



Case Study no.1

January 2007

This case study was undertaken in the framework of an SDC programme through which Master students from Swiss Universities were given the opportunity to do their final degree thesis on a topic related to SDC's financial sector development programme in transition and developing countries. The programme, implemented by Intercooperation, was part of SDC's contribution to the United Nations' Year of Microfinance in 2005.

Agricultural Credit Scoring System

An example from the FDL in Nicaragua

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All financial institutions are confronted with credit risk, i.e. the risk that clients default on their payments. Credit risk can be classified into individual risk, when one client is unable or unwilling to repay, and portfolio risk, when all clients from one economic sector or one region cannot repay. Credit scoring helps the managers and staff of an institution to reduce individual delinquency risk, by analyzing the historical repayment behaviour of clients and relating this to different client characteristics. It enables the estimation of future delinquency risk and thus complements other client analysis procedures. It also provides a mechanism to adapt monitoring measures, and the loan loss provisioning policy, accordingly.

In 2005, two students in Political Economy from the University of Lausanne, Switzerland, analyzed the possibility of introducing a statistical credit scoring system in the *Fondo de Desarrollo Local* (FDL), the most important credit provider for small producers and entrepreneurs in the agriculture and livestock sectors in Nicaragua.

The Fondo de Desarrollo Local (FDL)

The Fondo de Desarrollo Local (FDL) is a credit-only non-regulated financial institution created in 1998. Its credit activities date back to 1993, when it was part of *Nitlapán*, a Research and Development Institute of the Central American University in Managua.

The FDL was selected for this case study because of its know-how and experience in rural finance. Since its inception, the FDL has allocated more than fifty percent of its portfolio to small and medium agricultural producers and livestock owners.



The branch of the FDL in Quilalí

The institution is constantly developing new loan products according to the changing needs of the agricultural producers and livestock owners. For example, the FDL provides so-called “automatic loans” to clients with a good credit history, which have simpler procedures and faster disbursements than usual loans. Likewise, the “opportunity loan” is used to take advantage of seasonal or new business opportunities.

Table 1: The FDL, facts and figures (December 2005)

Date of creation	1998 (1993 to 1998 under Nitlapán)
Number of clients	43'123
Portfolio size	CHF 52'688'416
Average loan size	CHF 1221
Number of employees	380
Number of branches	29

In 2005, the FDL introduced the innovative “development portfolio”, which includes credit provision to groups of women in rural areas, and uses a range of products such as micro leasing for irrigation systems, loans for farm investments, and special “packages” for livestock owners and coffee producers.

Relationship between the FDL and SDC

Since the early 90s, SDC has been providing financial support to *Nitlapán*, an applied research and development institute of the Central American University, specialized in the rural sector.¹ The support of SDC and other donors has permitted *Nitlapán* to conduct research and training with and for the rural population, and to develop the credit program that later became the FDL.

Nowadays, the FDL collaborates with PROMIFIN, an SDC-funded program that contributes to the institutional development and promotion of the microfinance sector in Nicaragua, Honduras and El Salvador, by providing advice and training to the management and staff of microfinance institutions. Together with the FDL, PROMIFIN pilot-tested a tool to automate the risk analysis of rural credit demands. The authors of this case study collaborated with PROMIFIN’s experts in order to further develop a credit scoring system adapted to the specific needs and possibilities of the FDL.

Two types of credit scoring systems

Until recently microfinance institutions exclusively used so-called **subjective**

scoring, whereby loan officers assess the clients’ future repayment capacity, relying on their know-how, experience and intuition, as well as on references from neighbours or other informants.

Statistical scoring, already used by credit card providers for many years, is relatively new in the microfinance sector. This method helps to estimate the delinquency risk in a more explicit and objective way. Statistical scoring requires an electronic database containing the characteristics of current and past clients and their loans, in order to predict the repayment performance of future loans. This includes two different methods – the statistical regression and the expert system – which both predict to what extent client characteristics influence the delinquency risk (see box 1).

Box 1: Definition of statistical scoring systems

The **statistical regression** method requires preliminary collection of historical data on the characteristics and behaviour of the institution’s clients. This data can be analysed to obtain statistical relationships between past delinquency and different client characteristics. This in turn is used to predict the probability of future delinquency.

The **expert system**, also called judgmental scoring, is based on the experience and the judgment of the loan officers and branch managers. In addition to the subjective scoring, the expert system uses mathematical formulas to establish the influence of each client characteristic on the delinquency risk. Although the expert system is less predictive than the statistical regression, microfinance institutions find it more readily acceptable, because it is based on the know-how and experience of staff. If an MFI does not fulfil the requirements of a statistical regression, the expert system is the right tool to assess future delinquency risk.

Definitions based on Schreiner (2003).

¹ More information on SDC financial sector projects is given under http://www.sdc-employment-income.ch/en/Home/Financial_Sector

What are the risks faced by the FDL's rural clients?

In order to develop a credit scoring system for the FDL, the authors, together with clients and staff, identified and classified the multiple risks confronting small agricultural producers and livestock owners that are likely to have an influence on loan repayments.²

On one hand, clients face **endogenous risks**. Such risks depend on the availability of resources and the behaviour of the individual and his or her family. They are generated by: 1. Individual decisions on the productive activity: what to produce, on which land and at what moment 2. Handling of production factors, eg. correct use of fertilizers and tools 3. Capacity to influence sales prices: negotiating power, quality of products, quantity 4. Health: influenced by age, hygiene, education 5. Social environment: determined by migration, family upheavals, social relations, indebtedness.

On the other hand, clients face **exogenous risks**, which are beyond their control, and affect the community, the region or the country as a whole. These risks depend on: 1. The climate influencing agriculture and livestock productivity 2. The costs of inputs and the prices of products influenced by national and international markets 3. The political and institutional environment that influence the rural sector.



Cattle breeding, an important income source in rural Nicaragua

² For micro and small entrepreneurs of the secondary and tertiary sectors the risk structure would have to be analyzed accordingly.

Credit Scoring within FDL

Since the year 2000, the FDL has been gathering data on client characteristics and repayment performance in an **electronic database**. This provided the authors the opportunity to analyze 17,434 clients. Ten percent of these clients had experienced arrears of more than 30 days over the last five years. Although not all of the above listed endogenous and exogenous risks have a corresponding value in the database, some are included, and their influence on repayments can be measured.

The results of the **statistical regression** show that the delinquency risk is higher for men than for women, and that it increases with age. Subsistence farmers have a higher risk than larger farmers; crop producers have a higher risk than livestock owners; and finally, loans for working capital are riskier than those for investment. On the other hand, the delinquency risk decreases with the experience of the farmer, the degree of diversification of his/her economic activities and the number of loans received by the FDL.

In spite of these significant results, the available variables only explain 12.4% of arrears per client. This is insufficient to explain delinquency risk statistically (87.6% of arrears being unexplained); thus the database cannot be used for constructing a scoring system based on a statistical regression.

A further problem in adopting a scoring system based on statistical regression is that the FDL updates the clients' personal information in the database at each new loan application, erasing previous data in the process. The database thus cannot be used to measure historical data on delinquency.

Moreover, when loan officers analyse a loan application, they take into account variables other than those considered in the database. For example, FDL has a principle of non-discrimination according to age and gender, and thus does not record such data. These variables, usually considered important in a statistical credit

scoring, can therefore not be used as selection criteria.

As the statistical regression method seems inadequate for FDL, it is currently not used by the institution.

Why is the expert system currently more adapted to the needs of the FDL?

In order to develop an expert system, the authors selected variables based on the results of the statistical regression, and on in-depth discussions with loan officers and branch managers, as well as experts from PROMIFIN. Each variable was attributed a weight according to its estimated influence on the total risk.

The expert system uses an Excel sheet scorecard (see figure 1). There are two different programmes, one for first time clients and one for repeated clients. The programme for first time clients contains nine variables: personal references, commercial references, experience, diversification, debts with other institutions, personal impressions of the loan officer, description of the area, residence in the area, and land ownership.

In the programme for returning clients, these nine variables only account for 25 percent of the result. The remaining 75 percent consist of the three following variables: average arrears of the client, number of loans, and investment capacity. The result of the scorecard produces a percentage between zero (no risk) and hundred (full risk), with a classification into four categories: no risk, low risk, medium risk and high risk.

This expert system is easily used by loan officers and gives a quick response. Moreover, all parameters can be configured and modified, according to the needs of the institution. The more the loan officers' opinions are sought in the selection of scorecard parameters, the more readily they accept working with the system.

Conclusions

Statistical credit scoring systems (the statistical regression, as well as the expert

system) require regular collection of variables influencing delinquency risk. This information should be gathered in a central database. It is crucial that the database allows the collection of historical data on delinquency; previous data should not be erased when the database is updated.

The expert system is the right tool for MFIs wishing to assess future delinquency risk. The choice of variables to be collected in the database should be based on the loan officers' knowledge and experience and should be accepted by the whole institution in accordance with its principles. However, even a statistical credit scoring system with good predictive capacity should not be applied as an exclusive client selection procedure. The experience and professional know-how of loan officers should always remain the basis of credit risk assessment.

A credit scoring system is only one out of a variety of institutional mechanisms for diminishing delinquency risk. In addition to credit scoring and a good assessment of potential clients, delinquency risk can also be minimised by closely working with clients. Complementary services such as technical assistance or education will help diminish the risks related to credit provision, particularly in rural areas

References

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Figure 1: Scorecard of the Expert System of the FDL

Type of Client : Antiguo		
Personal References Regular	Experience in years De 2 a 5 años	Diversification per activity Pecuario menor
Live in the area De 3 -5 años	Commercial References Ninguna	Aptitude of the area Regular
Land possession Contrato de arriendo mayor al plazo	Personal impression of loan officer Buena	Debts in other institutions No tiene deudas
11%		
<i>For old clients</i>		
Avarage arrear per client Más de 30 días	Number of loans (passed) 1 préstamo	Capacity of acumulation Capital estable
65%		
Percentage 76%		High Risk