

AGENCY FOR INTERNATIONAL DEVELOPMENT WASHINGTON, D. C. 20523 <b>BIBLIOGRAPHIC INPUT SHEET</b>	<b>FOR AID USE ONLY</b>
---	-------------------------

1. SUBJECT CLASSIFICATION	A. PRIMARY <b>Agriculture</b>	<b>AE70-0000-0000</b>
	B. SECONDARY <b>Distribution and marketing</b>	

2. TITLE AND SUBTITLE  
**The functions of agricultural prices in economic development**

3. AUTHOR(S)  
**Mellor, J.W.**

4. DOCUMENT DATE <b>1968</b>	5. NUMBER OF PAGES <b>18p.</b>	6. ARC NUMBER ARC <b>338.13.N527a</b>
---------------------------------	-----------------------------------	--

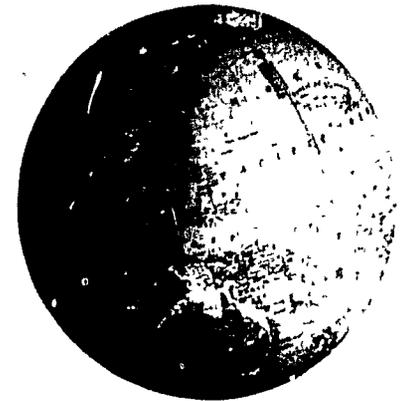
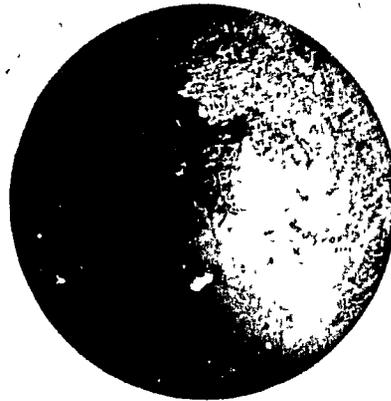
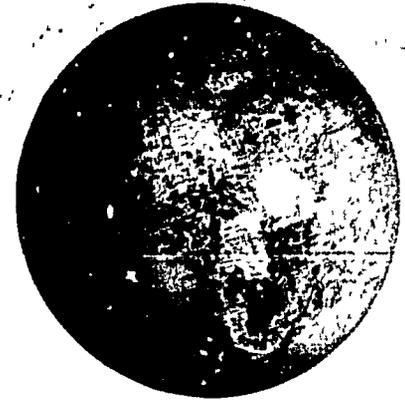
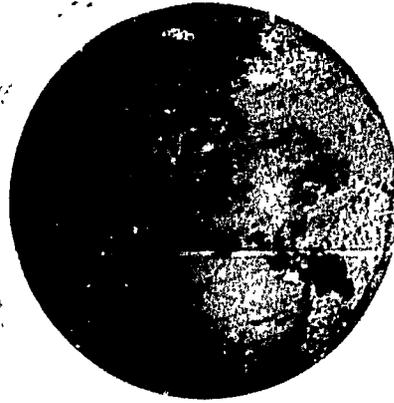
7. REFERENCE ORGANIZATION NAME AND ADDRESS  
**Cornell**

8. SUPPLEMENTARY NOTES (*Sponsoring Organization, Publishers, Availability*)  
**(In Indian j.of agr.economics,v.23,no.1,p.23-37)**

9. ABSTRACT

10. CONTROL NUMBER <b>PN-RAA- 291</b>	11. PRICE OF DOCUMENT
12. DESCRIPTORS <b>Prices</b>	13. PROJECT NUMBER
	14. CONTRACT NUMBER <b>CSD-1438 Res.</b>
	15. TYPE OF DOCUMENT

Reprinted from the Indian  
Journal of Agricultural  
Economics, Vol. XXIII, No. 1,  
January-March, 1968



## THE FUNCTIONS OF AGRICULTURAL PRICES IN ECONOMIC DEVELOPMENT

John W. Mellor

DEPARTMENT OF AGRICULTURAL ECONOMICS  
NEW YORK STATE COLLEGE OF AGRICULTURE, A STATUTORY COLLEGE  
OF THE STATE UNIVERSITY, AT CORNELL UNIVERSITY, ITHACA, NEW YORK

**W**ITH modern methods of travel and communication shrinking the world almost day by day, a progressive university must extend its campus to the four corners of the world. The New York State College of Agriculture at Cornell University welcomes the privilege of participating in international development — an important role for modern agriculture. Much attention is being given to efforts that will help establish effective agricultural teaching, research, and extension programs in other parts of the world. Scientific agricultural knowledge is exportable.

A strong agriculture will not only provide more food for rapidly growing populations in less-developed countries, but also a firmer base upon which an industrial economy can be built. Such progress is of increasing importance to the goal of world peace.

This is one in a series of publications designed to disseminate information concerned with international agricultural development.

Single Copy Free  
Additional Copies 25¢ each

**THE FUNCTIONS OF AGRICULTURAL PRICES  
IN ECONOMIC DEVELOPMENT**

By

**JOHN W. MELLOR**

Professor of Agricultural Economics  
Department of Agricultural Economics  
Cornell University, Ithaca  
New York, U.S.A.

---

*Reprinted from the Indian Journal of Agricultural Economics, Vol. XXIII, No. 1,  
January-March, 1968*

## THE FUNCTIONS OF AGRICULTURAL PRICES IN ECONOMIC DEVELOPMENT

John W. Mellor\*

Recommendation and critique concerning agricultural price policy are often counter-productive because they are made with only one of the various functions of agricultural prices in mind. Changes in agricultural prices perform three major functions and hence particular movements of agricultural prices may facilitate the achievement of certain goals through their operation on one function while those same price movements may operate against other simultaneously held goals through effect on other functions. This situation calls for great caution in formulating, operating and criticising agricultural price policy and closely circumscribes the extent to which agricultural price policy may be used for reaching any particular goal.

The three main functions of agricultural prices are to serve (1) as an allocator of resources, signalling to both producers and consumers regarding the level of agricultural production and consumption, (2) as a distributor of income and (3) as an influence on capital formation. The third of these influences grows naturally out of the second. It is treated separately because of its special significance to the processes of economic growth. There are very few empirical studies of the operation of these functions within the context of low income, agricultural dominated societies. Hence, there is little basis for arrogance in one's recommendations concerning agricultural price policy. Existing data and *a priori* reasoning provide the basis for a series of hypotheses which will be examined in the following pages.

### PRICE AS AN ALLOCATOR OF RESOURCES

Most of the scholarly discussion of agricultural prices and price policy has focussed on the allocative function of prices in production decisions. Because of the already copious literature of speculation in this area, I confine myself to a few relatively specific comments.

The empirical evidence is clear that changes in relative prices of various agricultural commodities may under some circumstances have a quite significant effect in reallocating resources among agricultural commodities. Observation and empirical study concerning sugar in Uttar Pradesh, cotton in the Punjab and jute in West Bengal are consistent with this judgment. The relatively high supply elasticities in these situations should not lead one to assume that the elasticities will be high for all situations, or that the elasticities for aggregate agricultural production are as high. The supply elasticities will vary depending on the physical, economic and cultural conditions of the specific situation and so will differ from place to place and from time to time.

---

\* The research on which this paper is based is part of a series of studies carried on at Cornell University as part of a USAID financed contract for research on agricultural prices. Professor M. L. Dantwala and Sarvashri J. S. Sarma and Ram Saran gave me the benefit of their comments on an early draft of this paper. A number of improvements in the paper reflect their help.

The aggregate supply elasticity for the agricultural sector with respect to the relationship between agricultural and non-agricultural prices would be considerably lower than that for individual commodities of the type mentioned above. Some evidence to this effect arises when commodities are studied which take up the bulk of the supply of land and other fixed resources. It has been common to find that the supply elasticity for the basic foodgrain crops such as wheat or rice are much lower than for so-called commercial crops such as cotton. The reason is often ascribed to a special attitude of farmers towards subsistence crops. The explanation probably is much simpler. The major foodgrain crops comprise a high proportion of the aggregate agricultural production and therefore respond much more like the aggregate, with consequently lower supply elasticities with respect to relative price. It is conceivable that a crop taking up 10 per cent of the total acreage in an area could have a much more elastic supply response than the aggregate, but it is not conceivable for a crop taking up 95 per cent of the acreage. The lesser crop after all can double in acreage at the expense of the major one, but the major one cannot similarly double at the expense of the minor one.

We are greatly in need of careful studies of aggregate supply response for the agricultural sector which can give us a more accurate idea as to the extent to which price changes do in fact affect aggregate agricultural production. Until we have such studies, I offer the speculation that the aggregate supply response to price is even lower in a low income traditional agriculture than in a high income modern agriculture.

Our impression of modern agricultures is that aggregate supply response is low. This is one of the basic precepts of United States policy towards the problem of low incomes in its own agricultural sector. The aggregate supply response in traditional agricultures is likely to be even lower because of the lesser use of purchased inputs and the lesser opportunity for transfer of labour resources to and from productive use in other sectors of the economy.

If this supposition concerning aggregate supply elasticity is wrong it is probably for one of the following two reasons. First, it may be that there is substantial scope for increasing labour use in agricultural production, higher prices inducing more hiring of labour and more shift of farm family labour from leisure to agricultural work. For there to be a production effect one would have to assume significant positive marginal productivities of labour in agricultural employment. Alternatively, it may be that there is acute capital rationing in agriculture and that higher prices have a substantial income effect which reflects itself in greater ability to invest in capital improvements such as irrigation wells, land improvements, bullocks and so on. If indeed credit rationing is a bottleneck to expanded agricultural production, credit programmes might be a more efficient way of breaking the bottleneck than high agricultural prices.

Agricultural prices may play a more important role in signalling to government the need for greater investment in roads, power supply, extension, research and other parts of the infra-structure of technological change in agriculture. It may be important to development policy that this function of prices not be blunted.

The empirical evidence concerning the effect of price on the consumption of agricultural commodities is considerably better than that regarding the effect on supply, but it is nevertheless largely circumstantial. For India there are numbers of well administered cross-section studies of the relationship between income and food consumption which indicate that income elasticity of demand for foodgrains is of the order of 0.5 and that for agricultural commodities in total of the order of 0.8. From the homogeneity condition and what appears a reasonable assumption about cross elasticities we assume that the price elasticity is the same as the income elasticity but with the sign reversed. This would suggest that price does play a quite effective role in determining consumption of agricultural commodities. It often does this, of course, at fearful social cost. The data and the logic together indicate that it is the lower income persons who must reduce consumption of food in response to rising prices. They, of course, do so despite an already inferior diet. It is sometimes argued that the income and price elasticity of demand for low income persons for foodgrains must be inelastic to the extreme since they are already at such a necessitous level of food consumption. However, it must be remembered that in that circumstance they would already have reduced consumption of other goods to the most necessitous level also. Even in a physical sense, man does not live by bread alone. In addition, if the bulk of one's consumption is food and food prices rise then there is an obvious income effect reducing the quantity one can buy.

#### PRICE AS A DISTRIBUTOR OF INCOME

Agricultural prices have what appears at first to be a somewhat peculiar effect on income distribution. Change in agricultural prices does, of course, effect a transfer of income between agricultural and non-agricultural sectors of the economy. In addition, however, it affects the income distribution between high and low income persons. A rise in agricultural prices redistributes income away from low income urban consumers and towards high income agricultural producers.

Change in agricultural prices affect cultivators' incomes in proportion to their sales of produce. In general, the lower income cultivators are those who sell a small proportion of what they produce. For a cultivator who sells only 10 per cent of what he produces, the rest being kept for home consumption, a 10 per cent relative increase in agricultural price only increases his real income by 1 per cent. For a cultivator who sells 70 per cent of what he produces, real income rises by 7 per cent with a 10 per cent relative rise in agricultural prices. The contrast in the change in income in actual rupee terms is even more striking.

We find a roughly converse situation in regard to consumers. Rising food prices affect relative real incomes of consumers in the proportion to which they spend their incomes on agricultural commodities. Lower income urban consumers spend a much higher proportion of their incomes on food than do higher income urban consumers. Thus for a low income consumer who spends 70 per cent of his income on food, a 10 per cent increase in food prices will represent a 7 per cent decline in real income, perhaps somewhat dampened by substitution of expenditure to other commodities.<sup>1</sup> For a high income urban consumer

1. As will be pointed out in the next section, in the long run, increases in money wages may shift this burden off the lowest income workers and on to the capitalist sector.

spending only 20 per cent of his income on food a 10 per cent rise in food prices provides only a 2 per cent decline in real income. Of course, the high income consumer spends a larger rupee sum on food than does the low income consumer and so the high income consumer experiences a greater absolute change in real income with changes in agricultural prices.

In a welfare sense, it is probably the relative changes in income which are important. In terms of the aggregate effects on other sectors of the economy, however, it may be the absolute impact on the wealthier consumer which is most relevant. The consumer situation is thus more complicated than the producer situation. The wealthy cultivator, compared to his poorer neighbour, sells a larger absolute amount as well as a larger proportion of his crop whereas the wealthier consumer consumes a larger absolute amount of food even though it is a smaller proportion of his total expenditure as compared to the poorer consumer.

One must not overdraw the income distribution effects of agricultural prices as entirely a matter of urban consumers *versus* rural producers. The large rural landless labour class is comprised of net purchasers of food. Many cultivators with very small holdings are also net purchasers of food. In so far as they purchase for cash, a rise in agricultural prices affects them primarily as consumers, causing a decline in real income.

#### PRICE AS AN INFLUENCE ON CAPITAL FORMATION

As in the case of income distribution, changes in agricultural prices have opposing effects on capital formation in the agricultural and industrial sectors.

An increase in agricultural prices encourages increased investment in the agricultural sector. It does this through two influences, one of which is indiscriminant between high income and low income cultivators, while the other discriminates in favour of the higher income cultivators.

Higher prices increase the returns to investment by increasing the value of output. One can perhaps reasonably assume that essentially all of the output from increased investment will be marketed, and hence the increase in gross returns to investment would be proportionate to the price increase. In so far as lower income farmers do market somewhat less than 100 per cent of an investment induced increase in output, they will have the real returns to increased investment increased somewhat less by higher relative prices than do higher income cultivators.

The second influence of higher prices on investment in agriculture is through the income effect. Higher incomes increase the savings pool as well as making farmers a better credit risk and thereby encouraging lenders to lend. This influence, however, is in direct proportion to the income effect which is in turn in proportion to marketings. Farmers who sell only a small proportion of their output will receive only a small proportionate increase in income and thus very little addition to their capacity to save and to borrow.

Rising relative agricultural prices are discouraging to industrial investment. The standard explanation of the depressing effect on industrial investment from rising agricultural prices traces from W. Arthur Lewis, and indeed prior to that from Adam Smith, with the basic argument of food as a wages good. Translated into price terms, rising food prices cause upward pressure on money wages and this in turn causes a squeeze on industrial profits, thereby not only reducing the incentive to invest by lowering returns but also reducing the ability to invest by reducing the pool of profits which serves as a prime source of investment funds.<sup>2</sup> In practice, the effects may work directly through influences on wages and raw material costs in manufacturing industry and indirectly through effects on the service sector, including government, with ramifications on availability of investment funds.

In this regard it is interesting to note that a continuing policy for providing subsidized food to urban workers may be rationalized in terms of equity in income distribution but may serve primarily to increase industrial profits and capital formation at the expense of whatever group pays for the subsidy. If the supply of labour to urban industry is highly elastic then providing subsidized food will reduce the cost of living in urban areas, attract more labour into the urban labour force and make it possible to maintain industrial wages at a somewhat lower level than would otherwise have been the case. Thus subsidizing food for low income urban consumers is not as counter to raising saving and investment rates as might appear at first. Seen as a short term measure in the face of temporary weather induced food shortages, such food subsidies may work primarily to redistribute income because the supply of labour may under the circumstances be quite inelastic in the short run. But even in this case a primary effect may be to forestall wage increases.

Rising agricultural prices might appear to favour industrial investment by an increase in demand arising from higher rural incomes. However, higher agricultural prices in themselves simply transfer income from the non-agricultural to the agricultural sector *in proportion to the marketings of agricultural commodities* and hence have no net effect on aggregate consumer incomes. The decline in urban incomes from the price increase will exactly counter-balance the rise in farm incomes from a price increase. The precise structure of demand will differ according to the distribution of income among different income and cultural groups. Hence the distribution towards cultivators may have a beneficial demand effect at such times as there may be slack in industries producing commodities most demanded by higher income cultivators. This, of course, only meets a short term cyclical problem and not a long run problem of growth.

Even the stimulative effect of higher agricultural prices on the demand for agricultural inputs produced in the non-agricultural sector is somewhat illusory. Demand for such inputs will be raised by higher agricultural prices but, of course, higher wage and other costs accompanying higher agricultural prices will place a

---

2. For a full exposition of these points in relation to agricultural prices see John W. Mellor : *The Economics of Agricultural Development*, Cornell University Press, Ithaca, U.S.A., 1966; and John W. Mellor, "Towards a Theory of Agricultural Development," in Herman M. Southworth and Bruce F. Johnston (Eds.) : *Agricultural Development and Economic Growth*, Cornell University Press, Ithaca, U.S.A., 1967.

profits squeeze on those industries. The profits squeeze may be mitigated by an increase in prices which apparently could be carried by the added demand, but that of course, removes the relative price increase of the agricultural commodities, returning old price relationships. Again such measures may have something to recommend them in a short term situation of slack capacity, in which case marginal costs of production may be very low. That argument weakens as capacity is reached. On the basic questions of growth underlying problems of growth re-appear. In net, higher agricultural prices will as in the case of consumer goods, restructure demand, and hence output, towards inputs used by agriculture, but this will be much more a matter of production shifts within the industrial sector than of net growth of industrial production.

#### THE RELATIONSHIP BETWEEN AGRICULTURAL INCOME, PRODUCTION AND PRICE<sup>3</sup>

Much of the preceding discussion has dealt with the implications of income effects of price change and has abstracted the effect of price changes from the effect of production changes. It is, however, important to distinguish clearly between an increase in income in the agricultural sector which arises simply from a transfer from the non-agricultural sector brought on by changes in price relationships alone and an increase in income in the agricultural sector which is due to a net addition to national income, such as might arise from yield increasing technological change. The former makes at best marginal additions to economic growth and may in fact detract from it. The latter makes a clear contribution to economic growth, quite possibly of very major proportions. Much of the confusion regarding price policy and the effect of changing price relationships arises from confusion concerning the normal relationships between agricultural incomes, agricultural production and prices.

There are three important facets to the relationship between agricultural income, production and prices. First, agricultural incomes are a function of both the level of production and the level of prices. Second, the two casual factors of production and price tend to move counter to each other thereby in some part offsetting their respective influences. Third, the extent to which the influence of production and price offset each other depends on both the price elasticity of demand and the proportion of output which is marketed. The more inelastic is demand and the higher the proportion of output marketed, the smaller the relative effect of production on real incomes and the greater the relative effect of the counter-movement of price. These relationships are exceedingly important for determining the effects of production and price change on farm incomes, demand for non-farm commodities, the effect of buffer stock operations and many other aspects of agricultural production and price policy.

In low income, agriculture dominated economies there are cogent theoretical reasons for expecting little or no long term trend in the relationship between agricultural and non-agricultural prices.<sup>4</sup> Experience in the Indian economy confirms

3. I am particularly grateful to Sarvashri J. S. Sarma and Ram Saran of the Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India, for suggestions providing major development of this section of the paper.

4. For a full development of this point see John W. Mellor : *The Economics of Agricultural Development*, *op. cit.*

this expectation. In the period of the first three Five-Year Plans, short term, weather related, changes in production account for most of the fluctuations in agricultural prices around the trend line.<sup>5</sup> In this period there have been two runs of years of declining relative agricultural prices and two runs of rising relative agricultural prices, each of 2 to 4 years in succession.<sup>6</sup> Thus relative changes in agricultural prices have been primarily induced by and moved roughly inversely with agricultural production.

In general, it is assumed that the demand for agricultural commodities is inelastic and hence that the price flexibility coefficients are greater than one and that therefore decreases in agricultural production are accompanied by more than proportionate increase in prices and hence with increased farm incomes. This is clearly the pattern in high income countries.

In a low income country two factors work to reverse this relationship between production and income. First, the price elasticity of demand is much less inelastic in low income countries. Indeed the price elasticity of demand for all food may not be much "less" than minus one and even for foodgrains alone it may be as "high" as  $-0.5$ , and is in any case less inelastic than in high income countries. Second, in low income countries, farmers who produce food crops generally sell only a portion of what they produce and hence receive a market price impact on only a portion of production.

On the average, in India, farmers presumably sell about 30 per cent of what they produce. Given these magnitudes of price elasticity and proportion of output marketed, real incomes of farmers are directly related to production, in sharp contrast to the inverse relationship in high income economies. Thus in a low income economy when good weather brings increased production, real incomes of farmers rise and conversely when weather is poor. And likewise when technological change brings increased production, incomes rise, even without the effect of shifting demand schedules which accompany population growth and rising incomes.

The whole matter becomes obvious when we state that increases in agricultural production increase national income, affecting demand as well as savings and investment potentials. Price changes then distribute this addition to income between the agricultural and non-agricultural sectors. Price elasticity of demand and marketing ratios in low income countries are such that only a part of this increased income is distributed to the non-agricultural sector through price declines and a part remains in the agricultural sector. In the longer run, as distinct from the short run weather induced fluctuations, growth in population and urban derived incomes place a further upward pressure on agricultural prices favouring maintenance of an even higher proportion of the income from increased production in the agricultural sector.

---

5. John W. Mellor and Ashok Dar : Determinants and Development Implications of Foodgrains Prices, India, 1949-50 to 1963-64, Occasional Paper Number 3, Cornell University-USAID Prices Project, December 4, 1967.

6. John W. Mellor and Ashok Dar, "Change in Relative Prices of Agricultural Commodities, India, 1952-53 to 1964-65," *Agricultural Situation in India*, forthcoming, 1968.

These relationships and the sources of variability in their effect is illustrated in the following examples.

To calculate the effect of changes in production on agricultural incomes we need to know (a) the price flexibility coefficient, (b) the proportion of output marketed and (c) the change in the proportion of output marketed with respect to changes in production and the consequent change in prices. We have a moderately good idea of the price flexibility coefficient,<sup>7</sup> good information on the average production of foodgrains marketed,<sup>8</sup> but essentially no idea as to precisely how farm marketings respond to changes in production and prices.<sup>9</sup> A most desirable area for future research would be to conduct studies, for a period of years and a fixed sample of farmers, of changes in marketings, home consumption and stocks in response to changes in production and other variables. These relationships are extremely complex, with quite different behaviour expected among different income groups of farmers and relative income shifts among the groups being quite different.

The following examples (Table I) assume that the real value or utility of home produced home consumed food does not change over time and hence we show that component at a constant real price. All price changes are relative to non-agricultural prices. It is assumed that the price flexibility coefficient for agricultural commodities is  $-2.0$ , consistent with a price elasticity of demand of  $-0.5$ .

Model 1 assumes 30 per cent of output marketed, consistent with the "average" situation in the Indian foodgrains sector. It will be noted that when production declines by 20 per cent, even with a price increase of 40 per cent, twice the percentage decline of production, real farm income declines by 10 per cent. In this example, which keeps the proportion of production marketed the same, the value of marketings increases, and thus the farmers' cash incomes are higher. One might prefer the assumption that farmers would decrease the proportion marketed under such circumstances. Model 2 illustrates the implications of the assumption that marketings decline from 30 per cent to 25 per cent of production. This results in a small drop in the farmers' cash receipts and an even larger drop in total real income. It is clear that the smaller the proportion marketed initially, or the greater the drop in the proportion the greater will be the decline in real farm income.

It might be argued that it is not reasonable to assume the price flexibility coefficient constant at  $-2.0$  while assuming changes in the proportion marketed. However, the price flexibility coefficient assumed is derived from a study which takes into account total production and consumption with whatever division between home consumption and sales has occurred in the periods studied, although it is not known what that percentage was or how it changed. However, it can be seen from the models that with the average situation of 30 per cent marketed,

7. John W. Mellor and Ashok Dar : Determinants and Development Implications of Foodgrains Prices, India, 1949-50 to 1963-64, *op. cit.*

8. Dharm Narain : Distribution of the Marketed Surplus of Agricultural Produce by Size-Level of Holding in India, 1950-51, Asia Publishing House, Delhi, 1961.

9. For an impressive contribution on this see Raj Krishna, "The Marketable Surplus Function for a Subsistence Crop : An Analysis with Indian Data," *The Economic Weekly*, Vol. XVII, Nos. 5, 6, and 7, February, 1965.

TABLE I—THE EFFECT OF CHANGES IN PRODUCTION ON FARM INCOMES WITH VARYING ASSUMPTIONS CONCERNING PROPORTION MARKETED

	I Base situation			II 20 per cent production drop and 40 per cent rise in market price		
	Units	Real value per unit	Value	Units	Real value per unit	Value
<b>Model 1</b>	Price flexibility coefficient of 2.0 and 30 per cent of output marketed irrespective of production					
Production .. .. .	100	—	100	80	—	90
Marketed .. .. .	30	1.00	30	24	1.40	34
Home consumption..	70	1.00	70	56	1.00	56
<b>Model 2</b>	Price flexibility coefficient of 2.0 and drop in per cent marketed from 30 per cent to 25 per cent with a drop in production of 20 per cent					
Production .. .. .	100	—	100	80	—	88
Marketed .. .. .	30	1.00	30	20	1.40	28
Home consumption..	70	1.00	70	60	1.00	60
<b>Model 3</b>	Price flexibility coefficient of 2.0 and 90 per cent of output marketed					
Production .. .. .	100	—	100	80	—	109
Marketed .. .. .	90	1.00	90	72	1.40	101
Home consumption..	10	1.00	10	8	1.00	8
<b>Model 4</b>	Price flexibility coefficient of 2.0 and drop in per cent marketed from 90 to 87.5 per cent					
Production .. .. .	100	—	100	80	—	108
Marketed .. .. .	90	1.00	90	70	1.40	98
Home consumption..	10	1.00	10	10	1.00	10

the price flexibility coefficient would have to be "higher" than  $-4.0$  (implying a price elasticity of less than  $-0.25$ ) for real income to be maintained as production declined. If we assume that the marketing percentage dropped to 25 as production dropped 20 per cent, as in model 2, then the price flexibility coefficient would have to be  $-10.0$  (consistent with a price elasticity of demand of  $-0.1$ ). Thus it seems virtually certain that in an economy in which only some 30 per cent of production is marketed, cultivators' incomes will on the average move directly with production changes.

For the cultivators with smaller holdings, marketing a smaller proportion of what they produce, the tendency for incomes to move directly with production will be accentuated. Likewise as the proportion marketed increases, a point will be reached at which incomes move inversely to production. Clearly when 100 per cent of production is marketed incomes will move inversely to production as long as the price flexibility coefficient is "greater" than  $-1.00$ .

Model 3 illustrates the relationships assuming a price flexibility coefficient of  $-2.0$  and 90 per cent of output marketed, a situation which might prevail for the cultivators with the larger holdings. As can be seen, real income is higher in the low production situation than in the high production situation. Since it is likely that the more wealthy cultivators will have quite inelastic demand for foodgrains, model 4 shows the results if we assume that the physical quantity retained for home consumption remains constant in the face of a decline in production. The increase in real income is positive but somewhat less, since a smaller proportion is marketed.

The models suggest the complexity of the income transfers incident to declining agricultural production and consequent increase in agricultural prices. The extent of these transfers depends very much on the extent of changes in marketing proportions. The extent to which cash income shifts among sectors is even more marked and is also highly dependent on the change in marketing percentages. Despite its importance to shift in demand for non-farm goods as well as to savings and investment, very little can be said on these relations without more empirical data. At the very best, however, we might expect that in a period of production decline and high prices, demand would drop for goods such as expensive textiles purchased by low income cultivators and might even rise for transistor radios and bicycles purchased by higher income cultivators. Again, however, we must be careful to take into account the off-setting income influences in other sectors of the economy.

#### CONCLUSIONS AND IMPLICATIONS TO PUBLIC POLICY

The basic conclusion of this analysis is quite clear. Changes in agricultural prices have conflicting influences. A rise in agricultural prices may foster some increase in agricultural production and some increased savings and investment in the agricultural sector. It is likely to have less of such influence in the context of traditional as compared to a technologically dynamic agriculture. A rise in agricultural prices will however be discouraging to industrial investment. There is some reason to think the latter may overbalance the former. In addition, a rise in agricultural prices fosters, at least in the short run, an income redistribution which is in opposition to the concepts of equity held by most modern governments. It is precisely these conflicting influences which push agricultural prices policy into a subsidiary role as a tool of public policy for stimulating agricultural development. Effort to mitigate the harmful influence of one effect of price change is likely to be at the expense of further harm on another.

It is precisely these weaknesses of agricultural price policy as an engine of growth for agriculture which turns attention to technological change. Technological change can provide all the favourable growth features of price policy with none of the unfavourable features. Technological change by definition increases efficiency in the use of inputs and thereby makes it profitable to use more inputs. Given the demand conditions in low income countries, technological change will be accompanied by increased agricultural incomes, providing an enlarged pool of capital at the same time that the attractiveness of investment has increased. And, incidentally, technological change provides its benefits in proportion to total production not in proportion to marketings and thus benefits the lower in-

come cultivator as much as the higher income cultivator. Indeed if market price drops somewhat in response to increased production, the proportionate effect of the technological change in raising real income is greater for the lower income cultivator than for the higher income cultivator.

Technological change, of course, is not a costless process, nor does it occur automatically. Clearly, Indian agriculture is just commencing a period of significant technological change after a long period of attempt. If the process is to continue, a number of constructive but difficult decisions will still be necessary in regard to such areas as research budget and organization, availability of fertilizer pesticides and water. Substantial administrative attention as well as physical resources will be needed.

The preceding analysis may be misleading in two important respects. At one extreme, it may suggest that public policy has a wide option in regard to the relative level of agricultural prices. At the other extreme, it may suggest no positive role at all for policy with respect to agricultural prices.

As stated above, there are strong theoretical reasons associated with the underlying supply demand factors to expect relative agricultural prices in a low income agriculture dominated economy to fluctuate with changes in weather, but not to define any trend movement and to offer very limited opportunity for public policy to affect that trend. Indian experience has been consistent with those theoretical expectations. A major upward trend in PI 480 imports could have affected relative agricultural prices, but taking the whole period since Independence there is no evidence that such a trend has occurred, although it might have been tending a bit in that direction for a few years after 1962. Particular sub-periods can, of course, be found which show an upward trend. Agricultural imports could be used in such a way that domestic prices are driven so low that increased input use is unprofitable even with greatly increased efficiency from new technology. Likewise, unsuccessful import displacement policies for the industrial sector might over the long run drive up prices of things farmers buy with the same major disincentive effects. There is no evidence that either policy has been followed in India.

Principal areas for a positive price policy for agricultural development are those of attempting price stabilization in the face of fluctuating weather through an open market buffer stock operation and mitigating the harmful effects of failure in the agricultural sector through rationing and price regulation. In addition, price policy may help smooth changes in price relationships as an increasingly dynamic agriculture makes such changes more frequent and substantial.

#### *Open Market Buffer Stock Operation*

It is apparent from the discussion in the preceding section that an open market buffer stock operation probably slightly stabilizes real incomes of the higher income farmers who sell a high proportion of what they produce and de-stabilizes real incomes of lower income farmers who sell a small proportion of what they produce. The net effect in a country like India is probably that of providing somewhat greater instability of aggregate real incomes in the agricultural sector. Thus in price regulation and rationing schemes, the primary positive value of

open market buffer stock operations is to lessen fluctuations in real income and food consumption of low income urban people, even though they are often argued on the basis of their stabilizing effect on the production side.

Unfortunately, very little is known of the costs and returns to buffer stock operations and so it is very difficult to frame a development oriented strategy for buffer stocks. To frame such a policy we need to know (a) the size of stocks needed to achieve particular effects on prices, (b) the costs of holding such stocks, which is in part a function of how long they have to be held, (c) the extent to which farmers make production decisions in the light of price expectations or income expectations, and (d) the extent to which price stabilization programmes destabilize real incomes of farmers. In addition, we need to know more about the relative costs of alternative programmes to buffer stocks as a means of meeting policy objectives.

#### *Two Price System with Producer Levy*

An alternative to an open market buffer stock operation for mitigating the effect of a short crop on low income urban persons is to use a two price system in which the supplies of the urban poor are levied from producers at a "normal" price (say, the same price that would prevail with a normal crop) and sold on a rationed basis at that price.<sup>10</sup> If the levy is in proportion to marketings then in effect higher income cultivators carry the main burden of subsidies to lower income urban persons. The burden may be shifted off cultivators in large part or even entirely however if the levy takes only a portion of the produce and the rest is allowed to move in the open market. The effect will be for the open market price to shoot up much higher than if the levy did not exist. This is so because the levy takes a significant portion of the supply and in effect gives it disproportionately to the lower income consumers with the more price elastic demand. The free market is then left to those persons with higher incomes with highly inelastic demand. The effect then is to concentrate the shortage among the consumers with the most inelastic demand. The larger the allocation to the poor the greater will be this effect. The precise extent to which the burden is distributed between the higher income rural and urban persons depends on the precise nature of the demand schedules, the levy price itself and various other aspects of administration of the system. An incidental effect of such a two price system is, of course, to make neither the control price nor the free market price representative of the prices which would prevail in a totally unfettered market.

A buffer stock may be built within a two prices system by imposing a levy on producers, at below market price, in high production years in order to build the stock. The impact on income distribution and stabilization is then analogous to the two price system described rather than the open market buffer stock system.

#### *Zonal Restrictions*

Obviously, a system of procurement from cultivators at below market prices is a politically and administratively difficult task, presumably providing the reason

---

10. For a substantial development of a two price concept see Raj Krishna, "Government Operations in Foodgrains," *Economic and Political Weekly*, Vol. II, No. 37, September 16, 1967, pp. 1695-1706.

for the variant on this system currently practised in India. By cordoning off surplus producing regions (States), market prices in those regions are depressed from the level they would otherwise reach in those States and procurement may proceed at or near the market price in those States. This has the political advantage of disguising the levy and the administrative advantage of concentrating government purchases in a few regions.<sup>11</sup> There are, of course, sharp limits as to how much may be procured and moved out of surplus States if prices are to be held at a "normal" level despite a decline in production.

The zone system does make for a much more complicated pattern of distribution of cost than the uniform levy. The burden falls on cultivators in the surplus States, in proportion to their marketings, and on the higher income urban consumers in the deficit States who purchase at the high market prices in those States. The higher income urban consumer in the surplus States does not carry a share of the burden. The higher income cultivator in the deficit States benefits from the high deficit State prices and, in proportion to his marketings, draws benefits from the system along with low income urban consumers.

The production effects of this system are difficult to judge. From the point of view of economic incentives we would need to know to what extent farmers respond to price changes as distinct from income changes in making their decisions and in so far as it is price changes we need to know to what extent they react to current or some concept of normal or "permanent" prices. The price maintained by the system in the surplus States is presumably a more or less normal price, rather than the inflated price of a deficit period. One may question both whether cultivators respond to a price related to what they know is an abnormal production situation or whether it is economically desirable that they should do so. There is, of course, an income depressing effect of a combination of poor crop and normal price in surplus States, suggesting the potential for more liberal credit in such States when a policy of restriction in movement is practised. One may also question whether the high prices in the deficit States may not be recognized as abnormal and therefore not affect investment decisions. Again, of course, there is an income effect on cultivators in such States that may encourage investment in production.

In summary, then, the problem of meeting scarcity is a complex one, in which questions not only of economics but of administration and politics necessarily enter. There is scope for various methods, including those of levy and zonal restrictions. As with all systems these too may be maladministered and create long term production and consumption disequilibria. The longer they are maintained the more likely are such disequilibria. One of the problems for the administrators and politicians is to consider the probabilities of any particular system being accompanied by maladministration and weight that consideration in choice of the system. One of the useful functions for the economists is first to note the needs for data and concepts for analysing the relevant problems and then to note the difficulties which arise from various approaches and suggest means of mitigating them.

---

11. For example, 75 per cent of the procurement for the 1966-67 *kharif* crop came from four States. Report of the Agricultural Prices Commission on Price Policy for Kharif Cereals for 1967-68 Season, Government of India, New Delhi, 1967.

Finally, it is important to keep perspective on the role of price policies of the type discussed above. They are basically a palliative, designed to lessen the unpleasant symptoms of an underlying problem while constructive policies for fostering a stream of technological change can be brought into play and have their effect.

#### *Smoothing Transitions in Price Relationships*

Two features of the early stages of modernization of a modernizing agriculture may lead to sharper and more erratic swings in agricultural prices than occur in earlier phases.

First, a combination of higher incomes and increased credit availability may increase the capacity of cultivators to store foodgrains. Farmers are probably less well informed and skilled speculators than the traditional trader groups and hence such transfer of storage function may result in more erratic seasonal fluctuations in prices. Greater instability in the pattern of seasonal fluctuations necessarily results in greater year to year fluctuations in harvest season prices. The results may be greater uncertainty regarding prices just at the stage in development when increased inducement to invest in purchased inputs is desired. The potential exists for a price policy which will reduce these erratic fluctuations and thereby encourage increased investment and production. In espousing such a policy it should be clearly kept in mind that the optimal policy in the face of major production changes from year to year is not one of maintaining the same average price level every year or even the same pattern and extent of seasonal price fluctuations. We do not as yet have nearly enough knowledge to set up an optimal policy. If such a policy were to be developed pragmatically it would be best approached rather carefully with relatively low initial sights regarding the extent of stabilization that would be attempted. The obvious twin hazards are those of building excessive stocks at excessive cost and that of failing to meet obligations with a consequent unleashing of major speculative forces and even wider price fluctuations. India experiences much larger weather induced swings in production than most other low income countries; a fact which greatly complicates the development of an optimal price and storage policy.

Second, technological change is unlikely to shift production functions and cost schedules for all crops equally. Thus one of the concomitants of rapid technological change is rapid change in cost relationships and consequent change in relative levels of production and relative prices. Such circumstances may result in demoralised markets and speculatively fed declines in prices which would in turn inhibit desirable investment. In addition, even normal relative price declines which can be absorbed by lower costs may, if they occur rapidly, discourage production excessively, whereas a more gradual transition might result in a more considered and optimal set of decisions by farmers. When such price instability is imposed on a past of substantial stability, the effects may be particularly counter-productive. The argument is that a positive price policy could smooth these transitions and thereby encourage investment and the rational movement of resources.

There is, of course, a major danger that an effort to ease transitions might become an effort to prevent changes in price relationships and shifts of resources.

For example, if India were to be successful in increasing foodgrains production at a rate of 5 per cent per year for a few years it would obviously be highly desirable for foodgrain prices to decline relative to non-foodgrain prices in order to encourage shifts of resources from foodgrains to agricultural commodities with more elastic demands. If technological change had been relatively greater in regard to foodgrains, the relative price decline required to bring about such a shift might be substantial. A price policy which attempted to hold old price relationships might prove extremely expensive in financial terms and would be counter-productive as well.

Thus even in situations in which price policy can play a useful role in the context of modernization it must be approached with caution if its effects are to be useful. This is particularly so given the paucity of knowledge of so many factors critical to determination of an optimal price policy.

---