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UNCERTAINTY AND SUBJECTIVE BELIEFS IN THE ADOPTION OF MODERN FARMING TECHNIQUES: A CASE STUDY OF NEPALESE FARMERS

Ramesh P. Sharma

HMG-USAID-GTZ-WINROCK PROJECT
STRENGTHENING INSTITUTIONAL CAPACITY IN THE
FOOD AND AGRICULTURAL SECTOR IN NEPAL

Foreword

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UNCERTAINTY AND SUBJECTIVE BELIEFS IN THE ADOPTION OF MODERN FARMING TECHNIQUES: A CASE STUDY OF NEPALESE FARMERS

Ramesh P. Sharma*

ABSTRACT

This study was conducted to ascertain whether subjective beliefs of farmers regarding yields from modern farming techniques have an influence on the rate of adoption of these techniques. The first two moments of the subjective probability distribution--the mean and the variance--were used to represent subjective beliefs. Data collected from a sample of 72 farmers in Kavre district of Nepal were used to conduct the analysis. Subjective expected yield was found to be an important factor positively influencing adoption, whereas farmers' beliefs regarding the expected variation of yields were found to be statistically insignificant.

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INTRODUCTION

Empirical studies have confirmed that farmers adopt modern farming techniques by passing through a series of stages in the adoption of innovations (Kohl, 1966; Singh and Pareek, 1968; Rogers and Shoemaker, 1971). The stages are: first, awareness--the farmer is exposed to the innovation and gains some understanding of how it functions; second, persuasion--the farmer forms a favorable or unfavorable attitude towards the innovation; third, decision--the farmer engages in activities which lead to adoption or rejection of the innovation; and fourth, confirmation--the farmer seeks reinforcement for the decision he has made.

In Nepal about 75 percent of all farmers are aware of modern inputs (improved seeds, pesticides, and chemical fertilizers), but only about 12 percent are adopters (HMG, 1970/71). The small percentage of adoption of modern techniques shows that progression from the "awareness" to the "decision" stage has not yet taken place. Obviously, success in the subsequent stages depends upon success in the "persuasion" stage. Therefore, one main strategy for an agricultural extension program is to create a favorable enviroment for farmers to develop a positive attitude towards the innovations being promoted.

One factor, perhaps the most important one, which determines a farmer's attitude towards the adoption of improved technology is whether there is belief in the profitability of the new technology. In other words, attitude towards new technologies depends not on the objective probability of the new technology, but on the farmer's subjective perception of profitability (Rogers, 1962). Another important factor is a farmer's ability to implement the new technology--that is, the new technology must be compatible with the means which are at his disposal.

A farmer's perception of (or his belief in) the profitability of new technology has two components: the average yield expected and the variability (spread) of this yield.

In this paper, expected yield will be called the farmer's "optimism" towards new technology, and expected variability will be called his "confidence" in new technology.

The less variability a farmer expects from modern tech-

niques, the greater will be the confidence in such techniques. Such confidence in new techniques is one important precondition for successful adoption of these techniques.

Wharton (1969) observed that in the early stages of innovation, a farmer's subjective perception of yield variability from new techniques is higher than the actual (objective) variability. That is, a farmer considers the yield from new techniques to be more uncertain, since a higher subjective risk is attached to modern techniques as compared with traditional techniques. Such uncertainties in yields are disliked, especially by a subsistence farmer, because a lower than normal yield can be disastrous.

The second important dimension of "attractiveness" is higher (subjectively) expected outcome of the innovation, such as higher yields. This depends upon the optimism of the farmer. Farmers are said to be optimistic if they assign a higher expected yield to the new technology.

With this perception of the problematic situation, this study attempts to identify whether subjective beliefs of farmers with respect to benefits (yields) from modern farming are important in adopting modern techniques (in decision analysis, belief is a synonym for subjective probability) and to identify important explanatory factors which significantly influence a farmer's subjective degree of belief.

THE MODEL

Theoretical Framework

One important factor postulated to explain the adoption of a recommended farming practice is farmers' perception of risk and uncertainty (O'Mara, 1971; Benito, 1976; Moscardi and de Janvry, 1977; Dillon and Scandizzo, 1978). The underlying idea is that modern farming techniques, when introduced to traditional farmers, are viewed to be more risky than the existing ones (Wharton, 1969; Roumasset, 1977). This has led researchers to try to explain the differences in adoption in terms of farmers' risk attitudes.

There is a general consensus among decision theorists that subjective probability, rather than objective probability, and utility, rather than money or income as the unit

of measurement of outcome, are the only valid concepts for decision making. (For a discussion of subjective probability, see Savage, 1954; de Finetti, 1964; Ramsay, 1964; Winkler, 1967, 1968, 1969; Anderson et al., 1977. For a discussion of utility, see Hiebert, 1974; Roumasset, 1976; Moscardi and de Janvry, 1977; Binswanger, 1978; Dillon and Scandizzo, 1978; and Herath, 1979.)

Eliciting a farmer's perception of utility is considered more difficult than eliciting beliefs. The empirical difficulties in eliciting utility functions are documented in Officer (1967).

On the other hand, few researchers seem to have explicitly included belief aspects (by discarding utility aspects) in their research on choice under risk by farmers (Hiebert, 1974; Chang, 1976). Belief aspects have the comparative advantage over utility aspects in so far as the former can be more easily "manipulated" with information, and hence are more relevant for policy making purposes.

For these two reasons (difficulties in eliciting utility responses and the relative advantage of belief aspects over utility aspects as a policy tool), farmers' adoption decisions have been analysed for belief aspects only. The justification for modeling a decision problem around belief aspects only has been given by Anderson (1976).

Conceptual Framework

The conceptual framework posited for this study is presented in Figure 1. In the causal order of variables, socio-economic factors have been posited as the initial or antecedent variables, and adoption of techniques as consequent variables. Information and beliefs are posited as the two intervening factors. In the causal order, information is posited before beliefs, because information plays the role of input in the revision of beliefs. Information acquisition and existing beliefs are influenced primarily by socio-economic factors.

Figure 1. Conceptual Framework

```
Socio-economic factors ----> Subjective)----> Adoption of
Information            ---->  beliefs  )      innovations
```

SAMPLING AND DATA

Kavre district lies in the central development region. The district capital Dhulikhel is located 30 km from Kathmandu on the only road that passes through the district. Out of 27 village panchayats with extension services in the district, ten were selected on the basis of their having extension services as well as being similar in terms of factors like soil, climate, topography, and irrigation. From these ten panchayats, five were selected randomly, and 72 farmers were selected randomly from these five panchayats.

Eleven socio-economic and situational factors relating to the farmers were considered for this study, the choice being based on past studies, the nature of the present study, and the study area. The socio-economic factors were--age, family size, literacy (years of schooling), caste, tenancy type, land size, occupation, radio listening, distance to various agricultural offices, membership in co-operatives, and change agent contacts.

Some variables could not be easily quantified. For purposes of analysis, scoring rules were used for some of the variables as follows: Caste--1 for high caste, 0 for low caste; Tenancy--1 for owner-operators, 0 for others; Occupation--1 for farming plus other occupations, 0 for farming only; Radio Listening--1 for listeners, 0 for others.

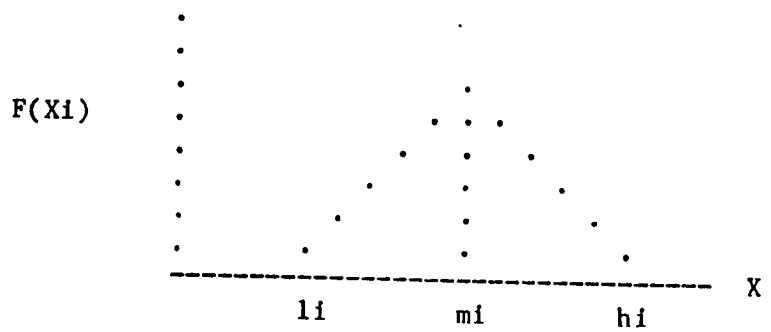
Questions were also asked to assess the farmers' state of knowledge regarding some of the institutional, economic and technical aspects relating to improved wheat farming. A score of 1 was given for a correct answer, and 0 for an incorrect answer. Similarly, an index for the adoption of modern farming techniques by farmers was constructed. Ten modern techniques were considered. They were: use of high yielding variety seeds, seed treatment, line sowing, irrigation timings, use of insecticides, use of nitrogen and phosphorus as fertilizers, use of potash as fertilizer, use of institutional credit, use of extension workers, and use of modern farming tools. One point was assigned for each technique adopted by a farmer to form an adoption index.

To elicit farmer's subjective beliefs regarding yields from modern farming, the direct method, based on a triangular probability distribution (Figure 2) was used. By eliciting three parameters, namely, the lowest expected yield (l),

the most likely yield (m), and the highest expected yield (h), the mean and the variance of the subjectively assessed yield were estimated as follows (Johnson and Kotz, 1970):

Expected Yield (Mean) = $(l+m+h)/3$
Expected Spread (Variance) = $[(h-l)(h-l)+(m-l)(m-h)]/18$

Figure 2. Probability Density Function (PDF) of Triangular Distribution.



In this study, the numerical figure of expected yield represents the level of optimism perceived by farmers, while the numerical figure of expected spread represents the level of confidence. That is, the higher the expected spread, the more risky the technology is perceived, and hence, the lower the farmer's confidence in the new technology.

STATISTICAL METHODOLOGY

To determine whether beliefs about expected yield and/or expected spread significantly influence adoption, the following linear regression equation was fitted:

(1) Adoption = f(beliefs)

But, according to Nie et al. (1974), if one bases conclusions as to the importance of beliefs only on the estimates of Equation (1), the indirect influences of socio-economic factors and information via beliefs on adoption (Figure 2) may be neglected. Therefore, Equation 2 was estimated:

(2) Adoption = f(beliefs, socio-economic factors and levels of information)

To determine the factors which influence beliefs, Equations 3 and 4 were estimated:

(3) Beliefs = f(socio-economic factors)
(4) Beliefs = f(levels of information)

(Several functional forms were fitted to these relationships, of which linear equations gave the best fit. Thus, the equations were fitted in linear form.)

RESULTS

The means and coefficients of variation of all quantifiable variables are presented in Table 1. The high coefficients of variation of these figures have important policy implications. For example, a very high coefficient of variation for education indicates extremely low literacy which a policy maker should attempt to minimize. This will accelerate the process of adoption from "awareness" onwards. Similar interpretation applied to information variables which also had high coefficients of variation. On average, farmers in the sample have adopted four out of ten techniques.

Regarding subjective beliefs, the following two findings were noteworthy (see Table 1). First, comparing the mean values of subjective expected yields, the average expected yield with modern techniques (1655 kg/ha) was almost twice the corresponding figure for local techniques (871 kg/ha). Second, comparing the mean values of subjective expected spread, the mean value for modern techniques (31,515) was significantly (in a statistical sense) larger than that for local techniques (24,689). In other words, farmers perceived yields from modern techniques to be considerably higher but relatively less reliable (more uncertain) in comparison to local techniques of production. This aspect is dealt with in more detail by Sharma (1980).

Estimates of the two regression equations (Equations 1 and 2) are summarized in Table 2. Of the two measures of subjective beliefs, namely the expected yield and the spread, only the coefficients of expected yield appeared significant with positive sign in the two estimates. The significance of the coefficient of expected yield remained consistent whether the influence of beliefs on adoption was estimated directly (Equation 1) or indirectly (Equation 2).

This implied that optimism regarding yields from modern techniques is important in positively influencing the adoption of modern techniques.

Also notable was the small explanatory power of beliefs alone (only 16 percent) in the variation of adoption rates. However, the R-squared value increased considerably when beliefs interacted with information and socio-economic factors in explaining the adoption rate.

The results of the effect of beliefs on adoption have shown that only beliefs about expected yields are significant in explaining adoption, whereas beliefs about expected spread were not significant. Therefore, only beliefs about expected yields were regressed on socio-economic factors and levels of information. The estimates of these two regression equations are presented in Tables 3 and 4.

Table 3 shows that of the socio-economic factors considered in this study, only age, tenancy and caste appeared statistically significant. The signs of the coefficients were as expected. The sign of the coefficient of age was negative, implying that younger farmers were more likely to be optimistic. The signs of tenancy and caste were positive, suggesting that both owner-operators and high caste farmers were more likely to be optimistic.

However, looking at the nature and the number of significant variables as well as the relatively small R-squared value, an attempt to explain beliefs about expected yields (optimism) with socio-economic factors cannot be said to be successful. The low R-squared value might be due to the omission of other relevant variables and/or due to the failure of farmers to articulate their beliefs clearly. There was no problem of multicollinearity, as was evident from the simple correlation matrix (see Appendix).

The regression estimates of the effects of various types of information on expected yields (Table 4) showed that, of the three types of information considered, only the coefficient of technical information was statistically significant. The positive sign of the coefficient suggested that the more technical information farmers acquire, the more likely they are to be optimistic.

CONCLUSIONS

The socio-economic picture of the study area revealed a wide variability in key variables like education, participation in cooperatives, contacts with change agents and level of information. For example, the wide variation in education indicated that while some farmers had received formal education for a number of years, other farmers had no formal education whatsoever.

Regression estimates revealed that only subjective expected yields (optimism) appeared as an important factor influencing adoption positively, while perception of expected spread (or level of confidence) did not seem to affect adoption. Attempts were made to identify suitable policy variables which influenced optimism among farmers. Younger, high caste, owner-operator, and technically informed farmers were likely to be more optimistic about yields and, consequently, to be adopters of new techniques.

The fact that the coefficient of technical information appeared statistically significant has important implications for policy makers to strengthen the extension network.

Finally, this study concludes that perception of expected yield, and not expected yield spread, does influence adoption. Support of this conclusion is also evident in Table 1, where perception of expected yield from modern techniques is twice the yield (1655/871) from local techniques, while a relatively smaller ratio (31516/24689) is operative for the expected variances. Thus, we may conclude that the farmers believe the yield advantage of new varieties to be so high that the concomitant expected wider spread--that is, the higher risk--does not influence their adoption decision significantly. In other words, perceived yield advantage, and not perceived variability difference, seems to be the dominant factor in adoption decision.

Table 1. Mean and Coefficient of Variation of Socio-Economic Factors, Information, Beliefs and Adoption Index

Variables	Unit	Mean	Coefficient of Variation*
A. Explanatory Variables			
Socio-Economic Factors			
Age	Years	44.2	28.0
Family Size	Number	6.0	35.4
Education	Years	3.1	121.4
Land size	Hectare	1.4	57.3
Distance to offices	Km	5.8	57.8
Participation in Cooperatives	Years	2.2	109.6
Contacts with Change Agents	Times	5.5	112.0
Information			
Institutional	Index	0.97	86.3
Economic	Index	1.08	94.0
Technical	Index	0.97	114.5
Beliefs			
Yield-modern techniques	Kg	1655	18.3
Variance-modern techniques	Kg	31516	33.6
Yield-local techniques	Kg	871	9.5
Variance-local techniques	Kg	24689	23.5
B. Dependent Variable			
Adoption Index	Index	3.83	60.84

Source: Survey Data, 72 farmers, Kavre District, 1978

* The coefficient of variation expresses the standard deviation of the variable as a percentage of the mean.

Table 2. Regression Estimates for Equations 1 and 2, Explaining Adoption

Explanatory Variables	Units	Regression Coefficients and Significance Levels: Equation 1	Equation 2
Socio-Economic Factors			
a. Age	Years		-0.013
b. Family	Number		0.060
c. Education	Years		0.127
d. Caste	Index		0.760**
e. Tenancy	Index		0.867**
f. Land size	Hectare		0.23
g. Occupation	Index		0.899**
h. Radio listening	Index		-0.177
i. Distance to offices	Km		-0.052
j. Participation in cooperatives	Years		-0.229**
k. Contact with change agents	Times		-0.113***
Information			
a. Institutional	Index		0.893***
b. Economic	Index		-0.056
c. Technical	Index		0.617***
Beliefs			
a. Expected yield	Kg	0.0029***	0.002**
b. Expected spread	Kg	-0.000011	0.00002
4. Intercept		-0.674	-1.207
Dependent Variable: Index of adoption			
R-squared =		0.16	0.69
R-squared (adjusted) =		0.14	0.60
N =		72	72

Significance levels: *10 percent, **5 percent, *** 1 percent

Table 3. Estimates for Equation 3: Regressing Beliefs about Expected Yield on Socio-Economic Factors

Explanatory Variables	Units	Coefficient	Standard Error
Intercept		1750.0***	194.5
Age	Years	-10.3**	4.3
Family size	Number	21.8	22.7
Education	Years	8.6	12.6
Caste	Index	0.000014*	0.000011
Tenancy	Index	180.8**	91.2
Land size	Hectare	-56.4	69.2
Occupation	Index	35.3	88.5
Radio listening	Index	-12.1	98.2
Distance to offices	Km	12.0	11.8
Participation in cooperatives	Years	21.9	18.2
Change agent contacts	Times	4.6	7.3

R-squared = 0.30; R-squared (adjusted) = 0.18; N = 72

Significance levels: *10 percent, **5 percent, ***1 percent

Table 4. Estimates for Equation 4: Regressing Beliefs about Expected Yield on Types of Information

Explanatory Variables	Units	Coefficient	Standard Error
Intercept		1548.4***	57.1
Institutional information	Index	11.1	46.9
Economic information	Index	14.9	42.9
Technical information	Index	82.4**	38.1

R-squared = 0.12; R-squared (adjusted) = 0.08; N = 7

Significance levels: *10 percent, **5 percent, ***1 percent

APPENDIX. Correlation Matrix of Study Variables

	1	2	3	4	5	6	7	8	9	10	11
1	1.00										
2	-.63	1.00									
3	.16	-.12	1.00								
4	.02	.14	-.17	1.00							
5	-.10	.24	.04	.53	1.00						
6	-.26	.32	.05	.01	.33	1.00					
7	-.17	.37	.06	.17	.33	.58	1.00				
8	-.16	.24	-.10	.14	.18	.49	.59	1.00			
9	-.39	.38	.01	-.25	.22	.26	.25	.34	1.00		
10	.34	-.27	.15	-.13	-.26	-.13	-.21	-.14	-.32	1.00	
11	.19	.38	-.06	.05	.19	.33	.63	.62	.40	.17	1.00

1 = Age; 2 = Education; 3 = Caste; 4 = Tenancy; 5 = Land size; 6 = Participation in cooperatives; 7 = Change agent contacts; 8 = Technical information; 9 = Expected yield; 10 = Expected spread; 11 = Adoption index.

REFERENCES

Anderson, J.R., "Economic Aspects of Risk in Resource Use, Farm Size and Spatial Diversification in Extensive Wool Growing," Agricultural Economics Bulletin No. 8, Department of Agricultural Economics, University of New England, Armidale, Australia, 1976.

Anderson, J.R., J.L. Dillon and J.B. Hardaker, Agricultural Decision Analysis, Iowa State University Press, Ames, 1977.

Benito, C.A., "Peasants Responses to Modernization Projects in Minifundia Economics," American Journal of Agricultural Economics, 58 (2): 143-51, 1977.

Binswanger, H.P., "Psychological Theories, Economic Theories, and Behavior Under Uncertainty: Tests in Rural India," unpublished paper, 1978.

Chang, S.L., "An Economic Analysis of the Adoption of New Wheat Varieties Under Uncertainty in Ferozepur District (India)," Ph.D. Thesis, North Carolina State University, 1976.

Dillon, J.L. and P.L. Scandizzo, "Risk Attitudes of Subsistence Farmers in North East Brazil: A Sampling Approach," American Journal of Agricultural Economics, 60 (3): 425-35, 1978.

de Finneti, B., "Foresight: Its Logical Laws, its Subjective Sources," in H.E. Kyburg and H.E. Smokler (eds.), Studies in Subjective Probability, Wiley, New York, 1964.

Herath, H.M.G., "Resource Allocation by Rice Farmers in Sri Lanka: A Decision Theoretic Approach," Ph.D. Thesis, University of New England, Armidale, Australia, 1979.

Hiebert, L.D., "Risk, Learning and the Adoption of Fertilizer Responsive Seed Varieties," American Journal of Agricultural Economics, 56 (4): 764-68, 1974.

HMG, "An Evaluation of Agricultural Extension Programs in Nepal," His Majesty's Government, Ministry of Food, Agriculture, and Irrigation, Kathmandu, Nepal, 1970-71.

Johnson, N.L., and S. Kotz, Distribution in Statistics, Houghton Mifflin, New York, 1970.

Kohl, J.W., "Adoption Stages and Perceptions of Characteristics of Educational Innovations," D.Ed. Thesis, University of Oregon, 1966. Quoted in Rogers and Shoemaker (1971).

Moscardi, E., and A. de Janvry, "Attitude Towards Risk Among Peasants: An Econometric Approach," American Journal of Agricultural Economics, 59 (4): 710-16, 1977.

Nie, N., D.H. Bent and C.H. Hull, SPSS: Statistical Package for the Social Sciences, McGraw-Hill, New York, 1974.

Officer, R.R., "Decision Making Under Risk," M.Ec. Thesis, University of New England, Armidale, Australia, 1967.

O'Mara, G.T., "A Decision-Theoretic View of the Microeconomics of Technique Diffusion," Ph.D. Thesis, Stanford University, 1971.

Ramsey, F.P., "Truth and Probability," in H.E. Kyburg and E. Smokler (eds.), Studies in Subjective Probability, Wiley, New York, 1964.

Rogers, E.M., Diffusion of Innovations, The Free Press of Glencoe, New York, 1962.

Rogers, E.M. and F.F. Shoemaker, Communication of Innovations, 2nd edn., The Free Press, New York, 1971.

Roumasset, J.A., Rice and Risk: Decision Making Among Low-Income Farmers, North-Holland, Amsterdam, 1976.

Roumasset, J.A., "Risk and Uncertainty in Agricultural Development," A/D/C Seminar Report No. 15, A/D/C, Singapore, 1977.

Savage, L.J., Foundation of Statistics, Wiley, New York, 1954.

Sharma, R.P., "Uncertainty, Subjective Beliefs and Adoption of Modern Techniques: A Case Study of Nepalese Farmers," M.Ec. Thesis, University of New England, Armidale, Australia, 1979.

Sharma, R.P., "The Nature of Yield Uncertainty of HYV and Local Wheat: A Subjective Probability Approach," APROSC Staff Paper No. 2, APROSC, Kathmandu, February 1980.

Singh, Y.P. and V. Pareek, "A Paradigm of Sequential Adoption," Indian Education Review, 3 (1): 89-114, 1968.

Wharton, C.R. Jr., "Risk, Uncertainty and the Subsistence Farmer," Development Digest, 7 (1): 3-10, 1969.

Winkler, R.L., "The Assessment of Prior Distributions in Bayesian Analysis," Journal of the American Statistical Association, 62-320, 776-800, 1967.

Winkler, R.L., "The Consensus of Subjective Probability Distributions," Management Science, 15 (2): B61-B75, 1968.

Winkler, R.L., "Scoring Rules and the Evaluation of Probability Assessors," Journal of the American Statistical Association, 64 (327): 1073-78, 1969.

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