkest days of the Second World War could reckon on her coal for a basic energy supply that could sustain her.

It is a different world today. Every major industrial nation imports some of its petroleum fuels. The Soviet Union, with vast and untapped resources, imports petroleum products from Iran. Recognition of the consequences of this form of fuel dependency has been unavoidable in oilpoor nations like Japan, Italy, the two Germanies, and France. It has come suddenly to the United States, and the shock has been great. We do not even have the statistics readily available to measure the degree of this dependency, and its consequences for domestic and foreign policy.

One question emerges with unexpected importance. How long will it remain economic for the United States to import petroleum for fuels and fertilizers to produce wheat, cotton, feed grains and soybeans for export in order to earn the money needed to pay for petroleum imports? How durable, in other words, is our present comparative advantage in export markets for farm products?

At the moment this seems to be a ridiculous question. We can export everything we have for sale and at prices undreamed of even twelve months ago. But it is a question that must be asked. Potentials for the improvement of agricultural productivity in the rest of the world are great, and especially so in the Soviet Union. The foreign markets that have generated the current euphoria in United States agriculture could prove to be transitory. And if the problem of farm surpluses returns it will be in a new dimension. The conservation of energy supplies will be an added and insistent consideration in any future farm programs that seek to manage farm output.

If a management problem of this type arises, it will be resolved in a changed political climate. An agricultural production plant producing export surpluses in competition with householders and motorists for energy supplies will face political opposition of a new kind. Should this occur, it seems probable that agriculture will be subjected to both input and output control measures that will be much more demanding than anything we have known in the past.

Programs of food aid to developing nations will undoubtedly feel a major part of the force of any rise in the real cost of energy. It is one thing to sell cheaply or to give away food surpluses produced with domestic resources. It is quite a different matter if these food surpluses must be produced with imported fuels and chemicals. That part of the energy crises in the United States that involves petroleum will have an especially heavy impact on international aid programs.

Cheap energy has also contributed to structural changes in agriculture that result in large and specialized farms. The impact of this change is especially heavy in the feed-livestock sector, with consequences for price and market policy that we are only beginning to perceive.

A major source of past imbalance in American agriculture has been the long-standing differential between labor rewards in crop farming and in livestock production. As long as mixed or diversified farming

predominated, the farm family could increase family income by care of livestock, although labor returns per hour were often quite low.

One consequence of expanding farm size is that the farm family feels less compelled to include a livestock enterprise in order to meet a target family income. If this income level can be achieved with cash crops alone, there is little compulsion for the family to commit labor to the demanding care of livestock.

This is especially true if the farm is very large and must depend on a significant amount of hired labor. The livestock sector of family farm agriculture is still less mechanized than the crop sector, and the quality of labor required for successful livestock rearing is frequently not available in the farm labor market.

The recent behavior of many family-type farmers in the Middle West suggests that they do have a target family income in mind, at least in the short run. Many farms that once included a substantial livestock enterprise have now eliminated the livestock, and produce only cash grain.

This trend has reduced both the number and the proportion of farmers who find a given increase in the price of livestock products to be an adequate incentive for increased output. In the past, a farmer growing his own feed could follow the traditional calculations involved in the hog-corn or beef-corn ratios in deciding whether to sell his grain or feed it. These were open options, and he could expand or contract his livestock operation relatively quickly.

For many corn growers today, this option is not available. They have liquidated their hog or beef-feeding enterprises, have no adequate equipment for livestock feeding, and have organized their family time schedules around a cash grain operation with its less insistent daily time commitment.

The price signals needed to secure a given production response are no longer adequately measured by the traditional hog-feed, dairy-feed, or beef-feed price ratios. Imbedded in those traditional ratios were assumed cost components that reflected underemployed family labor,

an unmet family income target, and the existence of some unused production-plant capacity in the form of farm buildings, equipment, water systems, etc.

These assumptions no longer hold. A large cash grain farm can meet the family income target. More opportunities are available for the employment of farm women. Children remain in school to older ages, go farther from home for schooling, and seek urban instead of farm employment. There has been a change in farm life styles.

This is nowhere more evident than in the growth of off-farm employment for farmers. The average farm operator family in 1972 received half of its income from non-farm jobs or investments. For farms with gross sales of $5,000 to $9,999, off farm income exceeded farm income by 58 percent. In commercial farms with gross sales of $2,500 to $4,999, off-farm income was over three times as large as farm income. The majority of the farming population today does not look to farming for its major source of income.[4/]

As a result, we may be witnessing a fundamental change in the reaction of farmers to fluctuations in agricultural product prices. Price changes may need to persist over longer periods of time before they elicit a supply response. And when it comes, it may be more massive than the same relative price change would have triggered a generation earlier. Larger, more specialized farms involve heavy capital commitments and elaborate organizational planning. It takes time to set them in production. And once in production they will tend to continue to produce at a given rate in spite of price changes that would have resulted in expansion or cut-backs in a population of family-farm producers.

This is one aspect of scale of operation and degree of specialization that we have not studied adequately. In other fields of agricultural

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4/ U. S. Census, 1970, "Income of the Farm Related Population", Series PC (2)-8C, Washington, D. C., U.S. Dept. of Commerce, 1973, and Farm Income Situation, U. S. Dept. of Agriculture, FIS-222, July 1973.

production where large-scale enterprises have predominated, there is evidence to suggest that large scale firms do not alter production schedules in response to price changes, except under sustained economic pressure. This has been reported for rubber in Malaysia, sugar in the Caribbean and pineapple in Hawaii.[5/] If production involves a mix of large specialized farms and smaller diversified farms the effect is to shift the short-run burden of output adjustment in response to price to the diversified farms.

We may be entering this phase, in the evolution of U. S. agriculture. Farm product prices have changed drastically in recent months, and output response has been sluggish in the livestock sector. Many reasons account for this lag in response, not least the wildly fluctuating prices of feedstuffs which make long-range livestock production planning highly uncertain. But it seems likely that one reason is that a basic change has taken place in the structure of agriculture. The result is a production pattern that could lengthen the supply response cycle in livestock products, increase the amplitude of its movements, and result in immobility in supply over relatively long time periods. The agricultural output curve for livestock products, in short, may come to resemble that of the steel industry.

This shift out of livestock has been building up over several decades. With the exception of 1940 and 1946, we have been net importers of meat for nearly 40 years. Domestic milk production is declining and we may well be entering into a production phase in which we will be net importers of dairy products, on an increasing scale.

We are beginning to exhibit the production characteristics of some developing countries in which large land holdings and very small farms exist in a symbiotic relationship. The big farms do not produce livestock products because labor requirements, market risks and price

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5/ C. R. Wharton, Jr., "Marketing, Merchandising and Moneylending: A Note on Middleman Monopsony in Malaya". Malayan Economic Review, Vol. VII, No. 2, October 1962, pp. 24-44; George Beckford, Persistent Poverty, London, Oxford Univ. Press, 1972.

levels do not encourage it. Cash cropping is the rule on big farms. The little farms are limited in their capacity to produce livestock products because they are too small to support risk-taking and management skills on the scale needed. As a result, livestock production is stunted, and unresponsive to price. In the European version of this relationship between scale of enterprise and output mix it has been difficult to secure an increase in meat production, especially beef, because the farms are so small. In the American version, we may demonstrate the reverse proposition. It may become increasingly difficult and expensive to gain increases in meat and milk output because our farms are so large.

In a wider sense, this is the way world wide food shortages will be reflected in domestic price levels and consumption patterns. Grain can be stored and shipped long distances at low cost. The revolution in ocean transport costs brought about by the giant oil tankers (which can also carry grain) has cheapened the cost of grain imports for food deficit areas. Grain prices have risen relative to livestock product prices. The grain surplus of the past two decades held down market prices and gave us cheap domestic livestock feed. This grain surplus is gone. Domestic meat consumers must bid against world market grain prices for the feed required to increase meat supplies. The world demand for more grain is being converted into a restructuring of our domestic output mix of agricultural products.

The argument can be summarized in this way:

Resource mobility within agriculture may be declining at the same time that the mobility of resources from non-farm sectors into agriculture is increasing. A more capital-intensive agricultural structure may also be a more rigid one. If this occurs, one casualty will be our conventional economic wisdom regarding the price elasticities of agricultural output.

One of the most persistent and visible trends in United States agriculture has been the continuing increase in size and decline in number of farms since the Second World War. In crude terms, the number of farms was cut in half from 1950 to 1973, and average size of farms doubled. These data are defective in that changes in the definition of a farm have taken place on several occasions since 1950. The 5,648,000 farms enumerated by the census in 1950, for example, included a number of small farms in size classes that are excluded in the estimate of 2,831,000 farms for 1973. Although the degree of decline in number of farms is overstated, the magnitude of the increase in average farm size is not significantly disturbed by this correction.

As we have seen, a part of the explanation for this increase can be traced to the relatively low cost of energy in agriculture which has encouraged the substitution of machine power for human and animal power. This trend has been accelerated by a continuous decline in the cost of machinery and equipment relative to labor. And in recent decades the trend has been heavily influenced by peculiarities in the institutional structure affecting farm price support programs, credit programs, and tax policies. Two of these peculiarities merit a closer examination.

Since price support programs have in the past been tied to crop acreage or a production history, the size of any government payments to individual farmers has had a direct and linear relation to volume of production. In sharp contrast, by underwriting a relative degree of farm price stability, the federal government has had an influence on the risk expectations of farms in different farm size classes that is not linear. A historic limitation on large scale farming activities has always been the indeterminant nature of large risks. In agriculture these involve both market price risks and climatic and biologic risks. By reducing substantially the risk of market price collapse, the net effect of government farm price support programs has been to make farm investments relatively more attractive to large scale investors

than to small scale investors or family type farmers. Large scale farmers have been encouraged to use venture capital more effectively than is possible for small entrepreneurs. Capacity to make use of financial "leverage" is in general unavailable to family type farmers. This becomes increasingly important as size of farm expands, permitting a given proportionate increase in equity capital to finance a much larger increase in total business activity.

This in turn has been a consequence of the peculiar nature of United States accounting practices and tax policy with respect to the taxation of income, and particularly income from capital gains. Since interest on borrowed capital is a business expense in computing income tax liability, those enterprises with adequate borrowing power and large incomes can shift from the use of equity capital to the use of borrowed capital to advantage. The net effect is to reduce the cost of capital to the large firm. This opportunity is either unavailable or of minor significance for family type enterprises.

The resulting stimulus to the expansion of the farm business has been given further impetus by our method of taxing capital gains. Up to 1969 this tax was levied at a rate of never more than 25% of the realized capital gain. Since tax liability on earned income can rise to a height of 70% on incomes above $200,000, there has been a substantial reward to high-income taxpayers for the conversion of earned income into capital gain. Some reduction in this incentive was achieved by the tax reform act of 1969, which provided for an increase in the capital gains tax liability from 25% to 35% when income from capital gains exceeds $50,000 in a tax year. This rate increase has been relatively small compared to the reward that could be achieved by realizing income in the form of capital gain, never to be taxed at more than 35%, while income from wages and salaries could be taxed at rates up to 70%.

As a consequence, an incentive condition has been created for wealthy investors or large firms to buy land on credit, and farm it while holding it in anticipation both of income from annual operation and from ultimate liquidation, through the differential savings made possible by the capital gains tax structure.

The development of corporation and large scale farming in the last 20 years has been heavily influenced by these trends. They introduced an element of institutional bias into a structure ofcost and returns

based on conventional farm operating practices that has greatly accelerated the trend toward larger farms. To put the matter in other terms, the farm size structure that we have today is in part a consequence of expanding technology, and economies of size resulting from the rising cost of labor relative to the cost of capital. But this fails to tell the whole story. A major part of the reason for the continuing expansion of farm size is due to our institutional structure, and particularly to our tax system and to the past twenty years of our farm price support programs.

The farm price support program has been changed but the tax inequity remains. We tax income from property at never more than 35% when realized in the form of capital gain. We put a penalty tax on income from wages and salaries that rises above the 25% marginal rate when income goes above $12,000 for a married tax payer filing a joing return. It rises above the 35% marginal rate when family income goes above $24,000. Put in other terms, for family taxable incomes above $12,000 our tax system gives an increasing reward to income from property over income from labor. This has insured that the operation of the land market will transfer real property over time from the hands of those with low incomes to the hands of those with high incomes. This trend is clearly under way in American agriculture today.

Another dimension of the problem is even more puzzling. It has been a major article of rural faith in the past that the disappearance of family farmers could be traced to low farm prices and lack of ability to command a reward in the market place that was commensurate with contributions to national welfare. We have recently had farm prices at or above parity levels in almost all farm commodities. It remains to be seen whether this dramatic shift in farm price levels will be a benefit or a disaster for family farmers. As noted above, one of the inhibiting factors that has historically prevented large investors from acquiring farm lands has been the combination of high market and weather risks. A major reason for the durability of a family farm structure is that it could survive catastrophe. It remains to be seen whether or not it can survive prosperity. Under our existing institutional structure, the prospects are that high and stable farm prices will work to the disadvantage of family farmers by attracting

an additional influx of non-farm capital that in the past was scared away from farming by high risk.

Apart from incentives for farm size expansion based on our financial and institutional structure, what are the incentives for continued expansionof the scale of farm businesses that are determined by technological and production considerations in agriculture? In answering this question it is important to recognize that we have been led astray by some of the language used in discussing this topic in the past. There is a rhetorical tradition in the United States that leads us to characterize large scale farms as "factories in the field". Much of the recent popular literature discussing trends in United States agriculture has included forecasts and sometimes artists' drawings showing the farm of the future in a version that has been derived from an idealized model of a factory. This imagery is doubly misleading. One major advantage of a factory system is that it permits economies of scale in the movement of raw material through successive processing stages. The other major economic argument in favor of a large factory is that it permits economies of scale in the supervision of labor. For some types of agriculture these two controlling economies can be achieved in large factory-type installations. The outstanding examples relate to vegetable crops and poultry and beefcattle feeding enterprises. Here it has been possible to bring together raw materials in a relatively confined space and establish production systems that utilize biological processes so designed that they resemble a production line structure in a conventional factory. In the language of business economics a "batch operation" has been converted into a "flow operation". To the extent that it will be possible to convert other types of agricultural activity from batch or seasonal enterprises to continuous or flow operations, we can expect a continuation of economic and technological pressures for the enlargement of farm sizes.

The reverse of this proposition must also be examined critically. To the extent that it is not possible to assemble agricultural raw materials at one location and organize them in such a way that they meet the test of a flow process, we can expect substantial diseconomies

of scale to be associated with large scale farm enterprises. This is still the case in those types of farm production processes that are based on the conversion of solar energy through plant life. As long as chlorophyll photosynthesis remains the cheapest available means of solar energy conversion, it will be profitable to distribute our crop growing activities over geographic space. In this circumstance, it will be difficult to satisfy the twin conditions necessary for factory systems to prevail, namely economies of size in transport and in labor supervision.

I do not rule out the possibility that we may see a continuing development in automation that will permit field crop enterprises to be converted from batch processes to flow processes. This is achieved, for example, in large scale hothouse operations where temperature, humidity and water supply can be subjected to exact controls. For premium priced fruits, flowers and vegetable crops this possibility is capable of further expansion. Some new technology makes it even probably that certain classes of field crops may be grown under environmentally controlled conditions in the future. At the present time, however, these prospects do not seem tangible for field crop production on the scale necessary to supply us with basic grain and forage inputs. If this is a correct appraisal, then one consequence is that the trend toward large scale farm enterprises for field crop production does not appear to be dictated by technological considerations. If this trend continues, it will almost certainly be due to institutional reasons, particularly those relating to price, credit, and tax policy.

Another dimension must be considered before this discussion can be regarded as balanced. The social structure of farming is a prominent part of the total picture. Throughout our history we have had a dispersed pattern of agricultural settlement, with family farmsteads dotting the landscape. With few exceptions we have never known the type of village-based agriculture that predominates in so many parts of the world. This era of dispersed settlement may well be coming to an end. It is ironic that the region of the country which in popular mythology has been regarded as most rigorously independent, namely the Great Plains, is the region in which we may first see the emergence of something akin

to the village agriculture of Europe or Asia.

The isolation involved in scattered farmsteads and ranches in the Great Plains is now reaching proportions that render it pathologic in a cultural sense. As a consequence, much of the Great Plains is being depopulated in two dimensions. Population is declining over large areas, and those who remain are clustering in villages and small cities. In the European version of this phenomenon, it has been customary to point out that the one-family farm is no longer a viable social institution if the family values its leisure time at opportunity cost rates of return. Young people, and particularly farm wives, are not satisfied to be chained to livestock enterprises in a manner that was accepted by their parents. As a result the agricultural price policies and planning systems of several European countries, especially Sweden and the Netherlands, have established a "two family farm" as the modal enterprise which their planning and price policies seek to support. The main reason for setting the norm at two families was not technological but social. In that way families could have some relief from the demanding work routine required by intensive farming.

On the basis of present trends, it is unlikely that a two-family farm model will prosper in the United States. Instead, the solution that seems to be emerging is a form of village agriculture in which the social defects of isolated one-family farms are being resolved by regrouping farm families in urban places. The farms and ranches that survive this economic and social change may remain in family hands but they will not resemble traditional family farms, in that they may be devoid of rural residences. It is perhaps no accident that this physical concentration of rural residences is taking place in areas where the social cost of distance generated traditions of fierce independence in a past generation, and is associated today with the most pronounced pattern of clustering now visible in American agriculture.

We can now refer back to the introductory remarks concerning the problems faced by American farmers in adjusting to their new status as a minority group. This shift in status involves two major dimensions. The most obvious one is the reduced ability to muster political strength in legislative processes. This is well documented and will not be explored further in this discussion. A second dimension is less well understood but is perhaps more significant in the long run. At the same time that farmers have been declining in absolute numbers and as a percentage of the electorate, an internal shift has taken place in the power structure within agriculture. The political decline has been associated with an economic concentration. From 1949 to 1969, farms with gross receipts from farm sales of $20,000 and over increased their share of total farm marketings from 31.5% to 73.5%. In that same time period the index of prices received by farmers increased by approximately 10%. Even after correction for price level changes, the share of farm marketings accounted for by farms with sales of over $20,000 in 1949 prices had more than doubled in 20 years.[6/]

An even more revealing indication of the degree of farm size expansion is provided if we compare the economic size of farms required to produce half of the total value of farm output in 1949 and 1969. Slightly over 50% of total receipts from farm marketings were received by farms with cash sales over $10,000 in 1949; by 1969 farms with gross sales of $40,000 and over accounted for just under half of total receipts from farm marketings. In 1972, farms with sales of over $20,000 per farm were 24.4 percent of the number of farms and accounted for 81.2% of the total cash receipts from farming. We can break this upper farm size class down into two groups. Over the past ten years, there has been virtually no change in the proportion of total cash receipts received by farms with gross sales of $20,000 to $39,999. They accounted for 19.7% of total cash receipts from farming in

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6/ These data and the statistics that follows are from U. S. D. A., Agricultural Statistics, 1972, and earlier years; Farm Income Situation, FIS-222, July 1973, pp. 69-71.

1963 and 20.0% in 1972. All of the increase in the proportion of receipts from farm marketings by farms with sales over $20,000 has been accounted for by farms with gross sales of $40,000 and over. In that same ten years they increased their share of total receipts from farm marketings from 40.2% in 1963 to 61.2% in 1972.[7/]

These data make it clear that the voting strength in agriculture is at the low end of the income scale while the economic strength is at the upper end. Although it is too soon to draw conclusions from trends of only a decade, it is at least plausible to suggest that we are witnessing the development of a dual economic structure in American agriculture. This is comprised of a relatively numerous sector of small to medium sized family farms, possessing some voting strength but little economic muscle. This sector accounts for most of the farm population but only a minor fraction of the total value of farm output. The second sector is numerically small but economically powerful, and thus unable to influence events through ordinary political processes. Lacking votes and possessing economic power, it finds it increasingly tempting to achieve its goals through the manipulation of the power structure.

We have already seen the first clear cut evidence of the development of this trend in the "chicken war" that broke out in the early 1960's. This concerned a small number of large poultry producing firms that saw a lucrative overseas market seriously threatened. They were able to mobilize the weapons of economic warfare in the United States out of all proportion to their numbers or their significance in total economic activity. Additional evidence is provided by the recent attempt of organized dairy farmers to use political campaign contributions to influence milk price decisions. In a past generation, the political influence of dairy farmers would have been exercised through the polls. It seems plausible to expect that the next

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7/ U.S.D.A., Farm Income Situation, FIS-222, July 1923, pp. 69-71.

manifestation of this use of economic power instead of voting strength to resolve agricultural problems will occur in the beef sector if large scale beef feedlots are threatened by price collapses and surplus production.

An opening theme of this paper can now be restated. To an important degree, the critical resource in United States agriculture is no longer land but minerals. We are today in a phase in the use of mineral resources that invites comparison with hunting, gathering and fishing stages of development, before the invention of agriculture.

With one great difference: In the hunting and gathering phase human beings were securing a food supply that was replenished primarily by the direct use of solar energy, through chlorophyll photosynthesis. When man accomplished the transition to agriculture he did so by a more efficient method of ordering and organizing these solar energy processes. The transition from manpower-agriculture to animal-power agriculture represented a still more efficient organization of these same energy sources.

The most recent transition from animal agriculture to mechanized agriculture represents a major change in the mode of energy conversion. Until well into the Twentieth Century almost all of our food supply came from flow resources derived directly from solar energy. Today a large and rapidly increasing share of our food supply comes from stock resources, primarily petroleum, coal and minerals. It is recognition that this stock is limited that generates the acute environmental concern that has exploded in the last decade.

But in what sense is it limited? The finite nature of the world's stock of resources can only be defined in terms of man's knowledge of how to use these resources. This knowledge gives them value, generates prices, and creates a structure of prices that indicates relative values. We have picked the "low-hanging fruit" first. We use the cheapest sources of power, until they begin to rise in price. Then we set to work to develop new ones.

Our experience with a heavy reliance on fossil fuels is encompassed by the life-span of a man. It is not surprising that we should be having

problems of accommodation. The wealth and abundance that has resulted from our discovery of ways to use stock resources is in fundamental conflict with the social systems and religious beliefs we have inherited from our history of resource scarcity.

How can this accommodation be accomplished?

The simplistic solution is a "return to nature." It is hard to believe that sensitive, humane and intelligent people can find this attractive, but some do. In its use of space, it is the ultimate form of conspicuous consumption in our society. Quite simply, we do not have land enough at a hoe-agriculture level of technology to support more than a tiny fraction of the world's population. Those who seriously propose this solution are advocating a form of genocide.

A more realistic solution is composed of two parts:

1.) A search for greater economy in existing patterns of use of stock resources. Here there is tremendous scope for improvement, through waste recycling, mass transit, improved space heating and cooling, longer-lived products, and a list of economizing measures that is almost endless.

2.) A systematic shift to flow sources of solar energy. And this has begun. Plant breeders are undertaking experiments to improve the biological fixation of nitrogen. Forest products are replacing steel, tin, and aluminum in packaging. But much remains to be done. Greatly expanded research is needed in solar space heating, greater use of winds and tides, multiple cropping under environmentally controlled conditions, zoning to promote land use in areas of maximum photosynthesis potential, biological methods of pest and disease control, and many other similar uses of flow and renewable resources.

A still bolder solution is to expand research into the possibilities of "farming minerals." We now stand at the threshold of the use of solar energy and existing stock resources to reproduce and multiply sources of energy that are substitutes for our present fossil fuels. This is the

promise of nuclear energy. There are enormous problems and great risks, but this possibility is no longer in the realm of science fiction.

Agriculture in the United States has an enviable record of invention, innovation, and adaptation. We have achieved a tremendous multiplier effect from our investment in agricultural research and development. One reason is that we have had many small firms with capacity to experiment and adapt new technology.

If there are only big firms, this research and development spectrum is broken. The main reason is that in hierarchical organizations decision makers at the top are acutely afraid of failure. This holds for firms in private industry or agencies in government. To achieve rapid diffusion of social change or new technology the cost of failure must be diffused. This is the service performed by a mixed structure of small, medium and large firms, or of local, state and federal units of government.

An alternative approach is to concentrate research and development efforts in large agenices. This has been the approach taken in the Soviet Union. Big increases in investment accelerate the output of new technology but the technology is not applied, or is applied very slowly. The multiplier effect of centralized expenditures on research and development is reduced, under hierarchical management systems.

A concentration of economic power in United States agriculture will find its ultimate test in the capacity of the system to promote change. The history of large scale firms is that they resist change. This is true across cultural and national boundaries, and in private enterprise and socialized economic systems. There is real danger that a reasoned examination of the present trend toward economic concentration will be rendered impossible by those who identify opponents of bigness with sentimental proponents of a return to the family farm. To silence discussion at this stage would be a monumental disservice to United States agriculture. It is for this reason that we should be grateful to the University of Missouri and to the Perry Foundation for this opportunity to meet and discuss these vital issues.