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RISK ATTITUDES OF RURAL HOUSEHOLDS IN SEMI-ARID TROPICAL INDIA

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INTRODUCTION

This paper reports findings from a sequence of risk attitude experiments carried out by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in 250 farmer and landless labor households in three agroclimatic regions of the Indian Semi-Arid Tropics (SAT). The risk attitude experiments form a part of a larger research program carried out by the Economics Program of ICRISAT to assess the effects of risk and risk aversion on the agriculture of these regions. The research program is aimed at testing the hypothesis that the high levels of production risks in SAT coupled with risk aversion leads to underinvestment into agriculture by farmers relative to the expected profit maximizing levels. If the hypothesis is found to be true, attempts will be made to quantify the investment gap and to study more carefully the policy alternatives which can be pursued to reduce the investment gap (if it exists).

Underinvestment could also be induced by credit constraints or more exactly, very high costs of borrowing. For an area as a whole, such high credit costs could arise from unwillingness of lenders to lend without high risk premiums over and above the rate of return in low-risk areas. This forms an alternative hypothesis to be tested as well.

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To establish that risk and risk aversion lead to underinvestment, empirical knowledge on three questions is required.

First, of course, investment in semi-arid tropical agriculture must be risky. This riskiness is a well known fact and needs no further research, except for more precise quantification. However, to later deal with development alternatives we must be able to quantify the relative importance of yield risks in and price risks in total production risks, the effect of crop diversification on those risks, the relative importance of drought risk in total yield risks, and the effect of modern inputs such as high yielding varieties, fertilizers and supplementary irrigation on the yield risks. A series of projects is underway to assess these questions, but results are not yet available.

Second, riskiness or increases of riskiness with input use will lead to underinvestment only if farmers are risk-averse rather than risk-neutral. Risk-neutral individuals will try to maximize average or expected net returns regardless of the extent of variability in these returns. This is also a strategy which leads to the highest returns on investment in the long run. On the other hand, a risk-averse individual will forego some expected returns if this also reduces the extent of variability of his income stream. Thus he will underinvest relative to the risk-neutral or socially optimal level. The question is whether the overwhelming majority of farmers in the SAT are risk averse. Also necessary is the quantification of the extent of pure risk aversion of farmers and landless laborers and the relation of risk aversion with the riskiness of agriculture of the region, the size of the farm and the size of the investment to be undertaken.[1]

Third, it is important to realize that underinvestment need not necessarily occur if agriculture is risky and if farmers are risk-averse. If they have effective mechanisms at their disposal for self insurance or risk diffusion, they may still invest up to the risk-neutral optimum. For example, an effective crop insurance system would allow farmers to shift the risks to the insurance system as a whole, i.e., risk would be diffused over wider areas and across years. Such systems do not exist at present and farmers have to largely rely on their own means for self insurance and risk diffusion. We distinguish two types of adjustment measures: Risk-reducing measures are used before damage may occur and include crop diversification, intraseasonal adjustment of sowing times and cropping patterns, soil and water management techniques, etc. Loss-management or risk-diffusion measures are designed to deal with the consequences of losses and include storage, salvage, operations, buildup of financial assets, reduction of financial commitments in drought years, borrowings and many more. They are aimed at risk diffusion over time, space and across individuals. Efficient devices for risk reduction and loss management would allow a farmer to take substantial levels of risk without being exposed to severe reductions in his customary consumption or without loss of productive assets even in drought years. If, as Morris Davies Morris reasons, these risk-reducing and risk-diffusing measures are costless or nearly so, we are in a situation analogous to perfect insurance and no underinvestment would occur. However, if these measures have a very high cost, and if cheaper and more effective measures could be designed or the existing ones made more effective by public policy, then risk aversion would clearly lead to underinvestment. At the present stage, research at ICRISAT--carried out by Narpat S. Jodha (1977-b) and reported in a companion paper--demonstrates that famers' own mechanisms for loss management or risk diffusion are very expensive in arid and semi-arid regions. This is contrary to our initial expectations. Together with the key conclusion of the present paper, that the overwhelming majority of farmers are indeed risk-averse, it forces us to start doing research into the cost effectiveness of public policy measures aimed at replacing or strengthening farmers' own adjustment mechanisms, and it further implies that quantification of the underinvestment induced by risk becomes crucial.

THE METHODOLOGY

In this paper only pure risk attitudes of farmers and landless laborers are considered. We need to know the proportions of the population which are risk-neutral, mildly risk-averse or severely risk-averse. Furthermore, we want to test the following hypotheses.

- Does risk aversion increase with the size of investment?

- Are poor people more risk-averse than rich ones?
- Are people in risky areas more risk-averse than in assured areas?
- Are progressive farmers less risk-averse than average farmers?

Accepting any of these hypotheses would strengthen the case for differentiated policies to deal with risk according to the size of investments considered in the case of the first hypothesis; according to income or asset class in the case of the second hypothesis; according to riskiness of the zone for the third hypothesis; or according to the level of progressivenss in the case of the fourth hypothesis.

Previous attempts to measure risk attitudes among farmers have usually been based on interviews.[2] The interview techniques typically consist of presenting to the farmer an uncertain prospect, in which he would receive Rs.1000 with 50% probability and '0' rupees with 50% probability. The individual is then asked to state the minimum fixed or sure amount of money for which he would give up or sell the uncertain prospect. If that is Rs.500 (the expected value of the uncertain prospect) he is considered risk-neutral; if it is less, he is risk-averse and he prefers risk if the sure amount desired is more than the expected value.

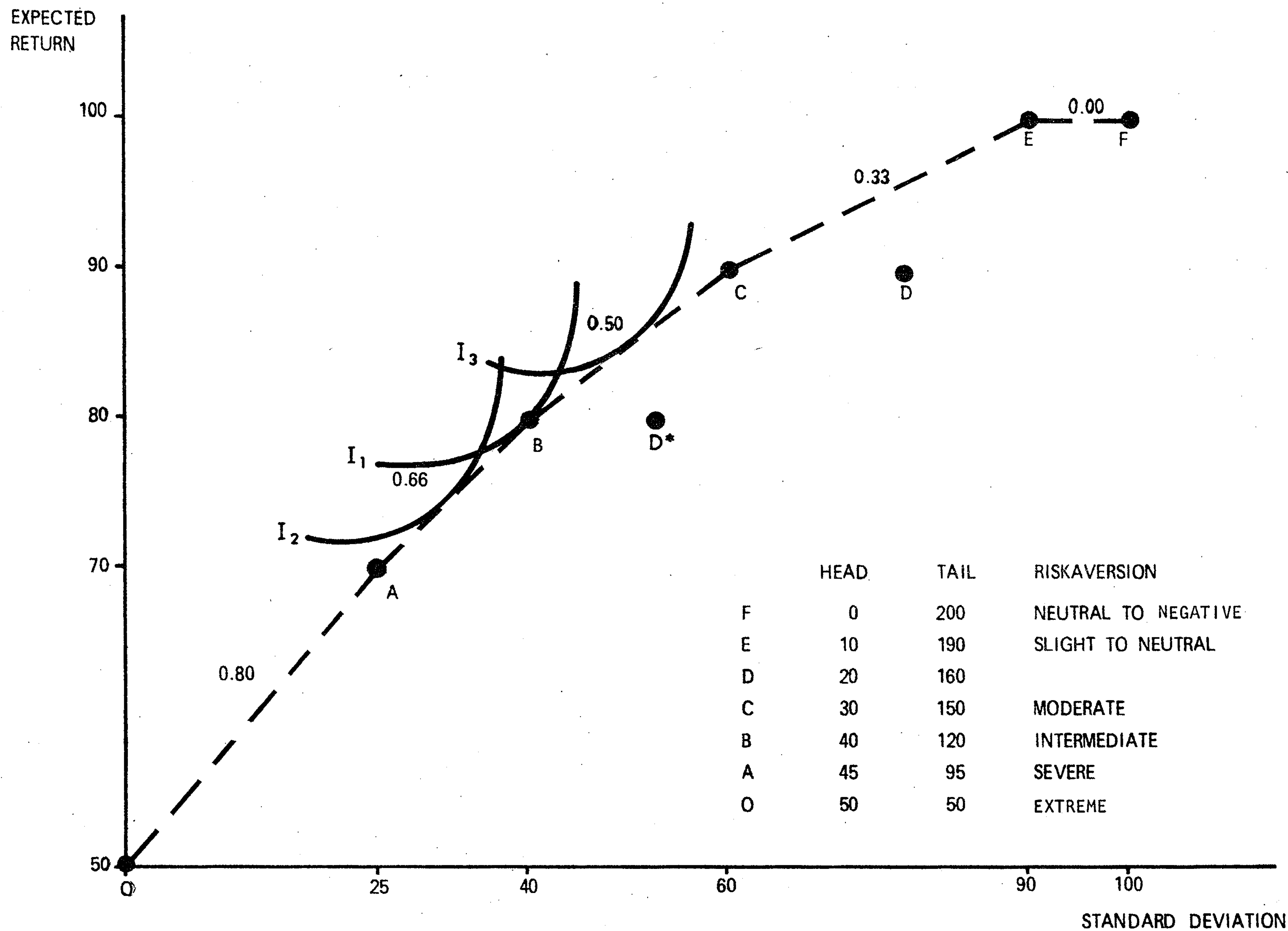
In the ICRISAT village level studies a variation of this method was used on all 240 household heads. The variation was based on Scandizzo and Dillon's (1976) work in Brazil and consisted in expressing sure and uncertain prospects in terms of net returns from wet land versus those of dry land (or from daily labor versus long term contracts for laborers). Considerable care was thus taken to make the question meaningful in terms of the respondents' own experience. Substantial pretesting of the schedules and training of the already very experienced investigators was done prior to the full study.

Inconsistencies in the answers obtained in neighboring villages, however, cast doubt on the reliability of this methodology. In five of the six villages the survey was repeated, switching investigators partially or fully for the second round. This check indicated that the interview method is subject to substantial investigator bias, although at least certain patterns appeared stable across interviews. Nevertheless, there was no way of judging the reliability of these apparently stable patterns and a new methodology was designed. Furthermore, it appeared that the measured risk attitudes were confounded with other attitudes such as leisure preferences, preferences for certain traditional occupations and learning difficulties of the respondents, many of whom are illiterate. The effort was thus abandoned and a new methodology developed.

The basic difference of the new methodology is that real choices are observed instead of hypothetical questions. A second important difference is that a sequence of choices is observed over a period of about six weeks during which the tested persons can reflect on their choices. Agricultural decisions are not made on the spur of the moment without much reflection and under imagined or real time pressure from an interviewer who has other work as well. The new method thus is closer to the decision process in agriculture than the interview methods.

The method can best be explained using Figure 1. Consider first the numbers in the lower corner. The respondent is asked to make a choice between the alternatives O to F. If he chooses alternative F, a coin is tossed and he is given 0 rupees if head falls and 200 Rs. if tail falls.[3] Note that at worst the individual does not win anything; he cannot lose any money. This is an important property of method. Most people have shied away from gambling to elicit attitudes towards risk because of moral problems involved when poor people are asked to put their own money at risk. This is not the case here. If the individual chooses alternative C, he gets 30 Rs. on head and 150 Rs. on tail. If he chooses O, he gets 50 Rs. regardless of how the coin falls, i.e., O is a riskless choice. In the context of individuals who are as poor as small farmers or landless laborers, it is also important to first give them the money to play with: otherwise the mere fact that they may have no cash at hand prevents them from exercising certain choices. But the goal of this experiment is precisely to distinguish between real risk aversion and behavior which looks like risk aversion but in fact is induced by cash or credit constraints.[4]

Graphically the alternatives can be presented in terms of their expected return and standard deviation (Figure 1). Alternative O has expected returns of 50 Rs. and zero standard deviation. In shifting from O to A, expected returns increase to 70 while the SD goes to 25. Expected returns continue to rise by 10 Rs. in going to B, C and E, but each



	HEAD	TAIL	RISKAVERSION
F	0	200	NEUTRAL TO NEGATIVE
E	10	190	SLIGHT TO NEUTRAL
D	20	160	
C	30	150	MODERATE
B	40	120	INTERMEDIATE
A	45	95	SEVERE
O	50	50	EXTREME

FIGURE 1 **THE RISK ATTITUDE CLASSIFICATION**

time a larger increase in SD is necessary to buy that increase in expected return. Moving from E to F implies no gain in expected return but an increased variability. Only a totally risk-neutral individual or a risk preferer would take this step. Finally, alternative D is introduced to test whether individuals can detect stochastic dominance.[5] D is stochastically dominated by C which has the same expected return but lower standard deviation. No risk-averse individual would choose it. And a risk-neutral individual or one who prefers risk should choose E or F over D.[6] However, this is not easily apparent if one looks only at the numbers under head and tail.[7]

One way in which one can measure attitudes to risk is simply by looking at the slope of the lines connecting the alternatives. The steeper the slope, the higher the risk aversion. The basis for grouping individuals is the following: If you choose B, for example, you must prefer it to A or C, or at best you do not care, i.e., are indifferent between A and B or B and C. An indifference curve between expected return and standard deviation must go either through point B or, as I_1 does, be approximately tangent to the line segments A B or B C.[8] Its slope Ƶ, which measures risk aversion, must be between 0.5 and 0.66. If you choose E, it must be between Ƶ=0.00 and Ƶ=0.33. Instead of keeping these numbers in mind I have associated with each choice a name categorizing the chooser.

In another paper I will discuss the methodology, its development and its testing in more detail. I will also place it more precisely relative to other choice theoretic frameworks. The most important of these is the von Neumann-Morgenston theory which is based on utility functions in terms of wealth. We can relate the devices of this game to this theory via the concept of <u>partial risk aversion P</u> introduced by Menezes and Hanson, 1970 and Zeckhauser and Keeler, 1970 (who call it size-of-risk aversion). Partial risk aversion is defined as follows: let $u(W)$ be the utility function of Wealth W and u' and u'' its first and second derivative. Let M be a certain income (or the certainty equivalent of any uncertain prospect). Then

$$P(W + M) = -M\, u''(W + M)/u'(W + M)$$

Absolute risk aversion (when measured at the sum of certain income plus the certainty equivalent of the game) is

$$A(W + M) = -u''(W + M)/u'(W + M)$$

Therefore risk aversion P is simply a multiple of A.[9]

Given the game payoffs we can estimate A by a quadratic approximation of the utility function[10] and from there estimate P.

Bounds on the value of P implied by the choices:

Choice	Lower Bound	Upper Bound
F	$-\infty$	0
E	0	.346
C	.346	.647
B	.647	1.088
A	1.088	1.951
0	1.951	5.0

Note furthermore that both Z and P are unaffected by multiplicative transformations of the payoffs of the game (say divide all the amounts by 10 or 100). We can thus test the hypothesis of increasing partial risk aversion (Zeckhauser and Keeler, 1970) by testing whether individuals choose alternatives 0, A and B with higher frequency at the higher multiples of the game payoffs.[11]

Finally, note that the sets of alternatives measure attitudes towards risk in a quite intuitive way, independently of any specific theory of behavior under risk. However, transfer of the coefficients of risk aversion to choices other than the ones presented here does require a specific theoretical formulation of choice under uncertainty.[12] The risk attitude experiment is rich in conclusions which improve our discriminating ability among alternative theories. These will, however, not be discussed in this paper.

The individuals are not allowed to choose immediately at the level of payoffs on Figure 1, which is called the 50 Rs. level. Instead, all payoffs under Head and Tail are divided by 100, so that the extreme risk averter gets 0.50 Rs. while the moderately risk-averse individual gets 0.30 Rs. or 1.50 Rs., depending on the outcome of the toss. The game is then played 5 times at this 0.50 level, each time paying out the gains to teach the game to the often illiterate individuals and convince them that they would really be paid! Between each game at least one day is left for reflection. Photographs of coins showing the amounts to be paid help the illiterate individuals to study the game payoffs for themselves. We handed out forms and photographs with the payoff structures on the first day of the game sequence to all participants who kept them at home to study and discuss with whomever they wanted.

The full sequence of questions and games is given in Table 1. Thus we next ask the individuals to indicate a hypothetical choice at the 50 Rs. level, i.e., we tell them that they will not receive the money but have to answer the question.

We then play the game at the 5 Rs. level, i.e., dividing all amounts in Figure 1 by 10. To simulate a real decision as if the individual's own money was involved we then give each individual 5 Rs. On the next day he can keep the 5 Rs. or come back and play. But then he must put the amount which his choice puts at risk on the table; he thus puts money at risk which he already owned for a full day. The risk aversion distributions found in the two 5 Rs. rounds do not differ statistically. This indicates that the methodology does do what it was intended to achieve: After playing the game several times at low payoffs, individuals come to regard the amounts offered for sure as their own money and play with it in this particular way.

Two weeks later we really play at the 50 Rs. level, but precede the game by a hypothetical question at the 500 Rs. level, i.e., multiplying the amounts by 10 again. The objective of the 2 hypothetical 50 Rs. question was to test the reliability of answers to hypothetical questions in the context of this game. If the answers to "50 Rs. Hypothetical" and "50 Real" do not differ too much, we may infer that the answers to 500 hypothetical are reliable as well. If this is the case, we get an answer at quite high payoffs without paying money. Playing the 500 Rs. game with 100 households would cost nearly 100,000 Rs., which is expensive. Right after the 50 Rs. real game, a hypothetical 50 Rs. question is asked to test the immediate impact of loss or gain on risk attitudes.

The methodological conclusions from the hypothetical questions are discussed in detail elsewhere. They indicate that hypothetical questions, when asked for the first time, differ in a statistically significant way from real choices but they come closer to the observed choices as the game and questioning process advances. In hypothetical questions many

Table 1. Sequence of Games

GAME NO.[1]	MINIMUM DELAY	GAME LEVEL IN RS.
1	FIRST DAY	0.50 Real
2	ONE DAY	0.50 Real
3	ONE DAY	0.50 Real
4	ONE DAY	0.50 Real
5	ONE DAY	0.50 Real
6	ONE DAY	50 Hypothetical
7	SAME DAY	5 Real
	SAME DAY	Hand out 5.00 for next day Game
8	ONE DAY	50 Hypothetical
9	SAME DAY	5 Real
11	TWO WEEKS	500 Hypothetical
12	SAME DAY	50 Real
13	RIGHT AFTER	50 Hypothetical
16	TWO WEEKS	500 Hypothetical
17	SAME DAY	50 Hypothetical

[1] Game Nos. 10, 14 and 15 are missing from this table. They were only played in certain villages.

people initially like to project either a more risk-neutral or a more risk-averse behavior than they actually choose depending on whether they believe that ideal behavior courageously faces up to risks or consists of being cautious in all circumstances. However, the hypothetical answers tend to coincide statistically with the real choices after playing at the 50 Rs. level once. On the basis of these conclusions this paper presents only evidence for the real choices, except that the results from the second hypothetical 500 Rs. game (no. 16) are also reported. Table 1 shows the sequence of games which were played with about 125 households, i.e., one village in each of the three regions considered. The sequence of games was set up in this way so that the methodology could be rigorously tested for its replicability and reliability at the same time as the conclusions were derived. All of these tests strongly support the reliability of the method.

For the 125 households in the other three villages the sequence was cut short after the second 5 Rs. game to save costs. Statistical tests indicate that there are some differences among villages at the 5 Rs. level, but that they disappear at the 50 Rs. level. We can therefore expect that there would be little difference in conclusions if the 50 Rs. game had been played in all the villages.[13]

Finally, in two villages, or about 80 households, the game was played up to the 5 Rs. level with both household heads (of which 8 were females) and the next most important female in the house. Usually the most important female was the wife of the household head. Where no wife was present it was a daughter, sister or mother.

The 0.50 Rs. games were played with the respondents by six resident male and three visiting female investigators. The 5 Rs. level games were played by two ICRISAT scientists and myself and all 50 Rs. games were played by me.[14] The total amount of money paid out in the experiment was approximately Rs.20000.00. For households included in the 50 Rs. game the average return was approximately Rs.110.00 which exceeded monthly income for many households.

THE AREAS AND THE SAMPLES

The ICRISAT Village Level Studies consist of two purposely selected villages each in three purposely selected districts of the semi-arid tropics. Table 2 gives the characteristics of the villages.[15] The most important characteristics to be kept in mind are as follows:

Sholapur (Shirapur and Kalman villages) is a medium to deep black soil (Vertisol) area with uncertain rainfall distribution. It is a high-risk area growing mainly Rabi (postmonsoon) sorghum. The region had experienced a three year drought from 1971-72 to 1973-74, the effects of which farmers are still to overcome. Akola district (Kanzara and Kinkheda) is a medium black soil area with assured rainfall. Agriculturally it is the most prosperous tract although incomes per capita may not be much higher due to higher population density.

Mahboobnagar district (Aurepalle and Dokur) is a shallow to medium red soils (Alfisol) area with less erratic rainfall than Sholapur. Nevertheless, agriculture without irrigation is at least as risky because of the low moisture holding capacity of the soils. Aurepalle has very little irrigation while Dokur has several tanks and many wells which irrigate 38% of the total cropped area. Dokur is therefore less subject to risk than Aurepalle.

Within each village a stratified random sample with 30 farmers and 10 landless laborers was chosen. Farmers fall into three size groups with 10 farmers in each. This is called the "Household Head" sample. The wives (or the next important female) in each household were also included in the experiments in Kinkheda village of Akola and Dokur village of Mahboobnagar. For short we call it the "wives sample." In all villages, except Shirapur (Sholapur) an additional three farmers were included in the experiments. They were the three most progressive farmers in the villages, with the choice left to the resident investigators. Progressiveness was defined as early adoption of new production practices and carefulness of farming in general. In some villages the progressive farmers included some of the village officials. Results for this group are reported separately as "progressive farmers I."

Since there are only 14 such "most progressive" farmers, the resident investigators of the villagers were also asked to identify, from within

Table 2. Characteristics of the Study Villages and Areas

District:	MAHBOOBNAGAR		SHOLAPUR		AKOLA	
Village:	Aurepalle	Dokur	Shirapur	Kalman	Kinkheda	Kanzara
1. Population (No/Sq.km)	167	100	110	93	133	156
2. No. of households	476	313	297	423	143	169
3. Landless households (%)	27.52	13.10	23.56	24.11	40.56	32.54
4. Landowners who leased out total land (%)	1.47	7.03	14.82	26.00	1.40	2.95
5. Land Operators (%)	71.01	79.87	61.62	49.89	58.04	64.50
6. Average size of Operational Holding (ha)	3.53	2.62	6.53	7.97	5.76	6.10
7. % Irrigable area to total cropped area	12.04	32.28	8.23	9.19	0.93	4.45
8. Average rainfall (at Taluka Hq. in mm.)	681.48	762.00	635.80	659.70	818.80	818.80
9. Soil Types	Deep Alfisol	Medium Alfisol Gravelly	Deep Vertisol Medium deep Vertisol	Medium deep Vertisol Deep Vertisol	Medium Deep Vertisol	Medium Deep Vertisol
10. Important crops of the village	Sorghum Castor Pearl Millet Paddy Pigeonpea	Paddy Groundnut Sorghum Pigeonpea Castor	Rabi-Sorghum Pigeonpea Chickpea Wheat Minor Pulses	Rabi-Sorghum Pigeonpea Chickpea Wheat Minor Pulses	Cotton Sorghum Mungbean Groundnut Wheat	Cotton Sorghum Mungbean Groundnut Wheat

the random sample, the 5 most progressive farmers. This group is pooled with the "progressive farmer I" sample to form a "progressive farmer II" sample containing about 45 individuals.

Note that in the following tables, sample number may vary slightly from village to village for the same games. This is caused by temporary absences of some of the respondents from the villages during the experimental sequence.

RESULTS

The basic results on risk aversion distribution is indicated in Table 3 by the choices in the 50 Rs. game. There is a large concentration of households in the intermediate and moderate risk aversion class containing 34.8 and 39.8 percent of the respondents respectively. The intermediate and moderate risk aversion classes correspond to risk aversion coefficients Z of 0.33 to 0.66 in a 0 to 1 scale (partial aversion coefficient lies between 0.346 and 1.088). This finding contrasts sharply with the evidence of Pasquale Scandizzo and John Dillon which is based on interviews. They identified substantial proportions of individuals in the neutral to negative or the extreme to severe classes.[16] In our evidence, at the 50 Rs. level, there are just 10% of risk-neutral or risk-preferring individuals. The proportion of individuals with severe or extreme risk aversion is equally small. There are also close to 10% of the households which are not able to detect stochastic dominance and choose the risk-inefficient alternative D.

<u>Increasing partial risk aversion</u>: The concept of increasing partial risk aversion (Zeckhauser and Keeler) means the following: An individual faced with the unfavorable prospect of losing an amount X with probability P would be willing to pay an increasing proportion of X as insurance against the loss of X as the size of the loss increases. Conversely, for favorable games of the sort discussed here, it means that the certainty equivalent of each alternative would be a declining proportion of the expected value of the alternative as the scale of the game increases. Increasing ~~size~~ partial aversion is confirmed if the proportion of respondents choosing the alternative O, A and B rises as the scale of the game rises.[17]

At the 0.50 Rs. level more than one-third of the households are

Table 3. The Effect of Payoff Size on Distribution of Risk Aversion

Payoff Level & Game Number	Extreme	Severe	Inter-mediate	Moderate	Slight to Neutral	Neutral to Negative	Inef-ficient	Sample Size
Household Heads: Shirapur, Kanzara, Aurepalle								
A 0.50 No. 2	1.7	5.9	28.5	20.2	15.1	18.5	10.1	119
B 0.50 No. 4 + 5	1.7	8.1	14.5	29.3	21.3	16.6	8.5	235
C 5 No. 7	0.9	8.5	25.6	36.8	12.0	8.5	7.7	117
D 50 No. 12	2.5	5.1	34.8	39.8	6.8	1.7	9.3	118
E 500 H No. 16	2.5	13.6	51.7	28.8	0	0.9	2.5	118
All Household Heads								
F 0.50 Games 2 + 3	1.7	7.6	18.5	22.7	17.1	18.7	13.7	475
G 0.50 Games 4 + 5	0.9	8.2	12.9	27.5	22.8	18.4	8.3	473
H 5.00 Games 7 + 9	0.8	8.1	23.8	36.5	11.9	9.8	9.1	471

Distributions tested	CHI-SQR	dF	$X^2_{0.05}$
A vs C vs D vs E	85.68	18	28.87
C vs D vs E	48.49	12	21.03
A vs C	11.91	6	12.59
B vs D	44.22	6	12.59
D vs E	23.46	6	12.59
A vs B	13.17	6	12.59
F vs G	16.30	6	12.59
G vs H	50.02	6	12.59

observed in the two slight to neutral or neutral to preferred classes combined. That proportion drops to 22% at the 5 Rs. level and to 85% at the 50 Rs. level. On the other hand, people who initially exhibit intermediate to moderate risk aversion at the 0.50 Rs. level do not exhibit increasing partial risk aversion to any marked extent. In fact the proportion of individuals in the extreme and severe risk aversion classes combined varies between 7.6 and 9.8% for the 0.50 to 50 Rs. level. Only at the 500 Rs. level does it reach 16.1%. There is also a clear indication that at the end of the game sequence projection of a risk-neutral image has stopped.[18] Out of 118 individuals only one says that he would make a risk-neutral choice. Having been asked hypothetical questions so many times and having them compared later with their own real choices has given the participants a better introspective capacity. On the basis of this we can have a substantial degree of confidence in the 500 Rs. level hypothetical answers, although the evidence is no doubt more open to challenge than if the game had actually been played.

The hypothetical 500 Rs. answer implies a continued trend towards higher degrees of partial risk aversion: 51.7% of individuals opt for the intermediate level. Severe risk aversion increases slightly, but it appears that the choice corresponding to extreme risk aversion remains unattractive even at high levels of games. For agricultural investments of consequence we can therefore state that the majority of farmers have risk aversion coefficients ranging from 0.33 to 0.66 (or from 0.346 to 1.088 for the partial aversion P). The concentration of individuals in these two classes is remarkable.

The proportion of severely risk-averse individuals rises to 13.6% in the 500 hypothetical question. Some of this may be projecting a cautious image. But note the rise of the intermediate category from 34.8 to 51.7%. Clearly many more people have shifted from the moderate to intermediate category than from the intermediate to severe. But people who always choose intermediate or moderate both in hypothetical and real situations do not try to project in hypothetical situations. Therefore the more pronounced shift from moderate to intermediate than intermediate to severe would indicate that there continues to exist a real increase in partial aversion between the 50 Rs. and the 500 Rs. level. One may therefore expect that as payoffs rise further the intermediate category would tend to absorb an even higher proportion of the individuals than the 51.7% observed at the 500 Rs. level.

In the second panel of Table 3 results for the 0.50 Rs. and the 5 Rs. level are shown for the full random sample. They are consistent with the results from the sample of those individuals who played the full sequence.

The differences in the distribution of risk aversion at different game payoff levels are statistically significant. The simultaneous test of equality of risk aversion distribution at all levels (A versus C versus D versus E) has a chi-square value of 85.68 against a critical value of 28.87 at a 0.05 probability level (see table footnotes).

Differences across asset groups: In Table 4 the results for the three villages where the 50 Rs. game was played are tabulated by landholding size group. Note that in the context of the SAT, holding size is not a very good indicator of differences in access to productive power in the form of land, because the proportion of irrigated land differs widely from household to household. It is even less reliable as an indicator of total income or net worth, which are further confounded with labor income, income transfers and levels of indebtedness. Nevertheless, farm size is correlated with income and asset holding. Work is in progress to reclassify the households by income and/or asset groups and to analyze the data by multiple regression analysis to get at the determinants of risk aversion such as age, dependency ratios, asset class, education and caste. But for the moment farm size groupings must do. If we look at Table 4 we find that there are some differences in risk attitudes at the 0.50 Rs. level. But they are not statistically significant at the 0.05 probability level, although the chi-square value of 23.98 is fairly close to the critical value of 28.87. Among the landless laborers, 27.5% fall into the two least risk-averse classes. This proportion rises to 36.7% for the small farmers, 38.3% for the medium farmers and 49.2% for the large farmers. Similarly the fraction falling into the two most risk-averse classes is larger for landless laborers and small farmers than for medium and large ones. Given the fact that the landholding size groups are imperfect proxies for asset groups, it is reasonable to assume that at this payoff level wealth does influence attitudes towards risk significantly.

Table 4. The Distribution of Risk Aversion for Different Landholding Classes

	Landholding Class	Extreme	Severe	Inter-mediate	Moderate	Slight or Neutral	Neutral or Negative	Inef-ficient	Sample Size
				0.5 Rs., Games 4 & 5					
A	Landless	0	13.8	20.7	27.6	17.2	10.3	10.4	58
B	Small	0	13.3	16.7	25.0	25.0	11.7	8.3	60
C	Medium	3.3	3.3	11.7	35.0	18.3	20.0	8.3	60
D	Large	3.5	1.8	8.8	29.8	24.6	24.6	7.0	57
				5 Rs., Games 7 & 9					
E	Landless	3.5	3.5	39.6	22.4	12.1	6.9	12.0	58
F	Small	0	6.9	20.7	50.0	13.8	1.7	6.9	58
G	Medium	0	6.8	18.6	40.7	20.3	6.8	6.8	59
H	Large	0	6.9	22.4	34.5	13.8	10.3	12.1	58
				50 Rs., Game 12					
I	Landless	6.9	10.4	31.0	31.0	3.5	3.5	13.7	29
J	Small	0	6.7	30.0	50.0	3.3	0	10.0	30
K	Medium	3.3	0	40.0	36.7	13.4	3.3	3.3	30
L	Large	0	3.5	37.9	41.4	6.9	0	10.3	29

Distributions tested		CHI-SQR (with dF, X^2 0.05 = 28.87)	
At 0.50 Rs.	A vs B vs C vs D	23.98	
At 5 Rs.	E vs F vs G vs H	26.28	
At 50 Rs.	I vs J vs K vs L	15.93	
All villages at 0.50 Rs.		40.93	(detailed tables not shown here)
All villages at 5.00 Rs.		41.81	(detailed tables not shown here)

Considering the 50 Rs. level bet, however, considerably dampens this conclusion. The fraction of household heads falling into the two least averse classes is 6.9, 3.3 and 6.9 respectively for the landless laborers, small farmers and large farmers. There is thus some slight tendency for risk aversion to be lower for medium and large farmers combined than for landless laborers and small farmers combined. But it is most remarkable that in every asset class the two central risk aversion classes contain more than 60% of the households, 62% for the landless, 80% for small farmers, 77% for medium farmers and 79% for the large farmers. Among all farmers the two central classes contain about 80% of all individuals, regardless of size of farm. Thus we must conclude that small, medium and large farmers have very similar attitudes towards pure risk once payoff levels are substantial. Landless laborers exhibit slightly more diffuse attitudes and they are marginally more risk-averse. But the differences cannot be considered large and they are not statistically significant. The chi-square value is only 15.93 versus a critical value of 28.87.

At the 5 Rs. level the situation is between the 0.50 Rs. and the 50 Rs. level. The distribution of risk attitudes is more concentrated than at the 0.50 Rs. level and less than at the 50 Rs. level. Differences among size groups are not statistically significant. Results for the sample from all six villages are not shown. For the 0.50 Rs. and 5 Rs. levels they closely replicate the results from the three villages where the full sequence was played and are statistically significant in both cases. Thus the larger sample size allows a stronger statistical inference.

These findings imply the following. People have much more similar attitudes towards risky prospects when large rather than small payoffs are concerned and when they are not faced with a budget constraint which prevents them from even considering a risky prospect. A game between 0 to 2 rupees is carefully considered by landless laborers and poor farmers for whom daily wages range between 2 and 4 rupees. Nearly half of the medium and large farmers consider the amounts as so small that they either prefer to project the risk neutral image, or they may get sufficient entertainment from the risky game to be willing to give up a maximum of 0.50 Rs. As soon as game levels rise, projecting that image or buying the entertainment of gambling becomes much more expensive and only a very few medium and large farmers want to pay the larger price. For agricultural policy what counts is not the behavior at the 0.50 Rs. level but at the 50 Rs. level and higher. Loans for large and small farmers to make productive investments usually exceed 50 Rs. Some policy implications of the substantial similarities in pure attitudes towards risk will be considered in the last section.

Regional differences: A frequently advanced hypothesis about the formation of risk attitudes is that they are influenced by past success or failure. Our data allow tests of a long run version of the hypothesis. The long run version would imply that individuals who have always lived in highly risky environments are more risk-averse than those in less risky ones.[19] Table 5 presents the results of this test. It appears that at the 50 Rs. level there are some area differences. Recall that Sholapur is the most risky area which has recently emerged from a very serious three year drought, Akola is the least risky area and Mahboobnagar falls in between. Again the two central classes contain 87.5% of the household heads in Shirapur (Sholapur), 66.66% in Kanzara (Akola) and 69.23% in Aurepalle (Mahboobnagar). Concentration is maintained. But in Shirapur no one is close to risk-neutral while Kanzara contains 15.4% of its households in these two classes and Aurepalle 10%. Shirapur and Aurepalle have 10% and 7.7% households in the most risk-averse classes whereas Kanzara only has 5.1% in these groups. There is therefore a modest difference among the three villages with the village having had the worst experience behaving in the most risk-averse manner. The effect is not strong and not statistically significant.

At the 5 Rs. level the differences are much more marked. Among villages within the same district a statistically significant difference exists between Shirapur and Kalman, the former having a more concentrated and more risk-averse distribution than the latter. Since they face the same agroclimate, this cannot be ascribed to the differences in past experience. On the other hand, the differences between villages in Akola and Mahboobnagar are not significant. If the extent of irrigation had an effect on attitudes towards risk it should show up as a significant difference between Aurepalle and Dokur, since the latter has a much higher level of irrigated area. Again the past experience hypothesis receives no support. It is only when looking at differences among the three areas

Table 5. The Distribution of Risk Aversion for Different Regions

	Village and District	Extreme	Severe	Inter-mediate	Moderate	Slight or Neutral	Neutral or Negative	Inef-ficient	Sample Size
				50 Rs., Game 12					
A	Shirapur Sholapur	2.5	7.5	45.0	42.5	0	0	2.5	40
B	Kanzara Akola	0	5.1	33.4	33.3	10.3	5.1	12.8	39
C	Aurepalle Mahboobnagar	5.1	2.6	25.6	43.6	10.3	0	12.8	39
				5 Rs., Games 7 & 9					
D	Shirapur Sholapur	0	3.9	51.3	33.3	6.4	0	5.1	78
E	Kalman Sholapur	0	19.2	34.6	25.6	7.7	9.0	3.9	78
F	Kanzara Akola	1.3	3.8	9.0	29.5	30.8	14.1	11.5	78
G	Kinkheda Akola	0	2.5	11.2	36.3	16.2	20.0	13.8	80
H	Aurepalle Mahboobnagar	1.3	10.4	15.6	48.0	7.8	5.2	11.7	77
I	Dokur Mahboobnagar	2.5	8.8	21.2	46.3	2.5	10.0	8.7	80

Distributions tested	CHI-SQR	dF	$X^2_{0.05}$
A vs B vs C	16.92	12	21.03
A vs B	11.20		
A vs C	10.27	6	12.59
B vs C	5.25		
D vs E	18.54		
F vs G	6.51	6	12.59
H vs I	4.79		
D + E vs F + G vs H + I	103.54	12	21.03

(combining both villages in each area) that the past experience hypothesis receives some support. A test of Sholapur versus Akola versus Mahboobnagar has a chi-square value of 103.54 with a critical value of only 21.03. The least risky area Akola has the lowest risk aversion and vice versa. The evidence on area differences is therefore still conflicting but can possibly be resolved by regression analysis. However, it is again clear that at high levels of bets the marked differences observed at low levels tend to disappear.

Females: Table 6 shows some results for the female sample. At the 5 Rs. level it is compared with the household head sample of the same villages (which contains female household heads). There is a consistent shift of the female distribution in the direction of more risk aversion relative to the males. This shift is not statistically significant but the chi-square value of 9.60 relative to a critical value of 12.59 is sufficiently high to leave the possibility of real differences among the sexes as a hypothesis which requires further work. But note again that the two central groups contain 61.2% of the females and 57.5% of the household heads. The central tendency is equally marked for males and females and while women clearly appear more risk-averse on average, the majority of women have the same attitudes as the majority of men. Furthermore, comparing the female sample at the 0.50 Rs. and 5 Rs. level reveals the same tendency for increasing partial risk aversion as the household head samples.

Progressive Farmers (PF): In Table 7 results are shown for the 0.50, 5, and 50 Rs. level for three samples. The sample PF I are the most progressive farmers in each village selected on a non-random basis. The sample PF II contains in addition the 5 most progressive farmers of the random sample. At the 0.50 and 5 Rs. level a test was run to see whether the PF I farmers differ from those of the random sample (PF II minus PF I). The hypothesis that there was no difference between them could not be rejected (see Table 7 for test results). Therefore only statistical results are discussed which compare the PF II sample with the non-progressive random sample from which the PF farmers were removed.

At the 0.50 and 5 Rs. level progressive farmers appear to be less risk-averse than non-progressive ones. For example, at the 5 Rs. level 43.4% of the PF II sample fall into the two least averse classes, whereas these

Table 6. The Distribution of Risk Aversion of Dependent Females in Kinkheda and Dokur

	Extreme	Severe	Intermediate	Moderate	Slight or Neutral	Neutral or Negative	Inefficient	Sample Size
			0.50 Rs., Games 2 & 3					
A Females	1.9	9.6	23.1	19.9	16.0	8.3	21.2	156
			0.50 Rs., Games 4 & 5					
B Females	1.3	8.3	18.0	26.3	16.0	10.9	19.2	156
			5 Rs., Games 7 & 9					
Females of:								
C Landless	0	11.1	27.8	41.7	5.5	0	13.9	36
D Small	0	10.0	15.0	37.5	2.5	20.0	15.0	40
E Medium	2.8	11.1	25.0	36.1	8.3	5.6	11.1	36
F Large	0	5.0	27.5	35.0	7.5	5.0	20.0	40
G Total Females	0.7	9.2	23.7	37.5	5.9	7.9	15.1	152
H Total Males	1.3	5.6	16.3	41.2	9.4	15.0	11.2	160

Distribution tested	CHI-SQR	dF	$X^2_{0.05}$
A vs B	3.41	6	12.59
A vs G	18.02		
G vs H	9.60		
C vs D vs E vs F	19.66	18	28.87

Table 7. The Distribution of Risk Aversion among Progressive Farmers

	Extreme	Severe	Inter-mediate	Moderate	Slight or Neutral	Neutral to Negative	Inef-ficient	Sample Size
			0.50 Rs., Games 4 & 5, All Villages except Shirapur					
A Progressive I	3.6	3.6	14.3	25.0	14.3	32.1	7.1	28
B Progressive II	2.6	4.0	9.2	18.4	26.3	35.5	4.0	76
C Non-progressive random sample	0.9	7.2	12.5	27.0	23.5	18.5	10.4	345
			5 Rs., Games 7 & 9, All Villages except Shirapur					
D Progressive I	0	7.1	17.9	28.6	21.4	25.0	0	28
E Progressive II	0	7.9	17.1	27.6	15.8	27.6	4.0	76
F Non-progressive random sample	1.2	9.0	18.6	38.5	13.0	9.3	10.4	345
			50 Rs., Game 12, Shirapur, Kanzara, and Aurepalle					
G Progressive II	0	5.0	15.0	55.0	15.0	0	10.0	20
H Non-progressive random sample	2.9	4.8	37.5	38.5	5.8	1.9	8.6	104

Distributions tested	CHI-SQR with 6 dF. $X^2_{0.05} = 12.59$	
A vs random sample P-farmers	6.17	Results for the progressive farmers of the random sample not reported separately.
D vs random sample P-farmers	2.81	
B vs C	16.32	
E vs F	22.91	
G vs H	6.59	

classes contain only 22.3% of the non-PF random sample. The differences are statistically significant at both the 0.50 and 5 Rs. level.

However at the 50 Rs. level, PF and ordinary farmers can no longer be distinguished statistically, although PF farmers are less risk-averse on average, which might become statistically significant in larger samples. But note that the two central risk aversion classes contain 70% of the PF II sample and 75% of the non-progressive random sample. There is nowhere near the sharp difference in risk aversion which would be required to explain differences in adoption behavior among the two groups on the basis of difference in their willingness to take risk. There still may be differences in ability to do so on account of wealth differences, but these are differences in the constraint set and not in willingness.

IMPLICATIONS FOR POLICY

The results of this research can be stated as follows: When payoffs rise to the level of agricultural investments, most people have similar pure attitudes towards risk. In all cases considered, at high payoff levels more than 60% of all households exhibit either intermediate or moderate risk-aversion. For farmers, except in Kanzara, the percentage is between 70% and 80%. As argued in footnote 7, one can probably classify those individuals who choose the inefficient alternatives into the same two groups, which would in general raise that percentage by another 10% to between 70% and 90% of most farmer groups. Apart from this overwhelming central tendency, four conclusions stand out as significant but quantitatively minor effects: (1) There exists a slight negative association between risk aversion and landholding size; (2) Risk aversion in risky areas is probably somewhat larger than in less risky ones;[20] (3) Females are slightly more risk-averse than household heads; (4) Progressive farmers are only slightly less risk-averse than average farmers at high payoff levels.

Together with N.S. Jodha's findings (1977-b) on the high cost of loss management or risk diffusion mechanisms available to farmers, we can safely accept the hypothesis that risk and risk aversion lead to underinvestment in semi-arid tropical agriculture. However, two important caveats are in order. First, we do not yet know the quantitative importance of the underinvestment. Further research is needed to assess this. Second, we now know that underinvestment exists relative to a situation where individuals either are risk-neutral or act as if they were (because they have access to cheap loss management and risk diffusion devices). However, unless economic and social policies can design new loss management or risk diffusion devices or improve the existing ones so that the "insurance cost" goes down, our findings are not of much operational significance. If public risk diffusion mechanisms simply replace the private ones without reducing their costs, not much is gained. Social science research must therefore be directed into finding these new or improved mechanisms. V.M. Dandekar's (1976) work is a significant step in that direction.

After this important qualification of the results, some policy-conclusions still emerge. First, it would not be worthwhile developing technologies which differ in their riskiness so that small farmers may adopt the low yield-low risk ones whereas large farmers adopt the high yield-high risk ones. There is simply not sufficient difference in risk attitudes among small and large farmers to warrant such an approach. Small farmers would like to accept the same technologies as large farmers, but are prevented from doing so by differentially higher costs of credit and inputs or by other constraints. Furthermore, techniques to measure differences in riskiness among technologies are still very complicated and data intensive, which makes the differential research strategy even less appealing. One may legitimately search for a "low input optimum" with a given technology. For example, in a wheat variety one might explore the best combination of fertilizers if, instead of an optimal dose of all fertilizers, one could only afford one-third of the money. Since the low ranges of production functions are usually the ones with highest marginal returns, pushing small farmers--on account of their higher risk aversion--towards varieties which do not require fertilizer is not doing them a service. This is another case in which removal of the disadvantages of small farmers requires institutional policies aimed at equalizing access to factor and product markets or to land rather than technology policy. (For other such cases, see Binswanger and Ryan, 1977).

Second, if it can be shown in other regions that risk attitudes vary as little across farm size groups as they do in Semi-Arid India, we have to reconsider in a new light the debate about risk aversion versus credit constraint as explanations for low fertilizer use. If all farmers in a given area underinvest in fertilizers (relative to the risk-neutral optimum) this underinvestment is more likely to be caused by risk aversion than by credit constraints. The reason is that it is hard to imagine how a uniform credit constraint across farm size groups could emerge, whereas rather uniform risk aversion has now been shown in at least the SAT case. On the other hand, if fertilizer adoption increases systematically and rapidly with farm size (or other indices of asset holdings) the underinvestment of small farmers must be caused either by adoption cycle phenomena such as slower access to information and inputs, or by risk aversion. If differential fertilizer use persists long after completion of an adoption cycle, it is most likely caused by differential credit or input costs (or constraints) across farm sizes.

Third, if it can be further firmed up that progressive farmers are not much less risk-averse than other farmers, then rewards for innovation are not rewards for superior risk-bearing willingness, as Schumpeter hypothesized, but are instead returns to superior human capital and superior ability to recognize and adjust to new opportunities and constraints (see Schultz, 1975). It is unlikely that some intrinsic attitude holds the less progressive ones back. It is more likely to be the lack of human and physical capital.

To close I want to repeat the caution which must be exercised in pushing these findings towards policy-conclusions. Underinvestment remains to be quantified more clearly and so does the cost of alternative means to reduce and diffuse risks in the SAT. Furthermore, some of the conclusions regarding farm size, geographic, sex and educational distribution of risk attitudes require more rigorous testing with regression techniques using the data presented here. Evidence from other areas, especially less risky or very arid ones, would also help. Now that a methodology exists which is quite straightforward to apply, such evidence may hopefully accumulate more rapidly than in the past.

FOOTNOTES

[1]Note that, even if all farmers were risk-neutral, investment in SAT areas would have to be lower than in assured zones. In good years, crops in both zones would yield the same under given management and soil conditions, but in the SAT the frequency and severity of negative deviations from the good year yields is much larger. Thus, for any given investment level, the rate of return would be lower, reducing the risk-neutral optimum investment level.

[2]Psychologists have performed experiments, but not with farmers and usually with small payoffs and small numbers of respondents.

[3]At the time of the experiment Rs.100 = US $8.80. Wage rates for unskilled female labor varied around Rs.2.00 and for unskilled male labor around Rs.3.50 per day.

[4]How "risk-averse" behavior is induced by budget constraints or by imperfection in credit markets is discussed in detail by Robert T. Masson (1972). Samuelson (1977) has also shown that the failure to consider budget constraints as an important determinant of choice under risk has been one of the main reasons for the confusion surrounding St. Petersburg paradoxes.

[5]One alternative dominates another stochastically in the second degree if it either has a higher expected return for equal standard deviation, or lower standard deviation and equal expected return, or both higher expected return and lower standard deviation. More precise definitions can be found in Anderson, (1976).

[6]The idea of introducing a stochastically dominated alternative came from the paper by M.J. Gordon et al. (1972).

[7]Two different payoff structures were developed. Payoff structure A contained the inefficient alternative D of Figure 1, which is derived from alternative D and has identical expected return. Payoff structure B is derived from A by deleting D but adding another alternative D* which gave 20 Rs. and 160 Rs. respectively for head and tail and has equal expected return than C, but higher variance. Different households were given structure A and B to test whether there are positioning effects. None,

however, could be found. It stands to argue that individuals choosing D and D* have risk attitudes which differ little from those who choose C and B respectively. Clearly they are not preferring risk or else they would choose E or F.

[8]The opportunity set of alternative 0 to F is not continuous: individuals cannot combine any two of them to achieve a point such as the tangency points with I_2 or I_3 and the slopes of the indifference curve along the line segments need not be exactly the same as those of the line segments.

[9]Partial risk aversion is not to be confused with Relative Risk Aversion, defined by Pratt (1964) as: $R(W) = -Wu''(W)/u'(W)$. Absolute, Relative and Partial risk aversion are related as follows (Zeckhauser and Keeler, 1970):

$$P(M,W) = R(W + M) - W\,A(W + M)$$

and once two of these measures are known, the third can be estimated.

[10]Higher order approximations make no sense since the distributions of the game payoffs are all symmetric and higher moments are either zero or functions of the first and second moment. If M is certain income and B and C are two different game alternatives, indifference between B and C and quadratic utility curves imply the following equation from which b, M, A and P can be estimated sequentially for an individual with zero wealth:

$$u(M) = M + bM^2 = u(B) = E(B) + b[E(B)]^2 + b\,V(B) = u(C) = E(C) + b[E(C)]^2 + b\,V(C)$$

where E denotes the expectation and V the variance of the alternative.

[11]Ƶ and P measures are useful in different contexts. To use Hazell's (1971) Motad programming model, Ƶ can be used directly. For quadratic programming, Ƶ will have to be transformed into an expected-return-variance measure. For most theoretical enquiries, P and other measures of the curvature of u(W) are more useful.

[12]In fact it is planned to test the classifications against actual farm behavior for which data is available in the Village Level Studies.

[13]There are very minor differences in the sequence of hypothetical questions in the two villages of the Sholapur area where the game was played first. In the other four villages some of the lessons learned in Sholapur led to changes. However, they affect mostly the methodological tests performed and are of no consequence in this paper.

[14]The experience indicates that once farmers and laborers understand the game and their right for free choice, the personality of the investigator can no longer influence these choices, except in the following sense: If he is impatient he can coax the respondent into making a choice quicker than desirable, and if asked again the respondent may shift his answer. To safeguard against this possibility, for the 5 and 50 Rs. questions, the respondent's choice was always ascertained by two persons (one investigator and the investigating scientist) and the process continued till the respondent no longer shifted his answer. Note that the procedure eventually worked remarkably fast. An investigator-scientist pair could complete one 5 Rs. or 50 Rs. round for 40 households in one day. This was possible because a majority of individuals came well prepared since they had time to reflect on their choices.

[15]A more thorough description of the areas and the sampling procedures is given in N.S. Jodha et al., 1977, and Hans P. Binswanger et al., 1977.

[16]Scandizzo and Dillon (1976) results are from a sample of 130 farmers and sharecroppers in Northeastern Brazil. Since they use outcomes with skewed distributions, their results are not directly comparable with ours. Two sharp contradictions can, however, be noted. In their subsistence assured case, i.e., at payoff levels much higher than the real income equivalent of 50 Rs., they find 27.3% of the household heads who prefer risk, whereas our experimental evidence finds at most 1.7% in this group. Furthermore, they found 32% of their household heads in their most extreme risk-averse categories while I find only 2.5%. In my first risk survey based on hypothetical question the findings were very similar to theirs.

[17]Increasing partial risk aversion is equivalent to increasing relative risk aversion as hypothesized by Arrow (1971, p. 96) only for individuals with zero wealth but not for individuals with positive or negative wealth. Increasing relative risk aversion is not confirmed by this set of experiments.

[18]Statistical tests were performed to see whether the risk aversion distribution between the hypothetical and real 50 Rs. answers differed. It was found that there was a statistically significant difference between game no. 6 and 12 but no significant difference could be found between game 12 and 17.

[19]There is an identification problem. Migration in the present and past history among areas with different levels of agricultural risks could have selected individuals or families with less risk aversion in the risky environments because risk neutrality in the long run is the growth maximizing strategy. Conversely, more risk-averse individuals or families would have preferred the more assured zones.

[20]B.C. Barah and I are pursuing research on the issue of regional diversification of policies towards dealing with risk. That case for regionally diversified policies will have to rest (a) on differential risk aversion, (b) on differential riskiness, and (c) on differences in sources of risk. (a) emerges here but not strongly, (b) is well documented, and for (c) Barah has preliminary evidence that price risk is much more important as a source of risk in irrigated areas whereas yield risk is the most important component of risk in SAT and arid areas. Any policy aimed at dealing with risk in the irrigated tracts will have to take account of these differences. There can be little demand for crop insurance where yield risk is small but price risk is large, and there can be little demand for price stabilization where price risk is low and yield risk is overwhelming. Again these points require more empirical evidence.

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Erratum

Center Discussion Paper No. 275

"Risk Attitudes of Rural Households in Semi-Arid Tropical India"

Hans P. Binswanger
January 1978

Page 27, lines 10 and 11:	error:	"risk aversion"
	correction:	"credit constraints"