CHAPTER SIX: ANALYSIS AND RESULTS

6.1 INTRODUCTION

The empirical results of the study are presented in this chapter. The chapter is divided into three main sections. The data description and analyses are presented in the first section. The second section deals with the estimates of the credit impact on productivity. The discussions focus mainly on three estimates: a) probit equation, b) output supply equation and c) credit effect measures. The last section focuses on the accessibility of credit to small-scale farmers. Indicators and factors influencing accessibility are discussed. Tabular analysis is also used to verify the differential access to credit within the small-scale farming sector. The chapter ends with a summary and conclusions arising out of the analysis.

6.2 DATA DESCRIPTION AND ANALYSES

This sub-section considers three main items, namely demographic characteristics, household production and incomes, and financial transactions of households sampled.

6.2.1 Demographic characteristics of households

Table 6.1 presents the demographic characteristics of the sample households. The analyses were based on the pooled data, credit status and farm size. About 83 per cent of farmers cultivate on communal lands; only 17 per cent have title deeds to their farmlands. The growth in title deeds in the area might be attributed to the land reform programme curently taking place. The average farmily size is 6, while on average two family members are involved in farming. However, with non-borrowers, 3 members of the family are involved in farming. The average age of household heads in the sample is 45, with borrowers being, on average, three years older than non-borrowers (47 versus 44). Some 57% of household heads have either no education or have attended school up to standard 6. Overall, borrowers tend to have higher education than non-borrowers.

6.2.2 Household production and incomes

Houshold production and incomes values are presented in Table 6.2. With the pooled data, the overall average farm size is 2.45 hectares. Borrowers, however, cultivated more than non-borrowers (3.2 hectares versus 1.9 hectares). On average, farm incomes for both borrowers and farmers with an average farm size greater than 2 hectares were higher than non-borrowers and farmers with an average land size of less than 2 hectares. For non-farm income, the opposite was the case; the latter groups have higher non-farm incomes. One conclusion that may be advanced is that most of the members of the latter groups are part-time farmers. Overall, borrowers and farmers with farm size equal or greater than 2 hectares have higher values for most of the chracteristics than non-borrowers and those with farm size less than 2 hectares.

6.2.3 Financial transactions

About 29.4 per cent of the sampled farmers have obtained loans during that particular growing season when the survey was conducted. These loans came from two main sources, namely: the Agricultural and Rural Development Corporation (ARDC) and Land Bank of South Africa (Land Bank). The ARDC constitutes the single largest credit provider in the study areas when the survey was conducted.

Interest rates charged ranged from 15% to 20%. None of the farmers indicated that they were asked to provide collateral before getting the loan. The major requirement was the loan contract which borrowers have to sign. The long processing period before loans can be disbursed was ranked first among the difficulties in applying for loans. Thus, it appears that collateral requirements are not a major factor constraining the access of small-scale farmers to formal loans in the study areas.

Table 6. 1: Average demographic characteristics of all sample households and two different sub-samples

Variable	All farmers (n =153)	Borrower (n=45)	Non-Borrower (n=108)	T-test	Group A < 2ha (n=93)	Group B ≥ 2ha (n=60)	T-test
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education 1 = no education – Std 5 2 = Std 6– Std 12 3 = above Std 12	 1= 57% 2= 27% 3=16%	 1= 52 2= 33 3= 15	 1= 61 2= 24 3= 15	 1.7*** 1.27*** 0.06***	 1= 53 2= 30 3= 17	 1= 61 2= 25 3= 14	1.07
Family Labour	2.39 (1.247)	2.0492 (0.8450)	2.6180 (1.4180)	-3.07**	2.5556 (1.342)	2.1333 (1.049)	2.16*
Land Ownership	0 = 83% 1 = 17%	72 28	92 8	3.75****	0 = 89 1= 11	0 = 75 1= 25	1.02***
Age of Household Head	45 (16.067)	47 (15.672)	44 (16313)	1.10	44.3556 (15.943)	46.30000 (16.315)	-0.72
Sex of Household Head	1= 52% 0= 48%	43 57	59 41	2.34	1= 56 0= 44	1= 43 0= 57	4.99**
Family size	63 (0.02446)	6 (0.2810)	6 (0.2877)	1.22	6 (0.2872)	6 (0.2447)	0.77
Remittances & Pensions	6725.47 (541.06)	3454.59 (992.19)	7029.30 (658.78)	-5.02****	5930.3333 (418.776)	5043.4667 (607.457)	0.99
Savings	1176.97 (2413.84)	2071.08 (3057.43)	564.15 (1599.35)	3.53***	783.9889 (1927.814)	1766.4333 (2918.831)	-2.29*

Standard deviations are in parentheses
Significance levels: p = 0.0001**** ; p = 0.001***; p = 0.01**; p = 0.1*

Table 6. 2: Average household production and incomes of all sample households and two different sub-samples

Variable	All farmers (n =153)	Borrower (n=45)	Non-Borrower (n=108)	T-test	Group A < 2ha (n=93)	Group B ≥ 2ha (n=60)	T-test
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Farm Income	2020.97 (542.64)	3236.56 (6661.69)	896.56 (2080.34)	2.66**	800.01 (1653.392)	3420.3833 (6828.686)	-2.92**
Non-Farm Income	2539.01 (1964.88)	2036.70 (1092.90)	3046.21 (2369.73)	1.77*	1154.4111 (2443.065)	365.9167 (605.826)	293**
Area Cultivated	2.45 (2.629)	3.2169 (2.9940)	1.9288 (2.2160)	2.87***	1.18 (0.417)	4.3515 (3.329)	-7.32****
Value of yield per hectare	828.58 (59.1799)	1179.3200 ((81.6505	641.8125 (0.2877)	3.82***	693.8842 (33.7159)	1110.1710 (89.7597)	2.25****
Total loan	1675.60 (363.79832)	4513.1212 (514.8400)	-	-	657.7778 (169.0096)	3601.6670 (574.0405)	3.04****
Value of fertiliser used per hectare	83.40 (4.1703)	114.8852 (5.4238)	69.2022 (3.4285_	3.14****	77.0000 (3.7275)	103.9521 (6.2398)	1.27**
Seeds used per hectare	5.89 (0.1131)	6.5377 (0.1512)	5.4843 (0.0985)	2.22**	5.4933 (0.0945)	6.5417 (0.1582)	1.22
Value of other inputs used per hectare	120.29 (5.3247)	153.6.66 (6.6899)	104.0449 (4.5752)	1.66*	113.3333 (4.8472)	140.5000 (7.5518)	2.29****
Labour inputs per hectare (in mandays)	14.48 (0.4184)	16.4590 (0.5934)	13.4494 (0.3878)	3.40****	14.0444 (0.4494_	15.6167 (0.5544)	1.79**
Family labour used	2 (0.0949)	2 (0.1503)	3 (0.1503)0	1.95	2 (0.1315)	2 (0.1606)	1.09

Standard deviations are in parentheses
Significance levels: p = 0.0001**** ; p =0.001***; p = 0.01**; p = 0.1*

Table 6. 3: Credit status and sources of credit in the survey area

Items	Number of farmers	% share of total	Interest rate	Collateral
Credit status				
With loan	45	29.4		-
Without loan	108	76.6		-
Total	**153**	**100**		-
Sources of credit				
ARDC	35	77.7	13	No
Land bank	10	22.3	15	No

The reasons given for not asking for loans are presented in Table 6.4. The most common reason for not asking for a loan was that the request would be rejected (43%). This is followed by those "still owing" (25%). Thus, it appears that there is a high default rate in the study areas, especially the Northern region (29%). "Not knowing where to apply for a loan" had the third largest share of respondents among the reasons (15%).

Table 6. 4: Reasons for not asking for loan (in percentages)

Reasons	Lowveld	Northern	All
I am still owing	20	29	25
Household has sufficient savings	1	5	3
Do not like to incur debt	5	3	5
Do not know how/where to apply	16	17	15
Do not apply because the request will be rejected	43	43	43
Interest rate too high	15	1	8
Other reasons	-	2	1

About 97.4 per cent of the sampled farmers obtained other financial services from formal financial institutions in the study areas. The most commonly received financial service is savings accounts (about 94.0%). See Table 6.5. The results suggest that there is a high demand for other financial services, particularly savings, among small-scale farmers in the study areas.

Table 6. 5 Other financial services obtained by the sampled farmers

Item	Number of farmers	% share of total
Obtained other financial services		
YES	149	97.4
NO	4	2.6
If Yes, type of services obtained		
Savings account	140	94.0
Cheque account	8	5.4
Payments and transfers	1	0.6

6.3 THE IMPACT OF CREDIT ON PRODUCTIVITY

Credit market intervention and credit liberalisation policies have been justified on the ground that they improve access to formal credit for small-scale farmers (Carter, 1989:13). The crux of the matter is: is accessibility to credit really necessary? And if it is, does credit actually enhance productivity of small-scale farmers? It is, however, argued that productivity will be enhanced by relaxing financial constraints through the provision of credit.

As indicated earlier in the previous discussions of the socio-economic characteristics of the target population, borrowers appear to perform better than non-borrowers in terms of productivity (See Table 6.1, columns 3 – 4). The descriptive statistics reported in Table 6.1 reveal a positive association between credit, input use and farm productivity. At first glance, these descriptive statistics seem to imply that limited working capital constrained input use and productivity on non-borrowing farms, ratifying the hypothesis of inefficient rural financial markets. However, such an inference from these statistics would have the serious weakness that it attributes all variations between the groups to the use of credit. Other attributes of farms and farmers in the two sub-samples may be responsible for at least some differences in resource use and productivity (Sail & Carter, 1996: 774). In an effort to resolve this attribution problem, endogenous switching regression is applied. The remainder of this section is divided into three sub-sections, namely: results of the probit analysis, results of the output supply estimation, and estimates of credit effects.

6.3.1 Results of the probit analysis

The results of the probit estimates are presented in Table 6.6. Non-farm income and remittances and pensions are statistically significantly different from zero at P=0.001 and have the theoretically predicted negative signs. The results indicate that the higher the non-farm income, and remittances and pension the farmer has, the less likely it is that he or she will take a loan. This is consistent with the "pecking order theory". The more assets the farmer has, the more likely it is that the farmer will not seek external funds, but utilise internal resources to operate the farm. With the pecking order theory a farmer chooses from a hierarchy of preferences in deciding on the source of finance to utilise. This choice is based on the "safety first principle" with internal funds being the safest (i.e. defined as not potentially causing the farmer to lose control, ownership and decision making in the firm) among the choices (Lapar *et al*, 1995: 9-10). These results validate this statement. Another reason might be poor repayment rates in the area; most might have been denied access to credit because they have defaulted. The significant, negative coefficient of the repayment variable validates this statement. The savings variable also has a negative coefficient, and is significant at p = 0.0001. As pointed out by Fenwick and Lyne (1998:501), formal savings are more of a substitute for credit than a source of information and collateral to lenders.

Farm size has a positive sign and is significant at p= 0.01. The bigger the farm size, the more likely it is that the farmer would obtain loans. Larger farm size affects the amount of the loan needed through a greater need for variable cash inputs, hence increasing the need for credit (Sial & Carter, 1996). These results are consistent with other results (e.g. Sial & Carter, 1996 and Feder *et al,* 1988). Transaction costs associated with many small loans act as a disincentive for lenders and the cost of credit to small farmers is likely to increase. In the presence of fixed transaction costs, the cost of borrowing in the formal credit market is therefore a declining function of the farm size (Mbowa & Nieuwoudt, 1999:337; Binswanger *et al,* 1992:26).

Land ownership has a positive sign and is statistically significant at P = 0.1. Individual ownership of land improves the ability of a farmer to obtain loans. Ownership, as

opposed to rental or the use of communal lands, increases the size of the loan because it may increase long-run investment incentives and the collateral value of the land to lenders (FAO, 1996). This confirms that the pledging of land collateral significantly increases the amount of credit offered by institutional lenders as compared to cases where there is no collateral. The family stock has a negative coefficient, implying that larger farm families have a smaller tendency to obtain loans. Family members may substitute labour for cash inputs like herbicides, etc., and /or sell additional family labour on the market, and in turn use off-farm income to purchase cash inputs, hence reducing the need for a loan.

The regional variable of the Lowveld region showed a positive coefficient and was significant at $p = 0.0001$, whilst that of the Northern region had a negative yet significant coefficient. These results imply that small-scale farmers in the Lowveld region are more likely to obtain loans than those in the Northern region. This may be ascribed to the greater number of financial institutions in the Lowveld region than the Northern region, or the greater number of individual owners with title deeds.

The joint hypothesis that all the coefficients of the probit equation are zero is rejected at the $P = 0.01$. The completed value of –2 (log likelihood ratio) is 169.6867 and this is larger than the $P = 0.01$critical value of X^2 (10 degrees of freedom) which is 23.209. Eighty one per cent of the observed variables are properly classified as being credit constrained or unconstrained, implying a fairly good fit. The coefficients of these variables were used to construct the cumulative probability functions and the probability density function, which are used as regressors in the endogenous switching regression estimations.

Table 6. 6: Estimated coefficients of the probit equation

Varaibles	Coefficient
Constant	0.1022 (0.7266)
Age (years)	0.0007 (0.0072)
Farm Income	0.0005 (0.0001)
Non-farm income	-0.0012*** (0.0001)
Remittances & Pensions	-0.0081*** (0.0000)
Financial assets	-0.2589**** (0.0125)
Education	-0.1236 (0.1889)
Gender	-0.1130 (0.2785)
Farm Size (Ha)	0.3815** (0.1398)
Family labour stock	-0.2589** (0.1123)
Landownership	0.5572* (0.4519)
Repayment	-0.9661* (0.0212)
Regional variable	
Northern	-0.2589** (0.0124)
Lowveld	0.7898**** (0.0211)
Log likehood ratio	-169.6863
Percentage correctly predicted	81.0000

Standard errors are in parentheses
Significance levels: p = 0.0001**** ; p = 0.001***; p = 0.01**; p = 0.1*

6.3.2 Results of the output supply equation

Table 6.7 presents the results of the output supply models. Three variants of the output supply equation are estimated: the full switching model, the restricted model, and the OLS model. The difference between the full and the restricted model is that the latter

ensures that there are no added returns to observable or unobservable characteristics of the farm and the farmer resulting from the use of credit, i.e. the δ

Table 6. 7: Estimated coefficients of the endogenous switching regression model

Variables	OLS	Endogenous Switching Regressions		
		Full Switching Model		Restricted Model
		All Producers	Borrowers Differential	
Constant	14.8749****	8.2072**** (0.2721)	3.2725 (0.0021)	12.3272**** (0.7291)
Age (years)	-1.7946 (1.6426)	-0.0375**** (0.1257)	1.2107 (0.2433)	-2.2288 (0.1078)
Extension	-0.0727 (0.0012)	3.7218**** (1.2789)	4.7821 (2.1111)	0.0078**** (0.0182)
Labour input (Mandays)	1.2742*** (0.0001)	0.0321 (0.0080)	0.7821 (0.1248)	0.0370 (0.0108)
Seed used (Kg per ha).	2.8910**** (0.5344)	0.0234**** (4.2750)	0.0400 (0.0124)	0.1070*** (0.1120)
Remittances	-0.0027 (0.0059)	-0.5478**** (0.7891)	0.05071 (0.1178)	-1.9515 (0.2861)
Value of fertiliser used (R per ha)	4.2443* (1.0415)	0.0029 (1.2701	1.7629 (0.0902)	0.3989*** (0.2128)
Education	8.8597* (1.3588)	-0.0971** (0.0247)	0.8921 (0.1183)	2.1082* (1.2827)
Gender	-7.8787**** (0.0027)	-4.2879 (0.2777)	-6.7811 (2.8912)	-1.2777 (0.2991)
Farm Size (Ha)	15.3399**** (0.3183)	8.0027* (0.1796)	2.0782 (1.8261)	2.8912** (1.2828)
Family labour stock	0.0027*** (0.0012)	1.7823 (0.2861)	3.8795 (1.6666)	4.8007*** (1.2018)
Land ownership	0.0257***** (0.0012)	1.7618**** (0.1928)	1.2674 (0.1007)	2.2411**** (0.1189)
Value of other inputs	3.4949*** (0.7020)	4.7628**** (2.1864)	0.9794 (0.1128)	0.0126*** (0.1246)
Regional variable				
Northern	-0.2361 (0.0251)	-0.6789* (0.1258)	0.9999 (0.5698)	1.2546**** (0.4589)
Lowveld	0.0625**** (0.0347)	0.8572**** (0.4789)	0.2587 (0.1247)	3.5789**** (0.2365)
Loan amount	0.0547 (0.0199)	-	0.0021* (0.0111)	0.0218** (0.1010)
Loan amount square	-0.0001**** (0.0021)	-	0.0005* (0.0001)	0.0010 (0.1201)
Pdf	-	-	-0.9264 (0.2486)	-
R^2 (adjusted)	0.742		0.701	0.730

Standard errors are in parentheses
*Significance levels: p = 0.0001**** ; p = 0.001***; p = 0.01**; p = 0.1**

δ ;and (ρ_c - ρ_n) parameters are equal to zero. The former therefore allows for the estimation of the direct credit effect parameters (that is, the α) and the indirect effect parameters (that is δ, and (ρ_c - ρ_n)). The direct effect parameters give the increase in output supply due to the use of the loan. Indirect credit effects represent the additional returns to observable and unobservable endowments which occur when credit is used. The full switching regression estimates show that borrowers do not enjoy differential returns from observable endowments as indicated by their estimated δ values, none of which are statistically significant at the P = 0.01 (see Table 6.7). It was also impossible to reject the hypothesis that aside from the direct effect of a loan, borrowers experience no additional returns to their unobservable endowments and attributes, that is the estimated coefficient representing (ρ_c - ρ_n) is not significantly different from zero at p =0.01. The restricted equation was therefore estimated to reflect these restrictions in the full switching model. The discussions will therefore be limited to the restricted model. The OLS model was estimated in order to get parameter estimates to be used in computing the gross output supply gap.

Seed, fertiliser and other inputs usage coefficients are statistically significant at p = 0.001 and have the expected signs. This implies that the more these inputs are used the higher is the output. The results are consistent with other results (e.g. Panin, 1999; Carter, 1989). The land ownership coefficient is positive and significant at p =0.0001. This implies that farmers with individual title deeds are more likely to invest in the land in order to produce more output.

The farm size coefficient has a positive sign and is significant at p =0.01. The bigger the farm sizes, the bigger the expected output to be produced. The results show that large farms are relatively better equipped in human resource capital, and are in a better position to adopt appropriate farming methods (Mbowa & Nieuwoudt, 1999:350). The education coefficient is significant at p= 0.1, which implies that the more educated farmers are more productive. The number of years of schooling is an indicator of human capital, which affects efficiency positively. Higher human capital increases the marginal productivity of variable inputs and the derived demand for cash. The performance of this variable compares favourably with the results obtained in Panin (1999). The results

suggest that education has a positive and significant impact on smallholder crop production systems.

The family labour stock coefficient is statistically significant at p =0.001 and has a positive sign. This implies that as the family size increases output also increases. This is because more labour can be utilised to produce more output. The regional dummy for the Lowveld has a statistically significant positive coefficient, whilst the coefficient for the Northern region dummy has a negative sign. Both are significant at p=0.0001. This implies that farmers in the Lowveld region have a higher output relative to farmers in the Northern region.

The loan amount variable has a positive coefficient. Borrowed funds can affect output by allowing the farmer to use more optimal levels of inputs, newer technology, and more intense input use. Additional funds help farmers overcome financial constraints on the purchase and allocation of optimal inputs, thereby allowing the entrepreneur allocative efficiency and output to increase (Lapar *et al,* 1995:11). The estimated output supply model has an adjusted R^2 value of 0.73, implying that the estimated equation explains 73% of the variations in the value of output.

6.3.3 Estimated credit effects

The credit effects coefficients were calculated using the coefficients of the restricted model. The loan variable was significant at p = 0.01, whilst the loan square variable was insignificant at p = 0.10. The joint hypothesis that the coefficients of the two variables are equal to zero is rejected at p =0.01, hence both coefficients are used in estimating the credit effects. The credit effect measures discussed in Sections 5.4.1 and 5.4.2 are used in the analysis. Table 6.8 presents the estimates for the credit effect measures.

The marginal credit effect at mean loan size is estimated to be 1.35 and is statistically significant at p = 0.0001. This implies that the marginal output effect of one rand of loan is R1.35. The marginal credit effect at mean loan size gives an indication of the optimality of the loan size. The results indicate that the observed mean loan amount is

below the income maximising the size, since the estimated marginal net return of 35 per cent exceeds the average 18 per cent interest charged[10].

Table 6. 8: Estimates of credit effects on output supply

Credit Effect Measures	Restricted Model	OLS Estimates
Marginal credit effects (per Rand) at mean loan size	1.35** (0.025)	
Marginal credit effects (per rand) at zero loan size	2.10**** (0.121)	
Random credit effects at mean loan size[11]	0.2169**** (0.002)	
Gross Gap: borrower, non-borrower[12]	-	0.4006**** (0.102)
Adams gap	-	0.184

Figures in parenthese are standard errors
*Significance levels: p = 0.0001**** ; p = 0.001***; p = 0.01**; p = 0.1**; p = 0.1*

When estimated at zero loan size the marginal credit effect is estimated to be 2.10, implying a potential increase of more than two Rands in output for every R1 of loan. A randomly selected individual with zero formal credit is estimated to be sufficiently capital constrained that he/she would generate an additional R2.10 worth of output with a R1 loan thus indicating a 100 per cent shadow price of the credit for a randomly selected individual who has no credit. The results strengthen the inefficiency hypothesis of rural credit markets.

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10 *The average interest rate levied on the sampled borrowers was 18 per cent. Information on transaction costs was not collected, hence it was not included in this average interest rate.*

11 *Under the restricted model specification, counterfactual and random credit effect estimates are the same.*

12 *In terms of consistent structure parameters in Equation (7) of Chapter 5, the gross output supply gap in equation (6) can be decomposed as follows:* $\delta^i Z_i + \alpha^i l_i + E(V_{ic}| Li = 1) - E(V_{in}| L_i = 0) = \delta^i Z_i + \alpha^i l + \rho_c \lambda_i^c - \rho_n \lambda_i^n$ *Adding and subtracting* $\rho_n \lambda_i^c$ *and rearranging terms yields:* $[\rho_n(\lambda_i^c - \lambda_i^n)] + [\delta^i Z_i + \alpha^i l] + [(\rho_c - \rho_n)\lambda_i^c]$. *The expected output supply gap between borrowers and non-borrowers is the sum of the Adams Gap, the Random Credit Effects, and the added gains borrowers achieve for the latent attributes when they use credit. The Adams gap is given by the term in the first square bracket and reflects pre-existing differentiation among small holders. The second two terms measure the additional differentiation induced by the credit programme. Given* $\rho_n = \rho_c$ *(implying no added returns to borrower's latent*

Sial and Carter (1996:771) argue that in such an environment, provision of interest rate subsidies on formal credit is not a rational economic policy since it may reduce, rather than improve, the access to credit. There is also a strong indication that the small-scale farmers are capable of realising such high rates of return on capital that they can potentially pay market rates of interest. In addition, a high shadow price of capital signals the absence or weakness of insurance markets (and their social substitutes), and a reliance upon autarkic insurance strategies under which individuals divert investable wealth from productive investment to assets that generate low or even negative rates of returns.

The random credit effect at the mean loan size is 0.2169, significantly different from zero at p = 0.0001. This implies that a hundred per cent increase in loans would yield a 21.7 per cent increase in output. In other words, the credit effect on an individual selected at random from the overall population of small-scale farmers in the study area to join a credit programme would be a 21.7 per cent increase in output. The anticipated output of a self-selecting borrower is also estimated to be 21.7 per cent larger than if the farmer were in the counterfactual state of being a non-borrower. As indicated earlier, the random credit effect and the counterfactual credit effect are equal under the restricted model.

The Adams gap, which reflects the effects arising from pre-existing differences among borrowers and non-borrowers, is computed at 0.184. This implies that borrowers do have an advantage in performance as a result of inherent characteristics compared with non-borrowers, when operating without credit. Thus, about 18.4 per cent of the difference in output between borrowers and non-borrowers is due to pre-existing differences between them. The results confirm the statement of Adams (1988) that borrowers may perform better than non-borrowers even without credit because they are inherently more productive than non-borrowers.

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attributes), the gross output supply gap can be written as the sum of the Adams gap and the Random Credit effects as follows: $[\rho_n(\lambda_i^c - \lambda_i^n)] + [\delta' Z_i + \alpha' l]$.

The OLS estimate of the gross gap between borrowers and non-borrowers is 40.1 per cent. This is the sum of the Adams gap and the random credit effect. This implies a gross gap of 40.1 per cent between endogenously sorted borrowers and non-borrowers. The results suggest that, overall, borrowers have a higher output than non-borrowers (about 40 per cent higher). This difference is due to both the use of credit and inherent characteristics.

6.4 ACCESS TO FORMAL CREDIT OF SMALL SCALE FARMERS

In this sub-section, two types of analyses are presented: a tabular analysis (to verify the differential access of credit within the small-scale farming sector), and logistic regression (to determine factors affecting small-scale farmers' access to formal credit).

6.4.1 Differential access to formal credit within the small farming sector

The relationship between formal loans and the size of holdings in the study area is shown in Table 6.9. Out of 153 farm holdings 29.4 per cent had borrowed from formal institutions. The proportion of households borrowing was as low as 26.1 per cent in the first group. The table shows that the proportion of household borrowing from formal credit institutions increases as the size of holdings increase. It is highest in the last two groups.

The percentage share of total formal credit received by each group is given in column 5. The values indicate highly skewed access for different size groups. They show greater access for households with larger farm sizes than households with smaller farm sizes. Of the total amount borrowed, only 14.89 percent was borrowed by the farm households operating up to 1 hectare of land, while this group accounts for 30.67 percent of the total sample of farm households. The share of group 2 and group 3 are 16.6% and 10.35% respectively.

Table 6. 9: Proportion of formal loans according to size of holdings

Group	Percentage of households in the group	Percentage of farmer borrowing	Percentage of area owned in terms of total area	Size of group's share (%) of total formal credit	Formal loan as percentage of total amount borrowed
1	2	3	4	5	6
Group 1 (Up to 1ha)	30.67	26.1****	17.47	14.89	16.09***
Group 2 (1.01- 2 ha)	32.00	33.3****	19.32	16.60	33.45**
Group 3 (2.01- 3 ha)	14.67	36.4****	15.57	10.35	45.21**
Group 4 (3.01- 4 ha)	10.66	68.8****	16.74	19.18	60.75*
Group 5 (4 ha and above)	12.00	77.8****	30.90	38.98	62.05****
Total	**100**	**29.4**	**100**	**100**	**42.75**

*Significance levels: p = 0.0001**** ; p = 0.001***; p = 0.01**; p = 0.1**; p = 0.1*

Group 4 (3.01 - 4 ha) and Group 5 (above 4 ha) had 19.18 per cent and 38,98 per cent of the total amount borrowed respectively, while these groups constitute only 10.66 per cent and 12 per cent of the households respectively. In absolute terms, this group obtained more credit than the above groups. What this really demonstrates is that farmers with farms greater then 3 hectares, although representing only 22.7 per cent of all farmers, received 68.2 per cent of all loans. In contrast, those farms with less than or equal to 2 hectares, representing 62.7 per cent of farmers, received 31.5 per cent of all loans. The results suggest that credit tends to gravitate towards holders of larger farm sizes. This is in line with other findings (Mbowa & Nieuwoudt, 1999; Amjad (1993). The results in column 6 indicate that more than 57.2 per cent of the funds invested in farming by the sampled small farmers came from informal credit and other sources like pensions and remittances, while formal loans constituted 42.75 per cent of the total.

The access ratio formulas in Section 5.4.2 were also used to analyse the differential access to credit within the small farming sector. Table 6.10 presents the access ratios. The value of ratio 1, for the group with the smallest farms is 0.64; the ratio increases as the size of holding increases. This ratio reaches a maximum of 1.91 for the group with the larger farm sizes, showing a greater access to credit. Ratio 2 shows a similar pattern, the group with smallest farms had the lowest ratio. Examining the pattern of the two ratios, it can be argued that farmers operating up to 3 hectares have less than equal access to formal credit, while those farmers operating above 3 hectares have more than equal access to these sources. Due to the inaccessibility of formal credit, the farmers on smaller holdings have to borrow from informal sources. The ratios show that the group with the smallest farms have a high dependence on informal credit sources.

Table 6. 10: Access ratios by size of holding

Size of holding	Ratio 1	Ratio 2
Up to 1 ha	0.64	0.85
1.01- 2 ha	0.82	0.86
2.01- 3 ha	0.89	0.66
3.01- 4 ha	1.69	1.45
4 ha and above	1.91	1.26

6.4.2 Factors affecting small farmers' access to formal credit

Now the question arises as to which specific variables influence farm households' access to formal credit. Which economic, demographic and physical factors enhance or limit small-scale farmers' decisions to borrow from formal sources. The use or non-use of formal credit sources is explained by using logistic regression analysis. In logistic regression one can directly estimate the probability of an event occurring. It predicts whether an event will occur or not, and it identifies the variables that are useful in making this prediction. Table 6.11 presents the results of the logistic regression. It includes the results for all sample farmers as well as for group A (farmers operating less than 2 hectares) and group B (farmers operating equal to or more than 2 hectares).

Table 6. 11: Logistic regression estimates

Explanatory variables	All Farmers	Group A (area < 2 ha)	Group B (area ≥ 2 ha)
Area cultivated	0.0203** (0.0377)	1.3878* (2.6797)	0.1427 (0.4179)
Education	0.4146** (1.5522)	0.2137 (0.2202)	1.3187**** (2.4322)
Farm Income	0.0001 (0.9800)	0.0002 (0.3885)	0.0001 (0.1422)
Family Labour	-0.6145** (6.8722)	-0.8253* (5.8796)	-0.9628* (3.5307)
Tenurial 1 = title deed 0= no title deed	1.1022* (2.2095)	2.3364* (2.8983)	1.3185 (0.9089)
Sex of Head of Household 1 = male, 0 = female	0.2289 (0.2384)	0.6153 (0.8870)	1.5038 (1.6270)
Non Farm Income	-0.0004** (4.5266)	-0.0003* (3.5710)	-0.0016* (2.5342)
Remittance & Pension	-0.004**** (20.2410)	-0.0002** (5.5238)	-0.0011*** (11.5629)
Savings	0.0006*** (10.6794)	0.0005** (6.3400)	0.0010*** (8.6302)
Awareness	0.9669* (0.0257)	1.2380* (1.0587)	0.1478** (0.2587)
Repayment	-0.1478*** (0.1561)	-0.7220 (0.0012)	-0.9658 (0.1587)

Explanatory variables	All Farmers	Group A (area < 2 ha)	Group B (area ≥ 2 ha)
Age of household	0.0026 (0.0351)	0.0025 (0.0178)	0.0040 (0.0174)
Constant	1.1285** (0.6522)	1.9068 (0.8222)	6.0628* (2.7496)
-2 log likelihood	124.440	68.309	33.445
Model chi-square	78.247****	38.042****	47.317****
% of correct Predictions - Overall - Borrowers	 85.33 81.97	 84.44 56.00	 88.33 88.89
No. of Observations	150	90	60

Figures in parentheses are Wald Statistics
Significance levels: p = 0.0001**** ; p = 0.001***; p = 0.01**; p = 0.1*

Area cultivated has a positive coefficient and it is significant at p=0.1 for the whole sample and also for the smaller farm size group (less than 2 ha). This implies that farmers with larger farms have better access to credit. The size of the farm cultivated has been one of the major criteria which formal institutions and intermedaries have used in their provision of credits to farmers. The result is consistent with other results (Mokoena *et al*, 1997; Kashuliza & Kydd, 1996).

Non-farm income and remittances and pensions (income transfers) have the expected signs, and were significant at p= 0.01 and p= 0.0001 respectively. Availability of non farm income, and remittances and pensions, are assumed to reduce demand for credit since the funds thus available can be used to purchase inputs for production (Amjad, 1993:7). Family labour has a negative coefficient, and is significant at p=0.1. This indicates a negative relation between family labour and accessibility of credit. Its influence to accessibility is similar to that of non-farm income and remittances and pensions, thus it can be used to substitute for credit.

The title deed has a positive sign and is statistically significant at p= 0.1. A title deed is expected to be positively related to credit, as formal lenders insist on collateral, particularly ownership rights to land. Thus, tenants have less chance of getting credit than owner cultivators. Savings have a positive coefficient, and are significant at p= 0.001. Formal savings aid in consumption smoothing and are expected to substitute for

credit, especially when they are deposited with institutions distinct from those providing credit (Fenwick & Lyne, 1998:499). In the study areas, observed loans were provided by suppliers and not by formal saving institutions. Consequently, savings accounts had little value to lenders as sources of informal collateral. The awareness variable has a positive coefficient; implying that awareness has a strong bearing on accessibility of credit to small-scale farmers. The Repayment variable had an unexpected significant negative coefficient. This unexpected sign might be due to the poor repayment record of the farmers in the study areas.

For the groups A and B, most of the parameters have the expected relationship; the patterns are similar except for the area cultivated under group B, which is not significant. On the whole, area cultivated; family labour; title deed; non-farm income; remittances and pensions (social benefits) and savings are found to be important variables, which could be used to predict accessibility to credit for small scale farmers in the study area.

On the whole the regression is significant with a high prediction rate and high values for the log likelihood ratio and goodness-of-fit statistic. This also rejects the joint hypothesis that all coefficients in the access equation are zero.

6.5 SUMMARY AND CONCLUSION

In this chapter the empirical results of the study were discussed, revealing the following:

- The marginal credit effect at mean loan size is estimated to be 1.35, implying that the marginal output effect of R1 of loan is R1.35. This estimated marginal credit effect indicates that the average loan amount is below the income maximising size since the estimated marginal net return of 35 per cent exceeds the average interest rate of 18 per cent experienced by the sampled borrowers; the marginal return exceeds this by 17 percentage points.

- The marginal credit effect at zero loan size is estimated to be 2.10. A randomly selected individual farmer with zero formal credit would generate an additional

R2.10 worth of output with a R1 loan. The result implies a shadow price of capital of 110 per cent for a randomly selected individual who has no credit; suggesting a potentially high return for loans to small-scale farmers in the study area.

- The random credit effect at mean loan size is estimated to be 0.22 per cent, which implies that a 100 per cent increase in loan would yield a 22 per cent increase in output.

- The OLS estimate of the Gross gap between borrowers and non-borrowers is estimated to be 40.1 per cent, with an Adams gap of about 18.4 per cent. This indicates that both credit use and latent borrower characteristics contribute significantly to productivity.

- About 29.4 % of the farmers sampled for the study had access to formal credit. More than 57% of the credit used by small farmers comes from informal credit and other sources like pensions and remittances. Access to formal credit is also highly skewed, and shows greater access for farmers with larger farm sizes than to those with smaller farm sizes.

- As already pointed out, area cultivated; family labour; title deed; non-farm income; remittances and pensions (social benefits), awareness, and repayment records are found to be important variables, which could be used to predict accessibility of credit to small scale farmers in the study area.

The findings indicate a lack of access to credit in the survey area and a high demand for credit, and that the average loan offered to these farmers is below the income maximising size (i.e. farmers are credit constrained). In addition, they also indicate that small-scale farmers in the survey area are capable of paying the present market rate of interest.