INTRODUCTION

The process of production in agriculture is subject to a considerable element of uncertainty all over the world. As an enterprise, it is susceptible to all the social, economic and structural uncertainties, which any other similar enterprise is called upon to face. Further, as a mode of life, it has to reckon with all the personal uncertainties arising from death or impairment of health of farmers through sickness, accident as also through inability to provide their labour power in the case of agricultural labourers. Besides, agriculture is susceptible to uncertainties arising from vagaries of nature, which are
Figure 1 explains cent per cent probability of the price to be Rs.20.0 per unit as its value is 1.0. This clearly reflects no chance of variations or it is a perfectly certain case. However, in real agriculture it is not observed except in cases of contract prices and ceiling or bottom prices determined by the Government.

Figure 2 indicates relatively risky situation where the probability value for the price of Rs.20.0 is only 20 per cent per unit. Not only that it reflects lower probability value but it also explains higher variations through large range of possibilities of price from zero to Rs.40.0. So this is a case of highly uncertain price situation, which can be often found in agriculture.

Fig. 3: More risky case.
Fig. 4: Less risky case.
Figure 3 indicates left skewed distribution of price expectations, i.e. relatively more uncertain situation. The skewed distribution explains increasing probability for the price ranging from Rs. 10.0 to 40.0 per unit and decreasing probability for the price ranging from Rs. 40.0 to 50.0 per unit. The highest probable price in this case is Rs. 40.0 per unit. In contrast to this, figure 4 presents right skewed distribution of expected prices, i.e. a case of relatively less uncertain situation. The right skewed distribution explains increasing probability for price ranging from Rs. 30.0 to 40.0 per unit and decreasing probability for price ranging from Rs. 40.0 to 80.0 per unit. The highest probable price in this case is Rs. 40.0 per unit.

Figure 5 illustrates normal distribution of probability which represents relatively higher uncertainty than that expressed by figure 1. The slope of the curve in
figure 5 is more flat than that of figure 1, which shows relatively higher variance. The probability value of expected price of Rs. 30.0 in this case is 60 per cent.

**Difference between Risk and Uncertainty**

Risk and uncertainty both result from the imperfect knowledge of future events. Though, its nature and degree differentiate than from each other. (1) A part of the variations which could not be measured in quantitative manner through frequency distribution or probability estimates is termed as risk, while that part for which parameters of probability distribution cannot be established in an empirical manner, is termed as uncertainty. (2) Risk is a hazard of a loss emerging out of uncertain occurrences and incorporated in the structure of business as an item of cost, while uncertainty is the conceptional apprehension of accidental deficit and unforeseen expenses which are difficult to measure in quantitative manner. (3) The element of risk can be predicted due to the availability of quantitative experiences of the large number of homogeneous cases and instances, while the uncertainty cannot be predicted due to the absence of historical experiences and individual uneven cases. (4) Risk is insurable due to frequent occurrences and sufficiently large number of cases, while uncertainty is not insurable as it is entirely subjective in nature. (5) The statistical methods are available for the measurement of risk, while no method exists
by which actual numerical values may be assigned to the uncertainty.

Thus, the distinction between risk and uncertainty refers not to the two entirely different situations, but to differences in the accuracy with which the relative probabilities of alternative outcomes of an event are known. These two terms in this study have been used in a very broad sense to include all circumstances in which decision is made without perfect knowledge of future events. In fact these two terms 'Risk' and 'Uncertainty' have been considered synonymous in number of studies. 4

Significance of Risk

A farm business to be efficient requires perfect or nearly perfect decision making at the farm level. For this purpose farmer needs different types of informations in relation to a number of factors: particularly of variability of nature, prices of inputs, overall cost of production,

prices of crop output, marketing channels etc. In this context, a farmer is mostly confronted with a situation of an imperfect knowledge. Besides, in the informations thus sought the degree of variability varies, the estimation of which is the principal task for them.

The historical data or experiences can provide an adequate basis for either estimating the degree of variability or the measurement of risk element. For this purpose the coefficient of variations for time series data on weather variables such as rainfall, temperature, humidity, cloudy days during the respective crop seasons, yield and net returns per hectare can be worked out, correlated with each other and with the area under respective crops.

The all-India farmers' council also considered the significance of risk element in its two day meeting in the recent past in the following manner. The council held that the agricultural price commission, while determining the cost of production of agricultural produce must also include charges on account of risk management and minimum margin of profit like other industrial goods.


6 All-India Farmers' Council, New Delhi, Bharat Krishi Samaj, Annual Meeting, 1980-81, Chairman - Balram Jakhar, News, Item in Indian Express, 2nd June, 1981.
The farm losses stemming out of risks can be incorporated into its cost structure. These types of incorporation of the cost is only possible when the number of occurrences is sufficiently large so that probability of loss can be established. Few instances of agricultural risks for which probability distribution can be established, are sighted below. The cost of broken egg out of the group of 100 eggs for a poultry farmer can be added into remaining 99 eggs and marginal returns can be reckoned. Ray\(^7\) has examined the coefficient of variation for crop losses from hailstorm by 21.72 per cent during 1934-1950 for U.S.A. Similarly for fire losses the coefficient of variation was estimated to be 14.80 per cent. Again, the annual average frequency of total farm accidents for the entire U.S.A. was found to be 7.21 per 1,00,000 farm people, 18.86 per 1,00,000 farm workers and 33.96 per 1,00,000 farms during 1940-1948.

**Nature of Risk**

Indeed, no growth in agriculture can take place without farmers taking risks. Agricultural processes are typically influenced by several stochastic variables due to imperfect knowledge of future events.\(^8\) Besides, the major

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problem of farm sector, particularly in India, is not only of unfavourable prices of farm output but also of weather variability placing serious threat against farmers. The weather variability in agriculture was well explained by A. S. Kahlon and Karam Singh with the help of few instances emerging from rainfall, cloudy days, sunshine, humidity, flood, water logging, insect-pests and government policies in their book 'Economics of Farm Management'. The types of uncertainties they discussed are very important for the long term decisions for agricultural production and investment. Above all, the farmers also get affected by uncertain physical health and productivity of their livestocks, which is highly associated side occupation for the farming communities, particularly in Indian agriculture.

Thus, the problem of instability in agriculture is of no less important than the problem of growth in agriculture. The risk of crop failure is not merely the impact of decline in output for the farmers, but it is one of loosing inputs invested and of decline in farm income. Hence, agriculture particularly in India, has the dubious distinction of having the most uncertain input-output

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relation of all such relations in the other sectors of the

economy. As the value of unforeseen risks and uncertainty
is not estimated during the process of decision making by
the farmers it results into either low income or total crop
failure. In brief, farmers are well aware of the nature
and existence of risk and uncertainty, though it is
difficult for them to assess their incidence in empirical
form.

Anderson, Dillon and Hardaker have identified two
broad approaches to specify the impact of risk on production
processes. Among them one is analytical in nature incorpo­
rating the following three situations:

(i) The input variables under cent per cent
producer's control at the time of decision.

(ii) The input variables beyond the farmer's
control whose values are known at the time
of decision.

(iii) The input variables beyond the farmer's
control, whose values are unknown at the
time of decision.

10 M. V. Nadkarni and R. S. Despande, "Agricultural Growth,
Instability In Productivity and Rainfall, Case of
Karnataka", Economic and Political Weekly, Vol. XVII,

11 J. R. Anderson, J. L. Dillon and J. Brian Hardaker,
"Agricultural Decision Analysis", The Iowa-State
Among the above three situations, the third one puts stress on resource allocation at farm level and it simply compounds all the variations.

Types of Uncertainty

Several types of uncertainties are involved in agricultural production process which can be classified into two broad groups:

(i) **On farm uncertainties**: These types of uncertainties are related to production and the farmer's own pool of resources.

(ii) **Off farm uncertainties**: These types of uncertainties are related to market prices, technology, government policy, individuals and institutions with whom a farmer deals in connection with farm business.

The above two types of uncertainties can be further divided into the following major groups:

(i) **The Price Uncertainty**: The economic factor plays an increasing role in the market instability affecting all the sectors of the economy. The individual farmer has no control over the prices of farm inputs as well as farm products, while the enterprises in non-agricultural sector have greater control over product and to some extent even
on input prices. The price uncertainty in agriculture is resulted from: (a) the fluctuations in national income and prosperity, (b) discontinuous production cycles, (c) random disturbances of weather fluctuations, and (d) changes in consumer's taste.

The product prices fluctuate more widely because of the relative inelasticity of demand and supply of agricultural products in a given period. The demand for agricultural products arises mainly on three accounts viz., human food, animal feed and industrial raw materials, of which the first two are fairly stationary in a given 'space time continuum'. Even the demand for raw materials does not normally vary much in a short period. But the supply or the production of agricultural commodities, tends to vary from season to season depending largely on weather conditions. With seasonal variations in production, prices become uncertain, assuming no carry over stocks from previous season or imports to counter-balance shortages in seasonal production.

Fig. 6: Possible Fluctuations in Price Level of Farm Products with Seasonal Variations in Supply.
Figure 6 presents a simple illustration, which shows that DD (Demand Schedule) remains more or less stationary, a partial crop failure due to drought, flood or any other reason will push the price up (from Op to Op₁). A bumper crop on the other hand, unless there is any offsetting arrangement for fertilizing the crop, the excess supply will force the price down (from Op to Op₂).

The inelasticity of demand tends to create uncertainty of prices of agricultural products in a short period, while the inelasticity of supply is likely to act as uncertainty and greater cause of uncertainty over a relatively longer period. Farmer stands to bear the losses incurred in planning in anticipation of the expansion of demand, which is illustrated in the following figure 7:

![Diagram showing demand and supply curves](image)

In figure 7 it is indicated that D₁D₁ is anticipated demand schedule and DD is the actual demand and Op is the actual price which indicates that with the change in demand and inelastic supply price increases from Op to Op₁. Thus, the inelasticity is inherent in farm enterprise.
Three additional factors often aggravate the position further, which are: (i) the farmer using traditional farm practices may be unable to react quickly to change through the conditions of new techniques, methods and organisation, (ii) even when farmers are willing to adopt some of the changes, circumstances may not be favourable to them, and (iii) the change in government policy to support prices of some products and the change in the relative profitability of certain enterprises are also the factors causing price uncertainty.

This type of uncertainty is very important for long run production plans and investment decisions.

(2) Technical Uncertainty: The agricultural production process is heavily influenced by various technical factors, the climate, an uncontrollable factor being one of them. The unfavourable, climatic factors such as severe and radical changes in the climate, aggravate the uncertainty in farming. In general the extensive agriculture is more sensitive to meteorological conditions than intensive agriculture.

Yield uncertainty is another type of uncertainty faced by a farm manager. It refers to variations in the production coefficients for a given technique. It affects the farm returns and also the decisions of a farmer. It is absent in some non-agricultural industries, but almost
universally present in the various lines of agricultural production. In the non-agricultural industries where it exists, its magnitude is not as large as that in agriculture. The farm yield varies from season to season depending on the quantum, time and distribution of rainfall, availability of irrigation facilities, other supplementary farm inputs and insect and pest attack on crops.

3) Uncertainty of Social and Legal Status: The existing social and legal framework also becomes a source of uncertainty for agriculture. The social factors include: (i) theft, (ii) strike, (iii) war or civil commotion, (iv) changes in social structure, namely size of households, age distribution of the farmers, caste systems etc. The moveable farm equipment is subject to burglary and theft like non-farm assets. In fact, the risk of theft of such farm property is even greater since farms are generally scattered over outlying regions where it is not possible to ensure watch and vigilance to the same extent as in the case of urban areas, like-wise, strike hazard is present wherever farming is run on a commercial basis necessitating the employment of a large proportion of hired labour. The changes in social structure are also likely to affect agriculture in various ways. For instance, the transition from a family farm system to one of commercial or collective farming may in some way enhance the uncertainties in
distribution of peasant's risk attitude coefficient is diverse and not necessarily well represented by the average population value, and (ii) the level of income and perhaps other socio-economic variables influence peasant's attitude to risk. The contracts of sales and purchases of agricultural produces and tenure system also give rise to uncertainty for agriculture. Two other risks besides those mentioned above may also be considered under 'social risks', namely, quality of management and moral delinquency. Uncertainty due to the personal factor involved in management confronts all types of farm firms, though in varying extent depending upon the nature and size of farms. The quality of management may vary on account of differences in physical capabilities of the farmer or of the quantum of technical and physical resources he can put in the farm. It may also depend upon the intensity of personal effort made by the farmer himself.

(4) Weather Uncertainty: There are two types of natural resource, namely controllable and uncontrollable. The use of fertilizers, pesticides, seeds, farm implements, irrigation etc. come under the first category, while the rainfall, climate, geographical structure, location etc. fall in the second category. Among the weather variables the rainfall is the major climatic factor which is beyond human control. Of course, to some extent, it can be substituted by measures like the development of irrigation facilities.
which is rather a costly measure for a farmer. In several tracts of land due to unfavourable slopes situated far from the source of irrigation and lack of underground water irrigation is very difficult to practise. Of course, efforts are being made to utilize the available water supply and to improve the measures like artificial rainfall. But it involves heavy cost. The climate depends upon some of the uncontrollable factors like altitude, the direction of mountains and winds, the distance from sea and aorestation round about. The nature and type of cultivation and the success of tilling process depend upon climate. The crops grown in an unfavourable climate would not be productive of their efforts. Some crops and fruits are climate specific and may not tolerate any other type of climate. So the farming activity could run on a variety of considerations.

(5) Resource Uncertainty: Uncertainty of resource availability is another type of uncertainty a farmer faces in agriculture. In most of the countries land is scarce in agriculture, while chances of obtaining land leased-in are limited. Thus, the farmer has to practise agriculture with the limited supply of a basic resource of land. Consequently he has to adopt proper planning of land use pattern over a year. Besides, the limitation of labour supply mostly in

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time of need is another problem for a farmer at the farm level. Even family labour which is always at his source becomes uncertain at times due to health hazards. Scarcity of hired labour is well-known even in a labour surplus economy like India particularly during planting, sowing and harvesting time. Similar problems are faced with regard to the supply of different other inputs like seeds, manure, fertilizers, irrigation, etc. Finally, finance which controls almost all inputs is also scarce in supply and sometimes uncertain in nature.

The changes in weather prolong or shorten the period of certain agricultural operations like sowing, weeding, harvesting etc. Accordingly, a farmer has to adjust the intensity of resource use at farm level. For instance, good and timely rain reduces the number of waterings to be practised at the farm level. An abnormal attack of insect pests leads to an increase in cost of insecticides and pesticides. Conversely, a minor attack of pests saves these costs. The extent of the loss suffered due to the various enemies of the plants like insects, nematodes, fungi, bacteria, viruses, parasites, weeds, rodents and other animals is placed around 20 per cent of the gross produced in 1973 estimated by many observers.  

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Hence any plan for agricultural development is based on pre-calculated risks. Some of the risks will have to be underwritten by government, like risk of loss due to non-sale of improved inputs despite of advance planning, risk of ready wells and tubewells not yielding reasonable quantity of water, risks of bad debts from credit institutions lending to small and marginal farmers etc.

Again one has to bear in mind that high yield capability is accompanied by high risk of pest and other diseases. The improved seeds can give maximum returns to the farmers within the resource endowments of soil and which can give a high yield also commensurate with "acceptable" risks. The cross varieties of seeds have high levels of desirable characteristics such as yielding capacity, resistance to disease and pests, maturity within usual period, resistance to drought and water logging.

**Risk in Agriculture and Non-agriculture**

The prevalence of risk is experienced in all the sectors of the economy. However, their types, nature, degrees, effects etc. differ from sector to sector. Viewed thus, in respect of risk there prevails a vast difference between agricultural and non-agricultural sectors, the two major sectors of an economy. The physical variability plays an important role in agriculture than non-agricultural
The sharing of risk between partners, firms or in share market is possible in the non-agriculture sector. Such a sharing in agriculture is not possible except some opportunities for insuring certain types of risks and partnership agreements. Uncertainties arising out of changes in technology, social structure and legal framework equally affect agriculture as well as non-agriculture.

Risk in Developed and Developing Countries

The degree of risk to be faced by a farmer is a function of a stage of development of an agricultural sector. Therefore, the degree of risk faced by a farmer in a developed agriculture is quite different from that in developing agriculture. Risks due to natural conditions have been reduced to a large extent by the development of irrigation facilities and improved techniques such as the use of pesticides, fungicides, high yielding varieties of seeds, improved breeds of livestock, better processing, sufficient storage and transportation etc. in the developed economics. Besides the increasing availability of credit, expansion in education and market programme for new techniques have reduced risks in agriculture in developed countries. These types of measures are yet to be adequately developed in developing economies. The crucial

resources like land, labour and water have been utilized at the maximum level in the developed countries, while they are often underutilized in developing economies.

Agricultural situation differs from country to country and also within the country. For example, within India, agricultural environment between wheat growing Punjab and either rice growing Orissa and Tamil Nadu or jowar growing Rajasthan widely varies. In the above context, the conditions of developing economies are far from satisfactory. Risk and uncertainty have been fairly reduced by providing technical services to farmers through farm management advisory services in developed countries, while in the developing countries very few efforts have been made in this area. For instance, a beginning has been made in India at farm planning activity by Intensive Agricultural District Programme. 18 The size of farm is considerably large in developed countries and provides sufficient marketable surpluses for the sectors other than agriculture. While in developing countries the average size of holding is very small, which does not provide sufficient marketable surplus to other sectors of the economy.

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The research in this area indicates that the risk bearing capacity of big farmers is higher than that of small farmers. Hence, it can be found that risk bearing capacity in the developed countries is larger than that in the less developed countries. The social customs and institutional factors are not the constraints in agriculture of developed economies, while in developing countries these factors are also the sources of uncertainties.

Risk and uncertainty change with the change in economic growth, i.e. either risk decreases or becomes manageable through some of the techniques at higher level of growth. This conclusion can well be supported with the example of developed economy like England on the basis of very long experience. The historical experience of 50 years, from 1925 to 1975 of England, with reference to yield per acre of wheat, explains that the year to year variability in yield is mainly the result of variations in weather conditions.\textsuperscript{19}

The graph presented here clearly shows the positive trend of yield per acre of wheat in England, but at the same time degree of variability is also found to be high from the zig-zag nature of the curve sighted in the above figure.

Risk Aversion in Agriculture

Most of the decision-makers in agriculture are thought to be risk averse. For instance, if there is the question of a choice between a certain Rs. 50 or the equal chance of receiving either Rs. 100 or nothing, the farmer will prefer the former to the latter. The implication is that usually a farmer does not aim at the production plan...
with the highest expected profit associated with equally high degree of risk.

Risk aversion can be examined by the use of a statistical measure of the 'variance' of expected profit from the particular production plan. If the variance of a particular production plan exceeds specific limit, that plan cannot be preferred in optimizing procedure. In this context, farmer's risk attitudes can be illustrated through the following utility function diagrams:

\[ U(R) \]

\[ U(R) \]

\[ 0 \quad \text{Risk Averter} \quad X \quad \text{Risk Taker}. \]

\[ U(R) \]

\[ 0 \quad \text{Fig-9:} \quad X 

\[ U(R) \quad 0 \quad \text{Fig-10:} \quad X 

\[ U(R) \]

\[ 0 \quad \text{Fig-11: Risk Taker for } R_0 < R < R_1, \text{ Risk Averter elsewhere.} \]
The utility function in terms of money income provides a good approximation of farm decision-maker's behaviour under uncertainty. In the above illustration utility is a function of net money income which can be formulated as \( U = U(R) \). In this situation for a risk averter \( U(R) \) is regarded as a decreasing function of \( R \) as a necessary and sufficient condition (Fig. 9), while for risk taker \( U(R) \) is regarded as increasing function of \( R \) (Fig. 10). In such cases a person exhibits a farmer's behaviour or risk aversion over some range of income and of a risk preferer over another range of income.

The knowledge of farmer's behaviour and attitudes is useful in estimating the subjective probabilities of risk. To examine precisely the subjective or objective probability distribution of outcomes of choices is difficult. The question whether non-protective modern inputs or any other factor involved in increasing risks of income depends on the extent of risk aversion of the farmers. Such knowledge can be incorporated into government policies to deal with concerns of the following table 1.1 and ultimately achieve greater efficiency:

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Table 1.1: Reasons concerning the attitudes towards risk of various actors in the development process

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<th>Contents</th>
<th>Actors whose attitude towards risk are involved</th>
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<td>Farmers, money-lenders, credit institutions.</td>
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<tr>
<td>2. Income distribution implications of differential risk aversion and its implications for crop choice, adoption behaviour and credit use.</td>
<td>Farmers, money-lenders, credit institutions.</td>
</tr>
<tr>
<td>3. Regional planning and investment strategies, e.g. whether to concentrate investment on high potential/low risk regions or not.</td>
<td>Policy-makers, administrators, donor agencies.</td>
</tr>
<tr>
<td>4. Agricultural research strategy, e.g. on which regions to concentrate research investment or what emphasis to give on stability of technology as against productivity.</td>
<td>Farmers, researchers, research administrators.</td>
</tr>
<tr>
<td>5. Attitude towards risk as determinants of rural institutions (e.g. share cropping)</td>
<td>Farmers/land-owners, labourers, lease-holders.</td>
</tr>
<tr>
<td>6. Take account of attitude towards risk in output supply analysis</td>
<td>Farmers</td>
</tr>
</tbody>
</table>

Table 1.2: Policy alternatives to deal with undesirable consequences of risk aversion

<table>
<thead>
<tr>
<th>Different policies for risks</th>
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A) **Policies specific to agricultural risk**:
- A-1 Crop/credit insurance, loan guarantee etc.
- A-2 Relief and famine policies.
- A-3 Pure buffer stock or price stabilization scheme.
- A-4 Plant protection by groups of farmers.
- A-6 Breeding for crop yield stability.

B) **Policies which are not risk specific**:
- B-1 Subsidization of inputs and/or credit.
- B-2 Agricultural price supports as income policy.
- B-3 Allocation of investment and research resources to regions.
- B-4 Reduction in background risk:
  - irrigation investments,
  - increasing efficiency of markets,
  - improve access to information about technologies,
  - improve non-agricultural job opportunities,
  - medical and other welfare policies.
- B-5 Legislation, regulation, institutional reforms in areas such as credit and land tenancy.
- B-6 Land reforms and other income/wealth distribution.

Table 1.2 lists some of the policies and policy instruments which can be used to alleviate undesirable consequences of risk aversion. The list is sub-divided into two classes on the basis of whether agricultural risk reduction or risk spreading over a wide range of outcomes is the primary goal of the policy.

Entrepreneurs sometimes allow to pass away good opportunities because of their aversion to taking what they call 'unnecessary risk'. The successful entrepreneur is not he, who seeks religiously to avoid risk, but the one who knows how to keep his risk under control.

**Risk Aversion and Learning Behaviour**

There exists a strong interaction between risk aversion and learning behaviour.21 Risk aversion totally depends on the process of the formation of expectations about risky outcomes. Risk aversion and learning speed of the farmers affect the adoptions of innovations in the following two different ways: First, it affects the process of profit maximization, and second, it affects the income distribution of farmers. The utility based model and safety model have explained the learning behaviour in a

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theoretical manner. The further progress in this direction through empirical manner has been made by Binswanger, who examined probability distribution of outcomes and risk aversion in detail. Similarly, O'Mara has also used personal probability distribution in his thesis and comes to the conclusion that 'in most cases the new technology did not seem to be subjectively more risky than the traditional one'. Likewise, using an approach of combining personal probabilities of certain disasters in well developed area of Philippines Roumasset found that fertilizer application does not substantially increase financial risk and hence the risk aversion cannot be the primary cause of fertilizer application which falls seriously short of profit maximizing level.


Binswanger has drawn four conclusions in his study of risk attitudes in rural households in semi-arid tropical India. They are:

i) There exists a negative association between risk aversion and size of land holding.

ii) Risk aversion in risky areas is probably larger than in less risky ones.

iii) Females are more risk averse than males of the households, and

iv) Progressive farmers are found to be risk averse than the average farmers.

Decision Making Under Uncertainty

It would be useful to distinguish between 'uncertainty averse' and 'risk averse' farmers which leads to different policies depending on the degree of the adoption of new technology and relative asset position of the farmer. The theory relates to innovation adoption behaviour of the farmers indicates that poorer farmers are relatively risk averse and uncertainty preferring, while


richer farmers are relatively uncertainty averse and risk preferring.

When an innovation is introduced to a community of farmers, some farmers adopt it immediately and some others adopt it afterwards. Thus, uncertainty is greater for the earlier adopters of innovation than for the later ones.
Asset position = Rank on size of farm or size of farm income.

Adoption = Percentage adoption before and after the specified stage.

The above figures indicate the relationship amongst different stages of asset position, i.e., low, middle and high. In other words, the rates of adoption of innovation by poor and rich farmers are different. In the case of low wealth or early stages the degree of uncertainty is found to be relative to the degree of risk which results into decreasing adoption rate (see Figure 13), while in the high wealth or latter stages the degree of uncertainty is reported to be lower relative to the degree of risk resulting in the increasing adoption rate. In the latter stages, the rich should be relatively the faster adopters of innovation with regard to risk and uncertainty (see Figure 14).

The low middle rank is predicted to have higher adoption rate than the high middle rank in stage 1 (i.e., early stages) of the adoption process. It is predicted that the relationship will reverse in stage 2 (i.e., latter stages) of the process. The above illustrations are tested with the data from the survey of sixteen communities in 1979 by rural sociologists, agriculturists and anthropologists. The 16 cases included 3000 farmers from eight
countries viz., Japan, India, Kenya, Mexico, Phillipines, Pakistan, Taiwan and U.S.A.

Uncertainty, Profit and Interest

In the production process profit is used in the sense of excess income over cost of production, but in economics it is the income of the entrepreneur who is a residual claimant and uncertainty bearer. Whoever bears uncertainty is an entrepreneur and whatever he earns as his remuneration for this sacrifice is called profit. Profit is, therefore, necessarily positive like wages, salaries and interest. The position of the entrepreneur in the economic system is to administer all expected gains from productive activities and suffer all accidental losses. The possibilities of such gains or losses are always there in all the situations where uncertainty exists. If nobody has to bear uncertainty profit as a reward for uncertainty bearing ceases to exist. But it is well-recognised fact that uncertainty exists and hence the profit too.