



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Vol XIX
No. 1

ISSN 0019-5014

CONFERENCE
NUMBER

JANUARY-
MARCH
1964

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

2. Guaranteed pricing system may be adopted with quality control and standardisation of tea manufactured.
3. Labour uncertainty may be reduced by checking the mobility of tea garden labour to other construction projects, etc., for which wage incentive may be offered.
4. Tea Board should extend cheap and interest free loans for future development of tea gardens and rationalisation of old tea factories.
5. Land laws must be relaxed to facilitate the extension of tea plantation.
6. Discriminating excise duty pattern may be adopted to give incentive to small tea growers.

RISK AND UNCERTAINTY IN IRRIGATED CROPS

B. V. S. BALIGA*

and

S. B. TAMBAD

Farm Management Research Centre, Bangalore

The decision-making process in farming is a complex and difficult process which calls for better managerial skill on the part of the farmer. An analysis of the effect of the factors like yield, price, technology and policies of government on his net income would be of great importance in building his kit of tools. Indian agriculture is often characterised as tradition bound. Centuries old practices are still in vogue. In the area of study farmers are tradition bound as elsewhere in India. The purpose of this paper is to examine how far the actions of farmers conform to economic logic. In the light of the findings, some suggestions about possible directions along which farmers should move to increase their profits have been made.

Risk and Uncertainty¹

Risk refers to events which can be ascribed some probability of occurrence, whereas uncertainty refers to events which cannot be associated with any probability. Risk may be due to hazards like fire, death, hail storm, which can be predicted with some probability. Risks are insurable.

* This is a joint paper irrespective of the order of the authors' names.

1. (a) E. O. Heady: *Economics of Agricultural Production and Resource Use*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, pp. 439-534.

(b) E. O. Heady and H. R. Jensen: *Farm Management Economics*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1960, pp. 515-550.

Types of Uncertainties

There are six types of uncertainties, namely, yield uncertainty, price uncertainty, uncertainty due to technology, uncertainty due to actions of other people, uncertainty due to government policies, and uncertainty in a family due to unforeseen events. Of these various types of uncertainties this paper focusses its attention on yield and price uncertainty.

Yield Uncertainty :—A farmer cannot accurately predict the yields he can obtain with a bundle of resources, because of fluctuations in rainfall, temperature, humidity, attacks of pests and diseases and the like.

Price Uncertainty :—There are wide fluctuations in prices of inputs and outputs which affect the net incomes of farmers. These variations may be seasonal, cyclical, secular or random in nature.

Ways of Meeting Uncertainties

There are a number of ways of meeting the different kinds of uncertainties. An individual farmer can overcome the yield and price uncertainty by entering into future cash contracts, selling the crops before harvesting or diversification. Price stabilization and support programmes of government may help to some extent in meeting price uncertainty. Farmers who rent their land for fixed contracts in kind meet the yield uncertainty. Those who lease their land for cash rent will meet both price and yield uncertainty. Farmers who rent their land on crop share basis are subject to both yield and price uncertainties.

Diversification is one of the means of meeting uncertainty in income. It helps to meet more of yield uncertainty than price uncertainty. With an increase in diversification the income decreases but the stability increases. With specialization the income increases but the stability decreases.

Objectives

The objectives of this paper are (1) to determine the extent of diversification among farmers and its influence on net returns and its variability ; (2) to determine the average net income and its variability for each crop; and (3) to study whether farmers' decisions are influenced by gross returns, by net returns, and/or by their variability.

Sample

Data from hundred farmers of ten representative villages in the red soils area of Bangalore district, selected for farm management studies, have been used for analysis. Farmers were selected on the basis of the extent of their operational holdings, from five size groups of 0-5 acres, 5-10 acres, 10-15 acres, 15-20 acres, and 20 acres and above, at the rate of 2 per group. Both villages and farmers were selected by judgment sampling. The data pertain to crops grown under irrigated conditions only and for the year 1959-60.

Characteristics of the Region

Bangalore District lies at an altitude of 3,000 feet and is in the dry belt of Mysore State. The average annual rainfall is about 30 inches. The average temperature varies from 55°F to 97°F. The humidity varies from 23 to 71 per cent.

Cropping Pattern of the District

Ragi is the most important crop grown under dry conditions where the common rotation followed is *ragi* after *ragi*. Under irrigated conditions paddy, potato, cabbage, garlic, onion, beans, chillies and mulberry are usually grown. The main sources of irrigation in the district are tanks and wells. Under tank irrigation paddy is grown whereas other crops are grown under well irrigation. The crops included in the analysis are irrigated mainly from the wells.

Analysis

The selected farmers grow any or a combination of the above crops. Among the factors that influence the net returns, selection of crops and the extent of diversification are important. To study the extent of diversification adopted by the farmers, diversity indices based on the area under each crop have been developed for each farmer. Only 61 out of 100 farmers have grown more than one irrigated crop and, therefore, are considered for calculation of the diversity indices.

Diversification among Farmers

The diversity indices for the individual farmers vary from 1.07 to 4.00 indicating wide variation in the extent of diversification.

TABLE I—DIVERSIFICATION AMONG FARMERS, RED SOILS AREA, BANGALORE DISTRICT, MYSORE STATE, 1959-60

| Diversity index | | Number of farmers |
|-----------------|-------|-------------------|
| Less than 1.99 | | 20 |
| 2.00 to 2.99 | | 29 |
| 3.00 and above | | 12 |
| Total | | 61 |

It can be seen that a majority of farmers (49 out of 61) do not go in for extreme diversification. The probable reasons for the same may be low net returns.

Diversification and Net Returns

Diversification is usually followed as a means of reducing variability or uncertainty in income. Net returns would be lower under diversification than under specialization. However, the variability² of net income would be lower in case of diversification as compared to specialization.

2. Coefficient of variability of net income indicates the extent of uncertainty in net income.

TABLE II—DIVERSITY INDICES, NET RETURNS, AND ITS VARIABILITY, SELECTED FARMERS, RED SOILS AREA, BANGALORE DISTRICT, MYSORE STATE, 1959-60

| Diversity index | Average net returns per acre (Rs.) | Coefficient of variability of net income (per cent) | No. of farmers |
|-----------------|------------------------------------|---|----------------|
| Less than 1.99 | 378 | 162 | 20 |
| 2.00 to 2.99 | 356 | 55 | 29 |
| 3.00 and above | 246 | 52 | 12 |

The average net return and its variability decrease with increase in the diversity indices. When the diversity index is less than 1.99, the average net return is Rs. 378 which is associated with very high variability of 162. Further diversification reduces the net income slightly, but effects an appreciable fall in the variability. Diversification beyond 2.99 is not advantageous as it reduces the net income substantially with a negligible fall in the variability. The results indicate that majority of the farmers (41 out of 61) have preferred lower incomes with a low variability to higher incomes associated with higher variability.

Income Variability

It is not only the average net income that is important for making rational decisions but also the variability in the net income of each enterprise. The average net income³ and its variability have been determined for each irrigated crop.

Farmers who seek high average net income irrespective of the amount of risk involved can select cabbage, onion and garlic in order of preference (Table III). Those who are interested in the stability of income can select onion, irrigated *ragi* and garlic. Farmers who take into consideration both the net income and its variability can select onion and garlic. Those who are prepared to assume more risk can select cabbage which gives highest average net income but is associated with higher variability.

TABLE III—AVERAGE NET RETURNS AND ITS VARIABILITY, IRRIGATED CROPS, RED SOILS AREA, BANGALORE DISTRICT, MYSORE STATE, 1959-60

| Crops | Average net return per acre (Rs.) | Coefficient of variability (per cent) | | Range in net return per acre (Rs.) | |
|-----------------------|-----------------------------------|---------------------------------------|-------|------------------------------------|---------|
| | | Net Return | Price | Minimum | Maximum |
| Cabbage | 1,325 | 134 | 19.1 | —76 | 5,077 |
| Onion | 539 | 50 | 17.6 | 44 | 992 |
| Garlic | 480 | 91 | 20.8 | —182 | 2,027 |
| Beans | 283 | 155 | 27.0 | —12 | 1,390 |
| Potato | 200 | 166 | 17.9 | —769 | 1,324 |
| Irrigated <i>Ragi</i> | 235 | 66 | 5.3 | 79 | 788 |
| Chillies | 85 | 266 | 25.8 | —230 | 564 |

3. For the purpose of this study net income is taken as gross income *minus* the variable cost excluding family labour. Since it is presumed that under the conditions in Bangalore district, family labour has no alternative employment opportunities it is not considered as a variable cost. The words "net income" and "net returns" are used synonymously.

To some farmers the price variability of different crops may be of major consideration than other factors. The results indicate the presence of wide variability among crops. Price of irrigated *ragi* has the lowest variability. Potato and onion have almost the same but higher variability than irrigated *ragi*. Cabbage and garlic have still higher variability.

In selecting enterprises farmers would be interested not only in securing high net returns but also in avoiding heavy losses. Farmers growing irrigated *ragi* and onion can be more certain of getting positive net returns as high as Rs. 788 and Rs. 992 respectively without any possibility of incurring losses. Garlic also gives fairly high net returns of Rs. 480 with a low variability of 91 and there is possibility of getting high net returns with some risk of incurring loss. Though beans has moderate net returns the variability is high with possibilities of getting fairly high net return and incurring meagre loss. Potato also gives moderate net return with very high variability. Chillies give the lowest net return associated with very high variability. Both in potatoes and chillies there are possibilities of obtaining high net returns and incurring heavy losses.

Distribution of the cases having positive and negative net returns according to crops throws further light on the problem of selection of crops (Table IV).

TABLE IV—DISTRIBUTION AND PROPORTION OF CASES SECURING POSITIVE AND NEGATIVE NET RETURNS ACCORDING TO CROPS, RED SOILS AREA, BANGALORE DISTRICT, MYSORE STATE, 1959-60

| Crops | Average net returns per acre (Rs.) | No. of cases having | | Per cent of cases having | |
|-------------------------------|------------------------------------|----------------------|----------------------|--------------------------|----------------------|
| | | Negative net returns | Positive net returns | Negative net returns | Positive net returns |
| Cabbage | 1,325 | 1 | 14 | 7 | 93 |
| Onion | 539 | nil | 10 | nil | 100 |
| Garlic | 480 | 2 | 30 | 6 | 94 |
| Beans | 283 | 2 | 8 | 20 | 80 |
| Potato | 240 | 23 | 87 | 21 | 79 |
| Irrigated <i>Ragi</i> | 235 | nil | 39 | nil | 100 |
| Chillies | 85 | 3 | 6 | 33 | 67 |

Onion and irrigated *ragi* have not given negative net returns. The cases giving negative net returns form only 7 and 6 per cent in cabbage and garlic respectively. The percentage of cases getting negative net returns are high in beans, potato and chillies.

Selection of crops can also be looked at from another aspect. The average net returns, maximum loss or gain over a unit of variable cost can be used as choice indicators for selection of crops.

TABLE V—AVERAGE NET RETURNS, MAXIMUM GAIN AND LOSS OVER RUPEES HUNDRED OF VARIABLE COST ACCORDING TO CROPS, RED SOILS AREA, BANGALORE DISTRICT, MYSORE STATE, 1959-60

| Crops | Total variable cost per acre (Rs.) | Average net return* per acre (Rs.) | Coefficient of variability of net return (Per cent) | Maximum gain* per acre (Rs.) | Maximum loss* per acre (Rs.) |
|-------------------------------|---|---|--|---------------------------------------|---------------------------------------|
| Cabbage | 231 | 574 | 134 | 2,198 | 33 |
| Onion | 177 | 304 | 50 | 560 | nil |
| Irrigated <i>Ragi</i> | 109 | 215 | 66 | 723 | nil |
| Garlic | 391 | 123 | 91 | 518 | 47 |
| Beans | 239 | 118 | 155 | 582 | 5 |
| Chillies | 214 | 40 | 266 | 264 | 107 |
| Potato | 683 | 35 | 166 | 194 | 113 |

* These are per each hundred rupees of variable cost.

The average net returns over each hundred rupees of variable cost are highest in cabbage and are associated with high variability. There is possibility of securing as high net returns as Rs. 2,198 and incurring a loss of only Rs. 33. Onion gives high net returns of Rs. 304 only next to cabbage with variability of 50 which is the lowest. There is possibility of getting maximum net return of Rs. 560 with no possibility of incurring loss. Irrigated *ragi* provides moderate returns with more stability of income. There are possibilities of getting as high net returns as Rs. 723 with no possibility of incurring loss. Garlic provides moderate returns with some stability and there are possibilities of incurring more loss. Though beans provide nearly as much returns as garlic the stability of income is lower. As regards potato and chillies the returns are low coupled with very high instability and possibility of incurring huge losses. Wherever conditions permit, farmers can go in for cabbage, onion, irrigated *ragi* and garlic in preference to potato, beans and chillies.

The total variable cost per acre can be considered as the working capital required for the individual crops. Irrigated *ragi* has the lowest capital requirement of Rs. 109 and gives moderate return of Rs. 215. Onion requires a capital of Rs. 177 and gives a high net return of Rs. 304. Cabbage requires moderate amount of capital of Rs. 231 but provides the highest return of Rs. 574. Garlic and potato require high amount of capital and provide low net returns. Chillies and beans require moderate capital but give low net return.

Among the crops potato requires huge capital, provides low net returns, has high variability of net income, has the lowest maximum gain and has the highest maximum loss. Thus it is not advisable to grow potato where other more paying crops can be grown.

In the light of the above results it can be seen whether the farmers' behaviour in determining the area under different crops is influenced by the net returns and

its variability. If variability in net income is the major criterion in allocating the area under different crops, then farmers should grow low variability crops on more area and high variability crops on less area.

TABLE VI—COEFFICIENT OF INCOME VARIABILITY AND AREA UNDER DIFFERENT CROPS, RED SOILS AREA, BANGALORE DISTRICT, MYSORE STATE, 1959-60

| Coefficient of income variability | Crops | Area in acres | Per cent |
|-----------------------------------|----------------|---------------|----------|
| High | Chillies | 93.6 | 67.01 |
| | Cabbage | | |
| | Beans | | |
| | Potato | | |
| Low | Garlic | 45.96 | 32.99 |
| | Onion | | |
| | Irrigated Ragi | | |
| Total | | 139.32 | 100.00 |

Farmers have grown in bulk of the area crops like chillies, cabbage, beans and potato which have high variability. Only about a third of the area is under crops with low variability. These results indicate that farmers do not seem to have considered the stability of income of these crops as they have grown crops with high variability in larger area than crops with low variability.

Similarly, the relationship between the net income and the area under different crops have been studied.

The results indicate that farmers have grown low income crops on as much as 78.54 per cent of the area (Table VII). This shows that farmers do not take into account the economic implications of their decisions. Their decisions seem to have been influenced by factors other than net income and its variability.

TABLE VII—MAGNITUDE OF NET RETURN AND AREA UNDER CROPS, RED SOILS AREA, BANGALORE DISTRICT, MYSORE STATE, 1959-60

| Magnitude of net return | Crops | Average net revenue per acre (Rs.) | Area in acres | Per cent |
|-------------------------|----------------|------------------------------------|---------------|----------|
| High | Cabbage | 781 | 29.89 | 21.46 |
| | Onion | | | |
| | Garlic | | | |
| Low | Potato | 211 | 109.43 | 78.54 |
| | Irrigated Ragi | | | |
| | Beans | | | |
| | Chillies | | | |
| Total | | | 139.32 | 100.00 |

The relationships of the gross income, its variability and price variability with the area under different crops, have been studied to determine whether they influence farmers' decisions.

TABLE VIII—MAGNITUDE OF GROSS RETURNS, ITS VARIABILITY, PRICE VARIABILITY AND AREA UNDER CROPS, RED SOILS AREA, BANGALORE DISTRICT, MYSORE STATE, 1959-60

| Category | Magnitude | Area in acres | Total area in acres |
|------------------------------|-----------|---------------|---------------------|
| Gross Returns | { High | 82.86 | 139.32 |
| | { Low | 56.46 | |
| Variability of Gross Returns | { High | 31.03 | 139.32 |
| | { Low | 108.29 | |
| Price Variability | { High | 20.60 | 139.32 |
| | { Low | 118.72 | |

Farmers seem to be guided by high gross returns, low variability of gross returns and low price variability since they have grown crops on larger areas under these categories.

Conclusions

Farmers have followed diversification as a means of reducing income variability. There is wide variation in the extent of diversification followed by the farmers. Onion, irrigated *ragi*, garlic and cabbage are found to be better crops as compared to others considering the average net income they provide, their variability, the maximum gain and loss per acre and returns per unit of variable cost. Potato, chillies and beans, though not advantageous, are still grown on large areas. This indicates that the farmers' decisions are less influenced by average net incomes of crops and their variability. They are mainly led by high gross returns, its variability and price variability. If the farmers' goal is to maximise profits they should shift their emphasis from gross income to net income. By doing so they will be selecting crops which have high net income with low variability. This study is based on a cross sectional analysis of one year data. However, time series studies may throw further light on some of these problems.