

Demand for Credit for Production in the Rain-Fed Sub-Sector of the Sudan

Babiker Idris

University of Khartoum, Sudan

Abdel Wahab El Bashir

The Agricultural Bank of Sudan, Sudan

Abstract: This study is concerned with estimating the demand for credit for production in the rain-fed subsector of the Sudan, for both traditional and mechanized agriculture. It is based on primary data collected through a field survey in Gadaref and North Kordofan states. To determine the factors influencing the demand for credit an econometric model was employed. The results of the study revealed that, there is a high demand for credit for production in the rain-fed sub-sector especially in traditional agriculture; that the demand for credit is highly influenced by the ability and capacity of a borrower as indicated by farm size and the use of agricultural inputs, and that the demand for credit is inelastic with respect to all variables including interest rate.

Keywords: Demand, Credit, Sudan, Rain-fed sub-sector, Traditional agriculture

1 Introduction

In numerous economic development theories, the lack of capital is regarded as the most serious bottle-neck in the process of growth and development. Capital is still regarded as one of the crucial pre-requisites for economic development. Credit represents that portion of the investment of a producer, which he can not meet from his own resources to attain a target of production. Credit requirement is very high in the agricultural sector because the overall production of the country depends on a large number of individual farmers, the majority of whom are in a marginal economic condition.

Empirical demand analysis is not based completely on application of the science of economics, but also entails the artful eye of an econometrician. Some (trial and error) efforts are inevitable, but strong logic is paramount in approaching demand management (Ferris, 1998). Several studies have estimated the loan demand in developing countries, but the estimates are often biased due to: data truncation by omitting non-borrowers and the non-identifiability of demand (and supply factors) and consumption decisions among farm households (David, 1979; David and Meyer, 1980; Igbal, 1983, 1988 cited in Nagarajan et al, 1998).

Sudan has an area of about 2.5 million square Kilometers, a population of about 34 million people in year 2006 and growing at a rate of 2.6 percent per annum. The economy is predominantly agricultural with about 80 percent of the population either living in rural areas or nomadic. Agriculture contributed about 39.6 percent of GDP in 2005 (Bank of Sudan, 2006). Exports were almost predominantly agricultural but since 1999, agriculture's share in exports started to decline due to the exploitation and exportation of oil (IFAD, 2001).

Despite the considerable interest shown by the government to further formal credit for production in agriculture, a large number of producers continue to suffer from shortage of financial resources. For instance, the average percentage share of financing requirements by the agricultural sector met by formal financial institutions for the period 1992-2001 was about 25% of the estimated costs of production. There is thus a clear financial gap and the prevailing credit delivered by the formal financial system is limited and inadequate to fulfill this high demand. However, the gap is partially met by informal credit which, although convenient, is not reliable and could be costly. Moreover, the use of improved practices and technology packages by small farmers, as recommended by researchers, creates a need for credit which, in the absence of formal credit access, forces them to resort to moneylenders.

The main hypothesis of this study is that there is a high demand for credit for production in the rain-fed sub-sector, especially in traditional agriculture. Most of the empirical research experience in Sudan has been focused on the technology needs of the irrigated sub-sector and large scale mechanized farming on mono-cropping patterns, which favoured the well supported farmers in the irrigated area and the large farmers in the mechanized schemes. Research targeting traditional rain-fed agriculture, on the other hand, has, to a large extent, been neglected by the government research institutions. The prevailing efforts were made by external donors development projects (IFAD, 2001).

2 Formal and Informal Financial Markets in the Rain-Fed Sub-Sector

The total rain-fed area is 35 million *feddan* (one feddan is about one acre) and represents about 85 percent of the total cultivated area. The rain-fed agriculture comprises the semi-mechanized and the traditional sub-sectors. The main cultivated crops are sorghum, millet, sesame, groundnut and *Karkadeh*. The inputs utilized in these sub-sectors are improved seeds, pesticides, fuel, Jute sacks in addition to agricultural equipments i.e. tractors, discs, etc. (IFAD, 2001). Rain-fed agriculture is the most important single economic activity of the country in terms of the number of people involved: it is estimated that about 20 million people, representing 67 percent of the total population are dependent on rain-fed production of crops, livestock and forestry products for their livelihood (Ministry of Finance and National Economy, 1998). The financial systems of most developing countries are characterized by the co-existence and operation side by side of a formal financial sector and an informal financial sector i.e. financial dualism (Germidis, 1990). The financial sector of the Sudan includes: the banking system, non-banking and/or financial institutions, government, and the informal financial sub-sector.

The formal financial sector of the Sudan comprises: the Bank of Sudan, the commercial banks which are classified in accordance with capital ownership into, Sudanese, Joint, and foreign commercial banks; the specialized banks (i.e. Agricultural Bank of Sudan, Saving and Social Development Bank); non-banking and/or financial institutions which include: financial institutions under complete supervision of the Bank of Sudan (e.g. Foreign Exchange Bureaus, Sudan Financial Services Company), financial institutions that operate partially under supervision of the Bank of Sudan (e.g. insurance companies, Sudanese Rural Development Finance Funds, Pension Funds, and National Social Security Funds), financial institutions that work in co-ordination with the Bank of Sudan (i.e. Bank Deposits Security Funds, Khartoum Stock Exchange). The informal financial sector comprises: moneylenders, merchants, farmers, lorry owners, friends and relatives.

3 Methodology

Data collection. Cross-sectional data were obtained through a survey of farmers in the rain-fed sub-sector. A total of 250 farmers were selected in Gadaref state which comprises four localities to represent the semi-mechanized rain-fed farming. The data were for 2003/2004 season and collected, using stratified random sampling, immediately after harvest. All four localities were represented. Respondents in the semi-mechanized rain-fed sub-sector cultivate sorghum which is a food crop produced for the domestic market, and for export when there is a surplus.

In North Kordofan state 120 farmers were selected during the same season, using cluster random sampling, to represent the traditional rain-fed subsector. Respondents in the traditional rain-fed farming cultivate sorghum, millet, sesame, groundnut, gum Arabic, and *Karkadeh*. Sorghum and millet are produced for consumption, while the others are cash crops.

Model specification. In order to estimate the demand for credit many models were tried including multiple linear regression, log-log, log-linear, and linear-log functions. The linear function gave the best fit. Demand for credit is believed to be a function of size of the farm, costs of production, hired labour, farm income, non-farm income, costs of borrowing, family labour, repayment of previous loans, interest rate, inflation rate, and informal credit. Although the direction of causality is theoretically ambiguous and is subject to empirical

verification (Ferris, 1998), according to the general theory of demand we postulate the expected signs for each explanatory variable in relation to rural loan demand, a priori, as indicated in Table (1).

The structural form of the model to be estimated is:

$$Dc = f (FS, CP, HL, FI, \text{non-FI}, CB, FL, IC, INR, \dots) \quad (1)$$

The mathematical form is as follows:

$$Dc = b_0 + b_1FS + b_2CB + b_3HL + b_4FI + b_5\text{non-FI} + b_6CB + b_7RL + b_8FL + b_9IC + b_{10}IR + b_{11}INR + \dots(2)$$

Where b_0 is a constant and the b_i 's are slope coefficients of the explanatory variables shown in Table (1). The loan size (Dc) or demand for credit, is a function of farm size (FS) measured in *feddans* of land operated by the farmer; costs of production (CP) which comprise costs of land preparation, seeds and pesticides, costs of weeding, harvesting, sacks and strings in SDG; cost of hired labour (HL), man-days per *feddan*, in SDG; net farm income, value of sales of product plus value of stored products less total cost (FI) in SDG; non-farm income earned from other jobs (non-FI) in SDG; cost of borrowing (CB) in SDG, comprising costs of official operations in addition to cost of transport from and to financial institution, plus expenses on food and residence, and opportunity cost of the working days expended for receiving the loan; repayment of previous loans (RL) in SDG; family labour (FL) in SDG, estimated as the opportunity cost of operating one *feddan* of land; informal credit (IC), the amount of SDG borrowed from informal institutions per *feddan*; inflation rate for the period 1990- 2004 and interest rate (%) is rate prevailing at time of survey (INR) and (IR).

The above equation is an exact equation, because it implies that the only determinants of the demand for credit are the ones which appear on the right-hand side of the equation. In economic life many more factors may affect demand for agricultural loans (i.e. policy changes, changes in law, institutional changes, etc.). Furthermore, human behaviour is inherently erratic. We are influenced by rumors, dreams, prejudices, traditions and other psychological and sociological factors which make us behave differently even though the conditions in the market (price, interest rate) and our incomes remain the same. In econometrics, the influence of these other factors is taken into account by the introduction into the economic relationships of the random variable (u).

Hence the model becomes:

$$Dc = b_0 + b_1FS + b_2CP + b_3HL + b_4FI + b_5\text{non-FI} + b_6CB + b_7RL + b_8FL + b_9IC + b_{10}IR + b_{11}INR + U \quad (3),$$

where (U) stands for the random factors which affect the demand for credit and is expected to be normally distributed with zero mean and constant variance.

Table 1 Factors affecting demand for credit for production (a priori signs)

The independent explanatory variable	Effect on demand for credit
1- Farm size (FS)	(+) positively related
2- Costs of production (CP)	(+) positively related
3- Hired labour (HL)	(+) positively related
4- Repayment of previous loans (RL)	(-) negatively related
5- Farm income (FI)	(-) negatively related
6- Non-farm income (non-FI)	(-) negatively related
7- Cost of borrowing (CB)	(-) negatively related
8- Family labour (FL)	(-) negatively related
9- Inflation rate (INR)	(.) negatively related
10- Interest rate (IR)	(-) negatively related
11- Informal credit (IC)	(-) or (+) relation.

4 Results and Discussion

Equation (3) was used to estimate the demand for credit in the rain-fed subsector. The dependent variable, total borrowing or loan size (Dc), is the sum of all loans reported by a farmer in season 2003/2004.

4.1 The Semi-Mechanized Rain-Fed Farm Model

The estimated coefficients of the explanatory variables, as shown in Table (2), have the expected signs except for the coefficient of borrowing costs and inflation rate. Farm size and costs of production coefficients are statistically significant at 1% level and are positively related to demand for credit. This means that demand for credit increases when these variables increase: increased farm size means more operations, more inputs, more costs and more need for credit. Informal credit and demand for credit for production are positively related and statistically significant at 1% level; this indicates that informal credit is complementary to formal credit and is an important factor in determining demand for credit. The relationship between inflation rate and demand for credit is unexpectedly negative. As borrowers usually benefit at times of inflation the relationship was expected to be positive. However, the data used for this variable, inflation rates for the period 1990 to 2004, were highly variable with a coefficient of variation of (.89), and the inflation rate declined during the period from 124.7% in 1990 to 10% in 2004. Repayment of previous loans, on the other hand, has a negative relationship with demand for credit as expected; the reason being that in the mechanized rain-fed subsector, good track record of repayment of loans indicates that the farmer gradually gets rid of the need for banks' loans and becomes self financier. The relationship of interest rate with demand for credit is negative as expected. All these variables are statistically significant at 5% level or higher.

The coefficients of family labour, hired labour, non-farm income and farm income may not be viewed with great concern because their coefficients are not statistically significant. This is expected for the semi-mechanized rain-fed where many cultural operations are carried out by machines. However, the relationship between demand for credit and the cost of borrowing is unexpectedly negative

Table 2 Estimated parameters of the demand for credit in the semi-mechanized rain-fed subsector

Variables	Coefficients	T-values
FS	+ 0.817	***21.18
IC	+ 0.229	***5.51
CP	+ 0.157	***3.92
CB	+ 0.111	***2.68
INR	- 0.58	***2.82
RL	- 0.091	** 2.12
IR	- 0.34	** 2.06
FL	+ 0.05	1.36
HL	+ 0.05	1.24
Non-FI	+ 0.02	0.63
FI	- 0.03	0.62
n	205	
R ²	.687	
Adjusted R ²	.675	
F-value	58.158	

*** Significant at 1% significance Level.

** Significant at 5% significance Level.

and statistically significant. This may be due to the fact that farmers are eager to get credit irrespective of the costs of borrowing, specially so as the alternative, moneylenders, is relatively more expensive. This underlines the need for credit and confirms the hypothesis that, there is a high demand for it in the subsector.

The extent to which demand for credit in the rain-fed sub-sectors responds to changes in the explanatory variables (is measured) by the elasticity of demand. Elasticity gives the percentage change in the dependent variable resulting from a 1% change in the explanatory variable. Generally, in computing the elasticity from an estimated regression model the parameter (b_i), the mean value of an explanatory variable and the mean of the dependent variable are used:

$$\text{Elasticity} = \text{mean of explanatory variable} / \text{mean of dependent variable} \times b_i$$

The demand for credit for production in the semi-mechanized rain-fed sub-sector is inelastic with respect to all variables as shown in Table (3). This confirms the hypothesis that, demand for credit for production by small farmers is inelastic and that farmers do not care much about high interest rates for timely, non-rationed and low transaction costs loans.

4.2 The Traditional Rain-Fed Subsector Farm Model

For the traditional rain-fed subsector, the coefficients of farm size, hired labour, informal credit and repayment of previous loans explanatory variables have the expected positive signs and are all significant at 5% level of significance or higher (Table 4). Farm size and hired and family labour, in particular, are highly significant as determinants of the demand for credit in this subsector. The relation between inflation rate, farm income, and interest rate to demand for credit for production are negatively related (i.e. demand for credit decreases when these factors increase). This indicates that, these variables are important factors in determining demand for credit for production in the traditional rain-fed sub-sector.

The relationship between cost of borrowing, non-farm income and demand for credit for production may not be viewed with great concern because their coefficients are statistically insignificant. This is expected for the traditional rain-fed because farmers depend heavily on informal credit where cost of borrowing is negligible if not absent. In case of non-farm income, generally non-farm business in the traditional rain-fed is very weak and/or negligible. The coefficient of family labour is positive and statistically significant at 1% level. But the positive sign contradicts the fact that according to the general theory of demand family labour influences demand for credit negatively. The positive sign could therefore be interpreted as the part of credit assigned for expenditure by family members on food and other consumption aspects. Demand for credit for production in the traditional rain-fed sub-sector is inelastic with respect to all variables, just as in the case of the mechanized rain-fed subsector.

Table 3 Estimated elasticity of the demand for credit in the semi-mechanized rain-fed sub-sector

Variable	Coefficient	Elasticity
FS	0.817	0.759
IC	0.229	0.027
CP	0.157	0.387
CB	0.111	0.002
IR	- 0.58	0.307
RL	- 0.091	0.871
IR	-0.34	0.088

Table 4 Estimated parameters of the demand for credit in the traditional rain-fed subsector model (Dependent variable is demand for credit)

Variable	coefficient	T-value
HL	+ 0.759	**8.857
FS	+ 0.497	**8.727
FL	+ 0.302	**4.016
RL	+ 0.154	* 2.198
IC	+ 0.128	* 1.956
INR	- 0.58	* - 2.82
FI	- 0.151	* 2.254
IR	- 0.34	* - 2.058
CB	+ 0.086	1.620
Non-FI	- 0.012	0.241
N	120	
R ²	0.712	
Adjusted R ²	0692	
F-value	34.348	

** Significant at 1% significance Level.

* Significant at 5% significance Level.

Table 5 Estimated elasticity of the demand for credit in the traditional rain-fed subsector model

Variable	Coefficient	Elasticity
FS	0.497	0.00019
HL	0.759	0.05019
FI	-0.151	0.02939
FL	0.302	0.04779
IC	0.128	0.00827
RL	0.154	0.001186
INR	-0.58	0.002417
IR	- 0.34	0.000695

5 Conclusions

The analysis demonstrated that the demand for loans for production in the rain-fed subsector is high, statistically significant and inelastic with respect to all variables in the regression model. This is more pronounced in the traditional than in the mechanized rain-fed. It is negatively affected by the rate of interest, inflation rate and repayment of previous loans. Similar results were obtained by other researchers. Nagarajan et al (1998) provide evidence that farm loan demand in the Philippines is negatively influenced by the rate of interest.

Demand for credit for production in the rain-fed sub sector is high but it is not met satisfactorily by formal lending institutions. The ABS is finding it difficult to sustain and expand its volume of lending to realize economies of scale (Ahmed and Adams, 1987). According to the authors, this is due to vagaries of nature which provide many farmers in the Sudan with low incomes, uncertain capacities to repay loans and few highly profitable investment alternatives. This severely limits the volume of loans credit worthy

farmers seek from the ABS. Moreover, the rigid controls by the Bank of Sudan on interest rates charged by banks do not encourage the formal credit institutions to play an important role in supporting technological change, facilitating investments, allowing a more efficient allocation of resources and providing attractive savings opportunities in the rain-fed sub-sector.

The newly introduced micro credit system and the directive by the central bank that commercial and specialized credit banks like ABS, should earmark at least 12% of their loans for this purpose, could be a step in the right direction of meeting the high demand for credit in the rain-fed subsector. This could be supported by a well planned strategy to mobilize savings and enhance loan repayment.

References

- Ahmed, H. & Adams, D. (1987). 'Transactions Costs in Sudan's Rural Financial Markets', *African Review of Money Finance and Banking* Vol. 1/187, pp.1-13.
- Bank of Sudan, (2006). 'Annual Report', Khartoum, Sudan.
- David, C.C. (1979). 'Conceptual Issues in Analyzing Impact and Demand for Agricultural Credit', Columbus: The Ohio State University. The Department of Agricultural Economics, ESO No. 610.
- David, C.C. & Richard L.M. (1980). 'Measuring the Farm Level Impact of Agricultural Loans', *Borrowers and Lenders*, ed. John Howell. Lodon, Overseas Development Institute. pp. 201-222.
- EL Hiraika, Adam, B. (1999). 'An Economic Analysis of Farm Household Participation in the Rural Credit Market in Sudan', *Savings and Development (CARIPO) Series No.2*, 293-211.
- Ferris, J.N. (1998). 'Agricultural Prices and Commodity Market Analysis', New York: McGraw Hill.
- Germidis, D. (1990). 'Interlinking the Formal and Informal Financial Sectors in Developing Countries', *Savings and Development(CARIPO) Series No. 1*, pp. 5-20.
- International Fund for Agricultural Development (2001). 'Republic of the Sudan: Country Portfolio Review', Main Report and Working Papers. Report No. 1277-SD.
- Iqbal, F. (1983). 'The Demand for Funds by Agricultural Households', *Journal of Development Studies* Vol. 20, No. 1, pp. 69-86
- Iqbal, F. (1988). 'The Determinants of Moneylenders Interest Rates: Evidence from Rural India', *Journal of Development Studies* Vol. 24, No. 3, pp. 364-378.
- The Ministry of Finance and National Economy (1995/2002). 'The Economic Survey Report 1995, 1996, 1997, ..., 2002', Khartoum, Sudan.
- Nagarajan, G., Meyer, R.L., & Hushak, L.J. (1998). 'Demand for Agricultural Loans: A theoretical and Econometric Analysis of the Philippine Credit Market', *Savings and Development (CARIPO) Series No. 3*, pp. 349-363.