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Subsidy as an Instrument for Increasing Agricultural Production and Income

THE ROLE OF SUBSIDY IN RISK-TAKING BY FARMERS— A STUDY IN A SOUTH ARCOT VILLAGE

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STATEMENT OF THE PROBLEM

It is hypothesized in this paper that the risk-taking is reflected in the level of investment made in modern inputs such as fertilizers and pesticides and it may be related directly to the subsidy given in both the implicit and explicit forms.

From the perspective of a farmer *risk* revolves around variability in income that lies below the normal prospects. The variation may be traced to three sources, namely, market, state policies and weather.[1] Weather and more particularly, its chief element, namely, rainfall, would go to influence the risk-taking function of farmers to a very large extent in drought-prone or dryland areas. But as far as a modern farmer in other places is concerned the prospects of market conditions and state policies are greater sources of disturbance and risk to him. Pessimism regarding the price prospects affects his investment decision and he is inclined not to make his investments in modern inputs to the optimum extent. A related concept of risk-taking is the awareness of farmers. The level of the farmers' awareness these days is such that we can presume their knowledge of the optimum extent of inputs-investment needed. But there appear several constraints in adopting this optimum level. If fulfilling the optimum level of investment could be taken as the maximum risk the farmers could assume, the deviation from that mark in respect of the various farmer categories will measure the degree of risk assumed by each of them.

Subsidy must be construed in developing countries like India as more an instrument promoting risk-taking function of the farmers than anything else. The imperative to maximize risk-taking ability is widely realised and several alternative solutions are proposed in this regard. There is a clamour for reducing the input prices and an equal urge for raising the output price. Another alternative suggestion could be to consider further concessions in terms of institutional loans, such as the co-operative loans.

The present note juxtaposes the relative performances of all the three alternatives, evaluating them on the basis of their contribution to increasing

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1. N. S. Jodha, "Role of Credit in Farmers' Adjustment against Risk in Arid and Semi-Arid Tropical Areas of India", *Economic and Political Weekly*, Vol. XVI, Nos. 42 and 43, October 17-24, 1981.

risk-taking ability. It is hoped that the results have policy implications, the adoption of which in practice will go a long way in turning our farmers all the more enterprising in their business.

CONCEPTUALISATION

The study focuses on risk-taking in agricultural operations by the small, medium and large farmers. The term *risk-taking* is interpreted here in the context of application of fertilizers and pesticides to the optimum level. The optimum investment in respect of these inputs is the standard laid down by the agricultural scientists. This amount is to be reckoned in rupees. The actual amount spent on fertilizers and pesticides is taken to represent the *degree of risk* assumed by the farmers. The difference between the *need* and the actual *practice* is defined as *risk gap*.

Farmers enjoy subsidy in two ways: one, by way of the reduced prices at which fertilizers and pesticides are made available to them, and the other is by way of concessional credit for their purchase available through co-operatives. To calculate the total subsidy, the difference between the open market and co-operative prices of inputs is worked out. To this is added the difference in the interest costs between the open market and co-operatives.

SURVEY DESIGN AND MODEL SPECIFICATION

A representative village of South Arcot, Kumaramangalam (Chidambaram taluk), was selected for the present study. The total cultivable land area of 292.02 acres was distributed among 35 small farmers, 13 medium farmers and 10 large farmers, in blocks of 40.42 acres, 73 acres and 179 acres respectively. The small farmer is defined as one who holds between 0 and 5 acres of land; the medium farmer is one who holds between 5 and 10 acres; those with 10 acres and above are categorised as large farmers. All the land holders were surveyed by administering a schedule-cum-questionnaire. The optimum level of investment that represents the maximum risk-taking, as defined above, came to Rs. 483. The difference in input price between the open market and co-operatives was Rs. 5. The difference of interest rates between the open market and co-operatives was 23 per cent (30 per cent minus 7 per cent). This was also taken into consideration to calculate the extent of subsidy.

The risk gap is assumed to be an independent variable. The single equation least square method was used to find out the effect of risk on the yields of the small, middle and large farmers. The scatter of the data indicated that Cobb-Douglas type of function was appropriate for the current analysis. The specification of the economic model is therefore:

$$Y = a\ R_g^b$$

where Y = yield,
R_g = risk gap,
a and b are unknown parameters.

Secondly, subsidy was taken as an independent variable affecting the risk in each of the farm groups. The model of elasticity of subsidy on risk is as follows:

$$R = a\ s^b$$

where R = risk,
s = subsidies,
a and b are unknown parameters.

Further, the effects of input price reduction to the tune of 5 per cent, 10 per cent, 15 per cent, 20 per cent and 25 per cent were releated to the independent variable, namely, the existig subsidy.

Finally, the effect of risk was related to a reduction in the differential rates of interest on subsidies of the small, medium and large farmers. The model of elasticity of different interest rate subsidy on risk is:

$$R = a\ S_{ri}^b$$

where R = risk,
S_{ri} = subsidy due to reduction in the interest rate in co-operatives,
a and b are unknown parameters.

ANALYSIS AND DISCUSSION

The study revealed that the large farmers and medium farmers were taking a high risk (Rs. 475 and Rs. 451 respectively) as compared to the small farmers who were taking risk only to the amount of Rs. 373. Therefore, the *risk gap* was maximum in the case of small farmers at Rs. 110. The risk gap for the medium farmers was much lower at Rs. 32. The risk gap was the minimum for large farmers, which was only Rs. 8 (see Table I).

Other things remaining constant, it was estimated that if the farmers applied inputs in tune with the average need per acre, the output would be to the level of Rs. 2,100 per acre (*i.e.*, 30 bags per acre). But the average actual yield differed greatly, in accordance with the difference in risk-taking. The small farmers got only Rs. 1,330 (19 bags) per acre. The medium farmers reaped an output worth Rs. 1,890 (27 bags) per acre, whereas the large farmers received Rs. 2,030 (29 bags) per acre (see Table I).

Thus the average opportunity loss per acre works out to Rs. 770, Rs. 210 and Rs. 70 for the small, medium and large farmers respectively. While the large and medium farmers assume higher risk, thereby reducing their opportunity loss, the small farmers incur a heavy loss alongside their assuming a low degree of risk. Therefore, the higher the risk taken the lesser is the opportunity loss incurred by the farmers. The risk elasticity of yield was less than one for all the three types of holdings individually. The pooling effect also gave the same result.

From Table II it is noted that the subsidy elasticity of risks is less than one in small, medium, large holdings and it is so in pooling effect also. The existing subsidy level explains nearly 39 per cent, 18.5 per cent and 6 per cent

TABLE I(A)—PER ACRE RISK GAP AND PER ACRE YIELD DIFFERENCE

(*Rs.*)

Land size (acres)	Average need per acre	Average practice per acre	Average difference per acre (risk gap)	Average expected yield per acre	Average actual yield per acre	Average difference in yield per acre
Small holders (0-5)	483	373	—110	2,100	1,330	—770
Medium holders (5-10)	483	451	—32	2,100	1,890	—210
Large holders (10 and above)	483	475	—8	2,100	2,030	—70

TABLE I(B)—ELASTICITY OF RISK ON YIELD

Cobb-Douglas model: ($Y=a\ R_g^b$)
Regression coefficient of the variables included

Land size (acres)	Constant (a)	Risk gap (R_g)	Coefficient of determination. (R^2)
Small holders (0-5)	2·7399	0·2136** (0·0746)†	0·2484**
Medium holders (5-10)	4·3004	0·0393 (0·1224)	0·0714
Large holders (10 and above)	2·2119	0·0004 (0·0006)	0·0191
Pooling effect	3·9268	0·1237 (0·9583)	0·0164

Source: Computed.

** Significant at 5 per cent level.

† Figures in parentheses are standard errors of the regression coefficients.

of variation in risk assumed by the large, medium and small holdings respectively. Hence, the influence of subsidies on risk-taking is maximum in large holdings than in the other holdings and the regression coefficient of large holdings is found to be significant.

TABLE II—ELASTICITY OF SUBSIDY ON RISK

Cobb-Douglas model: $R=a\ s^b$
Regression coefficient of the variables included

Land size (acres)	Constant (a)	Subsidy (s)	Coefficient of determination (R^2)
Small holders (0-5)	1·7579	0·1902 (0·2763)†	0·0640
Medium holders (5-10)	2·3549	0·0108 (0·0386)	0·1896
Large holders (10 and above)	18·3020	0·1257** (0·0657)	0·3924**
Pooling effect	1·8981	0·1563** (0·0679)	0·1546**

Source: Computed.

** Significant at 5 per cent level.

† Figures in parentheses are standard errors of the regression coefficients.

*Bridging the Risk Gap: Alternatives**

If risk-taking is to be maximized, the alternatives as already observed are: (*i*) reduction of input prices (raising the subsidy on input prices), (*ii*) lowering the interest rate on co-operative loans still further, and (*iii*) fixing a higher price for output (raising the subsidy on output prices).

The last one is to compensate the opportunity loss incurred as a consequence of risk gap. If the first two go to reduce the risk gap directly, the last one goes to fill up the likely loss in the non-assumption of risk to the required level.

With a 5 per cent reduction in input price, the risk gap of the large holders has been bridged and the risk gap of the medium holders has been narrowed down by 75 per cent (from Rs. 32 to Rs. 8). But the risk gap of the small holders has been adjusted only to the tune of 22 per cent (from Rs. 110 to Rs. 86 only). A 10 per cent reduction in the input price eliminates the risk gap of the medium holders altogether. In the case of small holders, the risk gap is brought down only to the level of Rs. 62. To eliminate the risk gap of the small holders, a 25 per cent input price reduction is needed.

The effect of 10 per cent reduction in the input price is that the medium holders are taking risk to the maximum extent and the subsidy is at 42 per cent level. The small holders take the maximum risk only when provided with 25 per cent reduction in input prices, keeping the subsidy level at 52 per cent.

The second method to make the farmers assume higher risk is through a reduction in the rate of interest charged by co-operatives. By reducing the interest rate of co-operatives from 7 to 5 per cent, the small farmers are not benefited much, because the interest subsidy in their case accounts for only 6 per cent of the variation in risk assumed, whereas the medium and large land holders are influenced to the extent of 22 per cent and 42 per cent respectively by interest subsidy in their risk involvement and they are found to be significant at 5 per cent level. Hence, a reduction in the interest rate might make the medium and large holders enjoy more subsidy than the small land holders.

The third alternative is to raise the output price, which will be a popular solution in the present context. In order to reduce the opportunity loss, if Rs. 10 is allowed as output price subsidy per bag, large holders will get Rs. 220 as opportunity gain, after offsetting their loss of Rs. 70. The medium farmers will gain Rs. 60 as against their original loss of Rs. 210. The small holders will reduce their opportunity loss from Rs. 770 to Rs. 580.

To eliminate the small holders' opportunity loss, an output subsidy of Rs. 40.53 per bag is needed. This will lead to an increase in the income inequalities to a large extent, since the medium and large farmers realise high income to the tune of Rs. 1,094 and 1,175 per acre respectively at these subsidy levels.

* Detailed tables for this section have been worked out, but they are too large to be included in this paper. These tables can be obtained from the authors.

Appraisal of Alternatives

A relative assessment of the three alternatives leads us to think that a reduction of input prices seems to be the most appropriate subsidy measure for making the farmers take the maximum risk. The demerits of the other two options are:

1. It is illogical to expect any further reduction in the interest rate as the gap between the co-operative rate of interest and open market rate of interest is already very wide.

2. Fixing a higher price for output will lead to the large farmers getting an extra-ordinary level of profit and a further perpetuation of income inequalities.

The foregoing analysis indicates that subsidy is the right instrument to maximize risk-taking. The reduction in input price is found to be the most appropriate form of subsidy. The policy makers may further choose to fix differential input prices as per the need of the particular category of farmers concerned.

IMPACT OF INPUT SUBSIDY ON INCOME AND EQUITY UNDER LAND RECLAMATION

P. K. Joshi and A. K. Agnihotri*

Subsidy plays a crucial role in the economic development of any developing country where it has a great bearing on production, employment and investment. Barker and Hayami[1] argued that to attain the goal of food self-sufficiency, government adopts short-term policies, such as support prices of products and input subsidy to stimulate the producers to increase their food production along existing production function. In fact, subsidy is necessary as a production accelerating catalyst for those new inventions, which are socially desirable but whose adoption needs huge capital and producers believe it to be risky investment.

Reclamation technology of salt affected lands[2] has a tremendous potential of increasing production, income and employment, but it requires large investment in the initial year. It has been observed in Haryana and Punjab that farmers do not adopt the reclamation technology unless any incentive or relief to cover risk is given. Therefore, Haryana Government has given

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1. Randolph Barker and Yujiro Hayami, "Price Support versus Input Subsidy for Food Self-Sufficiency in Developing Countries", *American Journal of Agricultural Economics*, Vol. 58, No. 4, November 1976, pp. 617-628.

2. It has been estimated that the extent of salt affected land in India is about 7 million hectares, which is gradually increasing due to faulty water management technique. I. P. Abrol and D. R. Bhumbla, "Saline and Alkali Soils in India—Their Occurrence and Management", in World Soil Resources, FAO Report No. 41, pp. 42-51.