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# UNCERTAINTY AND CROP-PLANNING

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## *Introduction*

Agricultural production is subjected to a larger degree of uncertainty<sup>1</sup> both natural and institutional than, say, industrial production. More so in some of the underdeveloped countries like India where the vagaries of nature are more pronounced and less has been achieved in providing a secure base for the agriculture by ensuring timely irrigation facilities, crop protection measures and the like. Further, in such countries weak and inadequate marketing system instead of warding-off large price fluctuations actually accentuates them. Lastly, there is no organised insurance against these uncertainties to evenly distribute the risks and to protect the individual farmer from huge losses. Because of all these factors the individual producer in the agricultural sector has to devise his own ways to survive and to progress in the face of these uncertainties.

One of the ways in which the farmer prepares himself to face these uncertainties is by judicious crop planning. It should be granted at the outset that several other factors besides the factor of uncertainty figure in the decisions about the crop planning. The physical feature of the land, the relative prices, availability of various inputs for different operations, marketing arrangements, etc., all have a say in determining the crop pattern. Yet one of the major determinant in the circumstances mentioned above must be the uncertainty consideration. It is proposed to examine the part played by uncertainties in yield, price and out-turn in influencing the rather spectacular shift in favour of groundnut crop in the Saurashtra region of our country.

## *Shifts in Crop Pattern*

Since most of the decisions regarding resource allocation in agriculture are made at the farm level, the data regarding the yield, price or out-turn uncertainties can be better examined at the micro level of farm. At progressively higher aggregations, usually, the data conceal a part of uncertainty by the process of averaging. However, the data pertaining to adequate number of individual farms were not available, hence in this study the district figures of the yields, prices, and out-turn are examined. For this purpose the changes in the crop-pattern of the Bhavnagar district of the Saurashtra region during 10 years, 1950-51 to 1960-61, were examined.

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1. In this note uncertainty and risk are treated as synonymous.

The Bhavnagar district, as other districts of Saurashtra witnessed a sharp shift in favour of groundnuts in its crop-pattern. Small year to year fluctuations not withstanding, the gross cropped area of the district, around 1,530,000 acres, has remained more or less stable during the decade.

The main crops of the district are groundnut, cotton, jowar and bajri. The four crops accounted for 69 per cent of the total cropped area in 1950-51 and 82 per cent in 1960-61. The area under groundnuts has shown spectacular rise during the decade, from 107 thousand acres in 1950-51 to 587 thousand acres in 1960-61, showing nearly a five-fold rise. Since the gross cropped area has remained more or less stable the area under groundnuts increased at the cost of area under other crops. Table I gives the decline in the area under various crops and the proportion this forms to the total increase in the area under groundnuts.

TABLE I

Crops	Decrease in Area in 1960-61 over 1950-51 ('00 acres)	Percentage to total increase (from 1950-51 to 1960-61) in area under groundnuts
Cotton .. .. .	630	12.7
Jowar .. .. .	1,641	33.0
Bajri .. .. .	607	12.2
Other Crops .. .. .	2,091	42.1
	4,969*	100.0

\*There is slight discrepancy between the decline in the area under these crops and the increase in the area under groundnuts due to a small decline in the gross area during the same period.

### The Relative Prices

The most important reason advanced to explain the increase in the area under groundnuts is the relative out-turn advantage which this crop enjoyed. While this is true in comparison to bajri and jowar (the figures of yield and prices of "other crops" are not available), it is not true in case of cotton as the figures below suggest.

TABLE II

Crops	Average annual out-turn per acre (for the years 1950-51 to 1960-61) in Rs.
Groundnut .. .. .	104
Cotton .. .. .	151
Bajri .. .. .	46**
Jowar .. .. .	22**

\*\* Value of the grains only (excluding fodder). Fodder content could not be evaluated for want of price data. However, it is presumed that fodder value of the crops would not be more than one-half in case of jowar, which is mostly a *khari* crop in this district, and more than one-fourth in case of bajri. Thus, the net result will be an addition of Rs. 8 to Rs. 10 in the out-turn per acre and hence will not materially affect the out-turn disadvantage.

From these figures it seems that cotton was the most remunerative crop. Its substitution by groundnuts therefore need some explanation. It is proposed to examine to what extent yield, price or out-turn uncertainties can explain the decline in the area under these crops.

#### *Measure of Uncertainty*

The yield, price and out-turn uncertainty of various crops, as measured by co-efficient of variation (percentage)<sup>2</sup> is shown below :

Crops	Percentage increase (+) or decline (—) in acre (from 1960-61 over 1950-51)	Coefficient of variations (percentage)			Average out-turn per acre (in Rs.) (for the period 1950-51 to 1960-61)
		Yield	Price	Out-turn	
Groundnut	+448	38	22	40	104
Cotton	-- 47	39	12	47	151
Bajri	-- 17	65	20	74	46
Jowar	-- 36	59	19	68	22

#### *Conclusions*

The experience of the Bhavnagar district during the decade 1951-61, suggests several important conclusions in this regard. A few of these can be listed here: (1) Coupled with their low out-turn per acre the uncertainty of yield and price is, by and large, greater in the inferior cereals like bajri and jowar. In spite of this if the decline in area under these crops is not perceptible, it can only be attributed to the subsistence-orientation of the farmers of the district, which necessitates a small proportion of the area under these crops for the purpose of food and fodder irrespective of price disadvantages. This seems irreconcilable in a district where a commercial crop like groundnut has made spectacular progress. This only suggests a low elasticity of substitution of commercial crops as a group for the food crops as a group, which needs further probe than it has received so far. (2) It seems that at low level of out-turn, the tendency to bear risk to augment income is higher than at a higher level of out-turn. Thus, bajri crop which witnessed greater uncertainty in yield, price and out-turn has fared better than the jowar crop, mainly because of the out-turn advantage, the former giving a per acre yield of Rs. 46<sup>3</sup> against a per acre yield of Rs. 22<sup>3</sup> by jowar. But at the higher level of out-turn the tendency of farmers in this district to take risk is low. Groundnut with slightly lesser uncertainty of the yield and out-turn, (though with higher uncertainty about prices) has increased in area even at the cost of cotton which has a markedly higher out-turn per acre at Rs. 151, against Rs. 104 in case of groundnuts. (3) If one assumes that a farmer at the time of crop-planning thinks in terms of yield uncertainty and the price uncertainty, rather than in terms of the out-turn uncertainty which is compounded value of the two, the former, *viz.*, yield uncertainty seems to have had a larger say in influencing the decisions of the farmers than the price uncertainty in this district. All these conclusions can be treated as hypotheses which may be tested with more extensive data and with more rigorous methodology.

2. The uncertainties were measured by four other devices, too, namely (1) mean deviation as percentage of mean, (2) range as percentage of mean, (3) year to year change as percentage of mean and (4) coefficient of skewness. By ranking them on the basis of the consistency of their results, it was found that coefficient of variation (in percentage) was the better measure for indicating the degree of uncertainty.

3. Excluding prices of fodder, the inclusion of fodder prices will not change the order. See footnote to Table II.