ASSESSING PEASANT FARMERS' RISK ATTITUDES AND FACTORS THAT INFLUENCE DECISIONS ON RISKY ALTERNATIVES : A CASE STUDY IN THE BORDER REGION OF SOUTH AFRICA

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The experimental method of measuring risk attitudes, using four hypothetical gambling situations, was used to elicit information from peasant farmers in the Border region of South Africa. The main intention was to examine peasant farmers' attitudes towards risk and the social and economic factors that influence these. Based on the results, peasant farmers in the study area are risk averse. Factors such as level of formal education and annual household income were found to have significant influences on peasant farmer's responses towards making decisions on risky alternatives.

BEPALING VAN KLEINBOERE SE HOUDING TEENOOR RISIKO, EN FAKTORE WAT HUL BESLUITE OOR RISKANTE ALTERNATIEWE BEÏNVLOED : 'N GEVALLESTUDIE IN DIE GRENS GEBIED

Die eksperimentele metode om respondente se houding teenoor risiko te bepaal, met behulp van vier hipotetiese dobbel-situasies, is gebruik om inligting te bekom van kleinboere in die Grens gebied van Suid-Afrika. Die hoofdoel was om ondersoek in te stel na hul houding teenoor risiko, asook die sosiale en ekonomiese faktore wat dit beïnvloed. Op grond van die bevindings het kleinboere in die studiegebied 'n afkeer van risiko getoon. Faktore soos hul vlak van formele opleiding en jaarlikse inkomste van die huishouding het 'n betekenisvolle invloed op kleinboere se besluite oor riskante alternatiewe getoon.

1. INTRODUCTION

In this study, peasant farmers' risk attitudes in the Border Region of South Africa are reported. Agriculture in this region is characterised by a semi-arid climate. Village-based rural households typically have access to communal grazing rights, and exclusive use of a small area of arable land. Most of these still employ less advanced methods of production, do not have ready access to formal markets, and are often reluctant to adopt new practices. In this study such households are termed "peasant farmers", in accordance with the definition by Ellis (1988). As will be seen from the results presented later, most of these households rely on off-farm sources of revenue.

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It is for this reason that the (then) Ciskei authorities agreed with the Development Bank of Southern Africa to designate the Keiskammahoek district in the Border region as one of the target areas for a farmer support programme. The aim was to develop small-scale commercially oriented agriculture as a means of raising the quality of life of the peasant farming households (Loxton, Venn & Associates, 1988; DBSA, 1988). Design and successful implementation of programmes aimed at improving agricultural production, and hence the wellbeing of the farmers, must include consideration of farmers' attitudes towards risk. In other words, it is extremely important that the likely responses of peasant farmers to the interventions included in the farmer support programmes be determined in advance.

There is a general consensus that peasant farmers are risk averse in their actions. In support of this general notion, Ellis (1988) asserted that peasant farmers are risk averse because "they can not afford not to cover their household needs from one season to the next since if they fail to do so they will starve to death". This general notion has been, however, refuted by some studies. Cairns (1990) has, for instance, shown that peasant farmers do not depend entirely on agricultural production for survival, since such production can be supplemented with purchases made by wage earners and pensioners. It should be noted, however, that Cairns' argument is specifically applicable to the South African situation, implying simply that peasant farmers in South Africa may display different attitudes to risk, compared to those elsewhere.

In any case, knowing some of the factors that influence peasant farmers' decisions towards risky alternatives is of paramount importance. It thus becomes necessary that risk attitudes of peasant farmers and the factors that influence their decisions on risky alternatives are assessed before any meaningful and successful support programme for such farmers can be designed and implemented.

Farmers' risk attitudes may be influenced mainly by the agro-ecological zone in which they live, by the crops they grow, and by the sector in which they work. Moreover, farmers' attitudes towards risk may also be influenced by other factors such as location, gender, age, education, size of household, income, etc. The influence of these latter factors is tested in this study.

The main objective of this study is, therefore, to assess risk attitudes of peasant farmers and some of the factors that influence these risk attitudes in the Border region of South Africa. The study will attempt to establish whether

peasant farmers are risk-averse, risk-neutral or risk-preferring in relation to the factors indicated above. Clearly, knowing the risk attitudes of peasant farmers would help to design appropriate support programmes for such farmers.

2. METHODOLOGY

2.1 Data collection

A sample survey was conducted to elicit information on peasant farmers' attitudes to risk. The survey was conducted in three villages in the Border region, which is the study area. The villages Mdlankomo, Mkutukeni and Mbhem's were randomly selected from villages covered by the Keiskammahoek farmer support programme. A list of peasant households was compiled for each sampled village from which a 20% random sample was drawn.

Of the total 50 households sampled for this study, 11 were from Mdlankomo, 14 from Mkutukeni and 25 from Mbhem's. Use was made of hypothetical gambling situations, with no actual monetary payoffs, to assess the response of the peasant farmers to risky choices. A questionnaire was compiled and interviews were conducted to elicit further information regarding personal and household characteristics. The interviews were conducted over a period of eight weeks which roughly works out to seven hours of interview per respondent. The interviews took so long due to the fact that the respondents had low levels of education and hence it took them time to understand the games properly and therefore give reliable responses.

2.2 Analytical technique

With regard to measurement of risk attitudes, a variety of methods have been developed. Nevertheless, the four major methods are direct-elicitation of utility functions, internal measurement of risk aversion, experimental methods, and observed economic behaviour. For details regarding these methods, readers can consult works done by Scott & Baker (1972); Barry & Willman (1976); Binswanger (1980); Musser & Stamoulis (1981); Robinson *et al*. (1984); Antle (1987); Grisley & Kellog (1987); Bardsley & Harris (1987); and Eidman (1989).

Due to lack of farm records by peasant farmers in the study area, none of these methods could be used in this study. Therefore, a modified version of the experimental method was used to analyse the responses of the

respondents to the hypothetical gambling situations constructed for this study. Contingency tables were used to check whether any trends are revealed as far as attitudes of the peasant farmers to risk are concerned.

Where appropriate the Chi-Square (X^2) test was used to test whether factors like geographical location, sex, age, education, size of household and average annual household income have any influence on the behaviour of peasant farmers towards risk. The null hypothesis of the X^2 test was that the two variables being tested are independent while the alternative hypothesis was that the variables are not independent. The null hypothesis shall be accepted when the calculated X^2 value is less than the critical X^2 value and will be rejected if the calculated X^2 value is greater than the critical X^2 value. The level of significance chosen for these tests is 0.05.

3. RESULTS AND DISCUSSIONS

Results from the analysis are presented in two sections. These are (1) characteristics of the respondents, and (2) behaviour patterns. Each of these sections is separately discussed below.

3.1 Characteristics of the respondents

This section deals with characteristics of the respondents according to sex, age group, education, household size and income.

As can be seen from Table 1, 54% of the total respondents were male and 46% female. With regard to age, 34% of the sampled peasant farmers were in the age group of 21-39 years old, 18% in the age group of 60 years and above. With respect to education, 44% of the sample peasant farmers had an education level between none and Standard 5, 52% between Standard 6 and Standard 10 and the remaining 4% had an education level above Standard 10. Regarding household size, 2% of the sample peasant farmers had a household size in the range of 1 to 3, 38% in the range of 4 to 6 and 60% had 7 and above.

Looking at income, 46% of the sampled households earned an annual income of up to R4 999, 20% earned between R5 000 and R9 999, 8% earned between R10 000 and R14 999 and the remaining 26% earned an income of R15 000 and above.

The percentages regarding the various characteristics of the sampled peasant farmers indicate that the sample was fairly representative of age, sex, education, household size and income.

Table 1: Classification of respondents according to gender, age, education, household size, and income

	Village							
	Mdlankomo		Mkutukeni		Mbhem's		Total	
Sex	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Male	5	45.0	5	36.0	17	68.0	27	54.0
Female	6	55.0	9	64.1	8	32.0	23	46.0
Total	**11**	**100.0**	**14**	**100.0**	**25**	**100.0**	**50**	**100.0**
Age group								
21-39	3	27.0	8	57.0	6	24.0	17	34.0
40-59	0	0.0	1	7.0	8	32.0	9	18.0
60 and above	8	73.0	5	36.0	11	44.0	24	48.0
Total	**11**	**100.0**	**14**	**100.0**	**25**	**100.0**	**50**	**100.0**
Household size								
1-3	1	10.0	0	0.0	0	0.0	1	2.0
4-6	5	45.0	5	36.0	9	35.0	19	38.0
7 and above	5	45.0	9	64.0	16	54.0	30	60.0
Total	**11**	**100.0**	**14**	**100.0**	**25**	**100.0**	**50**	**100.0**
Annual household income (R)								
0-4 999	10	90.0	3	21.0	10	40.0	23	46.0
5 000-9 999	1	10.0	2	14.0	7	24.0	10	20.0
10 000-14 999	0	0.0	1	8.0	3	16.0	4	8.0
15 000-above	0	0.0	8	57.0	5	20.0	13	26.0
Total	**11**	**100.0**	**14**	**100.0**	**25**	**100.0**	**50**	**100.0**

3.2 Behaviour patterns

This section attempted to establish the respondents' behaviour pattern in order to determine whether they can be regarded as risk-averse, risk-neutral or risk preferring. These attitudes to risk were assumed to be revealed by the respondents' answers to four different hypothetical gambling situations presented to them. The responses were also analysed in terms of location, sex, age, education, household size and income to determine if any of these factors influence farmers' responses to risk. This procedure was followed for all the gambling situations considered in this study.

The first gambling situation involving a risky choice consisted of tossing a coin and making a choice between heads and tails showing. If a respondent bets heads and heads show, he/she wins R100. If he/she bets heads and tails show, he/she wins nothing. On the other hand, if the respondent bets tails

and tails show, he/she wins R50 but if heads show, he/she still wins R10. The probability of either heads or tails showing in a fair coin is 0.50. A risk-preferring peasant farmer would bet heads in this game, choosing to forfeit the certain amount of R10 for the uncertain amount of R100. A risk-averting peasant farmer would bet tails to make certain that he/she gets R10 and would thus be willing to pay the premium R90 (R100-R10) to avoid the risky chance of heads.

Responses to the game are presented in Table 2. As can be seen from Table 2,

Table 2: Cross-tabulation of location, sex, age, education, household size, and income with choice

	Choice					
	Heads	**Tails**	**Total**	**Calculated value of X^2**	**Table value of X^2**	**d.f.**
Location						
Mdlankomo	9	2	11			
Mkutukeni	13	1	14			
Mbhem's	17	8	25	3.35	5.99	2
Total	**39**	**11**	**50**			
Sex						
Male	20	7	27			
Female	19	4	23	0.53	3.84	1
Total	**39**	**11**	**50**			
Age group						
21-39	14	3	17			
40-59	6	3	9	0.88	5.99	2
>60	19	5	24			
Total	**39**	**11**	**50**			
Formal education						
None to Std. 5	18	4	22			
Std. 6 to Std. 10	19	7	26			
Above Std. 10	2	0	2	1.12	5.99	2
Total	**39**	**11**	**50**			
Household size						
1-3	1	0	1			
4-6	11	8	19			
7 and above	27	3	30	7.28	5.99	2
Total	**39**	**11**	**50**			
Annual household income (R)						

0-4 999	18	5	23			
5 000-9 999	9	1	10	1.44	7.82	3
10 000-14 999	3	1	4			
>15 000	9	4	13			
Total	**39**	**11**	**50**			

of the total number of 50 respondents 39 (78%) bet on heads. This game, therefore, shows that a majority of the farmers in the study area are risk preferring with respect to this particular decision. The result looks convincing but there is one important caveat: the fact that this game did not involve any monetary outlay from the participants or any possibility of a loss, limits the game from playing a major role in indicating this risk-taking attitude.

With regard to the factors influencing risk attitudes of peasant farmers, the null hypothesis is rejected for all the factors with the exception of household size. This simply indicates that geographical location, sex, age, formal education and income have no significant influence on the choices made by the respondents. However, it was found that household size has a significant influence on the choices made by the respondents.

The second gambling situation involved drawing a white ball from any one of two boxes, one red and the other yellow. The red box contained seven black balls and three white balls. The yellow box contained five black balls and five white balls. The probability of success in drawing a white ball from the red box and yellow box respectively is 0.30 and 0.50.

The respondents were asked to choose between the two boxes, from which to draw, in one attempt only, the white ball. Success on the red box had a pay-off equal to twice the participants' monthly income, while failure meant a zero payoff. Success on the yellow box had a payoff equal to half the participant's monthly income while failure had a zero payoff.

A risk-taker would prefer to draw the white ball from the red box. He/she would be willing to forego the relatively safe option of drawing from the yellow box for the more attractive payoff of the red box. The risk averter would do the opposite, that is, he/she would be prepared to pay the risk premium of one and a half times his/her monthly income for the more promising chance on the yellow box.

Responses to this gambling situation are presented in Table 3. Perusal of Table 3 shows that out of the total number of 50 respondents, 40 (80%) preferred to draw the white ball from the red box. This indicates that the great

majority of the farmers in the study area are risk preferring with respect to this particular risky choice. The data from the same table reveal that none of the tested characteristics - location, sex, age, education, household size and income - influenced the choices made by the peasant farmers. This gambling situation, however, does not involve loss. It is, therefore, necessary to conduct another experiment where the gambling situation does involve the possibility of a loss.

Table 3: Cross-tabulation of location, sex, age, education, household size and income with choice

	Choice					
	Red box	**Yellow box**	**Total**	**Calculated value of X^2**	**Table value of X^2**	**d.f.**
Location						
Mdlankomo	7	4	11			
Mkutukeni	11	3	14	2.86	5.99	2
Mbhem's	22	3	25			
Total	**40**	**10**	**50**			
Sex						
Male	23	4	27			
Female	17	6	23	0.99	3.84	1
Total	**40**	**10**	**50**			
Age group						
21-39	13	4	17			
40-59	8	1	9			
>60	19	5	24	0.59	5.99	2
Total	**40**	**10**	**50**			
Formal education						
None to Std. 5	18	4	22			
Std. 6 to Std. 10	20	6	26			
Above Std. 10	2	0	2	0.70	5.99	2
Total	**40**	**10**	**50**			
Household size (no)						
1-3	1	0	1			
4-6	13	6	19			
7 and above	26	4	30	2.68	5.99	2
Total	**40**	**10**	**50**			
Annual household income (R)						
0-4 999	18	5	23			
5 000-9 999	9	1	10			
10 000-14 999	2	2	4	3.09	7.82	3
>15 000	11	2	13			
Total	**40**	**10**	**50**			

The third gambling situation was a variation of the second. The only difference was that success on the red box paid off an amount equal to four times the participant's monthly income and failure meant loss of monthly income. This meant that a participant would have to bet with his/her monthly income that he/she would be able to draw, in one attempt, the white ball from

the red box. The probability of losing the monthly income was equal to the probability of failing to draw the white ball, which is 0.70.

A risk-taker would still choose to draw the white ball from the red box. The risk-taker would base his/her decision on the following assessment: Let the monthly income equal ***X***. The expected income from drawing the white ball from the red box is given by $E(I_r)$ while the expected income from drawing the white ball from the yellow box is given by $E(I_y)$. The probability of drawing the white ball from the red box is P_{wr} and that of black ball from the same box is P_{br}. The corresponding probabilities on the yellow box are P_{wy} and P_{by}.

Let:

$E(I_r)$ = expected income of drawing white ball from red box,
$E(I_y)$ = expected income of drawing white ball from yellow box,
P_{wr} and P_{wy} = probability of drawing white ball from red and yellow boxes respectively, and
P_{br} and P_{by} = probability of drawing black ball from red and yellow boxes.

$$E(I_r) = P_{wr}(4)X+P_{br}(-X)$$
$$= 0.3(4)X+0.7(X)$$
$$= 1.2X-0.7X$$
$$= 0.5X$$

Drawing from the red box would, on average, win an amount equal to half the monthly income.

$$E(I_y) = P_{wy}(0.5)X+P_{by}(0.0)X$$
$$= 0.5(0.5)X+0.5(0.0)X$$
$$= 0.25X+0$$
$$= 0.25X$$

Drawing from the yellow box would, on average, win an amount equal to quarter of the monthly income.

Based on the calculations above, the risk-taker would opt for drawing the white ball from the red box. The risk averter would attempt to draw the white ball from the yellow box. It was felt that this gambling situation would be a more reliable measure of the risk attitudes of the farmers than the previous two as it involved the possibility of a loss.

Responses to this gambling situation are presented in Table 4. Out of the total of 50 respondents, 46 or 92% preferred drawing the white ball from the yellow box and the remaining 4 or 8% preferred drawing from the red box. This indicates that the overwhelming majority of respondents are risk-averse with

Table 4: Cross-tabulation of location, sex, age, education, household size and income with choice

	Choice					
	Red box	**Yellow box**	**Total**	**Calculated value of X^2**	**Table value of X^2**	**d.f.**
Location						
Mdlankomo	1	10	11			
Mkutukeni	2	12	14			
Mbhem's	1	24	25	1.31	5.99	2
Total	**4**	**46**	**50**			
Sex						
Male	2	25	27			
Female	2	21	23	0.03	3.84	1
Total	4	46	50			
Total	**4**	**46**	**50**			
Age group						
21-39	2	15	17			
40-59	0	9	9			
>60	2	22	24	1.12	5.99	2
Total	**4**	**46**	**50**			
Formal education						
none to Std. 5	2	20	22			
Std. 6 to Std. 10	2	24	26			
Above Std. 10	0	2	2	0.21	5.99	2
Total	**4**	**46**	**50**			
Household size (no)						
1-3	0	4	1			
4-6	0	19	19			
7 and above	4	26	30	2.90	5.99	2
Total	**4**	**46**	**50**			
Annual household income (R)						
0-4 999	2	21	23			
5 000-9 999	0	10	10			
10 000-14 999	0	4	4	2.20	7.82	3
>15 000	2	11	13			
Total	**4**	**46**	**50**			

respect to this risky decision. The reason why 92% of the respondents opted for the yellow box is that they were not willing to risk losing their monthly income.

The fourth gambling situation involved the acceptance or rejection of a loan. It was postulated that a respondent had identified a very promising farming operation that required a capital of R20 000 to start off. The respondent can be lent the amount by a lender who requires payment of the principal plus the interest within one year. The farming operation, if successful, is postulated to generate revenue within three months so that the borrower can be able to repay the loan within the time agreed upon. The intention of this gambling situation was to gauge the extent to which the peasant farmers were responsive to loan arrangements for financing risky projects.

Responses from the respondents are presented in Table 5. It seems that majority of the farmers would not like to take the loan. This perhaps indicates that generally peasant farmers in the study area are risk-averse with respect to agriculture loans. The probable reason is that farmers think that they would not be able to run the farming operation successfully.

Table 5: Cross-tabulation of location, level of formal education, and average annual household income, with choice

	Choice						
	Yes	**Not sure**	**No**	**Total**	**Calculated value of X^2**	**Table value of X^2**	**d.f.**
Location							
Mdlankomo	2	7	8	11			
Mkutukeni	8	0	6	17	4.95	9.49	4
Mbhem's	12	2	11	25			
Total	**22**	**3**	**23**	**50**			
Formal education							
none to Std. 5	3	3	16	22			
Std. 6 to Std. 10	17	0	9	26	17.06	9.49	4
Above Std. 10	2	0	0	2			
Total	**22**	**3**	**23**	**50**			
Annual household income (R)							
0-4 999	2	3	18	23			
5 000-9 999	6	0	4	10	23.86	12.59	6
10 000-14 999	3	0	1	4			
>15 000	11	0	2	25			
Total	**22**	**3**	**23**	**50**			

Of the five demographic factors that are expected to influence farmers' decisions on taking agricultural loans, only formal education and income were found to have an influence. With regard to education the observation suggests that acceptance of the loan grows with increasing level of education.

With respect to income, the observation suggests that the higher the household income, the more prepared such a household is to take the agricultural loan.

4. CONCLUDING REMARKS

The results from the third and fourth experiments have confirmed that peasant farmers in the study area display a risk aversion attitude to actions that have potential threat to their subsistence incomes. However, when the gambles involve no monetary loss (first and second experiments) the majority of the respondents opted for choices that promised bigger payoffs, even though the probability of wining the bigger paying option is considerably less. The results generally revealed that peasant farmers are willing to take some risks as long as their doing so does not threaten their survival.

Peasant farmers in the study area seem to have a risk-averse attitude towards agricultural credit. This does not, however, mean that peasant farmers do not like to take loans. This observation should be viewed against the observation that their level of income seems to influence their receptiveness to the loan. The experiment indicates that a majority of the respondents (78%), in the lowest income category, would not consider taking the loan, while about 85% of those in the highest income bracket, would take the loan.

It is clear that in-depth research on peasant farmers' attitudes to risk needs to be undertaken in the Farmer Support Programme target areas in South Africa. The multitude of factors that may influence peasants' choice of risky alternatives must be considered and vigorously investigated. The in-depth research should be conducted in such a way that the quantity and quality of data gathered would allow indicating the magnitude of risk in the various Farmer Support Programme target areas.

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