

FARMING & RURAL SYSTEMS ECONOMICS

edited by Werner Doppler and Siegfried Bauer

**VOLUME
141**

Impact of Microcredit on Poverty Alleviation in Rural Sudan: An Applied Modelling Approach in North Kordofan, Central-west Sudan

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ISBN 978-3-8236-1672-6
ISSN 1616-9808



MARGRAF PUBLISHERS

11. SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

This chapter provides a summary of the problem statement and methodological approach employed in the study, plus gives an overview of the main empirical findings made; those that link agricultural credit with farm household welfare. The main conclusions can be taken from the combined findings of the field survey, the econometric analysis and the results of the dynamic non-separable farm household model used. The chapter further presents a set of policy recommendations, those that may help policymakers to design a multi-pronged strategy, one able to enhance the effects of the provision of credit on crop yields and rural household incomes. Finally, we will also make recommendations for future research, that which takes account of the limitations of this study.

11.1 Research problem and methodology

In recent years, the role microcredit can play in helping to reduce poverty has become a key topic in many developing countries. Having more funds available in the form of credit and other financial services can empower impoverished rural farmers, allowing them to engage in productive economic activities which can help boost their income levels and create wealth. In Sudan, the government has adopted flexible policies to increase agricultural productivity and reduce poverty; instructing the banks to channel 12% of their loan portfolios into microcredit activities. Nevertheless, both government and non-government organizations' efforts to develop the microcredit sector and promote agricultural investment have so far had a limited impact, plus have not been well coordinated.

It has been reported that the greatest challenge facing the microcredit sector in Sudan is a supply shortage. The supply of microcredit is extremely limited when compared to actual demand; it meets only about 1% to 3% of potential demand. This can be attributed to a number of factors, the most important being a lack of clear government policy guidance for microcredit institutions (MFIs) and the reluctance of commercial banks to invest in the agricultural and manufacturing sectors. Commercial banks are often hesitant to expand their services into these sectors, and added to this, small enterprises do not trust the banks, or often regard their products as being unsuitable for their businesses. Gaining access to credit is a challenge for rural farmers in Sudan, where poverty rates exceed 60%. Access to credit is limited, because both formal and informal credit institutions are geared towards funding property owners. In other words, they require tangible collateral to be present as a condition for giving loans, so the poor and needy are denied institutional credit since they have no access to inherited property. Another serious

problem is the regular credit rationing behavior of farmers, which often results in low productivity levels. Thus, small farmers may find themselves trapped in a vicious poverty cycle, unable to access the funds needed to finance productive investment in the agricultural sector. This situation can lead to a misallocation of resources and to lower profit levels in terms of farm production. As a result, farmers do not have adequate capital to invest in new technology, no matter how profitable it might be. This situation is supported by recent research, which states that without increased demand for agricultural products and/or more efficient markets for their distribution, growth in agricultural productivity can quickly lead to a decline in prices, which then counteracts the benefits brought by productivity growth for producers, and discourages investment. In light of this situation, this study used a three-stage methodological approach, the purpose of which was:

- i. To investigate the linkages between the level of access to credit and government policies related to the agricultural sector; to evaluate empirically both the farm credit selection process and its effects on farm profitability.
- ii. To address the interaction between the loan use patterns and repayment behaviors of farm households, taking into account household perspectives on resource allocation; between subsistence and commercial production.
- iii. To develop a dynamic farm household model that could establish a link between the impacts of credit accessibility on resource allocation on the one hand, and the investment decisions of farm households on the other.

A crucial advantage of this study lay in the combination of econometric and dynamic non-separable farm household model used to assess the impact of microcredit on farm profitability, investment decisions and repayment behaviors, as well as the potential responses of farm households to consumption and production choices.

The data used in this study were derived from an interview-based sample survey of farm households (credit users and non-users) in North Kordofan State, Sudan, which was conducted during the 2009/2010 farming season. North Kordofan is an interesting area to study, due to its location and socio-economic characteristics, being as it is at the gateway between the eastern and western parts of Sudan. Given the great size of the study area and the difficulties faced when traveling around, along with security problems, gaining access to the area remains difficult, if not impossible. Therefore, a total sample of 200 farm households, representing 10% of the study community, was selected based on a multi-stage stratified, random sampling technique. After this, focus group discussions were held with

the key informants in the study villages, with three out of the nine localities in the state randomly selected during the first stage. During the second stage, eight out of 29 administrative units were randomly selected, then for the third stage, and with the help of local leaders, a proportionality factor of 25 was applied to come up with 22 villages which would act as the study objects. Since we wished to study villages participating in microcredit activities, those without microcredit programs were excluded from the study. A list of 536 villages in total was obtained from the local authorities in the state, and the first village was randomly selected by picking the corresponded number of the village from the list, while the other 21 villages were chosen from a group of 8 administrative units, in multiples of 25 proportionality approach. After that, 10 households were selected from each village.

To ensure the validity of the local lists, control lists from the microcredit institutions were used as a comparison, during the fourth stage. The number of households from each village was then selected using another proportionality factor, so that the number of respondents from each village was proportional to the number of total households there. During the fifth and last stage, the households were numbered, their numbers written on a piece of paper, and those to be studied randomly picked ‘out of a hat’ based on the number of households in the village. A standard questionnaire was then used to collect information on household assets, socio-economic characteristics, and consumption and income levels, including details of their participation in different farm and non-farm activities.

The econometric analysis used in this study included the Heckman selection model (two-step estimates) and bivariate model. The Heckman model was used to determine household participation and farm profitability levels, whereas the bivariate model was used to estimate the linkages between loan use and repayment performance. Moreover, the FGT poverty measures method was used to compare the incidence and levels of poverty among household categories. In addition to that, the Lorenz curve, Gini coefficient and Atkinson index tools were also applied, to identify the level of inequality in terms of income distribution among the household groups.

As a condition of this study, a dynamic non-separable farm household model was applied to study the behavioral changes that took place among farm households, based on varying input and output change scenarios and different agricultural investment policies. For mathematical simplicity, production and consumption choices such as household preference, risk and uncertainty, were not included in the model. Because some households had previously experienced commodity

market failures, the objective function of the model was obtained using a direct non-linear utility function maximization approach, based on a production function. Given this situation, the study used a dynamic farm household model, based on the study team's strong conviction that such a model would be appropriate for maximizing the utility function, subject to a number of constraints such as the production function, time period, prices, land endowments and capital stock used.

However, the estimation routines of the dynamic non-separable farm household model were carried out by two independent modules: the production and consumption modules. The production module was obtained from the basic production function, including farm profits principally obtained from cash crop and livestock sales as well as implicit profits from goods produced and consumed by the household. Likewise, the consumption module was comprised of market purchases and home produced goods. The model incorporated the four major crops in the area: millet, sorghum, groundnuts and sesame, in addition to livestock (goats and sheep). Production elasticities were computed using the factor shares value added approach. In contrast, consumption demand was modeled using the Cobb-Douglas linear expenditure system (LES) approach, based on the budget proportions taken up by the necessary consumption items. As a dynamic non-separable farm household model is always time dependent, some parameters were fixed in the first year to describe the base year equilibrium, however, for the other years we allowed some parameters to change over time. This parameter setting was necessary to compare the baseline situation with the final model values. For validity and consistency purposes, the field survey and econometric results were carefully evaluated for the household categories, credit users and non-users used. The results derived were then written in GAMS and run by using CONOPT solver. For each set of exogenous variables inputted, the model gave a result for output supply, input demand, amount of labour sold or purchased, the consumption of own production items, consumption on leisure, market surplus level and the consumption of purchased goods. To ensure that the model did what it was intended to do, it was validated by comparing model predictions with real-world field results. The results of this test showed that the outputs of the model were close to those obtained from the field survey, so could be assumed to reflect a verified implementation of the assumptions and be a valid representation of the policy scenarios.

The recent foundation of government policy reforms has been the liberalization of market forces through the introduction of exchange rate mechanisms, pricing policies, and public investment initiatives. This new policy direction has left rural household working under free market conditions, with farmers unable to buy food at reasonable prices and at the same time unable to meet the requirements of

credit institutions. As a result, the government's plan to enhance agricultural investment will be thwarted if it is not possible for households to access credit; changing their approach towards income diversification and production. In view of this possibility, a dynamic non-separable farm household model was used to analyze government policy interventions over time and under a variety of market scenarios. The simulated policies included changes to input and output prices for major crops and livestock, changes in credit amounts, interest rate changes and also a combination of input and output price changes.

11.2 Summary of the main findings

11.2.1 Key findings from the field survey

The results of the descriptive analysis show that the average education level in the study area was slightly higher among credit users (8 years) than non-credit users (7 years). In addition, credit users were found to be better-off in terms of farm profits and asset values, however, credit non-users recorded higher accumulated savings levels. This result implies that credit non-users may have had enough money to cover their expenditures, with no additional credit required. Generally, the average loan size was found to be very small, at 241.9 SDG, or around 65 €, but with high application fees (14 €) and reasonable interest rates charged of 12% per year. In spite of the fact that repayment frequencies depended mostly on the nature of the existing enterprises, the survey showed that the average repayment period was less than six months. Moreover, the average income from crops and livestock among credit non-users was greater than for credit users, whereas credit users appear to have had a higher non-farm income than credit non-users. This result matched our prior expectations; that households who engaged in non-farm activities were more likely to gain access to credit and so increase their incomes. The Mann-Whitney test showed significant differences between credit users and non-users in terms of livestock and total income sources, plus credit users had larger land holdings (18 ha) on average which were more capital intensive. Credit non-users, meanwhile, reported higher labor costs and smaller areas of land owned. According to a T-test, the two categories of household were found to be statistically significant in terms of land holdings and labor usage.

11.2.2 Econometric modeling results

The results of the binary model on household decisions whether to apply for credit or not suggest there are a number of factors which constrained credit conditions and the impact of these on farm profitability and investment decisions. The results from the Heckman (two-step estimates) model revealed that most of the variables that influenced farm profits were statistically significant, with

coefficient signs consistent with expectations. However, the factors found to be statistically significant here, were not the same as those found to be so in the first stage, suggesting the presence of differences in terms of the determinants of credit constraints and the size of farm profits.

The results obtained from a probit model during the first step showed that savings, asset values and incomes were significant in determining the credit constraints present. The assets and savings of farm households positively and significantly influenced the probability of the household being credit constrained. This result implies that as the value of assets and savings increases, the probability of being credit constrained decreases. Interestingly, total income, an indicator of welfare status, had a highly significant and negative effect on the credit constraints faced by farm households. The implication of this is that households with higher incomes are more likely to be credit constrained. It appears that microcredit institutions provide the credit based on the needs of the recipients, not their repayment ability, because if they were concerned about repayment ability, total income would have a positive impact on credit access.

The results of running the Heckman model, obtained during the second step, revealed that household size, value of assets, labor used, distance to financial institutions, non-farm incomes and extension services were found to be the most significant variables influencing farm profits. This result highlights that although access to credit had a positive impact, it was not significant. This indicates that loan volumes may have been too small to have a significant impact on farm production levels. This result raises concerns about the effectiveness of the credit programs in rural Sudan at enhancing the living conditions of farmers. As expected, the availability of assets and access to labor for agricultural production purposes positively and significantly influenced farm profits, suggesting that increases in asset values and labor availability (family-based and hired) can make a significant contribution to farm profitability in relation to agricultural activities. It was observed during our survey that most of the lenders were more likely to require information about the applicants' adult labor availability and asset base as a prerequisite within their application procedures. This is common, because lenders everywhere consider assets as being a strong indicator of a person's repayment capacity, while an abundance of labor indicates that one is able to complete a variety of agricultural tasks.

With respect to non-farm incomes, the variables used had a negative and significant effect on the level of farm profits. This result was unexpected, because if households have higher non-farm incomes, they should be less vulnerable to risk and as a consequence have greater access to agricultural technologies.

However, in this study, households with high non-farm incomes showed lower farm profits, owing to the small portions allocated to their investment in agricultural activities. This behavior can be explained by the fact that most households in the study area support their livelihoods through marginal work activities in urban cities, meaning that non-farm incomes tend not to be reinvested in crop production activities. It was observed during the survey that most farm households (70%) had a tendency to invest their additional money in livestock rather than agricultural crops.

Moreover, the results from the bivariate model show a strong interaction between loan utilization and the loan repayment performance of farm households, revealing that loan utilization was significantly influenced by application fees, asset values, repayment periods, group lending collateral and household locations. Variables such as punishment expected, application fees and asset values were found to be significant factors in determining loan repayment performance. These results also indicate that lenders did not focus on the age and education level of borrowers during the loan contract formation process, as it had no significant effect on loan repayment behaviors. On top of that, the results further demonstrate that the loan utilization mechanism adopted by microcredit institutions in the study area was somehow linked to the repayment behaviors of the borrowers.

Finally, poverty status and income distribution inequality were examined using FGT classes, the Gini coefficient and the Atkinson index. The analysis showed that poverty incidence was much higher among credit non-users (44%) than credit users (42%). These results also prove that households who have access to credit are more likely to escape poverty than those who do not. Concerning income inequality, the results show there were reasonable levels of disparity between household categories. While credit users recorded a Gini coefficient of 0.32, credit non-users reported only a 0.22 Gini coefficient value. This result implies that, although credit users were found to be better-off in terms of incomes, credit non-users seemed to be more equal in terms of income distribution. The calculated Atkinson index values for social welfare distribution among the credit users and non-users in Shiekan locality was 0.63 and 0.32 respectively, which indicates that credit users and non-users here would be ready to give up 63% and 32% of their incomes respectively, to have more equally distributed incomes. Similarly, credit users and non-users in Enuhud locality said they would be willing to sacrifice 18% and 49% of their incomes respectively, in order to have more equal incomes.

Generally, econometric model results allow one to test the hypothesis that greater access to credit can reduce poverty levels among credit users, but not necessarily

seasonal migration flows. Likewise, access to microcredit can positively influence farm profits, though there is not much to distinguish between credit users and non-users in this regard within the agricultural sector. Evidence from the econometric analysis carried out here also indicated that the existing financial services in place did not mobilize the rural people to participate effectively in microcredit programs, as claimed in the hypothesis; rather they inhibited remuneration and as a consequence encouraged clients to drop out after a few credit cycles. This will become a big problem when lenders require more guarantees, charge higher interest rates and lend to farmers on a shorter term basis.

11.2.3 Dynamic non-separable farm household model and simulation results

The model results showed that the local credit policy based on low interest rates motivated farm households to progressively increase their capital accumulation levels and as a consequence led to higher income and savings levels of the simulation years. However, large capital holdings and savings accumulations were found to be associated with the provision of large loan volumes. Moreover, the model results also proved that even with high interest rates, households could still improve their capital accumulation and savings growth levels by being able to access sufficient loans, perhaps through investment activities. The most striking result of the model was that capital accumulation went hand-in-hand with high savings growth levels and lower credit demand over the simulation period. This result allows us to test the starting assumption that greater capital accumulation through savings and investment activities would decrease households' credit demand and gradually lead to them withdrawing from credit programs and, as a result, become financially independent. The results of the model simulation confirmed that household did not need credit at all in the third year. Furthermore, an increase in the cost of inputs such as wages and improved seed varieties, as well a reduction in feed costs, under a number of scenarios had a limited impact among the household groups. However, credit non-users, as net labor sellers, were found to be more integrated into the market under such scenarios, due to the relative increase in market surpluses achieved and market purchases made over the years. Although credit users reported a rapid increase in welfare levels and market purchases over the three-year period, their level of market integration was less than might have been expected. This could be attributed to a market failure effect and also their risk aversion behavior, as credit users seemed to be more risk averse than credit non-users. The results of different input price scenarios also confirmed that capital accumulation and savings growth levels for both household

groups remained stable, with a minor advantage gained by the credit non-users over the credit users.

Likewise, the output price policy scenarios had a considerable impact on resource allocation decisions within both household categories. With the exception of market surplus, credit users seemed to be better-off when compared to credit non-users over the three-year simulation period. Interestingly, the welfare and market purchases of credit users increased markedly over the period, which was identified based on rapid capital accumulation and savings growth levels among credit users. These results aligned with our prior expectations - that as household incomes increased, the probability of consumption increases occurring, particularly for food, leisure activities and market purchases, would increase also. It could be observed that, although credit non-users were net labor sellers, they had a tendency to improve their market surplus based on livestock (sheep and goats) sales, and as a consequence, were able to increase their incomes.

Given the basic research question, as to whether the provision of credit would have a variable impact among credit users and non-users in terms of their income and investment decisions, one can conclude that credit services succeeded somehow in motivating clients to generate substantial incomes and allowed them to both increase and smooth their consumption levels. As evidence for this, when looking at capital stock accumulation and savings growth under the joint output scenario, we found that although both credit users and non-users accumulated 2% capital on average, credit users managed to save more than credit non-users, by 3%. Therefore, the propensity of credit users to save was much higher when compared to credit non-users. As a consequence, the scenario results of this model, together with the findings of the field survey and econometric models presented in earlier chapters, show that the credit users were better-off, generating farm profits of SDG 955 when compared to SDG 882 for the credit non-users. The results from the model also confirmed that despite the fact that credit users were asked to pay back their loans with interest, they were still able to save small amounts over time. In view of the progressive increase in welfare outcomes seen, coupled with market purchases over the three year period, it can be deduced that the advantage credit users had in terms of education level over the credit non-users was partly the reason for the positive impact they experienced from obtaining credit.

11.3 Policy implications of the study results

Although the econometric and dynamic non-separable farm household model used here showed that microcredit services enhanced employment activities and investment opportunities among the study credit users, government interventions

such as frequent, subsidized credit or targeting special groups for help, were often unequal and inefficient. This result supports our basic hypothesis that credit access has a positive impact only on those clients with access to remunerative businesses but who lack financial resources. Therefore, the findings of this study reveal that in order to improve the imperfect credit market in the study area, there is a need for a special policy framework to be developed that enhances the role microcredit plays in agricultural investment activities. Based on this view, we would like to make the following policy recommendations.

11.3.1 Development of agricultural investments policy

As shown in the literature and reinforced here, credit access does not significantly influence farm profitability levels, therefore, the Sudanese government should revise its credit policy objectives in order to improve the agricultural investment market. It can be understood why the existing policy of subsidizing interest rates has not been able to reduce or remove credit constraints. To improve farm agribusiness activities, there is a need for flexible investment support policies to be introduced for the agricultural sector, based on the use of efficient and sustainable technology. This might be made possible by gradually increasing loan volumes, and by providing repeat cumulative lending and certified seed varieties to farmers, along with fertilizer credit. The amount of loans given is an important factor in helping to establish competent businesses, therefore, it is recommended that loan volumes are matched to the clients' initial business proposals before loan disbursements are given out. It is also necessary to regulate the rules governing financial institutions, based on the economic conditions at any given time.

11.3.2 Improved access to rural credit

As the rural credit market is not functioning well in Sudan, in the short term the government should continue providing credit in-kind to smallholder farmers living in areas where such inputs have significant potential in terms of creating productivity increases. After such mechanisms are implemented, it will be essential to ensure the efficiency and quality of the in-kind mechanisms used, so that the clients' commitment to repay is maintained. However, the terms of these repayments need to be flexible enough to allow farmers to benefit from seasonal price fluctuations, such as through late season sales. Farmers should also be allowed to repay lower amounts during poor harvest years, and more in good years. The econometric estimates from our model indicate that such a flexible strategy could help achieve the credit program's objectives of promoting loan utilization and repayment performance. Moreover, the negative impacts of collateral and repayment period requirements on loan utilization and repayment

performance will require financial institutions to reconsider the standardized loan volumes and short repayment periods currently imposed. As a result, more attention should be paid to individual household characteristics during the loan contract formation process. As part of this, it should be examined as to why banks do not consider such characteristics during the loan decision-making process now; does it suggest some sort of discrimination is taking place? During the study it was reported that transaction costs, particularly application fees, are very high and have a significant impact on repayment performance. Banks should therefore look to simplify the bureaucratic process, which currently leads to funding delays for the farmers. Banks should also supervise farmers on how to use their loans, as this will reduce the chance of funds being diverted and also facilitate loan repayments. Despite the fact that banks have been responsible for managing microcredit procedures over recent years, they appear to have been inefficient in doing so. Therefore, the government should set up new microcredit institutions within rural areas, where most of the clients reside. This would not only improve credit market information provision, but would also help meet potential in terms of satisfying the demand for credit.

11.3.3 Improving infrastructure to strengthen domestic development

The results of our research show that the distance between the microcredit institutions (MFIs) and the study community is too far. Most of the institutions' clients live in remote areas, while the majority of MFIs are located in the cities, meaning that clients have to pay high transaction costs on transportation and on applications, plus suffer the opportunity costs of time lost during the application process. As the results showed, microcredit either had a limited impact on agricultural activities or in some cases clients dropped out after just a few credit cycles. Therefore, improvements to the local infrastructure are required, in order for the financial institutions to be able to reach-out to their clients more effectively. As a result, the government of Sudan should take positive steps to overcome the high costs of transportation by introducing long-term policies focused on investing in transport infrastructure; improving roads, railway networks and communications in general. Short-term policies should also focus on developing transport related lease facilities (such as trucks and buses etc) for farmers and farmers' associations, so they can transport their products from remote areas to the key markets. Within the context of infrastructure development, the aim should be to enhance intra-regional trade and entrepreneurship, and open-up rural areas for investment, improve productivity and create job opportunities. Most importantly, the private sector needs to be encouraged and supported to take the lead in national economic development.

11.3.4 Linking credit Facilities/schemes to the eradication of poverty

Given that poverty is deeply rooted in rural Sudanese society, poor people and low-income groups should be targeted with safety net schemes, as well as credit programs, in order to help them set up and run their small businesses. This may be achieved by providing soft loans (at low interest rates) through village development committees which represent households, and by organizing solidarity groups. Furthermore, the authorities and microcredit providers should also assist clients by providing “credit plus” services, those that include skills training and the provision of market facilities. The costs of these services should be borne by the government as public support, or may be shared between microcredit institutions and clients. Moreover, the government should help to create a population database and set up additional credit unions at the local level. The provision of such services is essential if one wishes to increase the bargaining power of borrowers and improve the credit information networks that exist between lenders and borrowers.

11.3.5 Improving extension services in the adoption of new technologies

Results from the field survey show that despite the provision of extension services by the government extension office and non-governmental organizations in the area, 53% of farmers said they had not received such services, either from the government or NGOs. Therefore, client and non-client farmers should be trained on new technologies, such as new crop varieties, improved livestock breeds, soil fertility improvements and conservation farming techniques, as well the adoption of new draft animal management techniques and implements. Special training should be delivered to client farmers on basic businesses management skills, and particularly on how to create, sustain and expand farm profits, plus repay loans on time. Farmers should also be educated on how to organize themselves into cooperatives, in order to bypass the activities of middlemen and maximize income levels for their labor. Moreover, to increase production levels among the farmers, further multi-disciplinary research is vital. However, in order for such research to be applicable to the study farmers, there is a need to create an agricultural research and extension linkage in the localities, so that farmers can choose the appropriate technologies developed by the research stations. Finally, radio remains the most popular mass media communication tool used by communal farmers in rural Sudan, however, we observed that the majority of rural farmers have access to mobile phones, and so these may also be explored as a medium of information dissemination.

11.3.6 Credit oriented towards resource base

Evidence from the previous literature and from this study suggests that economic development in rural Sudan will only be possible if endowment resources are managed more effectively and if investment is made in new, appropriate technology. Therefore, policymakers should encourage and support farmers to undertake high return agricultural crops that distinct to their area and cultivate them to nationally or even globally accepted standards. In this regard, a substantial amount of credit should be given to farmers in such regions, to support long investments in mechanization, as this will give the farmers experience in business management activities and also a greater amount of independence. It will also be a step toward the government being able to formulate a master investment plan in the area.

11.4 Suggestions for future research

As an attempt to assess the impact of microcredit on poverty alleviation in rural Sudan, this study could not address all the important issues present in the study area due to certain constraints. Therefore, further research work is needed, as described below.

The first limitation of this study was the employment of cross-sectional data, which was collected over just season due to time constraints and difficulties during the field survey, and especially security problems encountered in the study area. Future research in the area should be designed to collect time-series data over a longer period, as this will allow the researchers to use dynamic modeling to predict the impacts of credit on farm households' behaviors regarding resource allocations and investment decisions. Second, risk and transaction costs were not incorporated into the credit impact analysis here, so including such variables in the econometric and household model in the future will help assess the impact of future policy recommendations. In this regard, estimating the opportunity costs of time lost during loan application periods, and the risk and uncertainty created by such processes, will increase the accuracy of this analysis. There is a need to account for these variables, because farmers in these circumstances will not be able to achieve "maximum utility" but instead only "expected utility". Future studies should, therefore, seek to estimate transaction costs and at the same time test household market participation levels. However, different types of risk, such as those associated with prices, yields and incomes, might be assessed more effectively by incorporating them into the production side of the dynamic non-separable farm household model. Thirdly, the disaggregated nature of the models presented here means that the simultaneous nature of inter-household group

relationships might not have been captured, as would be in an applied village equilibrium framework. Although household models provide an in-depth view of the direct impacts of policy and market shocks on households, within-household level risks are not displayed, and indirect influences such as exogenous shocks - in addition to influencing production and consumption within affected households - create linkages with other households and other aspects of farm behavior that are beyond the mandate of household models. As a result, an alternative model - one used to examine inter-household relationships - could be developed at the micro-agricultural household level, to be used alongside a compatible, general equilibrium model.

ZUSAMMENFASSUNG

Trotz der flexiblen Armutsbekämpfungspolitik der sudanesischen Regierung 12% des Darlehensbestandes der Banken Mikrokrediten zu widmen, fehlen Finanzierungsmodelle wo sie am meisten gebraucht würden, besonders in Nord Kordofan, der Region, in der diese Studie durchgeführt wurde. Die meisten Bereitsteller von Mikrokrediten haben eine geringe Reichweite, sind wenig selbstständig und nicht nachhaltig. Schwache ökonomische Leistungen und die Konkursrate dieser Institutionen führen zu großer Besorgnis innerhalb des Staates. Unter den multiplen Ursachen ländlicher Armut ist der unzureichende Zugang zu formalen und adäquaten Finanzierungsmodellen eine der größten Einschränkungen, besonders wenn es um die sozioökonomischen Wahlmöglichkeiten der Kleinbauern geht. Aktuelle Studien, die in der Region durchgeführt wurden, identifizieren die geringe Produktivität landwirtschaftlicher Betriebe, den Mangel an Betriebsmitteln, den limitierten Zugang zu Krediten, insbesondere angesichts der saisonalen Engpässe im Cashflow und den Mangel an Vermarktungsstrukturen, als Hauptprobleme des landwirtschaftlichen Sektors (NKS/UNDP, 2010). Eine weitere Einschränkung stellt die Tatsache dar, dass die meisten kommerziellen Banken zögern in den Bereichen Landwirtschaft und Industrie zu investieren. Aktuell wird nur eine geringe Proportion der zur Verfügung stehenden Ressourcen diesen Sektoren zugeordnet. Weiterhin sollte erwähnt werden, dass eine der größten Herausforderungen, denen sich der Mikrofinanzierungssektor des Sudan stellen muss, das Verfügbarkeitsdefizit ist. Das Angebot von Mikrokrediten ist im Vergleich zur Nachfrage extrem gering und nur ca. 1-3% können befriedigt werden (CBOS, 2006). Als Konsequenz könnten viele Landwirte nicht befähigt sein, sich aus der gegenwärtigen Armut zu befreien, da ihnen Finanzierungsmöglichkeiten fehlen.

Die vorliegende Studie wurde im zentralen Westen des Sudan durchgeführt, mit Nord Kordofan als Fallbeispiel. Aufgrund seiner Lokalisation und sozioökonomischen Ausprägungen stellt Nord Kordofan eine interessante Studienregion dar. Vornehmliches Ziel dieser Studie war es, den Beitrag von Mikrokrediten zum Abbau der Armut ländlicher, landwirtschaftlicher Haushalte zu bewerten. In dieser Absicht wurden primäre und sekundäre Daten gesammelt. Sekundäre Daten wurden aus wissenschaftlichen Artikeln, Jahresberichten und vergangenen Studien relevanter Institutionen generiert, primäre Daten mittels einer interviewbasiert Umfrage landwirtschaftlicher Haushalte (Kreditnehmer und Nicht-Kreditnehmer) gesammelt. Die Umfrage wurde während der Saison 2009/2010 mittels eines Kernfragebogens durchgeführt. Unser Fragebogen wurde entwickelt um statistische Informationen über die demographische

Zusammensetzung der Haushalte, Einkommen und Ausgaben, Konsum und sozioökonomische Veränderungen zu erfassen. Den gesamten Staat abzudecken bleibt angesichts der Größe der Studienregion sowie von Transport- und Sicherheitsaspekten schwierig, falls nicht unmöglich. Aufgrund dessen wurden mittels einer mehrstufigen Zufalls-Stichprobenerhebungstechnik, basierend auf Proportionalität mit der Größe der Fokusgruppe, 200 landwirtschaftliche Haushalte ausgewählt. Es wurden fünf Stufen angewandt um 22 Dörfer zu selektieren die die Fokusgruppe innerhalb des Staates repräsentieren. Aus der kompletten Liste der Dörfer wurde das erste automatisch selektiert, 21 weitere aus den selektierten 8 Verwaltungseinheiten als Vielfaches von 25. Weiterhin wurden aus jedem Dorf 10 Haushalte per Zufall ausgewählt. Weiterhin wurden Fokusgruppendifiskussionen mit den Schlüsselinformaten der Dorfgemeinschaften durchgeführt. Um die Gültigkeit der lokalen Listen zu gewährleisten, wurden sie mit Kontrolllisten von Mikrokreditinstitutionen verglichen.

Die in dieser Studie verwendeten ökonometrischen Analysemethoden umfassen das Heckman-Zweistufen-Verfahren sowie die bivariate Analyse. Das Heckman-Verfahren wurde für die Bestimmung der Determinanten Haushaltspartizipation und Betriebsrentabilität angewandt, das bivariate Modell zur Schätzung des Zusammenhangs zwischen Kreditverwendung und Rückzahlungsleistung. Weiterhin wurde die FGT-Methode für Armutsmessungen verwendet um Vorkommen und Grad der Armut zwischen Haushaltskategorien zu vergleichen. Zusätzlich wurden zur Identifikation der Einkommensverteilung innerhalb der Gruppen Lorenzkurve, Gini-Koeffizient und Atkinson-Index verwendet. Ein nicht lineares, rekursives, dynamisches Modell wurde angewandt um Verhaltensveränderungen landwirtschaftlicher Haushalte unter dem Einfluss politischer Investitionsmaßnahmen zu untersuchen. Die simulierten politischen Maßnahmen beinhalten Veränderungen von Input- und Output Preisen für Vieh, Änderungen im Kreditumfang, in der Verzinsung und Kombinationen. Die Modellierung wurde über zwei unabhängige Module durchgeführt: Produktions- und Verbrauchsmodul. Das Modell umfasst die vier wichtigsten Feldfrüchte (Hirse, Sorghum, Erdnuss und Sesam) zusätzlich zu Viecheinheiten (Ziegen und Schafe). Volatilitäten innerhalb der Produktion wurden mittels der Faktanteile in einem Wertschöpfungs berechnet, Verbrauchsansprüche mittels eines linearen Cobb-Douglas Ausgabensystems (LES) basierend auf den Budgetanteilen der notwendigen Konsumelemente. Um die ursprünglichen und die abschließenden Zustände der Modellwerte über die Jahre zu vergleichen, wurden einige Parameter zur Beschreibung des Ausgangsjahres festgelegt, während andere zur Veränderung über Zeit deklariert wurden. Die aus der Feldstudie sowie den ökonometrischen Modellen gewonnenen Ergebnisse wurden dann in GAMS (Version 23.9)

eingespeist und mittels des CONOPT Solver analysiert. Um Gültigkeit und Kontinuität zu gewährleisten, wurde das Modell über einen Abgleich der modellierten Prognosen mit Feldbeobachtungen geprüft.

Die Ergebnisse der beschreibenden Analyse zeigen, dass das durchschnittliche Ausbildungsniveau der Kreditnehmer im Vergleich höher ist (8 Jahre) als das der Nicht-Kreditnehmer (7 Jahre). Auch sind Kreditnehmer in den Bereichen Betriebsgewinn und Vermögenswert besser aufgestellt. Auf der anderen Seite sammeln Nicht-Kreditnehmer höhere Ersparnisse an. Generell ist der Kreditumfang bei durchschnittlichen Antragsgebühren (14 €) und angemessenen Zinssätzen (12% per annum) sehr gering, $241.9 \text{ SDG} \approx 65 \text{ €}$ im Durchschnitt. Trotz der Tatsache, dass die Häufigkeit der Rückzahlungen in Relation zu den Betriebsunternehmungen steht, zeigt die Umfrage, dass der durchschnittliche Rückzahlungszeitraum weniger als sechs Monate beträgt. Weiterhin verfügen Kreditnehmer über höhere außerbetriebliche Einkommen als Nicht-Kreditnehmer. Dieses Ergebnis steht im Einklang mit vorhergehenden Erwartungen, dass Haushalte, die in außerbetrieblichen Aktivitäten involviert sind mit höherer Wahrscheinlichkeit Zugang zu Krediten erhalten und in der Konsequenz über höhere Einkommen verfügen. Der Mann-Whitney-Test zeigt signifikante Unterschiede zwischen Kreditnehmern und Nicht-Kreditnehmern in Bezug auf Vieh- und Einkommensressourcen. Außerdem verfügen Kreditnehmer über mehr Land, durchschnittlich 18 Hektar und kapitalintensivere Betriebe während Nicht-Kreditnehmer über weniger Land verfügen und einen höheren Arbeitskräftebedarf haben. Gemäß T-Test unterscheiden sich die beiden Haushaltstypen signifikant in den Bereichen Landbesitz und Einsatz von Arbeitskräften.

Die Ergebnisse des Heckman-Zweistufen-V erfahren zeigen, dass die meisten Variablen, die das Betriebseinkommen beeinflussen, statistisch signifikant sind während Koeffizienten mit den Erwartungen übereinstimmen. Allerdings stimmen die statistisch signifikanten Faktoren nicht mit denen der ersten Stufe überein. Dies legt die Existenz von Unterschieden in den Ursachen für Kreditverknappungen und die Höhe der Betriebsgewinne nahe.

Ergebnisse eines Probitmodells der ersten Stufe zeigen, dass Ersparnisse, Vermögenswerte und Einkommen signifikante Variablen darstellen, die die Kreditumstände bestimmen. Vermögenswerte und Ersparnisse der landwirtschaftlichen Haushalte beeinflussen die Wahrscheinlichkeit, dass der Haushalt kreditlimitiert ist signifikant positiv. Dieses Resultat legt nahe, dass mit steigenden Vermögenswerten und Ersparnissen die Wahrscheinlichkeit sinkt, kreditlimitiert zu sein. Interessanterweise hatte das Gesamteinkommen einen hoch signifikanten negativen Effekt auf den Zustand der Kreditlimitierung der Haushalte. Dies legt nahe, dass Haushalte mit höheren Einkommen mit höherer

Wahrscheinlichkeit kreditlimitiert sind. Folglich basieren Mikrokreditinstitutionen die Vergabe auf den Bedürfnissen der Empfänger, nicht aber auf deren Rückzahlungsfähigkeit; wäre dies nicht der Fall, hätten höhere Gesamteinkommen einen positiven Einfluss auf den Kreditzugang. Die Ergebnisse des Heckman-Modells der zweiten Stufe zeigen, dass Größe des Haushalts, Vermögenswerte, Einsatz von Arbeitskräften, Entfernung zu Finanzinstituten, außerbetriebliche Einkommen und Lohnunternehmungen die meist signifikanten Variablen darstellen, welche das landwirtschaftliche Betriebseinkommen beeinflussen. Trotz positiver Indikatoren ist der Zugang zu Krediten nicht signifikant.

Dies legt nahe, dass Kreditvolumen zu klein sind, um einen signifikant positiven Effekt auf die Betriebseinkommen zu haben. Diese Ergebnisse werfen Fragen auf bezüglich der Effektivität der Kreditprogramme im ländlichen Sudan, um die Lebensumstände der Bauern zu verbessern. In Bezug auf außerbetriebliche Einkommen hatten die Variablen einen signifikant negativen Effekt auf die Betriebseinkommen. Dieses Ergebnis legt nahe, dass Haushalte mit hohen außerbetrieblichen Einkommen, aufgrund ihrer geringen Investitionen in landwirtschaftliche Aktivitäten, über niedrigere landwirtschaftliche Betriebseinkommen verfügen. Eine weitere Erklärung könnte sein, dass die meisten Haushalte ihre außerbetrieblichen Einkommen durch marginalisierte Arbeit in den Städten generieren und diese nicht in die Pflanzenproduktion reinvestieren. Die Umfrage ergab, dass die meisten landwirtschaftlichen Haushalte (70%) diese Ressourcen tendenziell in Vieh statt in die Pflanzenproduktion investieren.

Weiterhin zeigen Ergebnisse des bivariaten Modells starke Interaktionseffekte zwischen Kreditverwendung und Rückzahlungsleistung der Haushalte. Die Kreditverwendung steht in signifikantem Zusammenhang mit Kreditnahmegebühren, Vermögenswerten, Rückzahlungsperiode und Standort des Haushalts. Variablen wie erwartete Strafzahlungen, Kreditnahmegebühren und Vermögenswerte stellen signifikante Faktoren bezüglich der Rückzahlungsleistung dar. Die Ergebnisse indizieren, dass Kreditgeber keinen Wert auf Alter oder Ausbildung der Kreditnehmer zum Zeitpunkt des Vertragsabschlusses legen, es konnte kein Einfluss dieser Faktoren auf das Rückzahlungsverhalten festgestellt werden. Die Ergebnisse demonstrieren, dass die Kreditvergabe der Institutionen mit dem Rückzahlungsverhalten der Kreditnehmer gekoppelt ist.

Weiterhin zeigt die Analyse, dass das Armutsvorkommen unter Nicht-Kreditnehmern leicht höher (44%) als unter Kreditnehmern (42%) ist. Die Ergebnisse zeigen außerdem, dass Haushalte, die Zugang zu Krediten haben mit

höherer Wahrscheinlichkeit Wege aus der Armut finden als solche ohne Kreditzugang. Die Einkommensverteilung betreffend haben Kreditnehmer höhere Einkommen während die Einkommensverteilung unter Nicht-Kreditnehmern konsistenter ist. Die Atkinson-Index-Werte legen nahe, dass Kreditnehmer in der Region Shiekan wahrscheinlich bereit sind 63% ihres Einkommens abzugeben um eine gleiche Verteilung der Einkommen zu erzielen während Nicht-Kreditnehmer in Enuhud 49% ihres Einkommens abgeben würden um gleiche Einkommen zu erreichen.

Die Ergebnisse des rekursiven, dynamischen Modells bestätigen, dass ein Kreditpolitikdesign basierend auf niedrigen Zinsraten landwirtschaftliche Haushalte zunehmend motiviert ihr Kapital zu vermehren und in der Konsequenz über die Jahre zu wachsendem Einkommen und Rücklagen führt. Nichtdestotrotz sind Kapital- und Rücklagenakkumulationen weitestgehend mit der Verfügbarkeit großer Kreditsummen in Zusammenhang zu bringen. Die Modellergebnisse beweisen außerdem, dass Haushalte, sogar unter hohen Zinsraten, Kapitalakkumulation und Rücklagenwachstum verbessern können wenn ausreichend Kredit zur Verfügung steht. Die Kapitalakkumulation geht über die Jahre mit hohem Rücklagenwachstum und abnehmendem Kreditbedarf einher. Die Signifikanz dieses Ergebnisses erlaubt uns, die vorhergehende Annahme zu testen, dass höhere Kapitalakkumulationen durch Rücklagen und Investitionsaktivitäten den Kreditbedarf senken, zu einem graduellen Ausstieg aus dem Kreditprogramm und folglich zu finanzieller Selbstständigkeit führen. Das Modell bestätigt, dass im dritten Jahr keine Kredite mehr gebraucht werden. Eine Erhöhung der Input-Preise führt bei Nicht-Kreditnehmern aufgrund der relativen Zunahme an Vermarktungsware sowie Zukäufen über die Jahre zu mehr Marktintegration. Währenddessen verzeichnen Kreditnehmer über drei Jahre zwar schnelle Zunahmen im Bereich Einnahmen und Zukäufe, ihre Marktintegration ist allerdings geringer als erwartet wurde. Erklärungen könnten Marktversagen sowie Risikoaversion bieten; Kreditnehmer scheinen eher risikoavers während Nicht-Kreditnehmer mit Risikobereitschaft assoziiert werden. Desgleichen zeigt das Modell, dass zunehmende Output-Preise ernstzunehmende Auswirkungen auf die Ressourcennutzung durch die Haushalte beider Kategorien haben. Kreditnehmer scheinen im Vergleich mit Nicht-Kreditnehmern über eine Modellperiode von drei Jahren besser dar zu stehen. Interessanterweise erhöhen sich sowohl Einkommen als auch Zukäufe auffallend. Es kann außerdem beobachtet werden, dass obwohl Nicht-Kreditnehmer Net-Arbeitnehmer sind, sie dazu tendieren die Menge an vermarktungsfähigem Vieh zu erhöhen und ihr Einkommensniveau dadurch zu verbessern.

Schaut man sich die Kapital- und Rücklagenakkumulation unter im szenario aller gemeinsamen outputs an, sieht man, dass obwohl sowohl Kreditnehmer als auch Nicht-Kreditnehmer eine durchschnittliche Erhöhung um 2% verzeichnen, Kreditnehmer Nicht-Kreditnehmern im Rücklagenwachstum um 3% voraus sind. Dies zeigt, zusammen mit den Ergebnissen der Umfrage und der ökonometrischen Modelle, die in vorhergehenden Kapiteln präsentiert werden, dass Kreditnehmer in Bezug auf bewegliche Vermögenswerte und Investitionen besser aufgestellt sind, besonders in den Bereichen Betriebsgewinn und Rücklagenakkumulation. Die Ergebnisse bestätigten außerdem, dass obwohl Kreditnehmer dazu angehalten sind Zins- und Kreditraten pünktlich zurück zu zahlen, sie potentiell in der Lage sind, über die Jahre kleine Investitionen hinzuzufügen. Schaut man sich das über die Jahre schrittweise zunehmende Reichtums-Niveau in Verbindung mit den ebenfalls steigenden Marktzukaufen an, liegt die Schlussfolgerung nahe, dass der Vorteil des Bildungsniveaus von Kreditnehmern über Nicht-Kreditnehmer unter anderem auf die positiven Spill-Over-Effekte der Kredite zurück zu führen ist.

Als ein Versuch die Einflüsse von Mikrokrediten auf die Armutsbekämpfung im ländlichen Sudan zu bewerten, konnte die vorliegende Studie aufgrund einiger Einschränkungen nicht alle wichtigen Aspekte behandeln. Weiterführende Untersuchungen werden deshalb in folgenden Forschungsbereichen benötigt:

Die erste Limitation dieser Studie ist die Nutzung von Daten, die aufgrund von Zeitlimitationen und Sicherheitsschwierigkeiten während einer einzigen Saison gesammelt wurden. Zukünftige Forschungsarbeit in der Region sollte so organisiert sein, dass eine Datensammlung in Zeitreihen erfolgen kann. Diese Daten würden die Verwendung dynamischer Modellierung erlauben um den Einfluss von Krediten auf das Verhalten landwirtschaftlicher Haushalte bezüglich der Verwendung von Ressourcen und Investitionsentscheidungen abzubilden.

Zweitens, Risiko- und Transaktionskosten wurden nicht in die vorliegende Impaktstudie einbezogen. Diese Variablen mit einzubeziehen würde dazu beitragen, die Auswirkungen von Mikrokrediten auf politische Empfehlungen zu analysieren. Hier würde eine Einschätzung der Opportunitätskosten, entstanden durch Zeitverlust während der Kreditbeantragung sowie durch Risiko und Unsicherheit, die Genauigkeit der Beurteilung dieser Auswirkungen erhöhen. Diese Variablen mit einzubeziehen ist relevant, da Landwirte unter diesen Umständen nicht in der Lage sind *Nutzen* zu maximieren, sondern eher *erwarteten Nutzen*. Zukünftige Studien sollten deshalb sowohl Transaktionskosten als auch die Marktpartizipation der Haushalte einschätzen. Verschiedene Risikotypen wie Preis-, Ernte- und Einkommensrisiken können reduziert werden, indem sie in das Produktionsmodul des dynamischen Haushaltsmodells integriert werden.