Credit Risk Analysis for AgriFinance
A Consulting Report for TechnoServe-Uganda

Manisha Basnet, Master of Arts in Law & Diplomacy, 2015
Charlene Hasib, Master of International Business, 2015
Yuan-Ting Meng, Master of Arts in Law & Diplomacy, 2015
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A Consulting Report for TechnoServe-Uganda
Submitted in partial fulfillment of the degree of
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and Master of International Business for Charlene Hasib
at the Fletcher School of Law and Diplomacy, Tufts University

Under the Supervision of Dr. Julie Schaffner

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Table of Contents

Acknowledgements ......................................................................................................................... 2

I. Introduction ................................................................................................................................. 5

Part A

II. TechnoServe Conservation Cotton Initiative Uganda ................................................................. 8
   a. Background .............................................................................................................................. 8
   b. CCI Farmer Production and Sales .......................................................................................... 8
   c. Research Focus: Gulu District .............................................................................................. 9
   d. Crop Production and Sales .................................................................................................... 9

III. TechnoServe – Crane Bank Loan Program Partnership ............................................................ 10
   b. Loan Process .......................................................................................................................... 10
   c. Loan Behavior ..................................................................................................................... 11
   d. Loan Program Limitation ..................................................................................................... 12

PART B

IV. Research Methodology and Findings ......................................................................................... 14
   a. Farmer Survey Collection in Gulu ....................................................................................... 14
   b. Demographic Data ............................................................................................................... 14
   c. Education Level ................................................................................................................... 14
   d. Financial & Communication Pattern and Behavior ............................................................. 14

V. Survey and Research Limitations ............................................................................................... 15

PART C

VI. Financial Inclusion ................................................................................................................... 18
   a. Smallholding Agriculture in Uganda ................................................................................... 18
   b. Access to Finance for Smallholder Agriculture .................................................................... 18
   c. Microcredit in Uganda ......................................................................................................... 19
   d. Uganda’s Development of a Credit Bureau ......................................................................... 20

VII. Credit Scoring .......................................................................................................................... 21
   a. The FICO Score: An Exemplar of a Statistical Credit Score ............................................... 21
   b. BancaMia – Exemplar of Credit Scoring for Microfinance .................................................. 22
   c. Credit Scoring Models for Micro-lenders ............................................................................ 23

Part D

IX. Recommendations and Next Steps .......................................................................................... 27
   a. Credit Scoring Approach ..................................................................................................... 27
      i. Empirically Verified Predictive Factors ......................................................................... 28
      ii. Challenges to Credit Scoring ......................................................................................... 32
   b. Systemic Risk Factors ......................................................................................................... 33
   c. Additional Risk Mitigation Techniques ............................................................................... 35
      i. Portfolio Diversification .................................................................................................... 35
      ii. Repayment Incentives .................................................................................................... 36
      iii. Agricultural Insurance .................................................................................................. 37
      iv. Cash Flow Analysis ....................................................................................................... 39

X. Conclusion ................................................................................................................................. 40
Appendices .................................................................................................................................................. 41
Appendix 1 - Abbreviations .................................................................................................................. 41
Appendix 2 - Glossary of Key Terms .................................................................................................. 41
Appendix 3 - Glossary of Key Players ................................................................................................. 43
Appendix 4 – Theory of Change CCI Program .................................................................................... 45
Bibliography ........................................................................................................................................... 46
I. Introduction

The purpose of this report is to help Crane Bank develop workable approaches to reducing credit risk when lending to smallholder farmers that are members of TechnoServe’s cooperative in Northern Uganda. We primarily consider methods to reducing default risk, including the introduction of score-based credit risk evaluation. We also consider methods to incentivize payment given that strong safeguards such as collateral and institutional backing (such as law enforcement) are generally not available for smallholder farmers in rural Uganda. Based on secondary research, and conversations with farmers and bank officials, we believe that some changes would be relatively low-cost and easy to implement (such as use of guarantors) while others (such as developing credit scoring systems) are complex and require significant time and resource investments. Although lending to uncollateralized, smallholder farmers is challenging and extremely resource-intensive, the benefits of access to credit for the local economy may be significant, and research demonstrates that such projects can get easier with time if institutional knowledge is retained and consistent methodologies are followed.

Crane Bank’s initial agri-loan pilot program began in the first half of 2013 with loan disbursements to over 8,000 member farmers. The lending project is funded primarily by Edun – a fabric company dedicated to fair traded sourcing of raw materials – and RaboBank, a Dutch financial institution. Along with providing subsidized funds to Crane Bank, sponsors have dictated some of the loan terms that borrowers must accept to receive funds, including the planting of at least 1-acre of cotton. We found that cotton was not produced consistently by borrowers, however, because of its lack of commercial viability in the marketplace and the intensity of labor this crop requires.

At present, farmer data is collected by TechnoServe and then passed on to Crane Bank for evaluation. Crane Bank’s field officers periodically visit farmers’ plots to verify land ownership and appropriate usage of funds. From conversations with farmers, we learned that the lack of direct access to Crane Bank may have contributed to confusions about loan terms. Some had believed that crop insurance was built into the interest rate whereas only life insurance was included. There were also misalignments between farmers’ self-perceived needs and loan restrictions; farmers received loans specifically for crop cultivation, but told our research team that they had occasionally used it to meet other expenses and generally wanted more flexibility regarding usage of fund. Moreover, farmers had meaningful interactions with TechnoServe officials, but did not have the same level of relationship with Crane Bank. Visiting the nearest bank branch required farmers to travel up to two hours and spend up to UGX 2,000 on public transportation. This report will recommend more direct ties between the lending institution and farmers in order to develop stronger repayment incentives and communicate loan terms more effectively.

According to the TechnoServe’s CCI Program Evaluation Report for 2014, 38% of borrowers have defaulted because of poor weather and misuse of loan funds. While weather patterns are a significant risk factor for agricultural lending, there are potential
avenues to decrease the impact of such shock events – namely through the diversification of crop production and portfolio management. Misuse of funds may be limited through incentives, training, and reputational factors. Credit scoring, in conjunction with other approaches, may over time enable wiser lending decisions by providing systematic assessments of a borrower’s ability and willingness to pay back loans. At present, lending decisions are based on applications and data collected by TechnoServe utilizing mostly demographic characteristics about farmer households and their past production yields. Based on research, we believe that collecting a wider range of data about borrowers may allow Crane Bank to better evaluate farmers’ ability and willingness to repay loans. Making the evaluation of this data more systematic through a credit scoring system could, in addition, streamline and improve analysis. Furthermore, research demonstrates that an experienced loan officer that interacts with farmers frequently can significantly decrease default rates.\footnote{Baklouti, Ibtissem, and Abdelfattah Bouri. "The loan officer’s subjective judgment and its role in microfinance institutions." \textit{International Journal of Risk Assessment and Management} 17.3 (2014): 233-245.} Investing in training and retaining staff, therefore, may help the program improve efficiency in the long-term. Given the complexity of the current lending program’s evaluation process, and the multiple sponsors and stakeholders involved, streamlining the evaluation process for applicants could significantly improve lending processes and outcomes. Credit scoring processes may exact discipline on the lending process, so in conjunction with other changes, may improve lending outcomes.

This report explores the issues mentioned above and other related findings in further detail. The report is organized into the following sections: Part A: Outline of the characteristics and goals of TechnoServe’s Conservation Cotton Initiative (CCI) project in Northern Uganda and the lending partnership with Crane Bank, and overview of the farmer cooperative members; Part B: Overview of research survey methodology and results; Part C: Research and analysis based on credit scoring and proven risk mitigation techniques in agricultural contexts; and Part D: Recommendations on risk mitigation approaches for TechnoServe.
Part A

This section provides an overview of TechnoServe’s initiatives in Northern Uganda and the farming characteristics of its cooperative members.
II. TechnoServe Conservation Cotton Initiative Uganda

a. Background

TechnoServe implemented the Conservation Cotton Initiative (CCI) program with the aim to improve the livelihoods of over 8,000 cotton farmers in Northern Uganda. The project aims to help farmers increase income from cotton production by providing training on farming, organizing community groups, and broadening farmers’ access to financial services and markets. The project was implemented as a three-year pilot program (2011-2014) and continues to serve farmers through loans from Crane Bank.

In order to improve credit access for the farmers, CCI has entered into a partnership with Crane Bank to provide loans to local cotton farmers. The project has also established 90 informal Village Savings and Loans Associations (VSLAs) and trained members to operate these community groups effectively. There are currently 2,700 farmer members in the VSLA, constituting 56% of the 160 farmer groups\(^2\). The social program also performs Functional Adult Literacy (FAL) training, whereby it provides members with literacy on accurate record keeping, information on market value chain assessment, and health and wellness education — all of which are conducive to improving agricultural productivity.

Additionally, in order to increase productivity and to improve product marketability, CCI organizes cooperative members into teams, called the Producer Business Groups (PBG), in order to enhance smallholder cotton farmers’ product marketing efforts and effective utilization of credit. Member farmers are also organized into Business Service Provider groups (BSP), and receive training to improve the commercial viability of farming. Members of the BSP are also eligible to apply for loans from Crane Bank.

b. CCI Farmer Production and Sales

In the second production season of 2013, 6,423 farmers, spanning across 17 sub-counties in Gulu, Amuru and Nwoya districts, harvested various combinations of four crops: cotton, maize, beans and groundnuts.\(^3\)


c. **Research Focus: Gulu District**

Gulu is situated 295 km north of the capital city of Kampala. It is the marketing center of the main agricultural region in Northern Uganda, the homeland of the Acholi ethnic group. Based on the 2014 Census, the population count within this region was 443,733.\(^4\) Agriculture remains a major economic activity in this region and over 80% of the population still relies on subsistence farming.\(^5\) Major crops grown are millet, sorghum, maize, upland rice, cassava, sweet potatoes, pigeon, peas, sesame, groundnuts, sunflower, soya beans, bananas, cotton and tobacco. Coffee, rice and groundnuts are newer cash crops; traditionally, the region was known for cotton and tobacco production.

\[\text{Source: Gulu District Local Government Statistical Abstract 2012/13}\]

\[\text{City Population Gulu District Population Census 2014 August 27.}\]
\[\text{http://www.citypopulation.de/php/uganda-admin.php?adm2id=005}\]

<table>
<thead>
<tr>
<th>CCIU Farmer Population Location (Total: 6423 farmers)</th>
<th>ALERO (N) 403</th>
<th>AWACH (C) 206</th>
<th>BOBI (G) 468</th>
<th>KOCH GOMA (N) 208</th>
<th>KOCH ONGAKO (G) 20</th>
<th>KORO (G) 193</th>
<th>LAKWANA (C) 1211</th>
<th>LALOGI (G) 1091</th>
<th>LAMOGI (A) 1028</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Sub-counties (N: nwoya; A: amuru; G: gulu)</td>
<td>MEDE (G) 2</td>
<td>ODEK (G) 1158</td>
<td>ONGAKO (G) 101</td>
<td>PABBBO (A) 15</td>
<td>PAICHO (G) 45</td>
<td>PALARO (G) 611</td>
<td>PATIKO (G) 132</td>
<td>UNYAMA (G) 230</td>
<td></td>
</tr>
</tbody>
</table>

| d. **Crop Production and Sales** |

Farmers under the TechnoServe program harvested one acre or more of each of the four-crop types - Cotton, Maize, Bean, and Groundnut:

<table>
<thead>
<tr>
<th>Key Performance Indicators for Targeted Households on 30th April 2014:</th>
<th>Cotton</th>
<th>Maize</th>
<th>Beans</th>
<th>Groundnuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Profit</td>
<td>UGX 328279</td>
<td>UGX 398322</td>
<td>UGX 604446</td>
<td>UGX 871684</td>
</tr>
<tr>
<td>Yields per acre</td>
<td>260</td>
<td>730</td>
<td>70</td>
<td>493</td>
</tr>
<tr>
<td>Production Cost</td>
<td>UGX 54742</td>
<td>UGX 69222</td>
<td>UGX 40,002</td>
<td>UGX 83240</td>
</tr>
<tr>
<td>Total Annual Household Expenditure (proxy for income)</td>
<td>UGX 1,760,225</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We noted that the amount a farmer chose to sell often depended on harvest output. When production was low, a greater proportion of the harvest was reserved to meet household consumption needs. Farmers with similar sizes of land and in the same climate zone and cultural communities demonstrate variance in yields, which could be derived from insufficient access to funds needed for output enhancing investments.

III. TechnoServe – Crane Bank Loan Program Partnership

a. Program

Crane Bank (CB) receives low interest funds from Rabobank, which is based in The Netherlands, and Edun, a fashion house that aims to source production inputs sustainably from the African continent. Notably, Edun is co-owned by Bono, lead singer of U2, and Irish activist, Ali Hewson.

CB lends funds that it borrows from Rabobank and Edun at a subsidized interest rate to farmers. In taking out loans, farmers agree to terms restricting funds to investments for agricultural purposes only. In addition, farmers are required to cultivate a minimum of 1 acre of cotton in accordance with the loan terms set by Rabobank and Edun.

Farmers receive loans at 9% interest rate for 6-month loans and at 18% interest for 12-month periods. To penalize non-payment and late payment, Crane Bank charges farmers 36% per annum on their loan balance starting the day after default. As of April 2014, 440 farmers had received loans from Crane Bank, with 95 being female recipients. Recovery of loans started in January 2014, with a recovery rate of 62% (put otherwise, the default rate was 38%).

b. Loan Process

Crane bank makes its funding decisions based on loan applications submitted by TechnoServe on farmers’ behalves. TechnoServe creates very basic farmer business profiles, which outline what and how much a farmer produced in the last season. Farmers also fill out CB’s bank loan application form with help from TechnoServe; this form specifies the farmer’s loan request in terms of amount and duration. CB sends bank officers to the field to verify the land area cultivated by an applicant through the use of Geographic Information System (GIS) mapping and interviews with neighbors. A loan committee uses the information collected to decide whether to approve the loan application.

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For CB to verify an application, the cost of document processing per farmer can take up to UGX 80,000, inclusive of advertising fees, GPS mapping, and transactional and educational expenses. The cost of loan processing, therefore, represents a significant lending cost as the average loan size is UGX 613,080\(^7\).

To ensure that loans are used exclusively for farming, CB initially distributed funds in three installments corresponding with key times associated with farming. Currently it distributes funds in two installments that are in accordance with the farming season: before planting season, so that inputs and preparatory measures can be taken; and, secondly, before the harvest season. The distribution timing was altered in response to farmers’ requests for larger disbursements.

In taking out a loan, farmers agree to mortgage some land as collateral with their family’s agreement; to declare number and names of wives/husbands and children, certified by the community; provide ID card of both borrower and guarantors; and possess a financial ID card (the cost of which is UGX 25,000) and security check issued by the national government. Hence farmers that choose to apply for a loan already have an established formal identity, which indicates that formal banking is skewed towards those that are able to afford and access the identity card.

\section*{c. Loan Behavior}

Farmer performance is very dependent on weather and the risks derived thereof. Not all farmers grow cotton every year because of their vulnerability to fluctuations in cotton price. Cotton prices have fluctuated from UGX 1,800 in 2011 to UGX 1,008 in 2013. Crop diversification among farmers is therefore rapidly and widely adopted to avoid loss of income. Such behavior though generally positive is not without challenges, including the increasing need for cultivating greater portion of available farmland, labor and greater access to financing. Many farmers do not cultivate the entirety of their agricultural land because of resource shortages. Repayment among all borrowers, local leaders and PBG chairpersons are not without default; women and youth generally require more assistance than men.

As mentioned previously, TechnoServe at present disburses loan payments in accordance with key points in the crop production cycle to ensure that loans are used for agricultural purposes only. Farmers claim that the strict timelines and parsing of loans into installments makes it hard for them to make timely investments and from making non-farming purchases that they deem necessary. Farmers told our researchers that if they had

\(^7\) Ibid.
received money all at once, they would have been able to make business-related plans on
a long-term basis, buy in bulk, and make more nuanced and timely planting and
harvesting decisions. Farmers also admitted to utilizing at least some portion of loan
funds for non-sanctioned purposes, including consumption and payment of existing loan
fees. However, CB believes that this installment loan system is important to prevent
moral hazard issues whereby farmers use monies for non-sanctioned and non-welfare
enhancing purposes, such as purchase of alcohol or paying for education fees.

d. Loan Program Limitation

This section will explore some of the limitations of the agri-lending program in brief - we
will explore some of these issues in greater detail in PART D.

We believe that not all participating farmers fully understood what the loan pilot program
entailed. Some farmers had believed that the program covered crop insurance, but
TechnoServe staff told us that this was not the case. This reflects the need for enhanced
communication to ensure both farmers and bank officials are on the same page. Misunderstandings may undermine the effectiveness of the program and reduce trust
between farmers and project officials.

Currently, repayment rate among borrowers is roughly at 62%, with the remainder
defaulting and entering extended payment agreements with Crane Bank. The prominent
reason stated for default by farmers was adverse weather in the 2013/2014 season. The
poor performance during this season for cotton farmers in Uganda can be attributed to the
dry spell, low soil fertility and limited use of fertilizers to enhance cotton production.8
The absence of agricultural insurance may compromise the effectiveness of the loan
program, since farmers are vulnerable to weather conditions.

One of the donors for this project, Edun, mandated cotton cultivation as a requirement for
those who accept loans. Farmers who produce cotton, furthermore, might be able to sell
their output to Edun, which is a fashion house. However, the low profitability of cotton as
compared to other crops in the region puts farmers at a disadvantage.

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8 Ugandan Cotton Farmers Decry Low Prices.” Ugandan Cotton Farmers Decry Low Prices. N.p., n.d.
prices.html>.
PART B

This section summarizes the methodology and research outputs of our interviews of 44 TechnoServe cooperative farmers who have borrowed funds from Crane Bank.
IV. Research Methodology and Findings

a. Farmer Survey Collection in Gulu

In order to develop an understanding of cooperative farmers’ capital constraints and to determine possible factors for consideration in credit risk evaluation, we conducted in-person interviews and home visits over a two-day period in the Gulu district. Researchers collected basic demographic information, financial and communication patterns, and behavioral information. All 44 farmers surveyed belong to a VSLA and possess certain similarities in terms of training and credit access since they are all affiliated with TechnoServe’s CCI program.

The survey was conducted in both English and Acholi, the regional language. Surveyors partnered with local translators, and were accompanied by a TechnoServe staff member who managed programs in the targeted areas. Prior to the survey, the VSLA chairman convened member farmers and shared the purpose and process of the interviews, and informed farmers of their right to suspend and withdraw from surveys at any time during the process.

b. Demographic Data

The average age of the farmers surveyed was 50.8 years old, with an age range from 20 to 82. Of the surveyed farmers, 66% were men and 34% were women. A typical household size in the area consisted of six to ten people: 73% of our survey sample falls under this category. Farming is not only the predominantly economic activity, but also remains a way of life: 66% of persons surveyed have been farming for more than 30 years. However, most do not cultivate more than five acres of land.

c. Education Level

Most of our survey farmers (57%) had attained some level of primary-level education. However, not everyone had completed primary schooling. About 14% received high school education and 11% attended junior high school. Only 7% of farmers surveyed did not receive any formal education. It should be noted that despite the fact that education is free in Uganda and almost all of our surveyed farmers received a certain level of education, the poor quality of instruction provided could mean that years of schooling may not be indicative of a certain level of functional literacy and numeracy.

d. Financial & Communication Pattern and Behavior

Physical access to financial institutions is a major barrier for surveyed farmers due to the distance from the village to the nearest CB branch. Of farmers surveyed, 41% take one to
two hours to reach the branch; 34% require more than two hours. Around 60% of farmers interviewed travel primarily by boda-boda (motorbike) as the prevalent method of transportation; followed by 20% on foot; and 14% who rely on buses and taxis; the remainder commuted by bicycle. Farmers told researchers that travel costs (on average) amounted to UGX 20,000.

Of the farmers interviewed, 93% save with VSLA; 45% reported saving through banks; 25% save at home, and 9% save by investing in livestock. None of the farmers currently save with an MFI.

Most farmers interviewed borrow funds from formal banks and the VSLA. For our farmers, two major regular payments are children’s school fees and mobile phone service, with both near 100%. Correspondingly, 85% said they possess mobile phone and 14% had easy access to one when needed. Depending on location, fees for pumping water is another regular expense.

We also asked if farmer intended to take out additional loans in the future, and 90% answered in the affirmative while 7% said they would assess the situation before making a decision. Farmers reported using loans for five major purposes: purchasing farm tools and inputs (70%); paying for children’s education (67%); paying for health expenses (27%); and livestock and land investments (27%). Other miscellaneous uses include: working capital, leasing land, and consumption. Based on our survey, farmers do not consider taking loans for ceremonial purposes.

At the end of the survey, we asked farmers whether they were aware of anyone who had ever defaulted. We consciously avoided asking whether they themselves were defaulters in order to safeguard against inaccurate answers due to social stigma or the fear of potential repercussions. A few of our respondents shared that the reasons for default were adverse weather (resulting in poor harvests) and lack of financial management skills. Another reason that came up was misspending on alcohol consumption.

V. Survey and Research Limitations

The survey was conducted within only two days. This allowed for interview of a small sample size, consisting of 44 farmers in 3 villages. There were also issues of self-selection since farmers had the option to choose whether or not to participate in surveys.

In addition, the lack of field testing of surveys may have resulted in operational inefficiencies in terms of the relevancy of questions asked and time allocated for interviews to be conducted by researchers. For instance, we asked farmers about the
value of their land and the amount they might sell their houses. We learned upon speaking with farmers that local customs and the nature of land ownership (which we will describe more fully in later sections) do not allow for such transactions. The concept of land ownership and sale, therefore, were not present and we found that farmers were offering us widely divergent estimates for home and land valuations that were unreliable.

We wish to provide a caveat that our results may only be applicable for participants of the CCI program. All the farmer groups we interviewed work with TechnoServe and undergo standard training and resources as cooperative members. They all have taken loans from CB. The high level of heterogeneity among farmers surveyed may skew our results. For instance, the age range in our respondent group tended to be higher than the cooperative population’s average.
PART C

This section provides an introduction to credit scoring and an overview of the credit market and approaches to credit risk analysis.
VI. Financial Inclusion

a. Smallholding Agriculture in Uganda

In Uganda, the agricultural sector’s contribution to GDP has remained steady at around 37% of national output. The sector employs up to 75% of Ugandans and, therefore, is a major area of focus for development initiatives by the government and non-profit organizations. Uganda enjoys warm climate, ample and fertile land and regular rainfall - presenting some of the best conditions for crop cultivation in East Africa. Moreover, agriculture provides nearly all of the country’s foreign exchange earnings, with coffee constituting 19% of total exports. IFAD adeptly summarizes agriculture in Northern Uganda:

“The agricultural pattern throughout the area is quite homogeneous, with cotton as the main cash crop, and maize, millet, groundnuts, cassava, beans, sorghum and banana as food crops. There is a large cattle population in the region, over one million head, or more than one third of the national herd.”

Most farmers are defined as smallholders, thus cultivate relatively small tracts of land and grow crops for both consumption and commercial purposes. In recognition of the importance of the importance of smallholder farming, the national government and the country’s central bank, The Bank of Uganda, have introduced numerous policies since 2005 to extend credit access to the sector.

b. Access to Finance for Smallholder Agriculture

Agricultural lending provides opportunities for smallholder farmers to improve production outcomes and improve their families’ health and economic outcomes. Khandker and Koolwal (2014) find that although not many households in Uganda report borrowing specifically for agriculture, access to institutionalized credit (especially microcredit) nonetheless leads to investments in agricultural initiatives and substantially improves production outcomes. Studies also indicate that self-financing is not an

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10 Ibid
13 Ibid
adequate vehicle for growth given the limited savings that smallholder farmers typically generate after meeting expenses. In fact, Anka (1992) notes that “without credit, agriculture productivity multiplication is impossible.”

Access to credit may allow farmers to increase the scale and efficiency of production. In Gulu, for example, many smallholder farmers in the TechnoServe cooperative do not cultivate the entirety of their farmland and significant portions remain fallow because of lack of resources and manpower. The ability to purchase or lease farming equipment could help such farmers make better use of their land. Apart from raising living standards and disposable income in the community, funds could be reinvested into productive enterprises. With access to affordable credit, some farmers might over time increase their scale of operations by purchasing or leasing neighbors’ farmlands and further improve upon their socioeconomic status.

Smallholder farmers continue to find it difficult to gain access to formalized lending channels. Access to credit is especially limited in rural areas with poor infrastructure, since such conditions present significant barriers in terms of travel time and access to lending institutions. The lack of commercial appeal and high operational complexity of lending to rural communities means that market solutions are rarely feasible. Instead, local communities must rely on MFIs where they exist. Micro-lenders provide credit as part of a social mission to improve socioeconomic indicators in impoverished communities. Thus MFI model presents a significant challenge in terms of achieving financial sustainability. However, MFIs can improve their likelihood of success by implementing methodologies that are highly efficient and thereby increasing repayment and lowering lending costs.

c. Microcredit in Uganda

Microfinance institutions (MFIs) in Uganda have attempted to fill the gap in credit availability to smallholder farmers to some extent. Currently, these MFIs provide access to approximately USD 620 million in loans to almost 540,000 borrowers, which is equivalent to about 3.8% of Uganda’s total population.

Many MFIs operating in Uganda tend to utilize proprietary credit risk scoring models. Among the methodologies used, we note that composite scores based on a mix of

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16 Ibid
behavioral data, psychological tests, judgmental analysis, and demographic and transactional information may be used.

Credit data is generally collected directly from the farmer by loan officers, or collected from farmers’ suppliers and service providers (including mobile phone operators and input sellers). In addition to credit risk scoring, micro-lenders such as Root Capital, Accenture, and BRAC-Uganda provide ancillary financial services to help farmers, including financial literacy training. These add-on services may help them develop skills and resources that increase repayment probability and also serve to build good-will among farmers.

Despite the growth of microcredit over the last several decades, individual lending organizations have found it difficult to achieve sustainable business models. Tarinyeba-Kiryabwire (2010) notes that a large part of this struggle has been characterized by the paradoxical necessity of charging high interest premium to the poor to compensate for their higher risk, but consequently running into adverse selection problems (quality of borrowers decrease as interests increase) that make it difficult for lenders to meet the social mission of providing affordable credit. Even where MFIs have access to subsidized funds through donor channels, they have struggled to pass these on to poor borrowers because of high operational costs fuelled by poor management and lack of adequate infrastructure.

d. Uganda’s Development of a Credit Bureau

In 2011, the Bank of Uganda partnered with a South African private company named CompuScore to develop a credit bureau for the first time in the country’s history. The bureau has led to documentation and development of cogent credit histories for 890,702 individuals and 18,870 commercial firms. The program has been heralded as a success in terms of increasing access to financial services—with ease of credit access increasing since financial institutions can now better evaluate credit risk for those whose default risk was previously unknown. The existence of a credit bureau also showcases a greater level of institutional and financial sector sophistication and, therefore, contributes to improving Uganda’s ranking in The World Bank’s Doing Business Report -- with the country moving from a ranking of 158 in 2008 to 131 in 2014.

18 Ibid.
Creation of a formal financial bureau has been an important achievement, but its coverage only extends to 4.9% of the adult population. Furthermore, the current credit system lacks transparency, with no laws providing access to credit scores or decision models to consumers. The CompuScore model is not helpful in terms of increasing credit access for smallholder farmers with no existing ties to the formal financial sector and limited documented credit histories.

However, the creation of the credit bureau indicates a turn towards more institutionalized financial operations, which may alleviate country-level risk and attract greater investment. Furthermore, the TechnoServe cooperative members possess biometric financial identity cards as part of the national credit bureau program and, therefore, as their formal borrowing history as Crane Bank’s clients develops to provide a picture of their credit health, they may have more flexibility in terms of gaining loans from other financial institutions.

VII. Credit Scoring

A credit score is a numerical representation of an individual’s credit worthiness as determined by analysis of data inputs from credit history records as well as transactional and demographic information. Arguably, the best form of credit score is a verifiable and field tested model based on empirical evidence. For such a statistical credit scoring model, the relationships between risk (as a probability) and client characteristics are statistically determined using historical data on client characteristics and their repayment performance, and then weighted by the scoring institution based on their perceived importance of the metric and the statistical relationship between default likelihood and the input (Schreiner, June 2002). The result of this weighted mathematical formula is a credit score that indicates the probability-based ranking of creditworthiness; i.e. that an applicant will make timely and full repayments on loans.

a. The FICO Score: An Exemplar of a Statistical Credit Score

We will use the FICO score, which is the predominant consumer credit score used by financial institutions in the United States to make lending decisions, as an exemplar of how a statistics-based credit score might work.


22 Ibid.
The FICO model uses less than 100 variables that are chosen because of their predictive power of repayment risk; the factors are weighted either higher or lower vis-a-vis other factors based on the statistical strength of the measurement in determining the probability of repayment. The weights assigned to predictive factors are such that they add up to 100%. For the FICO score, the input categories and their respective weights are as follows: Payment History (35%) + Amounts Owed Relative to Income and Assets (30%) + Length of Credit History (15%) + Types of Credit in Use (10%) + New Credit in Recent Months (taking on new loans and opening new credit lines in a short period of time increases default risk) (10%).

While we will refrain from going into granular detail about the FICO score, it is important to note some of the strengths and weaknesses of this statistical credit scoring model. The FICO score is based on a standard set of highly vetted inputs that allows for apples-to-apples comparison of prospective borrowers. Inputs are collected systematically by credit reporting agencies, which update consumer data within 30 days of new information being available. Applicants have a right to view their credit score data and financial institutions must provide reason if they reject a loan application.

The system is dependent on strong institutional reporting standards and the availability of credit reporting agencies for coverage. It allows for standardization and efficiency in the lending process and, because of consumer protection laws, ensures fairness. The credit score alone allows financial institutions to gauge the riskiness of a credit applicant without any direct personal contact.

Fairness in credit decisions is considered necessary because scoring systems may have strong welfare and social mobility repercussions. Among other things, loans are often used to expand businesses, support education goals, and pay for health care needs.

The strict standards embodied by the FICO score in terms of data quality, procedural transparency, and fairness, is difficult to fully implement even in the United States, which has a highly developed financial sector. It is unusable for individuals who have thin files (two or fewer trade lines) or lack credit histories altogether. Thus, a fully statistical model may not be possible in rural Uganda where there are significant resource constraints and limitations on data availability.

b. BancaMia – Exemplar of Credit Scoring for Microfinance

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BancaMia is a for-profit bank in Colombia that issues unsecured loans to micro and small enterprises. The organization introduced a credit scoring system that significantly improved efficiency in the loan approval process and improved allocation of credit without affecting average loan amounts and default rates.

Prior to the introduction of credit scores, BancaMia made credit approval decisions using information about the prospective borrowers collected by its loan officers. A credit committee would approve and reject applications that incorporated the collected information. In some difficult cases, the credit committee would either postpone their decision until further information was collected or refer the application for further review to upper-level managers. This loan approval process very much fell under the discretion of the committee and was very expensive due to the high number of referrals and rounds of information collection. BancaMia developed its own credit scoring software “to improve identification of the best and worst clients, decentralize the loan approval process, and reduce the labor costs involved in the loan application evaluation.”

The credit score is calculated using historical information in the credit applications to predict the repayment performance of prospective borrowers. Bancamia used both quantitative (age, gender) and qualitative client information that was verifiable to generate an applicant’s credit score.

The use of credit score increased the probability of the review committee reaching a decision by 4.6%. The computer-generated credit scores reduced uncertainty about borrowers’ creditworthiness, thus allowing the bank to provide appropriately sized loans to riskier borrowers. Hence, while the average loan size issued remained unchanged, the bank was able to match its lending to borrower characteristics. Loan outcomes, such as the average size of loans issued or default rates among borrowers were not affected as a result of the credit score. The BancaMia case underscores the potential of credit scores as a way to make better lending decisions in more efficient ways.

c. Credit Scoring Models for Micro-lenders

The USAID Credit Scoring Handbook (“the handbook”) breaks down credit scoring models for micro-lending into 3 types:

- Statistical: empirically derived from data on past loans;
- Judgmental: structured from expert judgment and institutional experience

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• Hybrid: some combination of statistical and judgmental techniques.

![Figure 2: Model Selection Drivers](image)


According to the handbook, the biggest determinant of an organization’s scoring approach is “quality and quantity of historical data available” and secondly the flexibility and direction of future operations. As data quality and quantity increases, the organization can move from judgmental to more statistically oriented analytical methods. Therefore, alongside collecting systematic data and records, the lender will initially rely more on loan officer judgments, available transaction and demographic data, and qualitative interviews of prospective borrowers’ acquaintances. As the transactional history develops for the population, the organization can move towards a hybrid model that incorporates some risk factors that are predictive of default risk.

For the statistical component of the credit assessment, Crane Bank must first identify potential risk factors that likely contribute to credit default (we cover some of these potential risk factors in Part D. It should then run an econometric analysis to assess which factors effect default probability and to what extent. Thereafter, the organization should pick the factors that have the highest substantial statistical and economic impact on default likelihood and create an index of factors that can be used for credit scoring. The handbook summarizes the benefits of starting out with a judgmental model:

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should discuss which factors guide their current decisions. One technique is to rank the risk factors used in the credit review process according to their perceived importance in determining a client’s creditworthiness. Consultants may provide advice during this process, but the bank and the MFI’s staff should contribute actively since they generally have an intuitive in depth knowledge of their client base.

Micro-lenders in rural agricultural contexts tend to utilize a blended model that consists of judgmental analysis by program officers of an individual’s credit-worthiness alongside demographic and credit history data where feasible. We recommend that Crane Bank and TechnoServe contact such agriculturally-focused micro-lending institutions in Uganda that have successfully grown the scope of lending. These organizations have institutional knowledge and insights that could be applicable for lending to TechnoServe farmers. Some suggestions on potential knowledge-sharing partners are:

**Finance Trust Bank:** This institution began providing microloans in 1984 as “Uganda Women’s Finance and Credit Trust Limited”. While the organization currently offers a broad range of financial services, agricultural lending and microfinance remains a strong component of its mission. The organization has grown tremendously over several decades and may provide key insights on making loans to smallholder farmers in resource constrained contexts.

**BRAC-Uganda:** BRAC is one of the world’s largest providers of financial services for the poor. The NGO opened its Uganda branch in 2006, and already has around 2 million borrowers, which include smallholder farmers without significant collateral.

**FINCA-Uganda:** FINCA began operating in Uganda in 1992 and currently services 150,000 microloans in Uganda. The organization’s social mission is to increase credit access as a way to reduce poverty.
Part D

This section contains our recommended next steps for TechnoServe and Crane Bank with respect to its lending project in Northern Uganda. We also offer potential tools and considerations that may facilitate the move to a systematic risk evaluation approach.
IX. Recommendations and Next Steps

a. Credit Scoring Approach

In general, we believe that a systematic credit scoring approach has potential benefits that could improve lending to smallholder farmers in conjunction with judgmental analysis based on loan officers’ experience. Credit scoring can provide a snapshot of a farmer’s default risk, that can be useful as part of the loan evaluation process. Credit scoring systems may improve loan officer efficiency by putting in place a standard range of risk factors that have been proven to be predictive in rural agricultural lending. Such systems may allow the bank to adjust credit terms and interest premia based on risk classification of applicants. Those with superior credit scores could, for example, be subject to less follow-ups from bank officials and have access to higher credit limits.

Having a consistent credit scoring system - over several years - might allow an MFI to better estimate what proportion and characteristics correlate with likelihoods of certain payment behaviors, such as tardiness or non-payment, and allow the institution to better estimate potential write-offs. Credit scores can also reduce time spent on collections since effective scores enable better lending decisions, which consequently reduce the need for collections officers to make repeat visits for collections and helps them prioritize visits to those who are at higher risk of defaulting.\(^\text{27}\)

In rural contexts and with limited resources, we believe that a hybrid model is perhaps the most feasible. We recommend that TechnoServe and Crane Bank begin the work of collecting and maintaining databases on farmers and train staff accordingly. Understanding local contexts and holding a long-term programmatic outlook are arguably essential in determining which factors and credit risk evaluation approaches would best optimize lending processes and outcomes.

We recommend that TechnoServe and Crane Bank develop credit risk analysis metrics that are based on qualitative and judgmental assessments, but with the aim to gradually work in more statistical analysis as an individual’s credit history record develops. Moving to a fully empirical model will depend on the quality and quantity of data and record keeping facilities available.

We also recommend that TechnoServe continuously monitor its risk exposure and ensure that this remains at an acceptable level. For example, if a portfolio consists of a specific village,

the organization should evaluate its Portfolio at Risk (PaR) on a monthly basis. This is calculated by dividing the outstanding balance of all loans with arrears over 30 days (or other relevant time frame), plus all refinanced (restructured) loans, by the outstanding gross portfolio as of a certain date.\(^\text{28}\) When this ratio goes above a pre-determined threshold of acceptability, loan officers should investigate whether any exogenous risk factors might have increased default rates, and work with farmers to address such issues if possible. For example, TechnoServe may determine that a combined default and overdue ratio of 20\% and under of total portfolio farmers is acceptable. If the PaR increases beyond this threshold, loan officers may conduct household visits and speak with farmers to determine whether there are specific issues making it hard for farmers to meet their obligations. TechnoServe can then determine whether training and ancillary support services can be provided to address the underlying issue, and whether loan terms need to be recalibrated to improve repayment.

i. Empirically Verified Predictive Factors

This section will outline potential factors that TechnoServe and Crane Bank may consider as potentially useful when collecting data to generate a credit risk model. These inputs have been found to be empirically predictive of borrower credit risk in a variety of other rural agricultural contexts. However, we note that contextual analysis is of great importance in determining which data points are included. Considerations in determining data will include pragmatic issues of data availability and verifiability. In addition, based on the literature, we believe that there is a steep learning curve for small MFI projects. As a result, learning will likely occur as the project’s time investment in Northern Uganda increases. We hope that TechnoServe and Crane Bank will consider the recommended data points below simply as a starting point in thinking about which factors to consider in evaluating credit risk.

Farmer Characteristics and Payments History

Years of schooling are positively correlated with reduced likelihood of credit default in agricultural contexts in rural Uganda.\(^\text{29}\) Years of schooling generally increase farmers’ literacy and numeracy levels. This allows them greater access to information. To provide one example, a farmer who can read is able to follow instructions on applying fertilizer packages, so might have improved yield. More schooling may also indicate a greater willingness to try new things based on information.


Research in Uganda has demonstrated that growing multiple crops improves creditworthiness. Farmers that grow more than one crop are willing and able to diversify against crop-specific diseases. In addition, farmers that grow more crops generally tend to be located in areas with better farming conditions, including rainfall and irrigation facilities.

Farming expertise improves productivity outcomes which may improve farmers’ ability to successfully repay loans. TechnoServe provides training to farmers on improving farm productivity. As a result, training and number of years of experience may jointly be considered in understanding an applicant’s level of farming expertise.

Farmers that have existing loans outstanding are at greater risk than those who do not have existing financial obligations. Existing loans may constrain funds available depending on the farmers’ expected earnings.

Regular and timely payment of children’s school fees indicates responsibility on part of applicant. While primary schooling is free, parents may be required to pay fees for uniforms and textbooks. Information on payment for these items could be potentially useful since the vast majority of farmers within TechnoServe’s cooperative told us that they paid school fees either for their own children or their grandchildren, or in some cases, for both. This data could determine farmers’ willingness and ability to pay recurrent financial obligations. However, there might be certain issues that may arise from collecting data on education costs. We would be concerned, for example, that using school fees as a factor for loan disbursement decisions could foster bad relationships between schools and guardians. It may also discourage parents from sending their children to school.

Payment of utilities may also indicate responsibility. The TechnoServe farmers may pay fees to pump water from local wells or have other regular overheads that might be considered in determining ability and willingness to pay bills. Such bills could be for any service that farmers pays for on a regular basis, including electricity, water, etc. Since none of the farmers we surveyed had access electricity or paid for utilities (with the exception of infrequent well access fees), we recommend that other regular payment sources, such as mobile phone top-up and supplier payments, be scrutinized. In one study, delinquencies on

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30 Ibid.
mobile-phone bills were 60% more predictive of eventual small-loan defaults than were delinquencies on loans from other banks.\textsuperscript{35} Since TechnoServe farmers do not generally have existing loans from financial institutions other than Crane Bank, their mobile payments history might be a good indicator of credit risk. TechnoServe might try developing agreements with mobile phone operators to access top-up history with an applicant’s consent.\textbf{Regularity of payments} to key suppliers has been found to be predictive of credit worthiness.\textsuperscript{36} This factor could potentially be collected by large wholesale suppliers that maintain reliable records of transactions with smallholder farmers.

Some research indicates that \textbf{loans taken for investment} in farming tools and equipment are more likely to result in repayment than loans that were taken to meet existing working capital needs, including paying staff and suppliers. Loans taken for capital investment are also attractive from a lenders’ point of view since farm equipment may serve as collateral against future loans.

\textbf{Land Use Ratio} (Food Crop Land Size/Total Land Size): The proportion of land used to cultivate food for subsistence as compared to total land cultivated is a good indicator of default risk.\textsuperscript{37} As the percentage of land used for commercial purposes increases and land used for subsistence decreases, the default risk also tends to decrease. However, we note that farmers that tend to use a large portion of their land for subsistence farming are generally poorer, so may be in greater need for financing to improve their livelihoods.

As \textbf{Net Income ratios} (Net Income/Debt) increases the risk of default decreases as borrowers financial capacity to pay back loans diminishes.

Increased \textit{cropping intensity} (fraction of cultivated area that is harvested) has been found to correlate with lower default.\textsuperscript{38} This means that as a farmer cultivates more of his or her available farmland, efficiency and production output tends to improve, so leading to better repayment capabilities. We believe that this measure may only be useful when farmers are evaluated against other farmers with similar land size.

\textbf{Relationship Factors}


\textsuperscript{36} McKinsey Working Papers on Risk, Number 30. New Credit Risk Models for the unbanked. Baer, Goland, & Schiff.


\textsuperscript{38} Ibid.
Reputational collateral has been used by some MFIs to increase repayment. Based on our conversations with TechnoServe farmers, we know that they tend to live in tightly knit communities. Furthermore, all the farmers surveyed for this report are members of VSLAs. TechnoServe could ask applicants to provide references for loan applications and may also share loan payment and default information of individuals with VSLA group members to increase accountability.

Delinquency Probability Typically Increases with Age based on some studies. This might be because of health problems and inability to invest labor because of increased age. This issue may not be a significant concern, however, if applicants have younger and able-bodied members of the household.

Guarantors have been found to reduce adverse selection and reduce unethical behaviors such as fraud, but only if the guarantors are not exposed to the same risk factors for asset loss as the farmers they guarantee. Guarantors must therefore not also be under loan obligations similar to that of the farmer. The guarantor system tends to reduce default since farmers who are already bad credit risk often find it harder to find support since guarantors may suffer reputational loss if the farmer defaults. As a result, those who are known to be untrustworthy or incapable of paying loans will find it harder to find guarantors. Guarantors may also police farmers and encourage them to repay their loans in a timely fashion by applying pressure and threatening to disclose non-payment to other members of the community.

Psychological Tests have been used to determine willingness to pay in some cases. Questionnaires have been successfully developed by Harvard University’s EFL program to gauge a loan applicant’s trustworthiness. We believe that these may not be feasible to evaluate TechnoServe farmers due to technology and capacity constraints, but we include them here nonetheless for potential consideration in the future.

“Psychometrics” or tests of Trustworthiness utilize psychological questionnaires based on the concept that those who are less trusting are more likely to themselves be untrustworthy. Along with these questionnaires, EFL uses a voice biometric test that detects unusual changes in voice patterns to detect lies to weed out attempts by applicants to game the questionnaire.

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39 Ibid.
40 Ibid.
ii. Challenges to Credit Scoring

**Resource Intensive:**

There is significant up-front cost required for credit scoring, but with the potential for great cost savings on a per-loan, on-going basis. And if you start simple, with a score based on the pooled opinions of current loan officers and invited experts, the cost might not be that great. More investment must be made to move forward in data collection and record keeping so that you can do a better score in the future.

**Susceptible to Fraud:**

Credit risk models must be safeguarded from possible gaming or cheating by loan applicants. The strength of a credit score is reliant on the predictive strength of inputs used. Analysts must therefore ensure the credibility of inputs utilized and safeguard against possible manipulations and outright fraud when inputs are not independently verifiable. For example, questions measuring a potential applicant’s integrity might be gamed if the applicant figures out which answer will increase likelihood of a favorable rating. Prevention might be as simple as considering only factually and highly verifiable data but can be as complex as incorporating lie-detection technologies (such as biometric voice analysis as discussed previously).

**Errors in Risk Analysis:**

Credit scoring synthesizes the range of information considered and may leave out factors that are potentially predictive. The shift from judgment to scoring, therefore, is not without potential downsides.

Statistics based credit scoring inherently carries some standard error that implementers must be comfortable with. This margin of error is likely to be even greater in a rural context given data reliability issues and the learning curve involved. This margin of error might mean that Crane Bank rejects some portion of farmers mistakenly as too high in terms of credit risk even though they are not, in fact, risky applicants. Generally, the higher the requirements and standards for creditworthiness (potentially in the form of a high cutoff threshold for scores), the more people will erroneously be rejected as too risky.⁴³

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The degree of risk Crane Bank is willing to take on, and the balance between its social mission to improve livelihoods through financial inclusion versus the financial sustainability of the project, will need to be weighed in determining acceptable cut-off margins. Considering some risk factors will tend to disadvantage poorer farmers (for example, ratio of land used for food crops and other proxies for liquidity and access to capital) while use of other factors could potentially be used to bring poorer farmers into the lending pool and help them build up a history (for example the use of guarantors and consideration of trustworthiness).

Lack of Documentation

Unlike formal economies, smallholder farmers in the Gulu region transact in the informal economy and therefore have little bill trail, rental payments and energy utility payments, from which to capture data to draw analytics. To drive financial inclusion nontraditional data need to be gathered from diverse sources together to generate meaningful insights of low-income borrowers especially first-time users. This is because first time smallholder farmers from Gulu:

- Do not have a record of past borrowing behavior
- Debt capacity is difficult to measure as they engage in cash transaction, have no formal savings or registered assets
- Depend on farming for income that is inconsistent by nature

Data Access

The datasets that are needed could be owned by entities (telecommunication companies or educational institutions) that may have little incentive to share the data. These entities may also lack trust in third parties owing to legitimate data security concerns.

b. Systemic Risk Factors

TechnoServe’s choice of operational location depends on non-commercial factors, including the economic need of local inhabitants and preferences of donors. Because of these reasons, systemic risk analysis is not a primary focus of this report. We provide a brief overview in this section because we feel that understanding of systemic risk might become important in the future as the organization seeks to expand its lending base.

Systemic risk scores help quantify the risk inherent to a specific market based on factors that are outside the control of the institution and its borrowers. This evaluation is conducted by the lender for its target market and may comprise considerations of country-level socio-
political and economic risk as well as village-level risk exposures. Research by Munro and Yuki (2014) demonstrate that risk levels can vary tremendously even within Uganda. The country consists of numerous climate zones which define the variety and types of crops and vegetables that can be productively cultivated. Considerations of systemic risk are generally precursors to entering a market to gauge whether the payoffs are palatable to investors’ given risk appetites. While there are numerous risk factors that could be considered in evaluating systemic risk, we include a few such considerations:

**Weather:** Uganda has seven distinct areas as determines by weather characteristics. The villages that have greater regularity and quantity of rainfall are better for agricultural production. Areas that are drought prone limit the number of crops that can be productively cultivated and may also face greater occurrences of harvest loss. Farmers’ ability to productively farm is determined by a large extent on their environment. Moreover, lenders themselves may be more concerned about covariate risk in villages that are over-dependent on a single crop. A pest infestation specific to root vegetables, for example, may destroy all harvests of affected species; for multi-modal villages, which may also grow other crop varieties, the risks are smaller.

**Commodity Price Volatility:** Based on conversations with TechnoServe cooperative members, we find that smallholder farmers lack negotiating powers and are price-takers in the marketplace. Agricultural outputs are commodity goods and this means that farmers are vulnerable to price declines of primary crops. Diversification, once again, may provide some protection against such market risk since price effects are generally crop-specific and may not be have positive covariance with other crops cultivated.

**Distance to Town and Road Conditions:** Based on research by Yuku and Munro (2024), these two metrics are related and have empirically been proven to impact the viability of a microlending project. As distance to town increases and road conditions decrease, the mobility of a community becomes consequently constrained. This limits their access to markets and support institutions and increases the likelihood of default.

**Number of Crops Grown Locally:** Diversified agricultural outputs are generally considered better than areas that are more limited in their output. Yuki and Munro (2014) distinguish between uni-modal villages - which have scarcer and more erratic rainfall - from multi-modal villages which have more diversified farming. Their research concludes that the uni-modal villages are generally riskier because farmers tend to be “risk-averse, more loss-averse and less patient” - all of which are detrimental to productive use of loan sums.
Number of Schools in the Locality: According to Yuki and Munro (2014), the number of schools in a community is positively correlated with credit-worthiness. This is likely the number of schools may serve as a proxy for educational attainment. This number may also indicate the extent of reinvestment and growth in a community.

c. Additional Risk Mitigation Techniques

In addition to credit scoring, there are a number of efforts that MFIs including Crane Bank and TechnoServe can take to mitigate default risk. These potential approaches are outlined below:

i. Portfolio Diversification

Klaus (2014) finds that agri-farming is particularly and acutely impacted by changes in exogenous factors. When a pest infestation or adverse weather event occurs, most farmers within a locality suffer widespread damages that might negate the entirety of their profit for that planting season; and, worse - such an event might put farmers in a debt trap as interest accrues amidst financial hardships. For lenders, this could mean wholesale default from borrowers.

MFIs could be forced to shut down under such conditions if their asset-base is not sufficiently diversified to mitigate against shock events. Research, however, supports that such portfolio risk can be mitigated through diversification within a particular portfolio area or by expanding lending to other “agro-climatic regions” and populations. Please note that we consider each village/locality to constitute an individual portfolio. Credit scoring might aid in this diversification process by allowing institutions to estimate the average risk profile for a village portfolio and thereby allowing institutions to selectively combine portfolios/villages that have an overall acceptable risk profile. Developing such a blended portfolio, however, would require significant time investment, long-term data collection, and consistent and effective risk analysis models.

More simply, TechnoServe and Crane Bank may choose to diversity their overall lending by consciously lending to farmers that are exposed to significantly different and potentially opposite exogenous risks. For example, they may lend to farmers that grow root vegetables and cotton (such as in Gulu) alongside lending to another farming community, in a different climate zone, that specializes in drought resistant crops. TechnoServe could also work with

agronomist experts to identify crops that react in opposite ways to the same weather patterns as a hedging mechanism. Thus, TechnoServe could require borrowers to plant both a drought resistant crop as well as a water-fed crop variety simultaneously in areas with unpredictable weather.

ii. Repayment Incentives

Although the TechnoServe and Crane Bank lending project requires that farmers post collateral, the project organizers have told our team that they do not plan to collect land or other collateral even in the event of loan default. This is understandable given that such confiscations might take away the main form of livelihood and otherwise cause unusual hardships on locals. To complicate matters further, land ownership in Uganda is retained by the tribal clan and individual members are simply given the rights to work and live on tracts; grazing areas and water resources are owned jointly by community members. Thus, there is no absolute security of land tenure and MFIs, as a result, cannot confiscate land in the event of default as a matter of law.

However, without confiscations or similar means of penalizing defaulter and enforcing loan contracts, the MFI opens itself to a potentially financially untenable situation in which farmers treat loans as “free” money. Moreover, cooperative farmers generally have few assets apart from the land they cultivate, but the land itself does not technically belong to the farmer.

In order to avoid this problem, strong relationship building and mechanisms to provide incentives for timely payment (perhaps through extensions of credit lines) are crucial. Continuation of loan access has been found to be an adequate incentive to induce loan repayment in some contexts. Empirical studies have found that lenders and trade partners have successfully used reputational factors and built on community ties, trust, and moral norms as an effective mechanism to incentivize repayment of loans. As examples, a supplier might reward consistently reliable customers or those they have stronger community ties with by providing more flexible payment terms; similarly, individuals will cease to engage in repeated transactions with those who have cheated them in the past. These relationship factors have been proven successful and allows for effective (if imperfect)

operation even in areas with subpar law enforcement, high levels of corruption, and institutional shortcomings.

Crane Bank might attempt to capture the potential benefits of interpersonal accountability building in a number of ways, including: (i) increasing transparency of loan payment information; and (ii) developing a stronger and more direct relationship with the borrower community. Because reputational factors have been proven useful to ensure repayment, greater transparency about loan payment could result in social sanctions in terms of reputational loss when an individual defaults on repayment.\footnote{Dufhues, Thomas, Gertrud Buchenrieder, Hoang Dinh Quoc, and Nuchanata Munkung. "Social Capital and Loan Repayment Performance in Southeast Asia." \textit{The Journal of Socio-Economics} 40.5, 2011.} The VSLA meetings could be used by TechnoServe to share information about loans outstanding and serve to provide moral support for farmers who are struggling to meet their obligations. Greater transparency of default information may help reduce default since farmers may pay a social cost in terms of reputation, if it becomes known that they are defaulters.

It is generally acceptable among lenders that as a relationship with a borrower increases (in terms of time), the risk of credit default decreases. This does not, however, mean that duration of a project is by itself sufficient in reducing default; it simply indicates that all else being equal, preexisting relationships are one factor (among many) that can reduce default. Crane Bank can invest in more branchless banking through agents to increase contact with borrowers. Crane Bank might also consider opening a branch office (although this may have large fixed costs) or train agents that engage regularly with farmers. The main goal of either of these approaches would be to build stronger interpersonal relationships between farmers and bank representatives. Relatedly, studies also demonstrate that creditworthiness increases as the distance to the bank decreases.\footnote{Mehmood Yasir, Mukhatar Ahman, Muhammad Bahzad Anjum. "Factors Affecting Delay in Repayments of Agricultural Credit; A Case Study of District Kasur of Punjab Province." \textit{World Applied Sciences Journal} 17 (4), 2012} Such a center would allow farmers to ask questions in order to clarify loan terms. This might be useful since, during our conversations with farmers, we found that some had mistakenly thought that crop insurance was built into the interest rate premia. Following harvest failure, however, farmers learned that the additional 1.5% in interest was for life insurance and did not, in fact, provide a safety net for poor agricultural production. We found that farmers were frustrated and disappointed with the misunderstanding. Easier and direct access to bank channels may help ease such miscommunications and create an interpersonal bond that might increase the probability of repayment.

\section{Agricultural Insurance}


\footnotetext[49]{Mehmood Yasir, Mukhatar Ahman, Muhammad Bahzad Anjum. "Factors Affecting Delay in Repayments of Agricultural Credit; A Case Study of District Kasur of Punjab Province." \textit{World Applied Sciences Journal} 17 (4), 2012}
Another challenge that TechnoServe - as well as other micro-lenders - faces is the difficulty of lending to farmers in the absence of crop insurance. This is particularly true in Uganda, which is vulnerable to occasional drought and a lack of irrigation facilities and technical understanding of such issues by smallholder farmers. Furthermore, the bulk of agricultural crops grows in Uganda are “rain-fed” and the March-May rainy season is of prime importance to farmers in Northern Uganda, and this rainy season has seen shrinkage in recent years; this makes TechnoServe cooperative members vulnerable to climate change.

Crop insurance provide reassurance to the bank that it will be paid since farmers are less likely to default. Crop insurance typically is purchased by farmers in order to provide a safety net in the event of certain exogenous shocks, including inclement weather and market events that may destroy value of harvests. Such insurance provides payments to cover damages and lost revenues to alleviate covered financial shocks. However, the events that would cause crop insurance tend to affect many, if not all, farmers in a locality and cause huge amounts of damage all at once. Covered shock events require large cash injections from insurance companies that may not have sufficient liquidity to provide characterized adequate recompense for damages incurred. This is in contrast to vehicle-insurance, which is by statistically predictable and steady stream of pay-outs for a particular pool of borrowers. Agricultural insurance, therefore, is not feasible in Uganda unless reinsurance arrangements that allow the primary coverage provider to hedge against risk by selling part of their payout liability to another insurance firm can be organized.

Without crop insurance, lending becomes a much riskier venture for banks, which are not diversified sufficiently against such risk. Farmers may not want to borrow if they realize that they will be responsible for loan repayment even if their entire harvest is destroyed due to bad weather or pestilence. Furthermore, if farmers do in fact borrow despite the lack of insurance, they might end up in a bad financial situation which forces them to default. Binding and inflexible loan terms might increase feelings of hopelessness among borrowers in such situations. This worst-case scenario has been played out in India recently, where farmer-suicides in indebted communities has become commonplace. To prevent similar issues in Uganda, MFIs should consider ways to improve credit risk assessments and to develop contingencies to prevent undue burdens on borrowers in the aftermath of a shock event.


However, insurance providers are not very active in Northern Uganda for commercial reasons. TechnoServe tells us, “Crop insurance is not provided, because insurance service providers do not see much value/return on investment, especially for smallholder farmers. We even struggled to get animal insurance for ox-plough entrepreneurs.”

We recommend, therefore, that TechnoServe continue trying to develop relationships with non-profit partners that may be willing to provide crop insurance even though it may not be commercially viable. TechnoServe and Crane Bank could take preventative measures to reduce the impact of default on their businesses by diversifying their investments or training farmers to diversify agricultural production in ways that reduce covariate risk. We also recommend that TechnoServe develop protocols to engage in during widespread default. This could involve restructuring payments and even accepting potential haircuts on loan payments.

iv. Cash Flow Analysis

In addition to developing credit scores, the IFC recommends that a microlender gain significant insight into the cash flow of the borrower-household to ensure that payment deadlines match with household’s cash flows. If a household’s annual income is considered on an annual basis, there might be problems with repayment when there are mismatches in timing of income inflow and due dates. Farmers tend to have uneven income streams; they tend to be cash poor during the production season and receive the bulk of their income from sales after harvest. An example of such an approach includes Financiera Confianza’s AgroMix product, which allows for irregular loan payments based on the borrowing household’s earnings patterns—and flexibility in lending terms seems to be a common trend in agri-lending.

TechnoServe at present disburses loan payments in accordance with key points in the crop production cycle to ensure that loans are used for agricultural purposes only. However, farmers told our researchers that such limitations restricted their ability to make timely purchases of farming inputs. We also found that farmers admitted to utilizing at least some portion of loan funds for non-sanctioned purposes, including consumption and payment for loan fees.

53 Ibid.
X. Conclusion

Credit scoring involves significant up-front costs but may help reduce on-going costs of lending to farmers. Crane Bank is operating in resource constrained areas with low institutional development and scarcity of formal documentation systems. In such an environment, the lending institution has to create databases of predictive inputs from scratch and engage in partnerships with third parties that may have verifiable and useful information. For TechnoServe and Crane Bank, this may involve partnering with local schools and mobile operators to collect data on bill payment.

While credit scoring can result in significant improvements in efficiency and engender better repayment outcomes, it is perhaps best paired with other risk mitigation strategies. The issue of collateral is one that abounds in Northern Uganda where land deeds are not held by farmers who simply farm and live off land owned by tribal leaders. In this context, we believe that relationship building and developing workable incentives may yield better repayment outcomes.

We believe that credit scoring may help the lending project become more cost effective in the long-term, so more sustainable, which may help attract donors seeking to invest in projects that have been proven to be effective. This approach is also timely since the development sector as a whole has shifted to more empirically verifiable and systematic approaches to program design.

Moreover, we believe that credit scoring may reduce default rates in the long term as Crane Bank learns to better identify and rule out riskier individuals. Through better lending, investments by the community may grow, and with such growth, the collateral (farming equipment and machinery) owned by the community may grow as well. Longer-term investments in the community (a necessary factor for credit scoring in this context) may also allow for greater relationship building and the growth of mutual trust and cooperation, which, again, will lubricate lending decisions. Thus, we believe that investing time and resources into enhancing credit availability and risk analysis now may make lending to this community an easier and more worthwhile endeavor in the future.
Appendices

Appendix 1 - Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>BOU</td>
<td>Bank of Uganda</td>
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<tr>
<td>CB</td>
<td>Crane Bank</td>
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<tr>
<td>CCI</td>
<td>Conservation Cotton Initiative</td>
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<tr>
<td>FAL</td>
<td>Functional Adult Literacy</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit</td>
</tr>
<tr>
<td>IFAD</td>
<td>The International Fund for Agricultural Development</td>
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<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
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<tr>
<td>MFI</td>
<td>Microfinance Institutions</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organizations</td>
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<tr>
<td>PBC</td>
<td>Producer Business Groups</td>
</tr>
<tr>
<td>UGX</td>
<td>Uganda Shilling</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
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<tr>
<td>VSLA</td>
<td>Village Savings and Loans Associations</td>
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</tbody>
</table>

Appendix 2 - Glossary of Key Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Adverse Selection</td>
<td>Adverse selection occurs when a product or service is selected by only a certain group of people who offer the worst return for the company. Adverse selection occurs because of information asymmetries and difficulties in selecting customers. The service provider often is not able to quantify or price for adverse selection costs.</td>
</tr>
<tr>
<td>Agricultural cooperative</td>
<td>A farmers’ co-op is a group effort by farmers to share knowledge and pool resources to better market their products and purchase supplies.</td>
</tr>
<tr>
<td>Collection officers</td>
<td>An individual from a financial institution who has been assigned to handle collecting on debt.</td>
</tr>
<tr>
<td>Cooperative farmer</td>
<td>Farmer member belonging to a cooperative group.</td>
</tr>
<tr>
<td>Credit Score</td>
<td>A number assigned to a person that indicates to lenders their capacity to repay a loan.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
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<td>-------------------------------------------</td>
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<tr>
<td>Crop Insurance</td>
<td>Crop insurance is purchased by agricultural producers, including farmers and ranchers, to protect themselves against either the loss of their crops due to natural disasters, such as hail, drought, and floods, or the loss of revenue due to declines in the prices of agricultural commodities.</td>
</tr>
<tr>
<td>Defaulting</td>
<td>Failure to fulfill an obligation, especially to repay a loan.</td>
</tr>
<tr>
<td>Exogenous Factors</td>
<td>Describes factors outside the control of the individual or organization.</td>
</tr>
<tr>
<td>Financial Literacy</td>
<td>The capacity to have familiarity with and understanding of financial market products, especially rewards and risks in order to make informed choices.</td>
</tr>
<tr>
<td>Geographic Information System</td>
<td>A computer system that allows you to map, model, query, and analyze large quantities of data specific to a certain geographic location.</td>
</tr>
<tr>
<td>Hybrid Scoring Model</td>
<td>A credit scoring model that utilizes a combination of statistical and judgmental techniques.</td>
</tr>
<tr>
<td>Informal Financial Institutions</td>
<td>Lending groups that are collectively owned and managed by members. They operate at the community or village level and are able to function with greater flexibility in rural areas than commercial banks. An example is the VSLA in Northern Uganda.</td>
</tr>
<tr>
<td>Judgmental analysis</td>
<td>A credit scoring model that is structured from expert judgment and institutional experience.</td>
</tr>
<tr>
<td>Lease</td>
<td>A contract by which one party conveys land, property, services, etc., to another for a specified time, usually in return for a periodic payment.</td>
</tr>
<tr>
<td>Moral Hazard</td>
<td>Moral hazard occurs when one person takes more risks because someone else bears the burden of those risks. Moral hazard may occur where the actions of one party may change to the detriment of another after a financial transaction has taken place.</td>
</tr>
<tr>
<td>Portfolio</td>
<td>A collection of investments all owned by the same individual or organization.</td>
</tr>
<tr>
<td>Portfolio at Risk</td>
<td>Refers to loans that are late in their repayments; it is the universal measure for quality of a loan portfolio.</td>
</tr>
</tbody>
</table>
Risk Mitigation

Taking steps to reduce lending risks, specifically related to default caused by adverse selection and moral hazard.

Risk-Averse

A risk averse investor is an investor who prefers lower returns with known risks rather than higher returns with unknown risks.

Smallholder farmers

The term ‘smallholder’ refers to the farmer's limited resource endowments relative to other farmers in the sector.

Systemic Risk

The risk of collapse of an entire financial system or entire market, as opposed to risk associated with any one individual entity, group or component of a system that can be contained therein without harming the entire system.

Appendix 3 - Glossary of Key Players

Accenture

Accenture provides management consulting, technology and outsourcing services.

Bank of Uganda

It is the Central Bank of the Republic of Uganda.

BRAC-Uganda

It is an MFI in Uganda. BRAC works with people whose lives are dominated by extreme poverty, illiteracy, disease and other handicaps.

CompuScore

Uganda's first credit bureau-based scorecard.

Crane Bank

Crane Bank is a commercial bank in Uganda. It is one of the commercial banks licensed by the Bank of Uganda, the national banking regulator.

Credit Bureau

A company that collects information relating to the credit ratings of individuals and makes it available to credit card companies, financial institutions, etc.

Edun

A fashion brand founded by Ali Hewson and Bono in 2005 to promote trade in Africa by sourcing production throughout the continent.

FICO score

A person's credit score calculated with software from Fair Isaac Corporation (FICO).

Financiera Confianza

A microfinance institution based in Peru.

Micro Lenders

The practice of granting small loans to those in need.

Microfinance

Microfinance is the supply of loans, savings, and other basic financial services to the poor.
<table>
<thead>
<tr>
<th>Microfinance Institutions</th>
<th>A microfinance institution (MFI) is an organization that provides microfinance services. MFIs range from small non-profit organizations to large commercial banks.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabobank</td>
<td>A Dutch multinational banking and financial services company headquartered in Utrecht, the Netherlands.</td>
</tr>
<tr>
<td>Root Capital</td>
<td>A non-profit social investment fund operating in poor rural areas of Africa and Latin America</td>
</tr>
<tr>
<td>TechnoServe</td>
<td>TechnoServe is an international nonprofit that promotes business solutions to poverty in the developing world by linking people to information, capital and markets.</td>
</tr>
<tr>
<td>Village saving and lending association (VSLA)</td>
<td>A group of people who save together and take small loans from those savings</td>
</tr>
</tbody>
</table>
Appendix 4 – Theory of Change CCI Program

CCIU Causal Logic

Super-Goal

Improved livelihoods for targeted households

Goal

Increased income for smallholder cotton farmers

Outcomes

Improved marketability of SHCF products

Enhanced farm-level productivity

Intermediate Outcomes

Enhanced marketing of SHCF products via PBGs

Adoption by SHCF of improved production, PWH, management & record keeping techniques

Enhanced SHCF use of input credit

Outputs

Improved SHCF household water provision

Key BSPs with capacity to provide key inputs to PBGs

PBGs with strong governance, management & extension capacity and linked to BSPs and buyers

Enhanced SHCF knowledge of production & PWH techniques

Loan guarantee operational

VSLAs formed and linked to PBGs

SHCFs completing adult literacy program

Boreholes under PBG village water committee management

Activities

Agricultural Program (TechnoServe)

Activity 2: Build BSP capacity to provide PBGs with key inputs for cotton and staples products

Activity 3: Set up and build PBG capacity in governance and business skills

Activity 4: Train PBG staff and other trainers in improved production & PWH techniques

Activity 5: link PBGs to cotton input and output markets

Activity 6: Set up and manage loan guarantee fund for farmer/PBG access to input credit

Social Program (Invisible Children)

Activity 7a: Set up PBG-based VSLAs

Activity 7b: Design and implement adult literacy program

Activity 7c: Set up village water committees and assist borehole drilling
Bibliography


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