THE ECONOMIC ORGANIZATION OF AGRICULTURE.*

The rapid growth of commercial farming, and the enormous economic development which followed the industrial revolution of the nineteenth century, has been attended by many "growth" problems of crucial importance to agriculture. Questions of how well agriculture fits into economic development, and how well agriculture can cope with the great price and income instability which has been associated with the growth of commercial farming, pose important problems of agricultural organization. These problems are of particular importance to Australia at the present time. In a recently published book, Professor T. W. Schultz, one of the leading agricultural economists in the United States, has attempted to advance our still very limited insights about economic development and economic stability as they relate to agriculture. Professor Schultz's new book, *The Economic Organization of Agriculture,* should prove of great interest not only to professional economists, but to many others who are closely associated with the economic problems of agriculture. In this article an attempt will be made to summarize the arguments advanced by Professor Schultz, particular attention being paid to those aspects of his thesis which are of special relevance to Australian agriculture.

Professor Schultz is head of the Economics Department at the University of Chicago. Much of his work has been concerned with problems of development and stability in agriculture, and this particular book is a development of the essential ideas expressed in his earlier *Agriculture in an Unstable Economy* (1945). Schultz has drawn widely and heavily on new research by his colleagues, so that his new book is a useful synthesis of recent developments in its field.

The book falls into three parts. Part I is a study of the relationship between economic development and agriculture. Agriculture may greatly assist or inhibit general economic development. "When the niggardliness of nature is real, and new and better production possibilities in agriculture come hard, the prospects of economic development are not bright. When technical advances in agriculture make possible a cornucopia, the stage is set for a more rapid development." Similarly, the general economic development of an economy greatly influences the welfare of the agricultural sector, bringing to it both benefits and problems. Part I is concerned with long-run problems in this relationship—the factors which explain the slow and gradual shifts in demand and supply.

Part II, on the other hand, is focussed on the large and abrupt short-term movements in economic variables which give rise to the problems of price and income instability in agriculture. Part of this instability is general to the economy as a whole, but a large part of it is specific to agriculture, and would be serious even in an otherwise stable economy.

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* *The Economic Organization of Agriculture*, Theodore W. Schultz (McGraw-Hill Book Co. Inc.), New York, 1953, pp. 374. $5.50.

Part III evaluates the organization of agriculture in meeting the problems of development and instability. It also suggests methods by which organization might be improved in the light of previous discussion.

1. Agriculture in a Developing Economy.

Much of Part I is concerned with investigating the economic effects of long-term shifts in the demand for agricultural products and long-term changes in the supply of factors of production (agricultural land, labour, materials and equipment and production techniques). In brief, Schultz finds that advances in production techniques have increased agricultural production in the United States by approximately 1.6 per cent. per annum over the past 27 years. He further suggests that there are reasons to expect that the increase in the domestic demand for farm products will slow up. This poses long-range problems of agricultural organization which are discussed in Part III.

Factors Affecting Long-Term Demand.

On the demand side, the two most important variables examined are income and population. The problem studied is that of gauging the future increase in demand for agricultural products, and the claims this increase will make upon agricultural resources and their utilization. Schultz points out that the growth of population in the United States is occurring at a diminishing rate. Further, the increase in income that comes with economic development is subject, in the case of farm products, to a relatively low income elasticity[1]. Thus it seems likely that *the demand for farm products in the United States will increase at a slow and diminishing rate.*

How far does this conclusion apply to Australia? No work has been done on the income elasticity of the demand in Australia for agricultural products, and this is a field of research which would merit attention. However, there is little doubt that results broadly similar to those in America would be obtained. Australian population trends, however, are likely to differ considerably, since Australia is at a much earlier stage of population growth. But the main fact impeding any facile analogy with the United States is the much greater dependence of Australian agriculture on wool (which has a relatively high income elasticity) and on export demand for food. The future demand for agricultural products in Australia's traditional and potential markets is, of course, far less capable of prediction.

To illustrate the importance of the effects of population growth and rising real incomes on the demand for agricultural products, Schultz cites the following situations based on development in the United States. During the decade 1900-1910 the population of the United States rose

[1] For the information of readers not acquainted with this technical term, the "income elasticity of demand" for a product is the measure of the extent to which demand for that product will increase with a rise in the community's real income, other things (including relative prices) remaining constant. Thus an income elasticity of .5 in the demand for a product means that a 100 per cent. increase in the community's income will be followed by a 50 per cent. increase in demand for that product *ceteris paribus*. Schultz is here referring to the well-known fact that as the real income of a community (or an individual) rises, that community (or individual) usually spends a smaller proportion of income on food.

by 20 per cent., whilst income per capita rose 25 per cent.; the income elasticity of demand for farm products at the farm was approximately .75. Under these conditions, with other things constant, it can be calculated that the demand for agricultural products would increase 42.5 per cent.—a very substantial rise. During the decade 1940-1950, population increased by 14 per cent. and per capita income 33 per cent., whilst the elasticity of demand for farm products had fallen to .25 approximately. In this situation, with other things remaining constant, demand for agricultural products would increase by only 23.4 per cent.[2]

"It can be seen that with incomes rising and with technology in agriculture improving, it makes a great difference whether the income elasticity of farm products is less than .5 or substantially more, and whether, taking the community as a whole, it is falling slowly or rapidly as incomes rise."

Population Growth and Demand.

To the embarrassment of the country's leading demographers, the population of the United States increased by 14.4 per cent. during the ten years ended 1950. This was an unexpected reversal of trends, since the rate of population increase had been steadily declining since the previous century. Schultz, however, does not consider that this development warrants any radical revision of ideas on the relation of the demand and supply of food. Whilst population increased 14.4 per cent. during the period, the production of food expanded a strong 26 per cent.

Generally speaking, an increase in population will tend to increase the demand for food. But in examining the relation between food and population, Schultz is led to deplore the confusion that has risen from the failure to specify the structural conditions which determine that relation. An increasing world population will not necessarily draw on the food supply of the United States to any significant extent. Under normal conditions the population of most of the world has no relevancy whatsoever to the demand for and supply of food in the United States. For example, there is virtually no connection of economic importance between the United States' food supply and the population of India, except under emergency circumstances.

In examining the relation between population and food, Schultz classifies world populations along the lines of the percentage of the consumer's income spent on food. The *High Food Drain* (Type I) community which spends 75 per cent. or more of its income on food, has a low standard of living and high and flexible birth and death rates, which maintain a balance between food and population (e.g., most of Asia). Here the population growth alone "determines" the demand for food (although the causal relation is that the food supply broadly determines the population). Very little of the demand for United States or Australian food production originates in Type I populations.

Intermediate Food Drain (Type II) populations, which spend 25-75 per cent. of incomes on food, are transitional. In the early stages of development there is a considerable increase in the demand for food,

[2] .25 x .33 x 114 = 9.4 per cent. increase in demand resulting from increased incomes. Add to this 14 per cent. for the population increase and there is a 23.4 per cent. increase in demand.

but usually this demand is largely satisfied from domestic production. As the standard of living rises in these countries, imports are mainly of capital goods rather than food. Thus the export demand for United States food is largely restricted to *Low Food Drain* (Type III) populations such as Western Europe, where less than 25 per cent. of income is spent on food. In these countries population is virtually independent of the food supply, and the level of income becomes an important governor of the demand for food.

Income and Demand.

Schultz estimates that the demand for agricultural products in the United States is increasing at an average rate of two per cent. per annum, although he expects this rate of increase to slacken in the future. The current rate of increase of demand results from a population growth of 1.5 per cent. per annum and an increase in average income of two per cent. per annum. In making this estimate, Schultz collates most of the important research on the income elasticity of demand for farm products in the United States, and uses an estimate of .25.

The research quoted falls into two types—cross-sectional and time-series. Cross-sectional research makes use of budget studies to compare the food expenditure in various income groups at a point of time. The time-series method involves an examination of aggregate consumption at various levels of income through time, allowances being made as far as possible for the effect of changes in other factors governing consumption (such as relative prices).

In the absence of any Australian data on the subject, some of the income elasticities of demand reported by Schultz for the United States are of interest. Set out in Table I are extracts from one of Schultz's tables. With different price relations and different income levels in this country, comparative Australian figures, if available, would differ to some extent. The products with the higher elasticities are, of course, those for which demand increases considerably as incomes rise. It will be noted that in the case of the relatively cheap "energy" foods, such as potatoes, and flour, the elasticity is negative, indicating an absolute fall in consumption with rising incomes.

TABLE I.

Income Elasticity of Demand for Food in Northern and Western United States.

Product.	Income Elasticity of Demand.
Flour	−0·236
Potatoes	−0·036
Sugar	0·054
Beef—Round Steak	0·206
Milk	0·284
Butter	0·327
Oranges	0·425
Cheese	0·503
Ham	0·607
Cream	1·12
Beef—Sirloin	1·32

Source.—Quoted in Schultz, *op. cit.*, p. 73, from Waite and Trelogan, *Introduction to Agricultural Prices*, Burgess Publishing Co., Minneapolis, 1948.

The measurement of income elasticities, beset as it is with difficulties, is only part of the task of assessing the future demand for agricultural products. It is also necessary to forecast the future level of real incomes. Quite apart from problems of measurement, there is also the difficulty of gauging the secular trend of real incomes. Between 1873 and 1933 the broad sweep of economic development is clearly recorded. During that period the national income of the United States expanded eightfold, population grew almost threefold, and income per head virtually tripled. After 1929, however, the data is more difficult to interpret, when one is seeking to project into the future. The depression of the 'thirties and the upsurge of one-third in per capita income in the 'forties were unique and isolated events which have differently coloured later forecasts according to the emphasis placed on each.

Factors Affecting Long-term Supply.

Between 1910 and 1950 agricultural production in the United States increased by 75 per cent., despite the fact that farm prices did not increase relative to the index of all other prices. In gauging the new and better production possibilities in agriculture, it is necessary to discover to what extent this increase was due to increased resources used in agriculture (inputs) and to what extent it was due to increased efficiency in production techniques (increased output per unit of input).

Schultz estimates that in the 40 years ended 1950 there was an increase of between 14 and 33 per cent. in agricultural inputs[3]. Labour inputs declined, whilst land remained fairly constant and capital items (farm machinery and equipment, fertilizer and other farm supplies) increased fourfold. A 14 to 33 per cent. increase in resources used, associated with a 75 per cent. increase in output, indicates an improvement in the efficiency of productive techniques of between 33 and 54 per cent. The rate of increase in production per input averaged between 1.19 and 2.00 per cent. per annum between 1923 and 1950.

In the light of these estimates it would seem that money spent on agricultural research and extension is a good investment. The question arises, "Is enough being invested in the 'production' of new agricultural techniques?"

Before answering this question, Schultz makes explicit his assumption that a new technique resulting from research is a kind of input, coming within the framework of economic analysis, rather than something the production of which is costless, accidental and unpredictable. He further points out that, as distinct from private industrial research, the results of agricultural research are immediately available to all producers, and in fact, the strong element of competition in agriculture tends to force their quick adoption.

In gauging the value of inputs saved by the advances in production techniques, Schultz estimates how many extra resources would be needed to produce the 1950 agricultural output with 1910 inputs (i.e., he estimates the effect of removing the 33 to 54 per cent. increase in efficiency). He calculates the saving in one year (1950) at a minimum of 9,600 million dollars. The cost of agricultural research and extension

[3] The range of 14 per cent. to 33 per cent. in the estimate of the increase in resources employed in agriculture represents the range of results obtained when 1910-14 prices and 1946-48 input prices are used as weights for the indices.

in 1950 (from public funds) was only 175 million dollars. On Schultz's estimates, the savings in 1950 alone from advances in production techniques were probably more than double the entire public investment in the "production" of new techniques over the past 40 years.

Whatever the validity of the method of calculation (and there seems to be a more than ample margin to cover the more obvious objections), one could hardly ask for a more spectacular answer to the question, "Is enough money being spent on agricultural research and extension?" Most students of agriculture are convinced that a similar answer to this question would be obtained in Australia.

Schultz's optimism with regard to future production facilities is in no way affected by any threat of a future shortage of land. Considerable space is devoted to showing that agricultural land (as a factor of production) is declining in economic importance in the United States, and is no longer a critical limiting factor. The proportion of all agricultural inputs represented by farm land fell from 19 per cent. to 17 per cent. between 1910 and 1950. Capital is being substituted for land and labour in the expansion of total agricultural resources. The same trends are also in evidence in Australia and other economies broadly similar to the United States.

In the concluding section of Part I, Schultz devotes two chapters to locational divergences and income disparities between communities in economic development. One of the major agricultural problems in the United States is the problem of the "backward areas," where a surplus and under-employed agricultural population receives returns far below those ruling in the rest of the country. This problem is less important in Australia, where the movement of rural populations to urban areas is proceeding all too fast in the opinion of many.

2. Economic Instability and Agriculture.

Leaving aside changes in the general level of prices, the rest of the instability that characterizes agriculture can be largely explained by the well-known hypothesis that the price elasticities of the demand and of the supply of farm products are low, and the shift in one or the other of the [demand and supply] schedules is large and abrupt[4].

[4] In elementary terms, the "price elasticity of demand' for a product is a measure of the extent to which demand for that product is affected by a change in its price, *ceteris paribus*. For instance, if the demand for agricultural products has a price elasticity of —.25, a rise of 100 per cent. in price will result in a fall of 25 per cent. in demand, other things remaining constant. This is related to price instability in the following way.

When the price elasticity of demand for a product is low, (i.e., demand is insensitive to price) a moderate fall in supply is met by a fairly rigid demand, and a large price increase is necessary before demand is reduced sufficiently to balance supply. Similarly, a moderate increase in supply necessitates a considerable fall in price to clear the market.

When the price elasticity of supply for a product is low, (i.e., supply is relatively insensitive to price) a moderate rise in demand necessitates a large rise in price if production is to be encouraged sufficiently to meet the increased demand. Similarly, a moderate fall in demand necessitates a considerable fall in price before production is discouraged sufficiently to eliminate the "surplus."

Inelastic Demand.

Schultz considers that the price elasticity of demand for agricultural products at the retail level is approximately —.25 (in the middle range of price). Because marketing costs are large and inflexible, the elasticity at the farm level is even lower. This is one of the major factors causing large short-term variations in agricultural prices. There are no comparative figures available for Australia, but there is no doubt that the elasticity of demand for agricultural products is very low in all well-to-do countries, where, generally speaking, people eat as much food *in total* as they want, almost regardless of price.

In view of the fact that no figures are available for Australia, some of the results quoted by Schultz for individual farm products should be of interest (see Table II). The products with the higher price elasticities of demand, such as meat, are those whose demand decreases most with a rise in price, and increases most with a fall in price.

TABLE II.

Price Elasticity of Demand for Agricultural Products in the United States (at the Farm Level) 1949.

Product.	Price Elasticity.
Potatoes	−0·11
Grain Sorghums	−0·38
Wheat	−0·41
Eggs	−0·42
Turkey	−0·55
Milk	−0·60
Butter	−0·75
Wool	−0·75
Hogs (excluding Lard)	−0·80
Beef Cattle	−0·80
Mutton and Lamb	−0·80
Farm Chickens	−0·89

Source: Schultz, *op. cit.* p. 190, quoted from Mehren, G. L., "Comparative Costs of Agricultural Price Supports in 1949", *Proceedings, American Economic Review*, Vol. XLI, No. 2 (May, 1951).

In Australia it is probable that eggs and turkeys would have a higher price elasticity, relative to the other products listed in Table II.

Inelastic Supply.

In the case of some of the minor crops in the United States, where land, equipment and other inputs are easily transferable from one line of production to the other, supply is fairly responsive to price changes (i.e., fairly elastic). But in the case of the major crops and most of the livestock industries, supply is not very responsive to price changes in the "short run" (two years).

The question as to how responsive farmers are to changes in prices has been the centre of considerable speculation and controversy in Australia in recent times. The theory has been advanced at several levels that higher prices for agricultural products are unlikely to provide a significant incentive for increased production, since, it is argued, the attendant higher incomes reduce the farmer's inclination to increase

his efforts, and allow him the opportunity for greater leisure. The corollary of this theory is that lower prices for agricultural products are likely to stimulate production, it being held that lower farm incomes will force farmers to expand production to maintain income.

Speaking of American experience, Schultz is emphatic in stating that the data shows that "the belief that, no matter how adverse the farm price situation becomes relative to other prices, farmers do not and cannot contract their operations, is fundamentally false"[5]. Schultz quotes a number of periods when farmers in the United States responded significantly (after a time-lag) to price changes. In the period 1931-33, a fall of 40 per cent. in farm prices was associated with a fall in agricultural inputs (resources used) of six per cent. This fall was quite significant, having regard to the stability of agricultural inputs and allowing for the long-term trend upwards. Examination of the period 1920-1924 shows a similar result. In the two periods 1917-1920 and 1939-1949, when agricultural prices rose considerably, agriculture expanded eight per cent. and nine per cent. respectively (in terms of inputs).

Large and Abrupt Shifts in Demand.

The mobilization for war, the waging of war, demobilization and the effects of international crises such as the Korean conflict have been, through their effect on demand, the most potent causes of agricultural price instability over recent years. Sharp variations in the general level of incomes during the trade cycle have also contributed considerably to the instability of demand for agricultural products.

During the period 1930-31 the fall in incomes reduced demand by approximately six per cent., whilst the mobilization period 1940-42 saw an increase in demand of five per cent., after allowing for the normal trend. These shifts in demand have been sufficiently large to cause considerable havoc, given the existing inelasticities of demand and supply and existing economic and political organization.

Large and Abrupt Shifts in Supply.

There is a sharp contrast between primary and secondary industry, in that agriculture is slow and gradual in committing resources to production, whilst industry is sensitive and erratic. "This behaviour on the part of farmers assures consumers of a large and steady supply of farm products, but has meant great instability in farm prices and incomes"[6].

The average annual variation in agricultural inputs is approximately one per cent. per annum, whilst the variation in planned inputs is even less (i.e., after allowing for extra resources used as a result of weather influences, such as extra harvest costs for a bumper crop). Although agricultural inputs are one of the most stable of all major economic variables, the instability of yields due to weather influences causes considerable variation in agricultural production. The effect of yield instability is seen in the fact that the average variation per annum in agricultural production in the United States after correcting for trend, is four times greater than the variation in inputs (i.e., four per cent).

[5] Schultz, *op. cit.* p. 211.

[6] Schultz, *op. cit.* p. 323.

Average yield variations from year to year for the period 1909-1949 were 4.5 per cent. for tobacco, 6.8 per cent. for potatoes, 8 per cent. for soya beans, 9.4 per cent. for wheat, 10.6 per cent. for cotton, 14 per cent. for corn, 16 per cent. for oats and 19 per cent. for linseed. The United States average yield variation for agricultural products was 7.1 per cent. Very large regional variations are hidden in these averages, as well as the bunching of good and bad years.

As examples of the effect of yield variations on farm prices, the following estimates are provided: "Bad weather and poor crops, especially in 1934, pulled down the sales of farm products in 1935 about five per cent.; enough to bring about a 20 per cent. rise in prices at the farm. The bumper crops of 1937, on the other hand, resulted in 16 per cent. more farm products being sold in that year than in 1935. After allowing for a recovery from the low of 1935 of five points, the remaining 11 per cent. would indicate a fall in the price at the farm of about 40 per cent., other things unchanged[7].

3. Economic Organization for Development and Stability.

In this section Schultz considers the possibilities of improving organization in the light of the arguments of the previous two sections. With this object in view, he examines organization at three main levels—the farm, the market, and "political and social integrating processes." The problems of the resolving of community preferences for various types of organizations are also treated.

Organizing Agriculture for Economic Development.

One suggestion made by Schultz on the problem of stimulating the development of agriculture is to the effect that the political process has worked imperfectly in determining the extent of agricultural research and extension. In other words, there has been insufficient investment of inputs in the discovery and adoption of new and better production techniques. Schultz also makes a plea for better information services—covering both technical and economic information—as an aid to the farmer in making the best use of his resources.

Considerable attention is devoted to the problem of "backward areas" already mentioned. This involves a discussion of methods by which agriculture's labour market and capital market might be improved. The labour market is apparently ineffective in the task of removing surplus population from these areas. Various proposals are advanced, aimed at reducing the barriers to migration and reducing the need for migration.

The inefficiency of the capital market in serving primary production is largely bound up with the problem of "capital rationing." The shortage of capital in agriculture is a problem of considerable significance in Australia, where the factors impeding a greater flow of investment into agriculture are similar to those operating in the United States. The general unwillingness of farmers to borrow and lenders to lend for investment in agriculture, up to the optimum level, leads on to the subject of price and income uncertainty and instability in agriculture.

[7] Schultz, *op. cit.* pp. 339-40.

Organizing Agriculture for Stability.

As far as *yield instability* is concerned, some relief can be expected from improved production techniques and an extension of irrigation. However, these are only partial solutions to the problem, and even then they apply only in the long run. The possibilities offered by yield insurance of various types are considered, and there is some reference to the need for adaptations of the farm firm to cope with the instability of both yields and prices. Larger farms capable of standing a long run of lean years have advantages in this respect, but as Schultz points out, the "community preference" (at least as it is expressed through the political process), is for "family farms," necessarily limited in size. Various forms of community aid to ameliorate the effects of yield instability are also briefly treated.

On the question of reducing agricultural *price instability,* Schultz points out that "Any proposal to reduce the variability of farm prices worthy of consideration must start with the general level of prices[8]." Although agricultural prices and incomes would be very unstable even in the absence of major movements in the general price level, such movements shift the demand for agricultural products substantially. It is equally necessary that any measures to counteract agricultural instability be anti-cyclical, otherwise there would be serious effects on the economy generally.

Schultz considers that little can be done to reduce the variations in agricultural production, since they are largely due to yield variations, and the price inelasticity of demand for agricultural products must also be largely accepted as "given." Efforts were made in the 'thirties to artificially increase the elasticity of supply of farm products by means of acreage allotments under the Agricultural Adjustment Administration. However, this attempt to induce farmers to reduce production in the face of falling prices had little success. Although many farmers accepted payments from the A.A.A. for conforming with their acreage allotments, the effect on production was insignificant. Farmers were able to maintain output by removing from production only their poorest land, farming the remainder more intensively, and producing substitute crops not covered by acreage allotments.

Three proposals are elaborated which could assist agriculture to *accommodate* itself to prices and income instability, as distinct from *reducing* agricultural instability. One of these—the development of larger farms capable of coping better with instability, has already been mentioned. The other suggestions are the safeguarding of agricultural incomes during depressions by direct payments to farmers, and the extension of storage to counteract variations in agricultural production.—A. G. LLOYD.

[8] Schultz, *op. cit.,* p. 343.