SYMPOSIUM ON FARMERS' RESPONSE
TO PRICES

A symposium on Farmers' Response to Prices was held at the 23rd Annual Conference of the Society in Bombay on December 23, 1969, under the Chairmanship of Professor M.L. Dantwala, School of Economics, University of Bombay. Summaries of the remarks of the various speakers are given in the following paragraphs.

In his opening remarks the Chairman made the following observations : —

The subject of farmers' response to prices is of vital importance to the country and its policy makers. Holding of this symposium is, therefore, very opportune. Agricultural price policy involves a number of difficult questions for which, at present, there are no satisfactory answers. The present symposium would serve a very useful purpose if during the discussions these problems are set out clearly so that some progress could be made in their solution in future. Some of these may be high lighted at the outset, though the intention is not to list them exhaustively.

The question whether farmers respond to prices at all may be dismissed without much hesitation. There is a school of economists which feels that under our conditions, farmers do not respond to prices. Without attempting to convert this school which is probably declining, it may be observed that while owing to certain constraints, the farmers' response may not always be conspicuous, it does not seem correct to suppose that prices do not influence farmers' decisions. We might, therefore, consider the problems assuming that farmers do respond to prices.

The simplest situation in which the response might be studied is where only two commodities are involved, say rice and jute. In such a situation, it is clear that production of one can be increased by raising its prices relative to the other. However, if the policy makers wish to increase the production of both the commodities, how can this be accomplished ? This is the situation in our country

since we want more production of all commodities such as rice, wheat, jowar, cotton, jute and oilseeds.

Then, it is not enough to know that production responds to prices. For purpose of price policy a reliable estimate of the response is required. It might be recalled that some time back when the price of groundnut was favourable there was a phenomnal increase in the area under groundnut in Saurashtra. However, at the same price level, production of groundnut went down in Andhra Pradesh. Why was this ? We have to be careful in aggregating supply function.

The general problem before the agricultural price policy maker may be considered as follows :

We know the present level of production and prices of various commodities. We have also certain targets of production of these commodities by the end of the Fourth Five Year Plan. Can we say what course the prices should take so that the respective targets are fulfilled ?

It should also be considered whether prices should be relied on for increasing production or more reliance should be placed on technology. It is clear that where production of all commodities is to be increased, the prices are of limited utility since they cannot overcome the limitations of resources. Another drawback to the use of price *increases* is that while it is easy to raise prices, it is virtually impossible to bring them down when that seems necessary. Since the problem of agricultural prices is of considerable importance we should take stock of the situation and find out whether our research material has grown adequately and what further work is necessary.

Shri B.N. Kapre* made the following observations :—

In studying the farmers' response to prices it is necessary to keep in mind the fact that the farmers' decisions in the matter of allocation of their acreage to this or that crop do not depend on prices alone and that simultaneous operation of other factors might result in a response, on the part of farmers, different from what one might expect on price considerations alone. In the early part of 1967,

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when the farmers in the jute growing areas took their decision in regard to cultivation of jute or paddy, the ratio of jute prices to paddy prices was 2:1. This ratio being favourable to jute, there was a substantial increase under acreage in jute aud this resulted in a bumper crop in 1967-68. Only two years later, however, the ratio of jute prices to paddy prices, at 2·5:1, was still more favourable to jute, and yet both the acreage under and output of jute are expected to be lower for the 1969-70 season than in 1967·68. This reduced response of the farmers to relatively more attractive prices of jute in 1969 could perhaps be ascribed to the emergence and spread of the high yielding varieties of paddy in the jute growing areas, it may well be that the advantages occurring to the growers as a result of the more attractive prices of jute were by and large offset by those occurring to him from the higher yields of the high yielding varieties.

It would be easily seen that it is not only the prices but also the other factors such as the cost of production of the different crops and the yield per acre that go to influence the farmers' decisions; the farmers would be interested in the net income that they can get from the different crops rather than merely in their prices. This conclusion also emerges from the fact that the price parities between the competing crops do not move around or tend towards any unique values. Relative changes in the costs of production and in yields per acre upset these price parities. Price parities would change with changes not only in the prices of individual crops but also in cultivation practices and the prices of inputs relating thereto. Any study on the farmers' response to prices has therefore to take in to account the relative costs of production and yields per acre of the crops concerned. A lot more data than are available at present would be required for such a deeper analysis. In the absence of these data and when the analysis is restricted only to the farmers' response to prices, one has got to be prepared to face situations in which the actual decisions of the farmers are different from those indicated by the relative trends in the prices of the relevant crops.

Since the data on cost of production and on net income from cultivation of the different competing crops are scanty, attempts are often made to deflate the prices of competing crops with suitable price indices, so as to broadly take into account the relative influence at least of the costs of production. Often the general index of wholesale prices or the index, of the prices of agricultural commodities is

used for this purpose. This procedure, however, does not help in the estimation of the relative attractiveness of the competing crops to the grower (a) because the prices of both the crops are deflated by the same price index, and (b) because no account is taken of the trends in the prices of inputs relevant to the different crops. To the extent that the input mix differs from one crop to another, the deflation of crop prices by the respective indexes of input prices would help in the elimination of the influence of relative trends in the cost of production of the different crops. Price parities based on such adjusted prices of the competing crops would give more realistic indications of the farmers' response to prices.

Finally, a reference may be made to the question of the coverage of area undertaken for the study of the farmers' response to the prices. In studies undertaken at the all India level, the impact of changing weather conditions will be mixed up with the influence of the changes in prices of different crops. In view of this, it might he better to do such studies as far as possible on a much smaller scale, where the weather conditions do not show undue fluctuations from one place to another. In fact, it would be better still if the analysis is restricted to a fixed set of farmers in a fixed set of villages and a study is made of the way these farmers distribute or rather redistribute their areas as between the different crops.

Dr. H Laxminarayan[*] made the following obserations :

In developed countries of the world where there are not many imperfections in the agricultural market farmers generally respond to price changes in a rational way while allocating their land area to different crops. This is not true of developing countries to the same extent. In these countries due to small size ot holdings and lacy of resources a large number of farmers grow mostly food crops for meeting their subsistence requirements. The large farmers grow largely for selling in the market. In the case of large farmers agricultural production in terms of crops grown responds to price changes. Their behaviour is not different from the behaviour of their counterparts in developed countries. Studies done by Dr. Dharm Narain and other confirms this behaviour pattern. The subsistence farmer on the other hand is not adequately responsive to price changes as

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the small size of his holdings does not permit much manoeuvrability in choosing his crops. It is only after sowing the area for meeting his household requirements he thinks of the market in the case of rest of the area.

It should be possible to bring the subsistence farmer nearer market by removing some of the imperfections in the market. One of the steps necessary is to educate the farmer and make him conscious of the price factor. Secondly, it is possible to draw the subsistence farmer closer to the market as monetisation of the rural aconomy progresses. Thirdly, it should be possible to increase the productivity of subsistence farmers by making available to them the benefits of technological changes. If his productivity could be increased it will help him in releasing a part of his sown area for purpose of catering to the market. In this connection attention might be invited to what is happening in the 'green revolution' areas. Though mostly big farmers have taken advantage of the benefits of higher technologies, there are numerous instances of subsistence farmers taking advantage of scientific techniques of production and thereby raising their productivity. This has helped them in releasing a part of their area for supplying agricultural commodities to others. However, bulk of the small farmers are not involved in this programme due to a number of reasons many of which are beyond their control. At least theoretically it is possible to visualise a situation where benefits of technological developments should help the subsistence farmer in responding to price changes. These technological changes should help in making farmers in under-developed countries respond to price changes in the same way as farmers in developed countries.

One of the alternatives for helping the small farmer in overcoming market imperfections is that of fixing agricultural prices at such a level that the small farmer is induced to sell a part of his output. However, this is not desirable due to two reasons. Firstly, it promotes inefficiency in agriculture. Secondly, attempts to interfere with agricultural prices may some times create other problems. A second alternative is that of subsidising inputs and the subsidy may be given only to small farmers. From the long term point of view of developing agriculture this is not a desirable method as it would be difficult to take back the subsidies once farmers get used to it. A third alternative is to supply cheap inputs. While this is a desirable method, the technologies which we have adopted for developing our

fertilizer industry and also high irrigation rates come in the way of supplying cheap inputs. All the same continuous efforts will have to be made for bringing down the cost of these inputs in the near future. The fourth alternative is that of reducing the gap between producer price and consumer price. At present bulk of the margin between the producer price and the consumer price is pocketed by the middleman. It should be possible to transfer this benefit to consumers and producers in an equitable way if speculative activities of the middleman can be eliminated. This should help the subsistence farmers in getting a better price for his produce. The other alternative is that of reducing the cost of production through application of the latest available technologies so that higher profit gives incentives to the subsistence farmer in addition to helping him in raising his productivity.

The path of choosing one or more of these alternatives would be easier if we are very clear about the objectives of our price policy. This problem is very much relevant for any question relating to the supply response of farmers. In our context, our price policy should be oriented towards increasing agricultural production without in any way creating distortions in the cropping pattern. It is also necessary that the policies aimed at increasing agricultural supply should not lead to making agricultural commodities expensive to the consumer and to industries. The objective of any price policy should be not only that of increasing agricultural production but also that of increasing the marketed surplus needed by the non-agricultural sector.

Most of the studies done so far in the field of supply response are largely based on regression analysis and they show by and large the same results. It would be useful to organise some study on the basis of study of individual farmers. In the 'green revolution' areas there are a number of subsistence farmers who have managed to divert a part of their land area in the direction of the market. It would be interesting to undertake case studies of a number of farmers of this type and see whether this gives us any clue for removing the existing imperfections in the market. Micro studies of this type may be more useful than undertaking macro studies. The data collected from these micro studies should be pooled and analysed statistically for arriving at meaningful results. While organising these studies one should always keep in mind the responsiveness of farmers in terms of marketed surplus of agricultural commodities.

Presenting her paper on 'Estimation of Acreage Response to Prices' Miss Sud[1] made the following observations.

Farmers' response to prices is reflected mainly in the allocation of acreage to crops, while studying this response with the help of regression analysis it is important to include variables other than price which are likely to influence farmers' decisions. A study was made of the acreage under wheat in the I.A.D.P. district of Ludhiana in the Punjab during the period 1950-51 to 1965-66. In the study two types of models were used, one with actual area under wheat in a year as the dependent variable and the other, with area under wheat expressed as a proportion of the total cropped area.

The independent variables considered in the models were the following :

1. Farm harvest price of wheat in the preceding year.
2. Farm harvest price of the competing crop gram in the preceding year.
3. Price of wheat relative to that of gram with (a) production as weight, (b) average per acre yield as weight.
4. Irrigated area as percentage of the total cropped area in the previous year.
5. Yield rate of wheat in the preceding year.
6. Acreage under wheat in the preceding year.

The results obtained for various models with acreage under wheat as the dependent variable were as follows :

With this dependent variable and the four of the independent variables enumerated earlier under 1, 2, 4, and 5 it was found that the coefficient of price of wheat was significant at 5 percent level. The coefficient of multiple determination was 0.81.

When the wheat acreage in the preceding year was also included as an independent variable the index rose to 0.85. However the significance of other variables declined.

When the price of wheat in this equation was replaced by its ratio to gram price, independent variable 3(a) and time variable was

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also included, only the time variable came out significant at 10 per cent level though the coefficient of multip'e determination was 0.89. With the omission of this variable the coefficient of price ratio indicated at 3(*a*) became significant at 1 per cent level, though R^2 declined to 0.84.

It might be concluded from these results that the lagged acreage incorporates the effect of many other variables and acts as a catch-all variable. The coefficient of price, on the other hand, was non-significant in all but the first model. Other models of the type confirmed these results and the coefficient of price was found to be significant only when lagged acreage (6) was omitted from the equation.

In view of the possibility that the increases in area under wheat might have been due to the increases in total cropped area two models with proportion of area under wheat as the dependent variable, were also studied. First of these models which included in the independent variables, price lagged proportion of acreage under wheat, yield of wheat in the previous year and irrigated area in the previous year, gave $R^2 = 0.72$. Only the coefficient of lagged acreage was significant at 5 per cent level. Omission of yield from the equation reduced the R^2 to 0.65 and the coefficient of price came out to be significant, indicating that the effect of yield was incorporated in the price.

Reviewing the results it is observed that most of the models gave a value of R^2 in excess of 0.80. However, the results for the first model, where farm harvest prices of wheat and gram were included as separate variables, were more encouraging. Other models, especially those in which lagged acreage was included as an independent variable, indicated lack of farmers' response to prices. Another conclusion emerging from the study was that lagged acreage acted as a catch-all variable and incorporated the effect of most of the other independent variables included in the model and consequently the coefficient of price was significant only when this variable was excluded from the equation.

Presenting his paper on 'A survey of methodological and conclusions emerging from recent studies on farmers' response to prices', Dr. Tyagi[1] made the following observations:

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During the past decade considerable addition has been made to the literature on farmers' price responsiveness. However findings of all the investigations do not lead to the same conclusion. The wide range in the findings may partly be attributed to the methods adopted in carrying out the investigations. In the present study an attempt has been made to analyse the methodologies adopted and conclusions emerging from 17 studies carried out in recent years, preference being given to the studies pertaining to Indian farmers. However to make the survey of methodologies complete a few studies conducted in other countries have also been included. On the basis of the methodology used the studies might be divided into three broad categories :

(*i*) Studies using graphic and tabular analysis,

(*ii*) Studies using simple regression and correlation,

(*iii*) Studies using multiple regression.

The methodologies adopted and main conclusions emerging from the studies might be discussed separately for the three categories.

In the most comprehensive study in category (*i*) Dr. Dharam Narain (9)[1] makes use of graphs in which two or more time series are brought together to see the correspondence in acreage shifts and price changes. Gupta and Majid (2) have studied correspondence between (*i*) changes in prices and areas under individual crops, and (*ii*) between relative price changes and relative area shifts in one district of U.P. Jakhode and Mujumdar (4) studied the correspondence in the changes in Jute/Rice price parity and acreage under these crops in the states of West Bengal and Assam. Kamladevi (11) follows a method in which the ranks of changes in prices and acreages of different crops for two periods are compared. The study is confined to Madras State. The various studies differ in the price variables used for relating with farmers' response. These studies due to limitation of the approach, are not able to reveal the relative significance of price in the complex of total variations of crop areas. In all these studies, however, at least a suggestive evidence of positive response hypothesis in case of foodgrain crops and relatively more significant evidence in the case of cash crops is available.

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1. Numbers in brackets represent serial nos. in the list of references at the end.

In category (ii), a study by Hussain (3) examines price elasticity of acreage under jute and rice in East Pakistan with the help of a simple regression, while another study by John (5) uses an exponential function of the form $Y=ax^b$ to study changes in area and output of crops in response to changes in prices. In the study by Subbarao (15) relative acreage under sugarcane is regressed against its relative price. The study by Tombin (16) is based on the data collected from 160 farms for 2 years and the price responsiveness is studied by correlating the actual acreage shifts with shifts which should have taken place in order to maximise profits at the given expected prices. While the results are not uniform the findings of this group of study suggest that farmers are changing acreage under different crops according to changes in their prices.

Six of the nine studies falling in category (iii) utilise the Nerlovian approach. Amongst the other three, the study by Rao and Jai Krishna (12), 12 different price expectation models have been tried and the acreage under wheat is regressed against the price index of wheat and weighted acreage price index of competing crops. Zvi-Griliches (1) uses in his study four independent variables ; apart from real price (i) weather, (ii) trend, and (iii) lagged output are also included. D. Ramesh (14) uses index of prices and production and makes use of Koyck and Alt models.

In the studies appearing recently, though the basic model used is Nerlovian adjustment model, the studies differ in respect of other variables included as well as with respect to the price variable. Raj Krishna (6) includes relative yield, irrigated area and weather in addition to relative price and considers post harvest price lagged one year as the price affecting farmers' decision regarding land allocation. Nerlov (8) in his study has used average realised price lagged one year. D. Ramesh (13) makes use of Nerlovian adjustment model but no other shifted variable is included in the regression equation and the price taken is the wholesale price index deflated by the wholesale price index of all other commodities.

One important fact emerging from these studies that estimates of price elasticities obtained in different studies differ considerably though they are roughly comparable in coverage. Another is that the price elasticities obtained in different studies differ considerably though they are roughly comparable in coverage. Another is that the price elasticities obtained for cash crops like sugarcane and cotton

are not only positive but high also ; on the other hand the elasticities obtained for food crops, though positive are of small magnitude

To sum up, the above studies lead one to the conclusion that farmers are responsive to price change but that questions relating to :

(*i*) price expectation behaviour of farmers,

(*ii*) risk and uncertainty,

(*iii*) profitability level of competing crops, and

(*iv*) relative importance of the crop in the produce mix,

should receive more attention in studies of farmers' response.

Shri A.V.K. Sastri[1] presented the paper 'Prices, Production and Marketed surplus of Foodgrains in the Indian Economy, 1951-52 to 1965-66' by Mrs. R. Thamarajakshi[2] on behalf of the authoress who could not be present at the Conference. He made the following observations :—

This study estimates and analyses the marketed surplus of foodgrains in the Indian economy during 1951-52 to 1965-66. The estimation has been done reviewing realis ed consumption as effective supply. For this purpose data on expenditure on foodgrains has been taken from the reports of 4th to 16th rounds of the N.S.S. These give the estimated expenditure on foodgrains separately for the rural and urban areas. These are blown up with population estimates in the relevant sub-sections of the non-agricultural sections to yield the total value of consumer expenditure on foodgrains of the non-agricultural sector for the period 1951-52 to 1965-66. By blowing up similarly the estimates of total consumer expenditure in the N.S.S. rounds by rural and urban population estimates, the total consumer expenditure of the economy was estimated and the ratios of the value of consumer exqenditure on foodgrains of the non-agricultural sector to the total consumer expenditure of the economy, were calculated for the respective years. These ratios were applied to the estimates of private consumer expenditure calculated from national income data published by the C.S.O to provide the estimates of expenditure

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on foodgrains of the non-agricultural sector, corrected for divergence between estimates of consumer expenditure from the two sources. These were divided by weighted average of actual prices per quintal of four important foodgrains, viz., rice, wheat, jowar and gram to arrive at estimates of consumption of foodgrains in tonnes. The actual prices of the different foodgrains have been derived by adding to their respective wholesale prices, an ad hoc margin of 7% on account of the retail margins which assumption is only nominal.

These estimates of quantities of foodgrains consumed by the non-agricultural sector in the different years have been further adjusted for the net issues by the government of foodgrains, to arrive at the time series of marketed surplus of foodgrains. The time series of marketed surplus of foodgrains, as well as of their total production and the prices were also presented as index numbers with 1960-61 as base.

A compound function of the form $Y = AB^t$ was fitted to each of these series, it was observed that the foodgrain prices have risen at an annual rate of 3 7%. As against this, the output of foodgrains has grown at a rate of 2.4% per annum while marketed surplus has expanded at an annual rate of 2.3%. As a result, the proportion of output marketed has recorded a slight decline over these fifteen years

A log-linear function was also fitted to explain the marketed surplus in terms of output and prices. The equation worked out to
$$\log X_1 = 1.1256 - 0.5653 \log X_2 + 1.0126 \log X_3$$

$$(0.1308)^* \qquad (0\ 1272)^*$$

$$R^2 = 0.8454$$

where X_1 = index number of marketed surplus of foodgrains,

X_2 = index number of foodgrain prices

X_3 = index number of output of foodgrains.

(The residuals were tested to be random on the basis of Durbin-Watson Statistic).

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*Indicates standard errors.

Thus marketed surplus of foodgrains is negatively related to the price of foodgrains, but positively related to their output. This result indicates the subsistence nature of the agricultural economy in so far as foodgrains are concerned. On the other hand, it is encouraging that the output elasticity of marketed surplus is not only positive but also high (1.01).

Professor P.N. Mathur* made the following observations :

In considering the farmers' response to prices, it is necessary to take into account the prevailing agricultural conditions which considerably dampen if not altogether eliminate in many cases this response. It is true that with higher prices the quantities of agricultural produce marketed by the farmers increase ; as far as the output is concerned, however, response is, by and large, negligible. It is not very surprising if note is taken of the factors that work against such a response.

It might be expected that area might be shifted from one crop to another if the latter gives a greater income. With substantial differences in the income from various crops this cannot happen except as a result of substantial change in the relative prices of the two crops. Such a price change is uncommon. Substantial changes in crop acreages are therefore associated generally with changes in technology. Secondly even when the cultivator finds as prices prevailing in a year that it will be profitable to shift acreage from one crop to another, he will still be hesitant to do so ; he cannot be sure that the price situation will be favourable to the crop in the next season, nor can he be sure that the weather conditions will be satisfactory. Thus the price and weather uncertainties discourage any changes in cropping pattern.

In many rainfed areas the cultivators are taking only a single crop and there is no alternative crop to change to. No response to price, is, therefore, possible under these conditions. Even where a number of crops are being cultivated the cropping pattern tends to get adjusted so as to give the cultivator somewhat uniform quantum of employment all round the year. This plan will be upset by any

changes in cropping. Small price incentives cannot, therefore, alter the cropping pattern.

As evidence of a positive response to prices, the investigation of Dr. Raj Krishna in Punjab is often cited. However, the response in respect of cotton acreage brought about in this case was a result not of prices, but mainly of the introduction of a better crop, namely, American cotton. When the same exercise was done in Punjab for post-war years no significant response was found.

It might be taken, therefore, that for achieving increases in output, it will not be advisable to rely on farmers 'response to prices, but on new technology for which intensification of research is necessary. In fact both factors will have to be taken care of and an integrated approach adopted to achieve the desired increases.

A paper on 'Farmers response to prices—some problems of estimation' by Dr. V. Rajagopalan[1] and A. Sennimalai[2] was also presented by the junior author. Apart from the discussion of the conceptual issues related to the response models, two models were specified in the study—the adaptive expectation and lagged adjustment model and what is commonly known as the 'naive' model. They were tested with the help of data on irrigated cotton in Coimbatore district of Tamil Nadu for the period 1941-42 to 1966-67. The results of satistical estimation did not support the first model and the second model seemed to be preferable.

In his concluding remarks the Chairman observed as follows :

It would be interesting to examine the past data statistically to find out which influenced production more—price or technology. It will perhaps be found that notwithstanding price increases there were no increases in production as long as technology remained stagnant. On the other hand with the advent of high yielding varieties of crops there were substantial increases in production. Of course, you can have incentive prices—you can raise them. You cannot introduce a technology unless it is there. It is therefore a question of allocation of time and resources. Should we invest more in research and give

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incentive to farming by offering better technology or adopt the lazy method—which is giving higher prices. What is the relative cost—economic and social of the adoption of these alternatives. It seems that better technology can make a much better and more lasting contribution to the increase in production than prices, and it may not be useful to carry on researches just to show that there is a positive response to prices.

There are many facets to the problem which should attract the attention of research workers, statisticians in particular and it is hoped that the discussions stimulate more research and thinking on the subject.

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