PRICE CHANGES AND CONSERVATION

Conditions Affecting the Value of Land as a Factor of Production

One of the most important functions of a flexible price system is that of assigning values to the factors of production according to their scarcities in relation to the demands for their respective products. In the early stages of development in the United States, land was abundant and cheap, but labor and capital were scarce and dear; as population and industrialization developed, land became relatively less abundant, and land values rose steadily while capital accumulation increased rapidly and interest rates declined.

Changes in the prices of productive factors are associated with changes in the combinations in which they are used, and these, in turn, are related to the substitutability of one factor for another. Thus, in a developing economy one would expect land exploitation to be followed by conservation and finally by improvement and reclamation. This has happened in many older civilizations, but the relationship between the growth of the economy and land use is likely to be direct only if the trade area is a closed one, which has not been true of the United States. Because so much of our agricultural production has been for export markets, a much more rapid exploitation of soil resources and rapid increase in land values has occurred. An earlier movement to conservation would have taken place if the export demand had remained constant

and other competing sources of supply had not opened up. This, however, did not happen, and as our high tariff policy bore fruits of retaliation, our export markets were curtailed, while competing sources of supply were forcing prices down. As a result our land resources since 1920 have become much more abundant in relation to demand and hence less valuable and less able to bear the more costly conservation measures. The implication is that a less intensive agriculture is desirable if this condition continues in the future.

Theoretically, adjustments of the intensive and extensive margins should take place as relative scarcities and prices change, but as was indicated in the last chapter, this adjustment is extremely slow to take place and faces a host of institutional resistances. When the dynamic changes in the technology of farming are also introduced, the difficulty of obtaining proper adjustments in the combination of factors is seen.

Some Factors Determining the Comparative Advantage of Exploitive and Conserving Crops

This lack of adjustment of the factors of production, however, does not necessarily mean that exploitation and erosion will be increased because, as we have seen, increases or decreases in intensity do not always imply decreases or increases in exploitation. Low prices and curtailed exports of wheat, cotton, and lard may result finally in less exploitation rather than more, because the comparative advantage of these crops may be reduced. The reason that we have exported vast quantities of erosion-inducing crops such as cotton, corn, wheat and tobacco has been the great comparative advantage we possessed in having vast areas of rich land with exceptionally low enterprise costs of production associated with an exploitive system. As fertility declined the costs of production would inevitably have risen, and conservation, with reduced

exports of erosive crops at higher prices, would have been the logical outcome. However, increased production from newer areas and reduced export demand have led to lower prices and a serious agricultural crisis which may lead either to greater or less exploitation of our soil resources. Which takes place will depend upon the institutional factors previously mentioned, the type of farming already being followed, and changes in the relative prices of exploitive crops such as corn and cotton to the prices of nonexploitive crops such as pasture and hay. These factors, together with the physical factors affecting yields, determine the comparative advantage of competing land uses.

Most of the soil conserving crops are marketed in the form of livestock, and the prices of these livestock products reflect the sale value of pasture and hay crops. Any movement of prices that increases the ratio of the price of grain or cotton to the price of dairy products, sheep, or beef cattle would increase the comparative advantage of the more erosive crops and encourage exploitation. As a result of the first world war, the price received by farmers for grains in 1920 was 132 per cent higher than in the period August, 1909 to July, 1914; cotton, and cottonseed prices were higher by 48 per cent, dairy products 98 per cent and meat animals 107 per cent (the latter figure is for 1919). During the six-year period from 1915 to 1920 the price ratios favored increased production of grain and cotton at the expense of hay and pasture. The price of tame hay increased only about 65 per cent during this period. During the postwar decade from 1921 to 1930 the price of dairy products did not decline as rapidly as grains, and the price ratio for these commodities favored dairy production. Cotton and cottonseed prices, however, retained their advantage from 1923 to 1925, while prices of meat animals fell drastically in 1921 but gradually increased to 1929 so that their competitive position was considerably better

than it was during the base period.[1] The effect of changes in price ratios for various products upon land use is very complex; physical and institutional factors, changes in costs, and the flexibility of the farming enterprises all play important parts; in one region such changes may have drastic effects upon land use while in others there may be only a negligible response.

EFFECT OF CHANGES IN RELATIVE PRICES ON LAND USE

To a large extent the effect of changes in comparative prices on land use will depend upon the internal organization of the farm and the presence or absence of alternative opportunities. Our exploitive crops can be grown in monoculture areas, or they can be grown in mixed farming areas where they would supply smaller parts of the total farm income. The generalization can be made that the more diversified the farm enterprise the less drastic will be the effect of changes in relative prices on income and the greater will be the possibilities of adjustment through competition. In monoculture areas the possibilities of adaptation are much less than in diversified regions because such areas have usually developed as a result of the very great comparative advantage of one crop over the nearest alternative. This is true of the specialized corn, cotton, and wheat belts.

Under these circumstances a change in land use patterns as a result of relative price changes can be expected only when two conditions are fulfilled: (1) The reductions in prices of the exploitive crops relative to alternative conserving crops must be so large that the conservation systems will yield higher net returns; (2) the new ratio of prices must continue for a period of time long enough to change the expectations of farmers, so that they no longer anticipate a return to the

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[1] Figures taken from U.S.D.A., *Agricultural Statistics, 1940*, tables 420 and 693, pp. 316 and 573.

old level and make their plans according to the new ratios. Smaller fluctuation will have little effect on land use and will be reflected in variable farm incomes, rents, and land values. Even large fluctuations over short periods of time may only affect the operators incomes and rents, with no changes in land use patterns taking place. These conditions are usually associated with very little secondary production and great inelasticity of supply; changing the land use pattern may involve drastic changes in the whole farm enterprise and the development of new skills and abilities by the operator.

In areas of diversified agriculture, changes in relative prices may affect land use patterns considerably. High grain prices relative to dairy products, for example, may increase the acreage of these crops at the expense of hay and pasture, and vice versa. Because of this diversification and its associated flexibility, changes in relative prices have less effect upon farm income and land values but lead to rapid adjustments in land use patterns.

Since the government is concerned with both conservation and prices of farm products, these interrelationships should be studied and probable reactions anticipated, in order to avoid spending funds to achieve conservation while at the same time spending funds to increase the prices of erosive crops relative to those of alternative conserving crops. The present war may or may not result in a great increase in the ratio of prices of erosive crops to conserving crops. The increased demand for food both for shipments abroad and for our industrial workers will largely affect beef, hog, poultry, and dairy products. This may cause a change in price ratios favoring soil conserving crops, and efforts of the government might well emphasize assistance in making adjustments in this direction with less emphasis upon maintaining prices of exploitive crops in those areas where alternatives are available. In the event of a rapid rise in the prices of soybeans, corn, cotton,

and wheat, there will be strong pressure to expand the acreage of these crops even where it may encourage serious erosion. Under these circumstances it may be advisable to consider programs which will effectively control such price increases or prevent them from introducing land use patterns that can be shown to be disadvantageous to society when the costs of a slow and painful adjustment to contracting extensive margins are considered.

Effect of Changes in the General Price Level on Land Use

In addition to changes in the relative prices of farm products we must also consider the effect of changes in the general price level, assuming that relative prices remain constant. Usually these changes occur together, but a simpler analysis is possible when they are treated separately. The effect of changes in the general level of agricultural prices is modified by the degree of commercialization of agriculture. Where a large part of the farm produce is consumed on the farm, price fluctuations may have little effect on either the level of living of the family or on land use, while in the case of highly commercialized farms, price changes will be much more important. Similarly custom or institutional factors[2] may modify the effect of price changes. In spite of these limitations which must be constantly kept in mind, a simple analysis of relationships is valuable in indicating tendencies and pressures which arise and have to be anticipated in any attempt to make conservation planning fit into a dynamic agriculture.

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[2] For example, where an increase in prices occurs, the prevalence of crop share tenancy may be an important factor in curtailing increased production through an increase in intensity, because the tenant will only increase inputs up to the point where they equal half of the marginal output. *See* Rainer Schickele, "Effect of Tenure Systems on Agricultural Efficiency," *Jour. Farm Econ.*, Vol. XXIII, No. 1, Feb., 1941, pp. 185–207. Under these circumstances government subsidies for lime, fertilizer, and seed, or leases which give the tenant the total returns above an agreed average yield, might be useful in increasing national production and retarding an expansion of erosive crop acreage.

It is sometimes assumed that an increase in the prices of farm products would have the effect of inducing conservation in all cases. As was indicated previously this assumption is not justified and whether conservation or exploitation is encouraged depends upon a number of factors. In general terms we may state that an increase in prices encourages conservation when it leads to an increase in primary and secondary intensity without any change in the crops grown, but where cropping plans are affected, either exploitation or conservation may result, depending upon the type of land use changes introduced. An increase in the price of cotton would encourage the use of fertilizers, terraces, and other means of increasing production on those areas already producing cotton, and this would result in greater conservation of the resources. As the increase in cotton prices raises the value of cotton land, the value of the soil capital destroyed by exploitation increases and conservation is encouraged. At the same time land in non-erosive crops might be placed in cotton, and exploitation increased.

Effect of Rising Prices on the Extensive Margins in Relation to Gross Income and the Elasticity of Production

A change in the extensive margin of production may take place although the *relative prices* of all farm products remain the same (under the assumption that an equal percentage increase in the prices of all farm products takes place). The change in the extensive margins of competing crops would depend upon the ratios of gross farm income under various alternative crop combinations and the elasticity of production of the specific products. If wheat production, for example, produced a net return of $3 an acre with a gross income of $10, and beef cattle on pasture also yielded a net return of $3 an acre but had lower costs and a gross income of only $7 an

acre, the same percentage increase in wheat and cattle prices which did not affect costs would increase the net returns from wheat more than from pasture, and the area in wheat would expand. If prices doubled, wheat farming would now yield a net return of $13 an acre, while beef cattle would yield only $10 an acre assuming that no increase in production or changes in costs took place. Actually, increases in production would take place, and the final relationship of net returns would depend upon the elasticities of production and demand of the two products. In general, the greater the elasticity of production the larger will be the increase in applications of variable factors as was indicated in Figure 2.

In considering the elasticity of supply we can not assume that the gross returns curve, and the associated marginal and average return curves, follow any universal form or any simple mathematical formula. The curves are the result of the combination of physical quantities of inputs of variable factors, and only as we know the physical relationships can we establish productivity curves. Point elasticity indicates changes in the relationship of output to input at a given level of input but gives no information regarding the shape of the curve beyond that point. At any given point the elasticity may be high, but as inputs are increased the point elasticity might be maintained or decline very rapidly. Because of this limitation, it is preferable to use the concept of arc elasticity as referring to the slope of the curves over the relevant range of increase in units of input.

In the example used above, the point elasticity of production of the wheat farm is 0.7, while for the cattle farm it is about 0.6.[3] This only indicates that at the given quantity of

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[3] If we assume that the cost line parallel to the X axis is drawn at a level of one dollar, inputs will be added until the marginal returns equal one dollar, and marginal returns will always equal one dollar at the highest profit combina-

input, wheat production has a higher point elasticity; as prices increase and more units of input are added, the point elasticity might decline rapidly in the case of wheat farming and remain relatively constant in the case of cattle farming. The only way we can know which would have the higher elasticity for a given increase in inputs of variable factors is by knowing the physical production relationships involved.

If the prices of products increase with no changes in costs, the elasticities of production at the old level of input remain the same. If prices double, both average and marginal returns are doubled, and the ratio of marginal to average returns remains the same. As more inputs are added, however, the elasticities at the new highest profit combination may be different because the shape of the productivity curves may change as production moves from the previous optimum.

Where an increase in prices leads to higher net returns under an exploitive system, there will be a shift from conservation to exploitation such as occurred during the period from 1915 to 1920 when grain acreage was expanded and the hay and pasture acreage decreased. This expansion of exploitive farming, however, was not entirely due to the increase in prices but also was the result of propaganda, tractors, weather conditions, and the fact that no one estimated the social costs of readjustments which had to be made as soon as the profitability of exploitation declined.

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[3] (*Continued*)

tion. Since we have shown that $E = \dfrac{MR}{AR}$, E becomes the reciprocal of average returns. In the example given the average returns for the wheat farm are $\dfrac{10}{7}$ and hence the elasticity is $\dfrac{7}{10}$ or 0.7; the average returns for the cattle farm are $\dfrac{7}{4}$ and elasticity is $\dfrac{4}{7}$ or approximately 0.6.

Effects Summarized and Related to Government Action in an Emergency

These relationships may be summarized in the generalization that, where resources are relatively scarce and used at a high intensity, an increase in prices will largely result in an increase in conservation and reclamation; while in areas of abundant resources utilized at a low intensity, an increase in prices will encourage more rapid exploitation. From a historical point of view the United States appears to have passed through a long period of exploitive agriculture culminating in the expansion period of 1914 to 1920 when the acreage of seventeen principle crops increased about 24 million acres. For the next twelve years this acreage fluctuated between 331 and 345 million acres but declined sharply from 1932 to 1934 when it reached a low point of 276 million acres. From 1935 the acreage increased, and for 1939 and 1940 it was approximately the same as in 1909 or about 300 million acres.[4]

If the present war emergency leads to an increase in the prices of agricultural products it need not result in a further increase in exploitation but rather to an increase in primary and secondary intensity and greater conservation. Government agencies could do much to encourage this by stimulating greater use of fertilizers and conservation measures to increase output rather than encouraging disinvestment through reckless expansion of erosive crops at the extensive margins. If shortages in Europe demand an increased output of erosion-inducing crops there are several methods of achieving this without increasing exploitation: (1) The area of such crops may be expanded on land which is not susceptible to erosion. (2) The yields may be raised by increasing the intensity of primary production; since labor may be limited this would

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[4] U.S.D.A., *Agricultural Statistics*, 1941, table 672, p. 538.

mean increased use of fertilizer, machinery, and soil and water conserving practices. (3) An increase in the acreage of such crops on land susceptible to erosion should be discouraged, and when it does take place the effects should be minimized by the use of the most suitable erosion control practices. The problems of adjusting agricultural production to war needs and conservation are discussed in greater detail in Chapter 11.

ADJUSTMENTS TO FALLING PRICES

When we turn to an analysis of the effects of falling prices for farm products we often find that adjustments, corresponding to the reverse of what occurs when prices rise, do not take place. Where rising prices have led to an expansion of wheat and arable farming and a reduction in pasture it may be difficult for the reverse movement to take place because of the difficulty of disinvesting capital in farm machinery and equipment. If the more intensive land use has meant that large pasture areas have been broken up into smaller arable farms, a return to pasture means consolidation of land areas and a smaller population. This, in turn, implies a new tax base and the curtailment of such services as those provided by roads, schools, and villages. Such changes occur mainly through bankruptcy and finally migration; before this takes place the farm operator will of necessity exploit the land to the limit in the hope of a return to previous price levels. When this condition is associated with declining yields resulting from the loss of virgin fertility or the reduction of soil moisture, the conditions are made more hopeless.

Where high prices have led to more intensive farming and high land values, falling prices lead to a reduction in the use of fertilizers, hired labor, and other operating expenses. Where an operator has purchased a farm on a mortgage he finds that his payments remain high and his income is lower. This

may lead to an effort to disinvest by using up the fertility of the soil without regard to the future because of the uncertainty of whether he can retain ownership or not. At the same time falling prices and land values retard investments in conservation measures and reclamation projects.

EFFECT OF THE TIME PERIOD

The effect of price changes upon land use and conservation are also related to the length of time the trend persists. Price changes which persist long enough to affect land values are of major importance in creating problems of adjustment and conservation. Short-time fluctuations, however, are also related to the problem of conservation because of the uncertainty they create. To offset uncertainty considerable diversity and flexibility of production are desirable. Diversification may encourage conservation while price flexibility may discourage it by making it more difficult to establish and maintain the necessary crop rotations. Investment and farm reorganization to control erosion can be evaluated only in terms of their profitability in relation to some anticipated price level. Where there is a great deal of uncertainty regarding prices, the risks of investment are greatly increased, and long-time planning is handicapped. This can be offset by making conservation plans as well as debt payments as flexible as possible. Governmental action aimed at reducing price fluctuations may also be helpful in encouraging conservation investments.

FLUCTUATIONS IN COSTS; INTEREST RATES

When we consider fluctuations in costs as well as fluctuations in prices of farm products, we find general relationships almost identical to those just considered. Lower costs lead to conservation in some cases, while in others they may result in exploitation. Lower costs of fertilizer, lime, terracing, etc., encourage conservation; lower costs for tractors and the de-

velopment of improved machinery, on the other hand, may lead to greater exploitation by expanding the area of erosive crops at the expense of hay and pasture. As in the case of changes in the price of goods produced, the effect of changes in costs will depend upon the changes in the profitability of competing enterprises, and this will be determined by the new combination of the factors of production and the gross farm income.

Increased costs are likely to be associated with an increase in the prices of all products purchased by farmers, and the ratio of prices received to prices paid may be changed adversely. · When this ratio declines it means that the farmer receives a lower real income, and where the level of living is low, pressure to maintain it by disinvesting is created. In many cases this may lead directly to exploitation of the soil, particularly where the capital loss is not borne by the operator. This pressure to exploit the land results from an attempt to maintain a given level of living in the face of a declining real income and would probably vary inversely with the accepted level of living and should, therefore, show wide regional differences. How important this pressure may be and what its relationships are to the availability of loans is not known, but it is probably closely related to conditions of tenure, the possibility of adjusting the size of the farming unit, and the availability of other sources of income. More research into these and related problems is needed.

Because of its relation to the value of the soil resources, one of the most important "prices" affecting conservation is the rate of interest. This problem is discussed at length in the next two chapters and need be mentioned here only by way of introduction. As interest rates are lowered land values increase, and the value of the soil capital destroyed by exploitation is increased; this encourages both conservation and improvement. At the same time the cost of applications of

capital to the farm enterprise are reduced, and larger expenditures may be made to attain the optimum combination of factors. This increase in the intensity of capital applications will encourage conservation in those areas where it increases the use of lime, fertilizer, livestock, terraces, etc., and it will encourage increased exploitation in those areas where it permits an expansion of the extensive margin of erosive crops by reducing the annual costs of tractors and other machinery. In this case the effect of changes in interest rates is identical with changes in other costs.