RURAL CREDIT MARKETS IN THE NORTHEAST OF BRAZIL

by

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ABSTRACT

This study examines rural credit market characteristics and their impacts on transactors in the Northeast of Brazil, as well as discusses some related welfare aspects of formal lending systems. In the first chapter credit market as well as institutional (formal) credit system characteristics are presented, as an introduction to the analysis of the credit market in a specific subregion of the State of Ceara, in the Northeast of Brazil, i.e., the Serra do Baturite Area.

In the second chapter, local information is gathered and presented for the completion of the informational requirements on the subject.

In the third chapter a conceptual framework of analysis regarding how individual borrowers as well as institutional and non-institutional lenders are thought to behave, is shown.

In the fourth chapter behavioral hypotheses of institutional and non-institutional transactors are tested. There, intermarket effects and other characteristics are detected.

Finally, in the fifth chapter, a cost-benefit analysis of existing institutional policies regarding credit allocation is presented and alternative allocation schemes are suggested.

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INTRODUCTION

This is a case study of a small section of the rural credit market in Brazil, specifically, the rural credit market of the Serra do Baturite Area in the State of Ceara, in the Northeast. It has the double purpose of examining specific market characteristics and consequences of such characteristics on farmer behavior regarding borrowing, as well as some welfare impacts, derived from the overlapping of an institutional lending system on a spontaneous non-institutional one. Borrowing in this context refers uniquely to temporary purchasing power (money) transfers.

The analysis is a disaggregated one, proper for the type of questions usually raised by micro policy makers, dealing with questions of interpersonal income distribution, price effects, etc. By adopting this type of approach specific features and nuances of the financing problem were identified, chiefly when policy recommendations were at stake.

As is well known, credit, by definition, is an interpersonal affair where specific individual characteristics of borrowers and lenders determine the type and size of a transaction. On the other hand, information regarding both sides of the affair is not always available and more likely not to be at all. Information regarding borrowers (farmers) may be obtained through direct interviews, as they usually are; but on lenders, chiefly private (individual), it is practically impossible given the lack of a consistent set of information regarding the composition of the lenders' universe. Not only farmers but any individual belonging to a population is a potential lender. Nonetheless, the problem is not

insurmountable because credit markets have not the same characteristics of ordinary good markets, which contributed to the original decision to dissaggregate the analysis.

The first, empirical, issue, is to show the existence of market interdependence, i.e., the interdependence of the institutional supply and the non-institutional (informal) demand for funds. Alternatively, the demand for funds in the non-institutional sub-market is affected by the type of behavior of institutional lenders.

This concept is not only intuitive but has important consequences for analytical purposes.

In a market in which part of an individual's financial demand may be satisfied by a low price supply, it would become obvious that a borrower would exhaust this cheaper source first, and afterwards return to a more expensive one, if worthwhile.

If this source is controlled by any type of rationing mechanism, it is this rationing process that is going to determine the type of behavior of the borrower in the non-institutional (or alternative) market. Therefore, when the non-institutional demand is analyzed, its potential as an institutional borrower must be determined. In other words, any potential borrower must be evaluated from an institutional point of view.

Given that institutional loans are subsidized, i.e., borrowers pay negative prices, two types of effects are observed, i.e., an income, or wealth, effect and a price effect. Both are measured in this study for specific individuals.

A second, and consequent, issue is the verification that non-

institutional rates of interest are actually shadow-prices to farmers, given that market interdependency is shown to exist, and farmers prefer to exhaust the institutional source first, meaning that non-institutional quantities are always marginal and, therefore, non-institutional prices.

Given market interdependency, a consequence is that farmers' marginal or shadow-prices are affected by institutional rationing schemes.

This has direct effect on the decision making process of farmers regarding where to allocate their resources; and specific incentives would induce them to allocate their funds in certain directions. Therefore, credit should be coupled with other policy instruments. Credit alone is not sufficiently powerful, unless circumstances generate the appropriate environment.

A second issue dealt with in this study refers to the policy question of who and how much credit should be granted by official lending institutions.

Institutional credit systems are, usually, concerned and organized with distributing credit to farmers with the purpose of expanding output levels. The feasibility of such programs is calculated on the basis of the expected additional output generated by institutional loans. Methodologically, and conceptually, this is obviously not correct given that farmers are not only producers as such.

As will be shown, farmers' decision making process regarding loans involves consumption and investment (in and outside the sector) activities, as well. Their demand for funds is the outcome of this total process, meaning that for production to be increased specific incentives must

exist; if not, it will be worthwhile to avoid roundabout methods for increasing consumption.

In this study, benefits for granting institutional, cheaper, loans are derived from farmers' demand for credit schedules, which encompass all types of user benefits. It will be shown that as farmers are absorbed by an institutional system granting cheap loans, a considerable part of their benefits are income transferences and only a small part refers to price effects. These price effects are derived from a shift in their non-institutional demand schedules, whose rates of interest are their shadow-prices.

Finally, it is shown that concentration of loans generate lower total benefits than deconcentration. This result refers to the net benefits to farmers, excluding processing costs. Chapter V is totally dedicated to the cost-benefit analysis of alternative credit programs. There it is shown that if processing costs, i.e., costs of transferring financial resources to farmers are proportionally low, or if inexpensive methods are devised, a large quantity of farmers may be attended, and the program is therefore still feasible.

Alternatively, if the distribution of loans is expensive, then concentration of loans is the only feasible outcome. Therefore, processing costs of lending are crucial in determining the feasibility of deconcentrated credit programs.

CHAPTER I

CREDIT MARKET CHARACTERISTICS AND THE INSTITUTIONAL CREDIT SYSTEM

The first chapter of this study is divided into three parts, i.e., a preliminary economic, background, description of Brazil and the Northeast; a description of the credit market and its main characteristics and, finally, a description of the institutional, or formal, credit system.

Credit market characteristics are specified through an enumeration of the type of lenders and borrowers, as well as the amounts of credit transacted in the institutional and non-institutional segments of this market.

The institutional credit system is, initially, presented through a brief description of the institutional system's legal framework or normative apparatus which guides institutional lender behavior. Afterwards the system is linked with the monetary system of the country, and, finally, the institutional lending performance regarding the "who" and "how much" was lent in the past is shown in greater detail.

The purpose of this and the next chapter is to introduce the reader to the following analytical parts of the study in a continuous way, so that the dimension of the credit problem is fully grasped.

- Preliminary economic background

Until 1960, the agriculture sector in Brazil was the second most important income generator in the economy, only being surpassed by the service sector. It was always the major employment generator as well as

the major source of export earnings.

From 1960 onwards, the industrial sector grew rapidly, surpassing agriculture in terms of income formation. Several factors contributed to this, based on the political decision to industrialize the country as an option for economic development, at the expense of agriculture.

Table 1 shows the evolution of Brazil's Domestic Income composition from 1939 to 1969.

TABLE 1 - Evolution of Brazil's Domestic Income Composition from 1939 to 1969

	1939	1949	1959	1969
Agriculture	28.5	30.5	27.6	21.5
Industry	18.8	20.0	21.5	25.5
Services	52.7	49.5	50.9	53.0
Total	100.0	100.0	100.0	100.0

Source: Centro de Contas Nacionais, FGV

Meanwhile, Brazil's population more than doubled during the period, while not so in the Northeastern Region, as may be seen in Table 2.

TABLE 2 - Population growth in Brazil and the Northeast, from 1940 to 1970, in 1000 inhabitants

	1940	1950	1960	1970
Northeast	14,434	17,973	22,429	27,871
Brazil	41,236	51,944	70,992	92,341

Source: FIBGE, Census Data

From a spatial distribution point of view, domestic income figures show that the Southeastern region was always the richest one on an aggregate as well as per-capita basis, while the Northeastern region being the third largest on the aggregate was always the poorest on a per-capita basis. Historically, the share of the Northeastern region in total income formation fell from, approximately, 17 percent to 14 percent on the aggregate, as shown in Table 3. Absolute values are shown at the bottom of the table, in thousand cruzeiros.

TABLE 3 - Percentage Distribution of Domestic Income, by Region, for period 1939 to 1969

	1939	1949	1959	1969
North	2.6	1.8	2.0	2.1
Northeast	16.7	14.4	14.4	13.8
Southeast	62.2	65.9	63.2	62.8
South	15.3	16.2	17.9	18.2
Center West	2.1	1.8	2.5	3.1
Brazil	100.0	100.0	100.0	100.0
Brazil-Absol.	39,564	195,859	1,614,038	103,682,662

Source: Centro de Contas Nacionais - FGV

Table 4 shows per-capita values taken as a proportion of the Brazilian average. Absolute values are shown at the bottom of the table. As may be seen, per capita income in the Northeast was always less than half the average income of the country (equal to 100).

Table 5 shows that the agriculture sector was always the second largest income generator in the Northeast, while Table 6 shows that it was the most important employment source. Agriculture was responsible

TABLE 4 - Proportion of Regional Per-capita Income Compared to Brazilian Average = 100, during the 1950-1969 period

	1950	1960	1969
North	48.1	60.9	53.6
Northeast	42.4	46.9	45.4
Southeast	151.0	143.3	146.4
South	107.9	106.4	103.5
Center West	53.6	58.2	58.0
Brazil	100.0	100.0	100.0
Brazil-Absol.	4.5	31.6	1129.5

Source: Centro de Contas Nacionais, FGV

TABLE 5 - Northeastern Domestic Income Composition in Percentage Terms from 1939 to 1969

Sector	1939	1949	1959	1969
Agriculture	39.3	39.5	40.1	35.8
Industry	13.6	13.1	12.4	11.5
Services	47.1	47.4	47.5	52.7

Source: Centro do Contas Nacionais, FGV

TABLE 6 - Economically Active Population in the Northeast, by Sector During 1940-1970, in Percentage Terms. Absolute values in thousand inhabitants

	1940	1950	1960	1970
Agriculture	75.6	73.8	68.2	62.6
Industry	7.4	8.3	9.0	10.6
Services	17.0	17.9	22.8	26.8
Total	100.0	100.0	100.0	100.0
Absolute	5,135	5,599	6,905	8,353

Source: FIBGE, Census Data

for three-quarters of total employment in 1940 and almost two-thirds in 1970.

Within the agriculture sector, cropping was always the most important income generator, as shown in Table 7, followed by animal ranching and extrativist activities. The share of income generated by cropping increased from, approximately, half of total sector's income to almost three-fourths, while the share of animal ranching fell from 38 percent to 24 percent, in the last 40 years.

TABLE 7 - Agriculture's Income Composition, by Type of Activity, in Percentage Terms, from 1939 to 1969, in the Northeast

Activities	1939	1949	1959	1969
Cropping	54	65	69	71
Animal Ranching	38	24	23	24
Extrativism	8	11	7	5
Total Agric.	100	100	100	100

Source: Centro de Contas Nacionais - FGV

Table 8 shows that cotton, corn and beans are the most land consuming crops in the Northeast, while Table 9 shows that cotton, sugar cane, beans and manioc generated the largest production values. Cotton and sugar cane are commercial crops while beans, corn and manioc are subsistence crops, indicating that a mixed type of farming is most common in the region.

Table 10 shows that the cattle herd almost doubled in the Northeast, and more than doubled in Brazil during the 1920-1970 period.

TABLE 8 - Size of Harvested area, by Crop, for the 1960-73 period in the Northeast, in Percentage Terms. Absolute values in 1000 of hectares

	1960	1965	1970	1973
Cotton	27	28	29	27
Rice	6	7	8	7
Sugar Cane	7	6	6	7
Beans	12	13	12	14
Manioc	9	8	10	9
Corn	18	18	17	19
Other	21	20	18	15
Total	100	100	100	100
Absolute	7,249	9,493	10,070	11,637

Source: FIBGE, Annual Reports

TABLE 9 - Percentage Composition of Total Value of Production of the Agriculture Sector, by type of crop, for the 1960-1973 period, in the Northeast. Absolute values in Cr$ million.

	1960	1965	1970	1973
Cotton	23	19	12	17
Rice	5	6	5	4
Sugar Cane	11	16	16	12
Beans	9	11	9	15
Manioc	10	10	14	13
Corn	6	8	5	6
Other	36	30	39	33
Total	100	100	100	100
Absolute	92.8	1,215.1	3,981.3	11,280.9

Source: FIBGE, Annual Reports

TABLE 10 - Cattle Population in the Northeast and Brazil, from 1920 to 1970, in million animals

	1920	1940	1950	1960	1970
Northeast	7.4	7.7	9.7	11.6	13.4
Brazil	34.3	34.4	44.6	56.0	78.5

Source: FIBGE, Census Data

Regarding ownership and land distribution patterns in the Northeast, in 1975, Table 11 shows that the distribution of land is highly skewed. Seventy percent of establishments (defined as being a productive unit under a same management) occupied, approximately, five percent of land, while one-tenth of a percent occupied more than the seventy percent.

TABLE 11 - Ownership and Land Distribution Patterns in the Northeast of Brazil, in 1975

	0 - 10	%	10 - 100	%	100 - 1000	%	1000 - 10000	%	> 10000	%
No.	1,656,324	70	567,064	24.0	130,850	5.5	8,996	0.4	238	0.1
Ha.	4,324 689	5.4	18,180,695	22.8	33,163,859	41.6	18,615,443	23.3	5,497,483	6.9

Source: FIBGE, Agricultureal Census of 1975

- General Credit Market Characteristics

a) Type of lenders:

Lenders will be divided into two general groups, i.e., institutional and non-institutional. Institutional lenders will be defined as those belonging to the National System of Rural Credit (SNCR), and non-institutional lenders as those which do not.

The SNCR composes the complex of financial institutions which execute the rural credit policy in the country, formulated by the Monetary Council (CMN) according to defined monetary and agricultural policies.

The following are included as non-institutional lenders: farmers, merchants, truckers, money lenders, friends, relatives.

b) Number of farmers attended and amounts lent:

The rural credit market in the Northeast of Brazil will be divided into institutional and non-institutional, as defined above.

Institutional credit is granted in money terms and non-institutional credit may also be granted in goods or merchandise, for later payment. The purpose of this study is to concentrate on financial loans. As will be shown, non-institutional lenders' share, in terms of number of farmers attended and value, decreased sharply from 1965 onwards when government decided to use rural credit as a form to stimulate the increase of the sector's output.

Estimates of the number of farmers (estabelecimentos) attended, as well as volumes lent will be based on two different data sources:

- FIBGE (Fundacao Instituto Brasileiro de Geografia e Estatistica)
- BACEN (Banco Central do Brasil - the brazilian central bank)

FIBGE data on rural financing are based on Census information. Census were realized in 1920, 1940, 1950, 1960, 1970 and 1975; but rural financing information was surveyed from 1960 onwards.

As shown below, 1960 information dealt only with the number of estabelecimentos attended but not with amounts lent (values), by type of source. Sources were divided into three groups: Public Entities, Private Entities and Both. Figures shown were based on samples taken from Census information and expanded for the universe. The unit of the universe is the rural estabelecimento, defined by FIBGE as being a productive unit under a same management. Therefore, a rural property may be divided into several estabelecimentos according to management (owner, renter, share-cropper, occupant), or vice-versa, i.e., an owner of two nearby properties will be considered as one estabelecimento. Nearbyness is extended to the same municipality. Table 12 shows the total number of estabelecimentos, the number of estabelecimentos which were granted financial loans and the corresponding breakdown by source, in 1960. It may be seen that, approximately, 60 percent of total borrowers were attended by non-institutional (private) sources, excluding double-source borrowers. The same percentage applies to Brazil as a whole. The table also shows that 5 percent of estabelecimentos get any kind of loan, a result that is slightly below the national average.

TABLE 12 - Rural Credit Attendance by Private and Public Institutions, in 1960

	Number of Estabments	Total Attended	%	Attended by Public Entities	%	Attended by Private Instit.	%	Attended by Both	%
Total in	1,408,114	84,970	5.19	23,856	28.07	52,214	61.56	8,900	10.47
Region	3,337,769	275,159	8.25	82,573	30.00	168,229	61.14	24,357	8.85

Source: FIBGE, 1960 Census

Table 13 shows 1970 Census information (estimates). FIBGE changed their lender groupings into Individuals, Government and Private Entities; Individuals referring to person-to-person loans; Government referring to loans granted by official institutions (Federal and State); and Private including loans from private bansk, cooperatives, firms, etc.

1970 data on financing was also based on census sample estimation. Lenders' groupings do not add up because of double-source borrowers.

Table 14 shows total values lent, by type of source, state and for the Northeastern Region, in 1970, as estimated by FIBGE. As shown in the table, non-institutional loans corresponded to, approximately, 10 percent of total loans granted by any source in the Region. The State of Ceara had the largest non-institutional share of money loans in the market, while in Piaui only 2.6 percent of total resources came from non-institu-

TABLE 13 - Rural Credit Attendance by Individuals, Government and Private Institutions, in 1970

	Total Number of Establish.	Total Attended	%	Attended by Individuals	%	Attended by Government	%	Attended Private Inst.	%
Region	2,179,787	107,410	4.93	72,980	67.95	72,980	67.95	8,116	7.56
Brazil	4,924,019	567,598	11.53	409,947	72.23	409,957	72.23	69,041	12.16

Source: FIBGE, 1970 Census

TABLE 14 - Loans, by Type of Source, by State, in 1970

State	Non-Institutional Loans Cr$1000	%	Institutional Loans Cr$1000	%	Total Loans Cr$1000	%
Maranhao	2,631	9.6	24,809	90.4	27,440	100.0
Piaui	514	2.6	18,968	97.4	19,482	100.0
Ceara	8,534	15.0	48,520	85.0	57,054	100.0
R.G.N.	3,469	12.5	24,390	87.5	27,859	100.0
Paraiba	6,013	12.7	47,465	78.3	53,478	100.0
Pernamb.	14,490	13.8	90,494	86.2	104,984	100.0
Alagoas	3,302	6.3	49,483	93.7	52,785	100.0
Sergipe	1,779	5.2	32,321	94.8	34,100	100.0
Bahia	14,065	9.2	139,645	90.8	153,710	100.0
Total	54,797	10.3	476,095	89.7	530,892	100.0

Source: FIBGE, 1970 Census

institutional sources. Pernambuco had the largest volume of non-institutional loans, and Bahia the largest volume of institutional loans.

Tables 15 and 16 present institutional and non-institutional loan

allocation by activity, in 1970, as estimated by FIBGE. As may be seen, non-institutional loans are primarily for agriculture purposes while institutional loans not so much. The reason for it is that small farmers are the most significant borrowers in the non-institutional market while this is not so in the institutional market. Loans for animal production are granted to larger farmers.

TABLE 15 - Institutional Loan Allocation by Activity, in 1970, in the Northeast

	Agriculture		Animal Production		Other	
	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000
Total	54,074	232,741	17,285	167,228	9,734	76,126
%	66.7	48.9	21.3	35.1	12.0	16.0

Source: FIBGE, Census 1970

TABLE 16 - Non-Institutional Loan Allocation, by Activity, in 1970, in the Northeast

	Agriculture		Animal Production		Other	
	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000
Total	25,183	33,163	2,439	13,026	1,971	8,618
%	85.1	60.5	8.2	23.8	6.7	15.7

Source: FIBGE, Census 1970

Tables 17 and 18 show how institutional and non-institutional loans were allocated to investment, production, commercialization or other purposes. As may be seen, depending on the source, a larger share of funds goes to investment. Institutional loans go primiarly to investment while non-institutional go to production. The reason for this preference comes from price and terms differences imposed by the alternative sources for each type of loan. Institutional loans are subsidized while non-institutional ones are not, and returns from borrowing are usually not fully absorbed by farmers as such, mainly by the smaller ones given their lack of commercialization and storaging facilities.

TABLE 17 - Institutional Loan Allocation, by Purpose, in 1970, in the Northeast

	Investment		Production		Commerce		Not Identified	
	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000
Total	27,816	192,263	37,561	151,905	3,748	20,364	11,971	111,563
%	34.3	40.4	46.3	31.9	4.6	4.3	14.8	23.4

Source: FIBGE, Census 1970

TABLE 18 - Non-Institutional Loan Allocation, by Purpose, in 1970, in the Northeast

	Investment		Production		Commerce		Not Identified	
	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000	Number of Farmers	Value in Cr$1000
Total	4,553	15,142	18,231	21,455	3,018	3,290	3,791	14,911
%	15.4	27.6	61.6	39.2	10.2	6.0	12.8	27.2

Source: FIBGE, Census 1970

- The Institutional Credit System

A) The Legal Framework

General Dispositions

- Concepts and Objectives

Rural credit consists of supplying financial resources through institutions forming the National System of Rural Credit (SNCR) for the exclusive use indicated in the Rural Credit Manual.

The following are the objectives of rural credit:

a) to stimulate the orderly growth of rural investments, including storaging, processing and handling of farm products, when performed within farm limits, by farmer cooperatives or any other person or enterprise considered as such;

b) to provide sufficient and timely resources for the financing of farm production and marketing activities;

c) to promote the economic strengthening of producers, particularly medium and small farmers;

d) to stimulate the use of rational production methods, aiming for the increase in productivity and welfare of the rural population, as well as of soil conservation and use.

The rural credit program has not the objective of generating investment opportunities to financial institutions, neither to substitute farmers' capital which should participate in the program according to their means.

It is not the purpose of rural credit to subsidize inefficient or financially unsound activities, or to finance repayments of debts which

were contracted before the presentation of the loan proposal, to recover invested capital, to favor speculative enterprise and to anticipate expected profits.

The granting of credit is subordinated to the idoneousness of applicants; budgeting of credit use by activity; opportunity, sufficiency and adequacy of demanded resources; submittance of applicant to use and repayment schedules previously accorded; and inspection, by financing agent, of use of resources.

Rural credit transactions are subordinated to the norms specified in the Rural Credit Manual, regardless of source of funds unless specifically authorized by the National Monetary Council (CMN) or Central Bank (BC).

- The National System of Rural Credit (SNCR)

The system is divided into three types of institutions:

a) basic; including the Central Bank; the government owned bank (Banco do Brasil); a regional bank (the government owned Banco do Nordeste do Brasil) and the National Bank of Cooperative Credit.

b) vinculated; including the National Institute for the Colonization and Land Reform (INCRA); the National Bank for Economic Development (BNDE); and auxiliary institutions such as State Banks, Private Banks, Savings Banks, Rural Credit Cooperatives and private financing agents.

c) articulated; including Regional Development institutions as well as technical assistance entities, which services may be utilized for comprehensive assistance programs.

The control of SNCR, for all means, is a direct attribution of the Central Bank and executed through its Bureau for the Coordination of Rural and Industrial Credit (GECRI) which directs, coordinates and fiscalizes all policies concerning rural credit emanated from the National Monetary Council (CMN); coordinates the action of all financial agents in the system; allocates resources and determines the adequate means of selection and priority setting; is responsible for repassing of funds; stimulates the increase in size of the distribution network of rural credit and is responsible for SNCR's personnel training.

- Beneficiaries of the SNCR

The following are eligible for rural credit loans: farmers, individuals or firms; individuals or firms which, even if not classified as farmers, be engaged in research or production of seeds and springs, agricultural and soil conservation, mechanization services or in the fishing industry.

Commercial firms or industries which buy farm products, as well as middle-handlers, are not eligible.

Eligible candidates are classified as small, medium and large farmers according to total yearly production value, and loans be proportional, at maximum, to this total. All candidates must be cadastraled and applications for credit must follow specific rules including complete budgetings. Projects and plans may also be submitted but subject to predetermined forms.

- Guarantees

Guarantees on loans may be chosen among the following: fiducial

exclusions, aval, personal guarantee, mortgage, securities, commercial securities and other, if accepted by the National Monetary Council.

The election of the specific type of claim is of free choice by the interested parties, which must adjust the deal according to the nature and terms of loans. Lenders may, at their choice, require free vinculated goods, unless rights were transferred by endorsement or cession. Debtors are obliged to reinforce or substitute their guarantees if loss, reduction, deterioration or depreciation occurs. Financed or potentially financed crops or goods may be included in the total value of collateral given as guarantee. Collaterals may include third party values.

- Expenses

Financial resources lent through the SNCR are subject to the following expenses: a) financial charges; b) financial operations tax; c) service changes. These expenses may be capitalized as part of loans. Improper charging of expenses are considered serious infractions and subject to legal sanctions.

Financial charges are interest, commissions and monetary correction (indexing) charges. Interest rates are determined by the National Monetary Council. These charges are due twice a year - June 30 and December 31, of each calendar year; at maturity of installments and at maturity of loans. Financial agents are prohibited to anticipate any collection of financial charges, which should be calculated by the "Hamburger Method" $[\frac{cit}{100}]$ including over balance due, excluding commercial discount transactions.

When monetary correction charges are adjusted, the new rates should

incide over existing debt, as well. In case of delay of any payment due, interest charges are increased by one percent. Loans up to 50 MVR (maximum reference values - a standard measuring unit being approximately equal to a minimum salary) receive favored treatment regarding financial charges. In case of subsidized production inputs (as defined) borrowers will be paying a rate of 7 percent a year and the Central Bank 8 percent, to financial agents.

Not all types of rural financial transactions are subject to the financial operations tax, but only rural commercialization loans, discounts, and pre-commercial loans, under specific circumstances.

Service charges may be collected for the following: a) technical assistance costs, at farm; b) patrimonial valuation costs, at farm; c) plan or project confection costs; d) auditing costs; e) inspection costs. These charges cannot exceed 1 percent of loan value at opening of the credit operation and 1 percent a year over balance due after first year of loan. Technical assistance fees may be charged while the services are rendered.

- Terms

Rural loans may be paid once or by installments, according to production and harvesting cycles. Terms and repayment schedules will be a function of the payment capacity of borrowers so that installment schedules coincide with income generation schedules.

Operating loans due dates should be fixed at the time of harvest plus 60 days, allowing for commercialization.

Payment of principal may be delayed as much as necessary according

to income, but limits are defined in each case.

- Use of Loans

Amounts lent may be drawn at once or in parcels according to cash requirements generated by farm activities (acquisitions and services). Parcels should correspond to, at least, a full month of expenses generated by the farmer. Payment of farmer expenses should be made directly to sellers of goods and services by submitting corresponding debt notes, when sellers consist of registered firms. For acquisitions of less than 3 MVR, or when the seller is not commercially registered, amounts may be paid directly to the borrowers, who should submit corresponding receipts within 30 days.

- Purposes of Loans

Loans may be granted for the following activities: a) production, b) investments; c) commercialization.

Production loans are supposed to provide financial resources required for payment of productive activities in farms.

Investment loans are supposed to induce the acquisition of goods whose services will be obtained for several production periods.

Commercialization loans are supposed to cover all or part of expenses which occur after harvest, or to convert commercial titles or claims into cash.

Loans may also be classified as a) current; b) educational; c) special. Current loans are all those which do not include technical assistance. Educational are all those which include technical assistance; and special loans are those provided to cooperatives, colonization and

land reform programs.

- Resources

Rural credit operations may be financed by: a) agent's own resources; b) specific allocations by government; c) special programs; d) rediscount; e) refinancing or repassing by the Central Bank; f) special Central Bank notations; g) resolutions, and other.

- Production loans

Production loans are classified as: a) agricultural; b) cattle raising; c) processing. Agriculture loans are supposed to finance production cycle expenses for periodic crops or maintenance expenses of permanent crops, as well as harvesting of spontaneous vegetable products, processing and storaging at farm or cooperative.

Total loan values should not, in general, exceed 60 percent of expected production value, considering average regional productivity and minimum price values fixed by government, or equivalent market prices in case of inexistence of minimum price values. Loans may be granted for a maximum of two years and terms fixed as a function of harvesting plus 60 days.

Cattle-raising loans are supposed to finance cattle-raising current expenses, as well as agriculture, fishing and sericiculture current expenses.

Processing loans are supposed to finance product processing activities, such as labor, maintenance of equipment, purchase of materials, handling, packaging, storaging, insurance, taxes, transportation and correlated expenses; but only when more than 50 percent of goods to be

processed were produced at farms or belong to associates, in the case of cooperatives. These loans may be granted separately or extensively as part of agriculture or cattle-raising loans. Processing loans may be granted for two years, at most, and deadlines should not surpass 180 days after the last installment has been granted, unless technically required.

- Investment Loans

Investment loans aim at the formation of fixed capital, financing the following activities: a) damming; b) purchase of long lasting (more than 5 years) machinery and equipment; c) reform, construction and enlargement of fixed installations; d) land clearing and cleaning operations; e) soil draining, protection and recuperation; f) electrification and rural telephony; g) foresting and reforesting; h) permanent crop and pasture formation; i) irrigation.

Investment loans also aim at the formation of semi-fixed capital, financing the purchase of farm animals; purchase of machinery, equipment implements and installations with less than 5 years average lifetime; as well as the purchase of vehicles, boats and airplanes.

Mixed budgets, derived from integrated projects and including production costs, should be considered as investment budgets for lending purposes if there is predominance of fixed and semi-fixed investment costs.

Loan terms should not surpass 5 years in case of semifixed capital formation and 12 years for fixed capital formation. Loans for land cleaning or (and) clearing operations, fertilizing, soil liming, earth removal and pasture restoration should not be longer than 5 years. Loans for tractor, harvesting and other large size machinery purchase should

not surpass 8 years with two years (maximum) grace period.

- Commercialization Loans

Commercialization loans have the objective to assure the necessary financial resources to producers and producer-cooperatives for the selling of their goods at the right time, in the market. They may be classified as pre-commercialization loans, discounts and minimum-price loans. Farm product buyers are not considered as eligible for these loans.

- Loans for Cooperatives

Loans may be granted to producer cooperatives for their operation and growth as well as for their patrimonial consolidation. Cooperative loans have the following purposes: a) advance payments for products delivered but whose prices were not fixed; b) acquisitions of inputs for later distribution to associates; c) revenue anticipation for services to be rendered to associates; d) repass of financial resources to associates for their normal production activities.

- Land Purchase Credits

Loans may be granted for colonization or settlement purposes as well as land-reform projects, consistent with Law No. 4504 of November 30, 1964; for any other governmental program of the same nature; or for purchases of land by individual farmers. Financed land must satisfy minimum settlement requirements including transportation, storage, input supply services, and technical assistance facilities. Colonization enterprises will have priority on land-purchase loans when executive INCRA projects or own projects approved by INCRA. Isolated land purchases may be financed to: a) farmers who do not possess land and for areas purchased

that are not less than one and not more than three regional modules; b) farmers who want to acquire contiguous land such that income generated by production on new plots is sufficient for maintenance of reasonable welfare standards; c) joint-owners who want to acquire remaining shares under specific conditions.

B) Monetary Policy and Rural Credit

Government controls its monetary policy and objectives, basically through the Monetary Budget. Monetary budgeting as a technique for implementing monetary policy objectives at a given period was introduced in Brazil in 1964 as a result of the government recognizing the need for greater monetary controls given the desired levels of inflation defined by the monetary authorities.

The monetary budget consists basically of a set of accounting equations and behavioral parameters of public and commercial banks. It uses explicitly a set of relations representing the link between the Monetary Authorities' and Commercial Banks' accounts. The Monetary Authorities' accounts are divided into assets (resource uses) and liabilities (resource sources). Liabilities are divided into monetary and non-monetary. Monetary liabilities are defined as the monetary base, which, when multiplied by a parameter (the multiplier) become the Money Supply (volume of the means of payment).

The monetary authorities in Brazil consist of the Central Bank and the Banco do Brasil. The monetary council is responsible for the formulation of the monetary policy and the Central Bank (BACEN) for its execution. Until 1977, Banco do Brasil had the double role of being a Commercial

Bank and a monetary authority. As a monetary authority, Banco do Brasil is the financial agent of the Treasury, an exclusive receiver of all deposits made by federal agencies, a keeper of voluntary reserves from Commercial Banks and an exclusive agent from the Central Bank.

Budget formation and control is executed by the Central Bank under the supervision of the Monetary Council.

Rural Credit is also a part of the monetary budget and the sources of resources which compound the rural credit institutional fund are several. Table 19 shows the relative importance of each item composing the resource side of the rural fund lent by the monetary system.

TABLE 19 - Relative Composition of the Rural Credit Fund, 1972 - 1977

Resources	1972	1973	1974	1975	1976	1977
Resolutions 69 and 260	66.5	66.3	61.2	65.0	68.0	71.6
Funagri	8.1	8.5	8.3	14.0	22.0	19.3
Other	25.4	25.2	30.5	21.0	10.0	9.0
Total	100%	100%	100%	100%	100%	100%

Source: BACEN

As may be seen, Resolutions 69 and 260 are the most important sources of funds for rural credit. Resolution 69 of the Central Bank stated that Banks were obliged to allocate 10 percent of total deposits, to the Rural sector. Afterwards, Resolution 260 expanded this proportion to 15 percent of the deposits from the public in the banking sector.

It may be shown that there is a direct link between the expansion

the money supply and rural credit, generated by a feedback to the monetary system, sustaining a monetary expansion. Anti-inflationary policies implemented through the control of the money supply may affect the total amount available to the sector. Finally, it may be seen that Resolutions 69 and 260 make the opportunity cost of resources to institutional lenders almost zero because of the exclusiveness of its use.

Funagri, is a composition of several resource items, i.e., Treasury contributions, external (international) loans, retention quotas from exported products, etc.

c) Institutional lending performance

Institutional lending characteristics are best shown through Central Bank (BACEN) information, on a time series starting in 1969 up to 1976. This information is considerably detailed and will be shown in the next seven tables. Values are ir constant, 1977, terms. BACEN, do not present the number of farmers attended but only the number of contracts signed. This number, in 1977, in the State of Ceara, ranged from 1.1 to 1.5 per farmer, depending on the lending institution's operational procedures.

Table 20 presents the number of contracts signed and amounts lent, in the Northeastern region, and shows that the absolute number of contracts signed doubled while the amount of loans more than quadrupled, in real terms, from 1969 to 1976.

TABLE 20 - Number of contracts signed and amounts lent by the Institutional System, in constant (1977) prices, in Cr$1000, in the Northeast

	1969	1970	1971	1972	1973	1974	1975	1976
Contracts	142,478	132,928	207,397	203,131	198,493	212,178	254,374	280,818
Constant (1977) Value (Cr$1000)	5,747	5,957	7,456	8,701	11,504	14,414	23,063	25,205

Source: BACEN, Yearly Rural Credit Reports

Tables 21 and 22 show that, approximately, 75 percent of contracts and 63 percent of loans -- average for the period -- were made for

agriculture activities and that the number of contracts signed for agriculture loans (crop production and investments) doubled while values lent quintupled. Contracts for animal raising loans almost doubled and values lent quadrupled.

TABLE 21 - Number of Institutional Contracts Signed, by Type of Activity, During the 1969-1976 period, in the Northeast

		1969	1970	1971	1972	1973	1974	1975	1976
Agri-culture	T	99,495	102,714	164,683	156,422	148,653	158,265	181,353	208,597
	0/0	70	77	79	77	75	75	71	74
Animal Ranch-ing	T	42,983	30,214	42,714	45,709	49,840	53,913	73,021	72,221
	0/0	30	23	21	23	25	25	29	26

Source: BACEN, Yearly Rural Credit Reports

TABLE 22 - Value of Institutional Contracts, at constant (1977) prices, by type of activity, from 1969 to 1976, in Cr$1 million

		1969	1970	1971	1972	1973	1974	1974	1976
Agri-culture	T	3,420	3,598	4,843	5,561	6,868	8,547	14,430	15,686
	0/0	60	67	65	64	60	59	63	62
Animal Ranch-ing	T	2,326	1,758	2,612	3,139	4,634	5,866	8,632	9,518
	0/0	40	33	35	36	40	41	37	38

Source: BACEN, Yearly Rural Credit Reports

- Type of Institutional Lenders and Amounts Lent

Institutional loans are primarily granted by the banking system. Banks may be divided into four groups: Federal (government owned), state, private and savings.

Bank behavior regarding rural lending is presented in Tables 23 to 25. Tables 23 and 24 show the number of institutional loan contracts and the amounts granted, by type of financial agent, in 1976. As may be seen, Federal Banks signed 61 percent of all rural contracts in the country, while 93 percent of all rural contracts in the Northeast. In value terms, Federal Banks lent 65 percent of total institutional loans granted in the country, being also responsible for 88 percent of total institutional loans in the Northeast.

TABLE 23 - Number of Institutional Contracts signed, by type of financial agent, in 1976, in 1000 units, in Brazil and in the Northeast

	Federal Banks		State Banks		Private Banks		Savings Banks	
	No. of Contracts	%	No. of Contracts	%	No. of Contracts	%	No. of Contracts	%
Brazil T	1116	61.0	167	9.0	490	27.0	29	1.5
North-east	269	92.7	8	2.7	7	2.3	-	-

No. of Contracts	%	No. of Contracts	%
31	1.1	1832	100
7	2.3	291	100

Source: BACEN, Yearly Rural Credit Report

TABLE 24 - Value of Contracts signed by Financial Agents, at Constant (1977) prices - Cr$1 million in 1976, in Brazil and in the Northeast

	Federal Banks		State Banks		Private Banks		Savings Banks		Cooperatives		Total	
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Brazil	120,515	65	19,079	10	43,082	23	1,552	1	1,554	1	185,782	100
North-east	22,089	88	1,186	5	1,469	6	-	-	461	1	25,205	100

Source: BACEN, Yearly Rural Credit Reports

On a Regional basis, Banco do Brasil signed 85 percent of contracts and was responsible for 73 percent of loans granted (institutional), in 1976, as shown in Table 25. As may be seen, Banco do Brasil, Banco do Nordeste do Brasil and Banco Brasileiro de Descontos signed the largest amounts of contracts and Banco do Brasil, Banco do Nordeste do Brasil and Banco do Estado do Pernambuco lent the largest volumes.

TABLE 25 - Number of Contracts Signed and Loans Granted to Producers and cooperatives in the Northeast, in 1976, by financial agent

Instituicao Financeira	Contracts	
	Number	Value (Cr$1,000)
Banco do Brasil S.A. (F)	238,461	12,906,422
Maranhao	15,438	626,206
Piaui	20,610	492,857
Ceara	36,919	1,541,468
Rio Grande do Norte	15,521	732,545
Paraiba	30,300	1,076,638
Pernambuco	30,802	1,761,921
Alagoas	13,402	1,555,513
Sergipe	15,489	516,178
Bahia	59,880	4,603,091
Banco do Nordeste do Brasil, S.A. (F)	19,820	2,267,252
Maranhao	128	37,784
Piaui	1,535	83,899
Ceara	5,194	503,689
Rio Grande do Norte	2,022	172,289
Paraiba	2,056	156,792
Pernambuco	2,543	448,057
Alagoas	1,295	120,959
Sergipe	1,342	140,051
Bahia	3,705	603,732
Banco do Estado de Pernambuco S.A. (S)	2,061	306,680
Banco Nacional de Credito Cooperativo (F)	626	247,691
Banco Economico S.A. (P)	911	220,957
Banco Brasileiro de Descontos S.A. (P)	3,815	206,005
Banco do Estado da Bahia S.A. (S)	2,022	137,733
Banco Real S.A. (P)	480	128,325
Banco da Amazonia (F)	411	62,623
Total	280,218	17,668,485

Source: Derur/Dipla/Secon - BACEN

F = Federal, S = State, P = Private

APPENDIX I

This appendix is to present an estimate of the approximate subsidy level received by farmers who borrow in the institutional market, and shown as the difference of the yearly rates or interest charged and the rate of inflation, for short term production loans, for the period 1971 - 1977. Actually, they reflect financial subsidies, given that economic opportunity costs are not separately identified. It should be stressed that Institutional Interest Rates shown are those charged to small farmers who do not use industrialized or processed inputs, such as fertilizers, seeds, etc, (because loans for the purchase of these inputs had no interest charged).

Inflation rates were based on the General Price Index as calculated by the Getulio Vargas Foundation (FGV).

The appendix also shows the cruzeiros/dollar, official exchange rates, for the same period, in Table 2.

TABLE 26 - Yearly Inflation Rates and Institutional Rates of Interest

Year	Yearly Inflation Rates	Yearly Rates of Interest	Difference
1971	20%	12%	-8%
1972	18%	12%	-6%
1973	16%	11%	-5%
1974	29%	10%	-19%
1975	28%	10%	-18%
1976	48%	13%	-35%
1977	39%	13%	-26%

Source: Centro de Contas Nacionais, FGV BACEN

TABLE 27 - Cr$/US$ Official Exchange Rates During the 1971-77 period

Year	Cr$/US$
1971	5.3
1972	5.9
1973	6.1
1974	6.8
1975	8.1
1976	10.7
1977	14.1

Source: Revista Conjuntura Economica, FGV

Chapter II

THE STUDY - AREA

Introduction

In the first chapter rural credit market characteristics in the Northeast of Brazil were presented as a general introduction to the analysis of the credit market in a specific sub-region, identified here as the study region of the Serra do Baturite, in the State of Ceara.

For the purposes outlined in the introduction to this study, considerable detail regarding borrowers' and lenders' characteristics are required as well as information on their environmental conditions, so that behavioral outcomes are correctly placed within an economic context.

Given that such detailed information is not available through general statistical data, specific farmer interviews were undertaken and will be presented in this chapter.

The basic purpose of the chapter, therefore, is to present in its first part a description of the study-region regarding its main geographic, demographic and economic characteristics; and in its second part a description of the sampling procedure and relevant sample results.

Regarding geographic characteristics, a brief description of climate and soil conditions will be presented given that these are the basic natural constraints on agriculture as well as determinants of the type of output generated in the sector. Besides soil and climate, population data including growth and migration are also discussed. Finally, performance of the primary and secondary sectors of the local economy are

shown, concluding the first part of the chapter.

In the second part, sampling procedures and outcomes are discussed. This is necessary as an introduction to the next chapter, in which an econometric analysis of lenders' and borrowers' behavior in both, institutional and non-institutional credit markets is undertaken.

Geography

The Serra do Baturite region is composed of ten counties, occupying an area of 3,822 Km^2, equivalent to 2.6 percent of the State of Ceara, and distant 100 Km, southwest, from the State's capital, Fortaleza.

This region may be divided into two distinct ecological zones, the Serra, or hilly, zone, and the non-Serra zone. The Serra zone includes the following counties: Aratuba, Pacoti, Palmacia, Guarami ranga and Mulungu. The non-Serra zone includes: Aracoiaba, Capistrano, Baturite, Redencao and Itapiuna.

Regarding the climatic aspects, basic differences are related to different altitudes, ranging from zero to 800 meters. In the non-Serra zone the climate is of the hot and dry version; temperatures ranging from 24^{o} to 35^{o} Celsius. Rainfall indices average 850 mm/year, which is almost half the Serra's index, and altitudes from 0 to 300 meters above the sea level.

In the Serra zone temperatures average 20^{o} Celsius, while altitudes go from 300 to 300 meters above the sea level. Given its higher rainfall indices, average of 1,400 mm/year, the climate is of the temperate and humid version.

Climate typology, according to Koppen indices, show that Serra

areas belong to the AW class and non-Serra to the Bsh class.

Regarding soil conditions, they vary considerably within each zone. In the non-Serra zone there are two distinct types of soil, i.e., of the sandy-well drained-deep type and of the shallow-clay type. The former is appropriate for manioc cropping and the latter for corn, beans and cotton (besides cattle ranching) cropping activities. In the Serra zone, a more fertile type of soil is available, i.e., of the bulkie and heavy textured-clay type. This soil is appropriate for coffee, banana, vegetables and fruit crops. Because of the hilly type of terrain and high rainfall indices, soil erosion is common.

Demography

The Serra do Baturite region's population, in 1970, was of 170,382 inhabitants, corresponding to 3.8 percent of the States' population. From these, 134,480 persons (or 69 percent) were living in the rural areas and 35,902 (or 31 percent) were living in the urban areas. Given that the study-region has an area of 3,822 Km^2, corresponding to 2.6 percent of the States' area, it is the third largest human concentration, with a density of 44,6 hab/Km^2.

As may be seen in Table , Serra counties are, usually, denser than non-Serra ones, this being explained by better farming conditions, chiefly in Baturite, Palmacia and Pacoti, where cropping of commercial produce is more profitable because of better soil and climate.

From a dynamic point of view population growth rates are falling since 1960, in the study-region, while rising for the State of Ceara, as shown in Table .

TABLE 28 - Population Densities Within the Study-Area, by County, in 1970

County	Density(inhab/Km^2)
Non-Serra	
Aracoiaba	22.95
Baturite	86.73
Capistrano	50.28
Itapiuna	25.60
Redencao	68.99
Serra	
Aratuba	64.26
Mulungu	38.62
Palmacia	106.51
Pacoti	96.06
Guaramiranga	68.09

Source: Fibge, Census, 1970

TABLE 29 - Annual Population Growth Rates in the Serra do Baturite and State of Ceara

	1950/1960	1960/1970
Study-Region	1.91	1.03
State of Ceara	2.13	2.95

Source: Fibge, Census

On a county basis, the following annual growth rates were observed:

TABLE 30 - Annual Population Growth Rates in the Serra do Baturite Region

County	1950/1960	1960/1970
Non-Serra		
Aracoiaba	.98	2.44
Baturite	.82	.99
Capistrano	.43	.16
Itapiuna	5.90	1.11
Redencao	1.60	1.13
Serra		
Aratuba	1.59	.69
Mulungu	1.99	.59
Pamacia	6.85	.11
Pacoti	2.04	.16
Guaramiranga	0.85	.35

Source: FIBGE, Census

As may be seen, growth rates fell in all but two counties, which were Non-Serra ones: Aracoiaba and Baturite. The reason given is that coffee plantations, which sustained during the fifties the Serra's agricultural labor demand, were erradicated because of excess production, during the sixties, causing considerable migration from the study-region.

In a migration survey[1] done in 1967, regarding the inflow of farmers from other regions of the state to the capital, Fortaleza, it was found that the Serra do Baturite farmers represented 27 percent and 22 percent of total incomers, in two samples interviewing 3,783 and 28,909 farmers

respectively. The reasons given by interviewees, were low income and land scarcity. The author of the study also conjectures about coffee erradication measures taken by government and the fall of sugar-cane prices. The study also showed that migration within the study-area was common, i.e., from rural to urban areas.

Comparing population growth rates in rural and urban areas for the study-region and for the State, it may be seen in Table that urban growth rates fell in the region and in the State, but, rural growth rates fell for the region but not for the State. This indicates that rural economic conditions play an important role in the settlement preferences of the population, and that urban congestion may be partly avoided by rural settlement programs in which credit may play an important role.

TABLE 31 - Annual Population Growth Rates in Urban and Rural Areas in the Serra do Baturite and State of Ceasa, 1950/60 and 1960/70

	1950/1960		1960/1970	
	Urban	Rural	Urban	Rural
Study-Region	2.69	1.72	1.24	0.90
State	4.94	0.93	4.68	1.91

Source: FIBGE, Census data

The Economy

The Primary Sector

More than 90 percent of the State of Ceara is in the semi-arid zone of the Northeastern Region of Brazil and one of its most important characteristics is the lack of a comprehensive irrigation system. One consequence is that the agriculture sector is highly dependent on rainfall occurances, a random element. The Serra do Baturite Region, more specifically the Serra zone, is not so dependent given its natural rainfall performances. This may be shown by comparing production performances in a "dry" and in a "normal" year (1969 was a normal year and 1970 a dry year) for four crops, in the Serra do Baturite Region and in other State regions (the largest producers of each crop) in Table 32:

TABLE 32 - Proportional Changes in Production in a Dry Year (1970) Compared to a Normal One (1969) in the Serra do Baturite Region and in other State regions (largest producer in State)

Type of Crop	Study-Region	Other Regions
Rice	- 58 %	- 81 %
Sugar Cane	+ 2 %	0 %
Cotton	- 12 %	- 62 %
Manioc	+ 4 %	- 51 %

As may be seen in Table 32, natural conditions are more favorable in the study-region than somewhere else in the State.

Agricultural production within the Serra zone may be divided into two types, i.e., subsistence and commercial. Subsistence cropping is

mainly done in the lower parts of the Serra zone, i.e., in the "quebradas" sub-zone; and commercial cropping in the upper parts.

Commercial crops are coffee, sugar-cane, rice, vegetables and fruits. Subsistence crops are rice (of a different type), beans, corn and fava-sprouts. Some commercial cropping is also done in the "quebradas" subzone such as tomatoes, carrots, sugar beets, cabbage and bananas.

In the non-Serra zone, chiefly in the "valley" sub-zone, rice and sugar cane are the main commercial crops.

Besides the "valley" sub-zone, there is also the "sertao" area in the non-Serra zone with a hot and dry climate as mentioned before, while soil conditions are favorable for manioc, corn, cotton and cattle ranching activities.

Agricultural crops may be divided into four groups, i.e., industrial crops, fruits, vegetables and subsistence crops. Table 33 shows the value of production of such crops for the Serra do Baturite region, in 1971, in Cr$1,000.

TABLE 33 - Composition of the Agricultural Value of Production in the Serra do Baturite Region, in 1971

	Group	Value of Production (Cr$1,000)	%
1.	Industrial crops	33.525	42.3
2.	Fruits	22.706	28.7
3.	Vegetables	5.856	7.4
4.	Subsistence Crops	11.564	14.6
5.	Cattle Ranching	5.541	7.0
6.	Total	79.192	100.0

Source: Departamento Estadual de Estatistica

Regarding the value of production of specific crops, banana has the largest value corresponding to 27.3 percent of total (Cr$79,192) and is classified under fruits; sugar cane has the next largest value, corresponding to 23.3 percent, and is classified under industrial crops; then cotton (industrial crops) with 11.9 percent; cattle with 7 percent; coffee (industrial crops) with 6.7 percent; tomatoes (vegetables) with 4.5 percent; manioc (subsistence) with 4.4 percent; rice (subsistence) with 4.2 percent; and all other with 10.7 percent.

Spacial distribution of the total value of production indicates that 50 percent is generated in the Serra zone and the remaining 50 percent in the non-Serra zone.

The Secondary Sector

Industries in the Serra do Baturite Region may be described as primarily of the Transformation type, utilizing agricultural products as their basic raw material. Production methods are, usually, primitive, labor is unskilled and technology obsolete.

Table 34 shows the number of firms, value of production and employment levels, by ecological zone, in 1974, in the study-region.

As may be seen in table 35 , 93 percent of total regional value of production in the sector are generated by the transformation (processing) of sugar-cane, cotton, coffee and rice; while these industries employ 22 percent of the labor force used in the sector.

Table 36 shows the industrial production in the Serra zone, and, as may be seen, 56 percent of the value of industrial production were generated by the processing of coffee, which employed only 8 percent of the

TABLE 34 - Number of firms, Value of Production and Employment in the Secondary Sector of the Serra do Baturite Region, in 1974

Ecological Zone	Number of Firms	Value of Production (Cr$1,000)	Employment
Serra	180	6.252	1437
Non-Serra	44	70.256	475

Source: SUDEC/DDM

TABLE 35 - Number of Firms, Value of Production and Employment, by type of industry, in the Serra do Baturite Region, in 1974

Activity	Number of Firms	Value of Production (Cr$1,000)	Employment
Sugar-Cane Blocks (Rapadura)	117	1.605	1,250
Coffee Processing	49	3.500	119
Sugar-Cane Spirits	7	2.377	118
Rice Processing	21	3.465	40
Cotton Processing	6	30.470	88
Lumber Processing	3	-	13
Lime Extraction	20	1.710	117
Total	224	76.508	1,912

Source: SUDEC/DDM

TABLE 36 - Number of Firms, Value of Production and Employment by Type of Industry, in the Serra Zone of the Serra do Baturite Region, in 1974

Activity	Number of Firms	Value of Production (Cr$1,000)	Employment
Sugar-Cane Blocks (Rapadura)	117	1,605	1,250
Coffee Processing	49	3,500	119
Sugar Cane Spirits	4	97	58
Rice Processing	10	1,050	10
Total	180	6,252	1,437

Source: SUDEC / DDM

labor force in the sector, in the respective zone.

The Sample

Information utilized in this study regarding individual farmer characteristics and behavior were generated through direct interviews, in the Serra do Baturite region, State of Ceara, during the months of July and August, 1977, by the author, in conjunction with CEPA-CE[2]. A stratified sample of 320 farmers was selected, based on INCRA's (Instituto Nacional de Colonizacao e Reforma Agraria) census of 1972.

Considering that the Serra do Baturite region presented a high degree of heterogeneity regarding natural conditions, farm size and types of output, it was divided, initially, into two distinct areas: Serra and Non-Serra, each area including five counties. Serra counties being Palmacia, Pacoti, Aratuba, Guaramiranga and Mulungu; while Non-Serra

counties being: Redencao, Aracoiaba, Capistrano, Itapiuna and Baturite.

Afterwards, farmers were stratified into four distinct groups according to:

a) size-class

b) ecological zone

c) county

d) tenure condition

Non-Serra farms were divided into four size-classes (in hectares):

0-25, 25-100, 100-500 and more than 500 hectares.

Serra farms were divided into five size-classes (in hectares):

0-10, 10-50, 50-200, 200-500 and more than 500 hectares.

The Non-Serra farmer population contained 3,795 individuals, while the Serra population 2,250, for a total of 7,159; according to INCRA.

Farmer location in the Regional space was plotted on specific maps which were used for stratification purposes regarding ecological zone and county. These maps showed the location of farms.

Type of tenure condition was defined by INCRA data.

Sample Size and Sampling Procedure

As mentioned before the sample size was arbitrarily defined to be 320. No other technical criteria generated this quantity but survey costs. The sampling procedure used was the four-stage proportional sampling method. Initially the total number of defined interviews (320) was divided into two area groups (Serra and Non-Serra) proportional to population data, generating 185 interviews in the Non-Serra area and 135 in the Serra area.

As a second step, each group was divided, proportionally, by size-class according to the following formula:

$$n_h = W_h n , \quad \text{where} \quad \sum_{h=1}^{c} W_h = 1$$

n_h = number of questionnaires to belong to the h^{th} size-class

$W_h = N_h / N$ = weight

N_h = population belonging to the h^{th} size-class

N = total population

n = number of questionnaires to be submitted in the respective area (Serra and Non-Serra)

The third step was to define the number of questionnaires to be submitted at a given ecological zone, belonging to a specific size-class. The following formula was used:

$$m_{hj} = W_{hj} n_h$$

m_{hj} = number of questionnaires to be submitted in the j's zone to the h's size-class

$W_{hj} = M_{hj} / N_h$

M_{hj} = number of population units belonging to the j's zone and h's size-class

The same procedure was used for the definition of the amount of questionnaires to be submitted in each county and by tenure conditions, using always population proportions as weights.

After the definition of the amount of questionnaires to be submitted considering size-class, ecological zone, county and tenure condition characteristics, a random sample within each category was selected.

Problems regarding the interview of selected farms were observed:

a) some selected plots have been sold, dismembered or added to existing plots, since census data was published;

b) access to some plots was impossible because of rainy conditions in the Serra region at the time of interview.

To compensate for such events, a triple stand-by list of randomly selected farms, for each category, was elaborated. In case that this list was exausted, the choice of which farm to select was delegated to the interviewing personnel which received the instruction to select missing farms within each group or category according to a cross drawn on the map where plots were located in space. For some counties in the Serra region this last procedure was used in almost half of the interviews because of time constraints generated by unexpected rainfall prolongations and availability of trained personnel, originally from other state institutions.

Finally, after farmers had been interviewed, questionnaires were critized and resubmitted in some cases. This procedure, nonetheless, did not avoid the loss of thirteen questionnaires because of missing information or inconsistencies.

For comparison purposes, Table 37 presents the total number of existing property owners and non-owners (universe), in 1972, according to Incra Census information; as well as selected ones (sample plan), by farm size-class, and the actually obtained sample, in the Serra zone.

Table 38 shows the same information for non-Serra owners and non-owners.

TABLE 37 - Total Number of Existing Owners and Non-Owners, Sample Plan and Actually Obtained Sample, by Size-Class, in the Serra Zone, in 1972

Size (ha)	Universe		Sample Plan		Sample	
	Owners	Non-Owners	Owners	Non-Owners	Owners	Non-Owners
0 - 10	992	145	45	6	41	7
10 - 50	515	258	24	11	26	10
50 - 200	225	468	11	21	16	16
200 - 500	47	301	1	13	2	9
> 500	9	76	0	3	0	2
Total	1785	1251	81	54	85	44

Source: Incra, Census 1972

TABLE 38 - Total Number of Existing Owners and Non-Owners, Sample Plan and Actually Obtained Sample, by Size-Class, in the Non-Serra Zone, in 1972

Size (ha)	Universe		Sample Plan		Sample	
	Owners	Non-Owners	Owners	Non-Owners	Owners	Non-Owners
0 - 25	1422	327	65	14	60	16
25 - 100	1181	113	55	4	54	8
100 - 500	458	322	19	15	19	12
> 500	81	219	3	10	3	8
Total	3142	981	142	43	136	44

Source: Incra, Census 1972

Sample Results

Basic sample results regarding farmer production, consumption, financing characteristics and asset composition will be summarized in the next paragraphs, by farmers' size-class.

As may be seen in Table 38A, the average value of own production, i.e., the value of farmers' production not including any produce transference from share-croppers or payments to land owners, is 25 times larger for the largest size-class as compared with the smallest (0 - 10 hectares). The value of assets is 30 times larger for the largest size-class; the value of yearly income is 40 times larger; the value of commercialized production, i.e., the value of production sold in the market, is 45 times larger and the value of production expenses increased 46 times.

Regarding the income composition of each type of farmer (by size-class) the following is observed in Table 39:

a) For the smallest class (0 - 10 owners) commercialized production is less than the total value of production meaning that part of it goes for consumption. These farmers have also the largest share of outside income, i.e., part of total income generated outside the farm, indicating that income generated inside the farm is not sufficient for subsistence of farmer's household, therefore having to compensate with work outside the farm.

b) For all but two classes, commercialized production is larger than own production with the exception of the smallest group (0 - 10 hectares) and the (25 - 50 hectares) group. The largest increment of commercialized to own production is for the largest group, over 500

TABLE 38A - Average Asset Value, Production Expenditures, Own Production Value, Commercialized Production, Basic Yearly Consumption, outside income and total income of farmers, by size class, in the Serra do Baturite Region, in 1977

Class (ha)	Average Assets Value (Cr$)	Average Production Expenditure (Cr$)	Average Value of Own Production (Cr$)	Average Value of Commercialized Production (Cr$)	Average Basic Yearly Consumption Expenditure (Cr$)	Average Yearly Income Generated Outside Farm (Cr$)	Total Income (4 + 6) (Cr$)
non-owners*	-	4,567	-	12,685	7,753	16,438	29,123
0 - 10	55,565	3,311	14,535	12,603	9,822	12,661	25,264
10- 25	93,520	11,729	29,468	29,708	14,276	22,702	52,410
25- 50	122,400	21,707	49,339	45,951	12,292	13,439	59,390
50-100	198,194	35,892	91,406	93,784	16,324	39,162	132,946
100-200	356,133	59,706	99,399	130,176	17,529	31,166	161,342
200-500	479,889	102,667	144,107	150,666	21,333	12,222	162,888
> 500	1,611,667	139,333	366,133	571,666	20,000	429,000	1,000,666

(*) Includes renters and sharecroppers

Source: Sample from Serra do Baturite Region, CEPA-CE

TABLE 39 - Income Composition of Farmers by Size-Class

Size-Class (hectares)	Value Own Production	Commercial Production	Outside Production
	Total Income	Total Income	Total Income
0 - 10	.57	.49	.51
10 - 25	.56	.58	.42
25 - 50	.83	.79	.22
50 - 100	.69	.70	.30
100 - 200	.61	.81	.19
200 - 500	.88	.93	.07
≥ 500	.37	.57	.43

hectares, the difference coming, basically, from the rent extracted from sharecroppers.

c) Large farmers, over 500 hectares, also get the largest share of income generated outside the farm (with the exception of the two smallest groups which have the lowest income levels) meaning that they have plenty of resource allocation alternatives. As may be seen, only 37 percent of their total income is generated from own production, the rest being rents from land use, received from sharecroppers, and revenue generated outside the farm in other activites.

d) With the exception of the largest group, income generated outside the farm decreases as farmers become larger, indicating that in the study-region resource use alternatives are scarce for small and medium farmers.

Regarding the comparison of Production Expenses to the Value of Own Production, Table 40 shows that expenses increase, proportionally, as farmers get larger, with the exception of the largest group. This is indicative that the largest group is, probably, using more intensive mechanized production processes, as will be shown at a later stage of this chapter when the asset composition of farmers is discussed.

TABLE 40 - Ratio of Production Expenses to Value of Own Production by Size-Class of Farmers in the Serra do Baturite

Size-Class	Production Expenditures / Value of Own Production
0 - 10	.23
10 - 25	.40
25 - 50	.44
50 - 100	.39
100 - 200	.60
200 - 500	.71
> 500	.40

Smaller farmers' production expenses are the lowest for all groups, indicating that labor and other types of inputs are usually not bought or hired by these farmers.

Regarding the amount of production sold and consumed by farmer groups, it may be seen in Table 41 that:

a) Small farmers produce primarily for subsistence purposes while larger farmers for commercial. As shown in Table 41, the ratio of Production plus Consumption Expenses over Commercialized Production decreases as

TABLE 41 - Ratios of Expenses over Commercialized Production and Value of Own Production, by Size-Class

Size-Class	Consumption & Production Expenses / Commercialized Production	Consumption & Production Expenses / Value of Own Production
0 - 10	1.04	.90
10 - 25	.88	.88
25 - 50	.74	.69
50 - 100	.56	.57
100 - 200	.59	.78
200 - 500	.82	.86
> 500	.28	.44

farmers' size gets larger, the same happening to the ratio of Production plus Consumption over the Value of Own Production. Table 41 also shows that the first ratio (Production + Consumption Expenses / Commercialized Production) is larger than the second for small farmers (0 - 10); and no slacks between expenditures and revenues exist, indicating that production is for consumption purposes and that commercialization of production is for the only purpose of acquiring those goods not produced on the farm but basic for subsistence.

b) Smaller farmers (up to 50 hectares) commercialize less than what they produce as compared to larger farmers (50 hectares and up) who commercialize more, the difference being accounted for consumption and rental payments of smaller to larger farmers.

Regarding institutional production loans to farmers, by size-class,

Table 42 shows that the larger the class, the larger the percentage of attended farmers in the group, and the larger the average loan granted (columns 4 and 6).

TABLE 42 - Allocation of Institutional Production Loans by Banks and Cooperatives to Farmers, in 1977, in the Serra do Baturite Region

Class (ha)	Number of Farmers in Class	Number of Farmers Attended in Class	Percentage Attended in Class	Value of Loans Granted to Class (Cr$1000)	Average Loan Granted to Class (Cr$)	Percentage of Total Loans Granted to Class
Non-Owners*	89	12	13.5	195	16,250	6.97
0 - 10	63	10	15.9	74	7,400	2.64
10 - 25	48	22	45.8	335	15,227	11.96
25 - 50	41	24	58.5	317	13,208	11.32
50 -100	37	24	64.9	701	29,208	25.04
100-200	17	12	70.6	594	49,500	21.22
200-500	9	6	66.7	410	68,333	14.64
> 500	3	2	66.7	173	86,500	6.18

Source: Serra do Baturite Region Sample

*Includes renters and sharecroppers

Comparing the results shown in Table 42 and Table 38A the following is observed:

a) As shown in Table 43, the ratio of Intitutional Loans to Production plus Consumption Expenditures is, approximately, constant for all size-classes, while the ratio of Loans to Production Expenditures fall as farmers become larger, indicating that

- small farmers have part of their consumption and all production expenses financed by the institutional system, when attended by this source.
- as larger farmers become as less, the institutional system finances their production expenses

TABLE 43 - Comparison of Production Loans and Production Plus Consumption Expenses

Size-Class	Average Production Loan: Production + Consumption Expenditures	Average Production Loan: Production Expenditures
0 - 10	.56	2.23
10 - 25	.58	1.30
25 - 50	.39	.61
50 - 100	.56	.81
100 - 200	.64	.83
200 - 500	.55	.67
> 500	.56	.64

b) Table 44 shows that the ratio of average production loans received from the institutional system over value of own production is decreasing as farmers become larger, indicating that farmers become more independent as their size increases, confirming the previous statement regarding the proportion of expenses financed.

Table 45 shows that farmers who do not possess land are not eligible for receiving institutional investment loans given that there is no

TABLE 44 - Comparison of Production Loans and Value of Own Production, by Size-Class, in the Serra do Baturite Region

Size-Class	Average Production Loan Value of Own Production
0 - 10	.51
10 - 25	.52
25 - 50	.27
50 - 100	.32
100 - 200	.50
200 - 500	.47
> 500	.24

TABLE 45 - Allocation of Institutional Investment Loans by Banks and Cooperatives to Farmers, in 1977, in Serra do Baturite Region

Class (ha)	Number of Farmers in Class	Number of Farmers Attended in Class	Percentage Attended in Class	Value of Loans Granted to Class (Cr$1000)	Average Loan Granted to Class (Cr$)	Percentage of Total Loans Granted to Class
Non-Owners*	89	0	0.0	0	0	0
0 - 10	63	6	9.5	54	9,000	2.8
10 - 25	48	6	12.5	69	11,500	3.5
25 - 50	41	10	24.4	185	18,500	9.5
50 -100	37	18	48.6	743	41,300	38.1
100-200	17	7	41.2	545	77,800	28.0
200-500	9	6	66.7	278	46,300	14.3
> 500	3	2	66.7	72	36,000	3.6

Source:

*Includes renters and sharecroppers

collateral to guarantee the transaction. Under certain conditions they may buy land.

Table 45 also shows that investment loans increased 8.6 times as the size of farmers increased, the same being observed for group attendance.

Table 46 shows that the ratio of Average Investment Loans to Average Value of Assets, by size-class, decreases as farmers become larger, but increase up to medium sized farmers, indicating that medium sized are the preferred target for investment lending by the institutional system.

TABLE 46 - Comparison of Average Investment Loans to Average Value of Assets

Size-Class	$\frac{\text{Average Investment Loan}}{\text{Average Value of Assets}}$
0 - 10	.16
10 - 25	.12
25 - 50	.15
50 - 100	.21
100 - 200	.22
200 - 500	.09
> 500	.02

Table 47 shows some non-institutional market characteristics, such as:

- the percentage of attendance of farmers decreases as they become larger indicating that non-institutional loans are granted to those who do not get enough (or any) loans from the institutional

TABLE 47 - Non-institutional Moneylender and Trucker Loans Granted by Size-Class, in 1977, as shown in sample

Class (ha)	Number of Farmers in Class	Number of Farmers Attended in Class	Percentage Attended in Class	Value of Loans Granted to Class (Cr$1000)	Average Loan Granted to Class (Cr$)	Percentage of Total Loans Granted to Class
Non-Owners*	89	41	46.1	148	3,610	54.6
0 - 10	63	18	28.6	62	3,444	22.9
10 - 25	48	8	16.7	16	2,000	5.9
25 - 50	41	4	9.8	13	3,250	4.8
50 -100	37	3	8.1	11	3,666	4.1
100-200	17	4	23.5	21	5,250	7.7
200-500	9	0	0.0	0	0	0.0

Source:

*Includes renters and sharecroppers

system;

- The average loan granted in the non-institutional system is almost constant for all size-classes, increasing slightly for the larger farmers. The largest class do not borrow in this market, probably because they get sufficient resources from the institutional source.
- Regarding the constancy of the average loan granted, this may be explained by the increasing proportion of institutional loans received by larger farmers so that the non-institutional market becomes marginal for them while it is the main source of borrowing for those not attended by the institutional system.

- Non-landowners are the main customers of the non-institutional system getting more than half of total loans granted and representing 52 percent of total customers attended. More than half of these borrowers got credit from non-institutional money lenders or truckers.

Consumption Credit

Consumption credit (credit in goods), on the other hand, is the most expensive type of credit. Sample results indicate that 71 percent of landless and 51 percent of small farmers up to 10 hectares use this type of credit, while no large farmer, from 200 hectares up was using it. Rates of interest ranged from 6 to 25 percent monthly depending on what and how much was financed, to whom.

Asset Composition

Regarding asset composition, value of land corresponded, approximately, to 20 percent of total, for all classes, as may be observed in Table 48. The share of construction sites decreased as farmers became larger, and machinary plus equipments and animals, increased. This may be in part because animals and machinary plus equipment were mostly financed to larger farmers by institutional sources, at negative rates of interest, in the last ten years.

TABLE 48 - Percentage Distribution of Farmers' Asset Composition, by size-class, in 1977, as shown in sample

	0-10	10-25	25-50	50-100	100-200	200-500	> 500
Land	19.6	15.4	15.8	28.3	19.7	29.0	13.4
Construction	67.4	63.0	34.2	46.1	42.7	45.2	27.5
Machinery & Equipment	7.6	13.8	4.6	16.0	23.8	15.6	33.2
Animals	5.4	7.8	45.4	9.6	13.8	10.2	25.9

Source: Serra do Baturite Sample

Demand for Institutional Loans

Finally, analyzing the answers of farmers not belonging to the institutional system, regarding the reasons for not doing so, it may be seen, in Table 49, that the share of farmers which stated that they had no sufficient guarantees for applying for these loans decreased from 62 percent to nil, the larger they became. Those which were not attended because they were in debt, increased; those who did not want any institutional loan increased with size; those rejected by the institutional system decreased with size; and those who would like to enter the system decreased with size.

These results indicate the existing form of institutional credit rationing system, regarding size-class, as interpreted by demand. Comparing them with previously shown institutional distribution patterns in the Northeastern Region of Brazil, by FIBGE, as well as with distributions shown by this sample, there are strong indications that the institutional

rationing system discriminates smaller farmers. This hypothesis is tested at a later stage of this study and, actually, is one of the most significant characteristics to explain not only institutional lenders' behavior but borrowers' expectations regarding credit transactions in general.

Depending on lenders' opportunity costs of financial resources as well as on financial market conditions, an institutional credit system may not only generate direct benefits to borrowers but indirect benefits to potential ones by affecting their set of alternative borrowing sources. Therefore it will be crucial to the market performance the way the institutional rationing mechanism is set up. Economic growth or development may be the outcomes as the institutional system expands.

TABLE 49 - Percentage Distribution of Resons for not Belonging to the Institutional Credit System as Perceived by Non-Participating Farmers

Class (ha)	Number of Farmers in Class	Number of Respondents (=100%)	Percentage Distribution of Answers (Number of Resp. = 100%)					
			Not enough collateral	Debtor of Instit. System	Does not want to Belong	Rejected by banks	Other	Would belong if possible
Non owners *	89	60	62	-	8	5	13	80
0 - 10	63	43	30	-	14	9	26	65
10 - 25	48	22	18	9	27	5	14	45
25 - 50	41	11	36	9	18	-	9	54
50 - 100	37	7	14	29	14	-	14	57
100-200	17	3	-	67	33	-	-	67
200-500	9	0	-	-	-	-	-	-
500	3	0	-	-	-	-	-	-

FOOTNOTES

1. Amelia A. N. Moreira, "Migraices para Fortaleza," ISNPS, Gov. Ceara, 1967.
2. Comissao Estadual de Planejamento Agropecuario do Estado do Ceara.

CHAPTER III

CONCEPTUAL FRAMEWORK

In the first two chapters a description of Regional as well as local credit market characteristics was given. As shown, institutional lending sources concentrated their allocations on medium and large farmers, both in the Region as well as in the study area (The Serra Do Baturite Region). Non-institutional loans, irrespective of type of lender or form of loan, were granted to that part of the market which was not served by the institutional system.

In this chapter an analytical framework will be presented so that theoretical and empirical features are clearly identified when dealing with specific aspects of market analysis and policy considerations.

The first task would be to describe the theoretical structure embedding the empirical investigation regarding borrowers' and lenders' behavior in the institutional and non-institutional sections of the financial market.

The second task would be to outline the type of empirical analysis used for each segment of this market.

The third task would be to link theoretical formulations and empirical outcomes with policy analysis, done through cost-benefit evaluations of changing existing institutional lending procedures.

- The first task: the theoretical structure

One of the main purposes of this study is to show that intermarket effects, i.e., effects stemming from the type of behavior of the institu-

tional supply on the non-institutional demand, are important in determining borrowers' behavior in general. The second purpose is to examine the feasibility of spreading credit to small farmers.

The existence of intermarket effects on the demand schedule of farmers is shown through an econometric analysis presented in the next chapter, and the feasibility of spreading credit to small farmers is analyzed in the fifth chapter, through a cost-benefit analysis.

The task of analyzing observed financial transactions requires, initially, that some theoretical framework is formulated; if not, observations become meaningless. In this study a specific formulation regarding individual borrowers' and non-institutional lenders' behavior is suggested but its use is limited serving the only purpose of indicating the set of variables which could explain empirical phenomena.

The following discussion concerns a dynamic programming model formulation for borrowing farmers, which may easily be extended to individual lenders as will be shown later.

The purpose of this model is to present a systematic description of the derived demand for loans by farmers which own land. This model will be helpful in specifying some empirical relations, to be tested somewhere else in this study, regarding farmers' demand for loans. A dynamic programming type of model is suggested given that intertemporality and goal pursuing characteristics are believed to be present in the farmer decision making process regarding loans.

The modeling process of farmers' credit demand requires that economic activities which generate this demand be specified as well as the system which links them, i.e., consumption, production and investments.

Assuming that farmers are utility maximizers and their goal is to maximize long-run yearly consumption levels, it is possible to write the following objective function:

(1) $\text{Max } u(C_1 \ldots C_T)$

where $C_1 \ldots C_T$ are yearly consumption levels. Consumption levels in each year may be optimized, given a certain income schedule, through the capital market, i.e., by borrowing and lending at a certain price. Alternatively, borrowing or lending may be necessary when there is a disequilibrium of desired and actual flows of resources at a given point in time. But consumption is only possible if income exists or assets are depleted; and there are roundabout methods to generate income. Borrowed funds may be used for investment, to expand production which, ceteris paribus, would increase income and consumption. The equilibrium conditions to be met by any farmer at any given point in time t may be written as

(2) $D_t = C_t + I_t - Y_t + D_{t-1}(1 + r_t) - \Delta A^F$

Borrowing at any time t, (D_t) will be equal to consumption (C_t), investment (I_t) and previous debt payments [$D_{t-1}(1+r_t)$] minus the amount of income at t(Y_t) and own (mobilized) financial stocks (ΔA^F). As may be seen, farmers may equilibrate in and outflows mobilizing part of their own stocks before borrowing. Borrowing will be preferred if sacrificed consumption in the future is lower than when using own stocks. The term sacrifice, in this context presupposes an interemporal preference ranking of consumption levels and given financial market interest rates. These interest rates are also important in accessing the amounts of income

transference from or to borrowers. These transferences generate positive or negative consumption increments. If interest rates are negative it would be worthwhile to borrow as much as possible because borrowing would generate positive income transferences toward borrowers.

An important aspect of this formulation is that it is irrelevant what part of inflows (income or asset mobilization ΔA^F) is used for what purpose. Borrowing (positive or negative) must make up the difference. This would not be so if loans were given for specific purposes.

Farmers may engage in three types of activities: consumption, production and investment, therefore using economic resources for three different purposes. As a next step in the modeling process, it is necessary to specify what variables explain (determine) the behavior of farmers regarding these activities so that equilibrating resource quantities (lending or borrowing) be recognized given behavioral standards, farmer goals and exogenous conditions and variables which generate or limit activity levels. Putting it differently, disequilibrium is balanced through lending or borrowing so that the utility of farmers is maximized. Specifying the relationship of activity variables as function of technology, market, institutional and other types of guiding variables, empirical hypothesis regarding individual credit demand behavior may be formualted and tested.

Production net income generated within the farm is a function of factor use intensity, input and output prices, and interest rates.

$$(4) \quad Y_t^{PROD} = f(K_t^I, L_t^{FI}, N_t, W_t, L_t, r_t, p_t) = f(K_t^I, L_t^{FI})P_t - W_t L_t^{FI}$$

$$- i_t K_t^I - (1 + r_t)N_t = Q_t P_t - W_t^o L_t^{oFI} - i_t K_t^I - (1 + r_t)N_t$$

$$- W_t^H L_t^H$$

where r_t = rate of interest of loans

W_t = opportunity wage

i_t = rental cost of capital goods

P = price of output received by farmer

K^I = capital used in production

L_t^{FI} = family labor used inside farm

N_t = industrialized inputs

Income may also be generated outside the farm by leasing family labor somewhere else or making capital investments in non-farm businesses such as commerce, loan businesses, etc. This is written:

$$(5) \quad Y_t^{OUT} = W_t L_t^{Fo} + \rho_t K_t^{Fo}$$

where W_t = wage received by family labor employed outside the farm

L_t^{Fo} = amount of family labor employed outside the farm

ρ_t = capital returns of farmer capital employed outside the farm

K_t^{Fo} = amount of farmer capital employed outside the farm

It becomes obvious that as higher W_t or ρ_t, compared to factor returns when used inside the farm, as more resources would be diverted to

outside farm activities, given objectives and farmer conditions. Total farmer net income is written as:

$$(6) \qquad Y_t = Y_t^{PROD} + Y_t^{OUT}$$

The main reason for income partition in two groups comes from the timing characteristic of each. Income generated outside the farm Y^{OUT} refers actually to revenue with a higher time frequency than Y^{PROD}, given that the later is, usually, a function of natural (time) cycles (cropping, for instance, is only possible once (or twice) a year) and the farmer (Y^{OUT}) a function of mutual contractual agreements between economic agents when producing economic goods or services, like wages, capital rental payments, etc., which are, usually, in a monthly basis.

The effect of different timing characteristics on the demand for loans, is obvious, mainly if the demand is originated by cash-flow irregularities.

Given farmers' opportunities and rates of return, they may engage in a third type of activity, i.e., investments. The expansion of capital resources in or outside the farm is a function of future returns and the rate of interest, being written as:

$$(7) \qquad I_t^{PI} = \Delta A^{PI} = f_{PI}({}_k\pi_{t+1} \cdots {}_k\pi_T,\ r_{t+1} \cdots r_T)$$

$$(8) \qquad I_t^{PO} = \Delta A^{PO} = f_{PO}(\zeta_{t+1} \cdots \zeta_T,\ r_{t+1} \cdots r_T)$$

$$(9) \qquad I_t^{T} = \Delta A^{PI} + \Delta_A{}^{PO}$$

As a final step in the modeling process a set of basic conditions

have to be stated so that model results stay within acceptable dimensions and farmer constraints be incorporated in the analysis.

The first set of conditions refers to factor returns and constraints:

$$(10) \quad L_t^{FO} = f_W(W_t, \pi_L)$$

$$(11) \quad K_t^{FO} = f_K(\rho_t, \pi_k)$$

$$(12) \quad K_t^{FI} < A_t^{FI}$$

$$(13) \quad K_t^{FO} = A_t^{FO}$$

$$(14) \quad A_t^{T} = A_t^{FI} + A_t^{FO}$$

$$(15) \quad L_t^{F} = L_t^{FO} + L_t^{FI}$$

Equation (10) states that the total amount of family labor which is going to be diverted to outside employemnt is a function of outside wages and internal production returns (π_L) of labor. Equation (11) states the same for capital use. Equation (12) states that total capital used inside the farm in production cannot exceed available stocks. Equation (13) states the same for capital used outside the farm. Equations (14) and (15) give total available family labor and capital assets (stocks).

The second set of conditions refer to initial and final desired stock of assets:

$$(16) \quad A_1 = \bar{A}_1$$

(17) $A_T = \bar{A}_T$

The third set give borrowing or lending flow directions and debt stock conditions:

(18) $D_{t-1}(1 + r_t) \geq 0$

(19) $DB_t \geq 0$

(20) $D_t \geq 0$

(21) $DB_t \leq A_T$

(22) $D_{t-1}(1 + r_t) = DB_{t-1}(1 + r_t) + D_t - DB_t$

(23) $D_{t-1}(1 + r_t) \leq DB_{t-1}(1 + r_t)$

Equations (18), (19) and (20) state that past debt repayments, total debt stock and yearly borrowing must be larger or equal to zero. Equation (21) states that total debt in the final year must be less or equal to value of assets. Equation (22) says that total accumulated debt at time t is equal to total accumulated debt in the previous period plus new borrowings minus debt repayment. Equation (23) states that debt repayment cannot be larger than past accumulated debt.

A final constraint refers to the availability of financial assets and capital assets.

(24) $A_t^F = A^F + \Delta A^F$

$$(25) \quad A_t^{PI} = A_{t-1}^{PI} + \Delta A^{PI}$$

$$(26) \quad A_t^{PO} = A_{t-1}^{PO} + \Delta A^{PO}$$

As seen, this model may be divided into four parts: an objective function, a borrowing landing equilibrium condition, some economic activity generation and conditional equilibrium equations. There is no limit to borrowing or lending but the ones stated by conditional equations. Borrowing would go on until marginal gains in consumption equal marginal losses. Economic production and investment are mere instruments to generate consumption. If returns from these activities are lower, in the long run, in terms of consumption gains, borrowing goes directly to financing of consumption. On the other hand, if returns generate higher consumption (in present discounted terms) then it is worthwhile to farmers to engage in investment activities.

A Review of Model Equations

$$(1) \quad \text{Max } u(C_1 \ldots C_T)$$

$$(2) \quad D_t = C_t + I_t - Y_t + D_{t-1}(1 + r_t) - \Delta A^F$$

$$(3) \quad Y_t^{PROD} = Q_t P_t - W_t L_t^{FI} - iK_t^I - (1 + r_t)N_t$$

$$\text{where } Q_t = f(K_t^I, L_t^{FI})$$

$$(4) \quad Y_t^{OUT} = W_t L_t^{PO} + \rho_t K_t^{FO}$$

$$(5) \quad Y_t = Y_t^{PROD} + Y_t^{OUT}$$

(6) $I_t^{PI} = \Delta A^{PI} = f_{PI}({}_k\pi_{t+1} \cdots {}_k\pi_T,\ r_{t+1} \cdots r_T)$

(7) $I_t^{PO} = \Delta A^{PO} = f_{PO}(\zeta_{t+1} \cdots \zeta_T,\ r_{t+1} \cdots r_T)$

(8) $I_t^T = \Delta A^{PI} + \Delta A^{PO}$

(9) $L_t^{FO} = f_W(W_t,\ L\pi_t)$ $\qquad L\pi_t = \dfrac{\partial Q_t}{\partial K_t} P_t$

(10) $K_t^{FO} = f_K(\zeta_t,\ {}_k\pi_t)$ $\qquad K\pi_t = \dfrac{\partial Q}{\partial L_t} P_t$

(11) $K_t^{FI} \leq A_t^{FI}$

(12) $K_t^{FO} = A_t^{FO}$

(13) $A_t^T = A_t^{FI} + A_t^{FO}$

(14) $L_t^F = L_t^{FO} + L_t^{FI}$

(15) $A_1 = \bar{A}_1$

(16) $A_T = \bar{A}_T$

(17) $D_{tT}(1 + r_t) \geq 0$

(18) $DB_t \geq 0$

(19) $D_t \geq 0$

(20) $DB_T \leq A_T$

(21) $D_{t-1}(1 + r_t) = DB_{t-1}(1 + r_t) + D_t - DB_t$

$$(22) \qquad D_{t-1}(1 + r_t) \leq DB_{t-1}(1 + r_t)$$

$$(23) \qquad A_t^F = A^F + \Delta A^T$$

$$(24) \qquad A_t^{PI} = A_{t-1}^{PI} + \Delta A^{PI}$$

$$(25) \qquad A_t^{PO} = A_{t-1}^{PO} + \Delta A^{PO}$$

Given this theoretical framework (or model) regarding the decision making process of borrowers, the next step would consist of generating institutional and non-institutional lender models.

For institutional lenders the analytical framework would, in essence, be reduced to the understanding of institutional lending rules, at least regarding the selection of specific variables. Examining these rules, as presented in Chapter I, it becomes obvious that assets, education and land ownership are important characteristics besides past behavior (performance) regarding debt repayment and the value of existing debt.

Besides lending rules, pricing, amounts lent and costs must also be considered. When these variables are incorporated, it becomes obvious that a rationing process exists and that some groups or types of borrowers may be getting more out of the system than others given that revenues per unit and quantities to be lent are fixed.

Available pricing data lead to the conclusion that negative prices in real terms are charged from all borrowers of the institutional system. This means that under certain conditions the demand may be infinite. Therefore, the analysis of the type of rationing mechanism becomes crucial for explaining "who" and "how much" each type of borrower is getting in

terms of loans. The question regarding the "who" can be answered by comparing individual farmers' characteristics and their success or failure in getting institutional loans. The "how much" would be a function of the same characteristics and past behavior regarding previous compromises, as stated in the legal framework presented in Chapter I.

Non-institutional lenders' behavior is explained by the same type of dynamic framework specified for borrowers. The basic difference refers to the investment part of the model. As mentioned before in the borrowers model, investments may be undertaken within the farm or outside it, in other types of activities. A non-institutional lender may be assumed to have a specific type of outside activity, i.e., investing in other farmers' activities. Besides, he may not be a farmer at all, but engaged in production as well as consumption, as any other economic agent. He may be using capital and labor resources in these productive activities and may be borrowing from somebody else at the same time.

Regarding the investment part of the lenders model, the following conceptual framework is considered: individual lenders have the problem of selecting a specific set of investment opportunities so that their portfolio maximizes their objective function. Total amounts to be lent are flexible and function of intertemporal utility maximization. Given that risk and uncertainty are not included in the suggested borrowers model, but become important aspects for lenders, mainly risk because of default, this may be included into the lenders framework as an additional cost reducing the value of the capital returns parameter (ζ_K). Actually an entire matrix of ζ_K's would be considered, one for each type of farmer (borrower).

The selection of a given portfolio composition by the lender would be part of a long-run decision making process regarding investments, production and consumption activities.

- The second task: an outline of the empirical analysis.

Considering that one of the main purposes of this study is to evaluate costs and benefits of different types of lending programs and that farmers' benefits accruing from borrowing are best explained by their own demand functions, the results of the empirical investigation to be presented in Chapter IV regarding the statistical evaluation of these demand schedules are utilized when benefits are calculated in Chapter V.

On the other hand, intermarket effects were hypothesized as influencing demand schedules making it necessary to incorporate institutional rationing procedures into these schedules. For this, institutional resource allocation functions were specified and estimated as well.

For the institutional supply model, two independent regression schemes were run, i.e., a PROBIT model which estimates the probability of access that any type of local farmer has to the institutional system, given his characteristics, and an Ordinary Least Squares model which estimates the average volume transacted by each farmer in the institutional system.

For the non-institutional market an econometric system was specified in which prices and quantities are assumed to vary freely and are mutually determined. It was assumed that observed price-quantity combinations were equilibrium ones and that these observations were determining individual demand functions but not individual supply functions. Instead of supply functions as ordinarily defined, transaction schedules were specified.

The reason for this is that available information regarding transacted quantities refer, actually, to total amounts borrowed by a farmer but not total amounts lent by a lender, given that data was obtained from farmer (borrower) questionnaires. There is no lender information as such.

Thus, econometrically derived "supply" functions actually refer to transaction schedules in which a price-quantity relation shows how an individual lender reacts, in terms of prices, to individual borrowers' requests for given quantities, given farmers' (borrowers) characteristics. They are marginal adjustment relations in terms of portfolio compositions. One outcome is that it is not possible to perform any aggregate market analysis.

The Third Task: Cost-benefit Analysis

The third task of this chapter is to explain the linkage of theoretical and empirical considerations with policy analysis. As mentioned before when discussing the demand for credit in the dynamic programming model, prices of loans were the costs of borrowing. If farmers could get loans at lower prices this would increase their income levels.

There is, in this case-study, an alternative cheap credit source, which is the institutional system. This system is government regulated and sustained. Policy considerations in this context would refer to contraction, expansion or other kind of changes in the system, and the analysis would be reduced to the comparison of costs and benefits of different institutional lending programs.

Regarding the benefits of such programs, it may be seen that, as any individual borrower is absorbed by the institutional system, he is going to pay lower rates of interest for any amount he gets in this sub-

market. This may also be interpreted as an increase in his consumer-surplus generated by the amount of additional resources available, at lower prices.

From the costs side, as new borrowing farmers are absorbed by the institutional system resources are lent at less than going market prices. These loans have an opportunity cost corresponding to the difference in lending prices. Besides these opportunity costs to institutional lenders there are also transaction costs mainly of the administrative type. In this study these transaction costs are not included, neither to lenders nor to borrowers. Therefore, net benefits are overestimated.

Finally, two independent feasibility analyses are presented. One referring to the analysis of costs and benefits of transferring a given farmer to the institutional system, and another examining the possibility of extending institutional credit to a group of farmers (small farmers) keeping the existing total amount of resources to the group, constant.

APPENDIX II

A SOURCE SELECTION MODEL BY FARMERS

The selection of the source of credit (institutional or non-institutional) by farmers which are land owners is assumed to depend on transaction costs (interest rates plus other related costs).

Define C_B = Total institutional (formal, cheap) credit costs

C_K = Total non-institutional credit costs

Total non-institutional credit costs consist of interest rates solely, because they are granted in an informal way and sources are, usually, nearby farmers. Institutional credit includes other costs given formal lenders' location in space as well as legal requirement fees and taxes.

Institutional loans' cost composition may be written as:

$C_B = rx + \Delta C_B$

$\Delta C_B = nda + ndc + FC$

nda = transportation costs

nde = food and shelter costs

FC = legal requirement fees and taxes

x = amount borrowed

r = institutional interest rate

n = number of trips to institutional source

d = distance from institutional source

a = transportation costs/km

c = food and shelter costs/km

Non-institutional loans' cost composition will be written as:

$$C_K = kx$$

k = non-institutional interest rate

x = amount lent

The borrower will select the non-institutional source if:

$$kx < rx + nd(a + c) + FC$$

or $$k < r + \frac{nd(a + c) + FC}{x}$$

As may be seen, even if interest rates are low (or negative in real terms) this does not guarantee that farmers are interested in obtaining institutional loans because of ΔCB costs (additional transaction costs). If expected amounts of loans are small or even zero, $\frac{\Delta CB}{x}$ costs may go to infinity.

It is also possible that non-institutional lenders provide additional benefits to borrowers if other types of services are included in the loan transactions, making indifferent situations regarding costs tend to their favor.

APPENDIX III

A SIMPLIFIED, TWO PERIOD, VERSION OF THE DYNAMIC BORROWING MODEL, ALLOWING ACCESS TO CHEAP CREDIT SOURCES

One aspect of farmer's decision making process refers to cases of changing interest rates or market conditions.

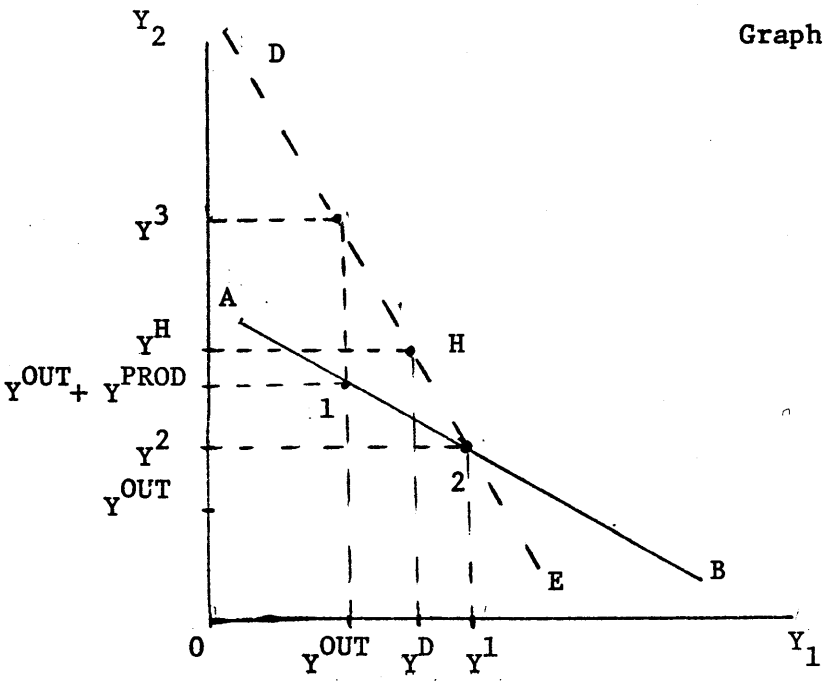
Assume that a farmer who was not eligible or self-excluded himself from an existing cheap credit system, becomes eligible.

Originally he has two sources of income: Y^{OUT} and Y^{PROD}. In the first period he gets only Y^{OUT} (while engaging in cropping activities which are only available during the second period.) In the second period he gets Y^{OUT} and Y^{PROD}. The combination of both types of income for periods one and two is shown as pointl in the graph.

As mentioned, the farmer is eligible for a certain, rationed, amount of loans, whose interest rate is negative in real terms, corresponding to the distanee $Y^{OUT} - Y^{1}$ in the graph. This combination of loans and a given interest rate traces a transaction opportunity line, AB, in terms of consumption "bundles" for periods one and two, where Y^{1} is maximum possible consumption in the first period and Y^{2} is consumption in the second period, if loans are used entirely for consumption purposes (point 2 in graph).

Alternatively there is a possibility to use the loan in expanding production, or any other opportunity, which has a given positive return. The farmer may use part or all of the loan in that activity. If used entirely for production, his total income in period two would be equal to Y^{3}, tracing an opportunity line DE regarding consumption alternatives

in the two periods.



Graph 1

The actual amounts diverted for production or used in consumption in period one would be a function of his preference scheudle determined by the tangency of his utility curve and opportunity line DE. Assuming that tangency at point H is the preferred one, the amount of loans used in production would be the difference of OY^1 and OY^D, and consumption being Y^D in period one and Y^H in period two.

Looking from the lender's point of view, who presumably granted the loan for production purposes (or investment), this shows that the farmer will do his best to be at his prefered combination point and <u>not</u> use loans entirely for the original purpose, unless expected returns and

preferences coincide for doing so. If, on the other hand, better opportunities exist outside the sector and consumption be increased further, the chance for diverting resources out of the sector increases.

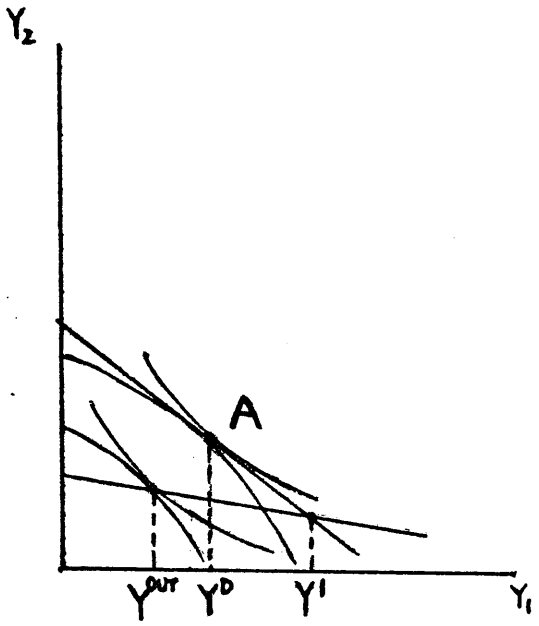
One aspect worth mentioning is that returns must go to the loan receiver (farmer) and not be transferred to second parties because of market imperfections, as usually is observed with small farmers. Compensating market prices are not sufficient to guarantee higher returns to farmers. Lack of transportation facilities, for instance, are one type of distortion in the system given that those who provide transportation to farmer goods may extract all the benefits from favorable market prices, reducing the efficiency of credit programs and diverting the benefits to non-target groups.

A second aspect worthwhile to mention is that, if traditional characteristics regarding production possibility frontiers, types of indifference curve maps and farmer behavior are assumed, results will reinforce the argument that only part of borrowed funds will be used for the original purpose of funds (loans). This may be shown as follows.

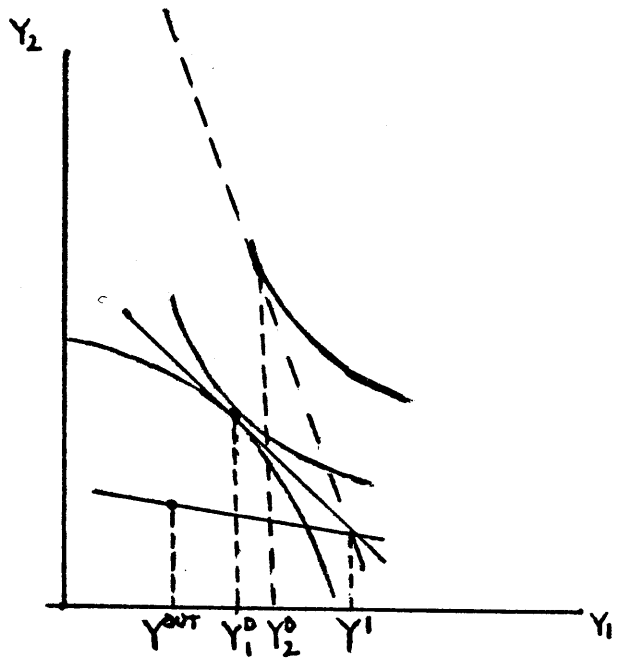
Assuming that the only possibility open to the farmer is to further expand farm production (given his production possibility frontier) there will be just one point which maximizes the use of factors and his utility--that is, the point of tangency of the production possibility frontier, the transaction opportunity line and his indifference curve. See graph 2, point A. This is certainly to the right of the original equilibrium.

If, on the other hand, he was not originally at an optimum, he may get there but always to the right of the original point. If there is

another, better, opportunity outside the sector he will choose this later one. See graph 3.



Graph 2



Graph 3

CHAPTER IV

ECONOMETRIC ANALYSIS

Rural credit in the Serra do Baturite Region is granted to farmers by two types of lending sources: institutional and non-institutional. It has been shown that chronologically the institutional credit system was superimposed on the non-institutional (informal) one and that non-institutional loans shrank in volume and number, while farmers' alternatives changed given that prices of credit in the formal system were negative in real terms and quantities available larger.

Regarding the institutional system, Chapters I and II showed that the number of farmers attended as well as amounts granted varied with size of farms (property) and that the system had its own rules defined exogenously by government authorities. Farmers would be granted institutional loans if:

(a) their individual characteristics fitted institutional requirements

(b) their productive capabilities complied with certain minimum financial returns.

A second set of observations, this time regarding the non-institutional system referred to the pricing mechanism indicating that rates of interest in this market were free to vary and quantities transacted in apparent equilibrium. Therefore, econometric analysis of market participants was divided into an analysis of the institutional system and one of the non-institutional one; borrowers (farmers) being visualized as pursuing

a common set of behavioral conditions and rules (as shown in the previous chapter) while lenders having different objectives and behavioral patterns.

The modeling of such a phenomena for empirical hypothesis testing purposes considers that borrowers were passive regarding the institutional market but active regarding the non-institutional one, i.e., given that prices and quantities in the institutional market were given, farmers (borrowers) would have to submit to existing lending rules on a "take-it or leave-it" basis, while they would be active in the non-institutional market in the sense of bargaining prices, quantities and conditions.

The Institutional Credit Model

Credit transactions in general depend on lenders' and borrowers' willingness to transfer and receive financial resources for a pre-set period of time, at a given price.

Conceptually, from the farmers' demand point of view, the choice of source as well as the potential amounts borrowed and prices paid are not independent of a larger economic decision making framework regarding production, consumption and investment activities.

Chapter III presented a dynamic behavior model, in which credit is inserted in this broader framework; as well as a source selection model which suggests that the choice of credit source by farmers is a function of total transaction costs and not only the rates of interest charged by lenders.

From the supply point of view, given that institutional resources were supposed to be lent at negative prices, a rationing mechanism is enforced. This assumption (or fact) dominates the model formulation

because, at least in principle, the demand for financial resources at negative prices would be infinite. The institutional rationing mechanism dictated who was going to be attended and how much each attendee was supposed to be granted, at least in terms of maximum amounts.

Given these considerations, two distinct but related econometric formulations were used. The first dealing with the likelihood of an institutional transaction to be observed, and the second with the amount of resources that a specific type of farmer was, in average, receiving, given his characteristics.

The use of farmer characteristics is conceptually required in the first model but not in the second. The choice of farmer characteristics to explain individual attendance or transaction success becomes obvious not only because of formal rationing procedures but also because of the type of market imperfection existent in financial markets involving person-to-person negotiations.

The Set of Institutional Variables

The first institutional model examines the likelihood of farmer attendance by the institutional system, given his characteristics. As stated in the legal framework of the institutional credit mechanism, in Chapter I, farmers may be eligible if, among other things, ownership is comprobated. Non-owners are only eligible if some type of legally accepted document stating the conditions and type of deal and partnership to owners, is formally submitted. Therefore, ownership was selected as a plausible variable to explain the likelihood of a transaction. Its hypothesized sign in the regression analysis is positive, given that owners are supposed to be accepted.

A second variable which seemed indicative of transaction success or failure is the size of the farmers' property, as shown in previous chapters by Census and Sample data. The larger the size the higher the percentage of attended farmers. Given that there is a close relation of the size of a farm and the value of assets, and that collateral is an important element in credit transactions; assets instead of land size was selected. Its expected sign in the regression analysis is positive, meaning that the larger its value the larger the probability of acceptance to the system.

A third variable was included in the acceptance model, i.e., education. The reason is that it is claimed that farmers have problems in communicating with the banking bureaucracy. It is true that banking procedures require a set of legal paperwork that is not easily understood by the non-formally educated farmers. Therefore, credit transactions may be hindered because of lack of formal education of borrowers. A dummy variable "education" was tested, and farmers with no education at all (formal education) or barely educated, were considered as not-educated while farmers with at least one year of formal education, were considered educated. The expected sign of this variable in the regression is positive, meaning that educated farmers have a better access to the institutional system.

Given that for an institutional transaction to be successful, borrowers must be willing to submit to the institutional rules, and this would only be so if there are net gains from it, transaction costs besides the rate of interest should also be included as a source selection identifier. Considering that these costs were not available as such but only a proxi to them, i.e., the distance of the farm to the nearest

institutional borrowing source; distance was included in the model. Its expected sign in the regression is negative, meaning that the larger the distance the larger such costs and the lower the willingness to transact the pre-set quantity.

The second institutional model deals with the amount of loans a farmer gets once he is accepted by the institutional system.

Referring back to the legal institutional framework regarding the limits for production and investment loans, it may be seen that production loans should, in principle, "not exceed 60 percent of expected production value ..." and investment loans should not exceed 100 percent of net worth, in some cases, or less than that in others. The main aspect here is that both types of loan constraints are closely related to assets, i.e., the value of production and net worth, as may be seen in Tables and for each size-class in the first case, and, assuming debt is regularly paid off, net wealth becomes equal to value of assets in the second case. Therefore, the value of assets was also used for explaining quantities transacted, its expected sign being positive implying that larger farmers get larger loans.

A second variable already used in the source definition model is education. But here it played a more extensive role than in the first model. Education was considered as an important instrument in explaining quantities because it was assumed that when dealing with institutional lenders as such, information regarding the functioning of the institutional system as well as the capacity for negotiating loan quantities were better understood and bargained by formally educated farmers. Its expected sign in the regression analysis is positive.

Finally, land ownership was also included in the quantity model because part of farmers included as non-owners, such as renters, received institutional loans and it would be possible that they also received different treatment by institutional lenders than the one usually given to regular land owners. If this hypothesis were not true land ownership would not be as significant as in the access model, or not significant at all. Its expected sign is positive as in the first model.

Econometric Analysis of Institutional Transactions

Econometric specification and estimation of the institutional transaction likelihood and quantity models were based on the preceeding arguments, but used different statistical instruments.

The source selection, or likelihood, model used a PROBIT model, which is associated with the cumulative normal probability function that is defined as having as its value the probability that an observed value of a variable X (for every X) is less than or equal to a particular X.

On the other hand, there is an index Z which is a transformation of X values, so that the higher Z the greater the likelihood of an event happening. The PROBIT model assumes that the Z values of each individual (which has a given set of characteristics X) are normally distributed so that, given Z values, the probability is computed through:

$$P_t = F(Z_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z_i} e^{-S^2/2} \, ds$$

which is the cumulative normal function. As may be seen, the probability is a function of index Z, and Z of the characteristics X, or:

$$Z_i = a + b(X_1) + c(X_2) \ldots.$$

The value of these parameters are estimated through the maximum likelihood method given that the cumulative normal transformation is not linear and dependent variable observations are not continuous assuming only 0 or 1 values, generating non-normality and heteroscedesticity of the error term. In this study, farmer characteristics regarding the volume of assets, the level of education and ownership, determine a Z value (given regressed parameter values). Given the intensity of Z, a larger or smaller probability of an institutional transaction will be stated by entering Z values into the F(Z) equation.

For the estimation of the non-linear model, the Berndt, Hall, Hall and Hausman[1] algorithm was utilized.

Model estimation is described as follows:

$$B = \alpha_1 + \alpha_2 \text{ ASSETS} + \alpha_3 \text{ OWNERSHIP} + \alpha_4 \text{ EDUCATION} + \alpha_5 \text{ DISTANCE},$$

where

B = 0, if an institutional transaction was not observed and,
1, otherwise.

ASSETS = value of farmers' assets in Cr$1,000

OWNERSHIP = 0, if farmer is not an owner and 1, otherwise

EDUCATION = 0, if farmer has less than a year of formal education,
1, otherwise

DISTANCE = distance in kilometers of farm location to nearest bank

Regression results show the following values for the parameters:

$$Z = -1.71 + 0.0054\ \text{ASSETS} + 0.8838\ \text{OWN} + 0.4616\ \text{ED} + 0.0074\ \text{DIST}$$
$$(7.165) \qquad (6.21) \qquad (4.43) \qquad (2.32) \qquad (1.76)$$

Values in parenthesis represent asymptotic t statistics

Number of observations: 307

As may be seen, the coefficient of ASSETS is positive and significant, implying that, ceteris paribus, an increase in the farmer's value of assets of thousand couzeiros, increas the probability of an institutional transaction by .0054. OWNERSHIP has a positive sign and is also significant in explaining the probability of success in observing an institutional transaction, this being a supply determined constraint. EDUCATION has a positive sign and is significant at a 99 percent level of confidence, but DISTANCE is getting an opposite as expected sign, being significant only at a 90 percent level of confidence. The expected sign for DISTANCE is negative, as demonstrated in Appendix II but, given that there were two institutional lenders in the Serra do Baturite Region at the time of the survey, it seems that existing distances from farms to those lenders were not a hinderance for the success of transactions.

Regarding the quantity model, i.e., average quantity lent to farmers, the ordinary (weighted) least squares method was used to estimate the parameters as well as test the hypothesis regarding the behavior of institutional lenders in granting loans to farmers; assuming that unilateral non-price rationing procedures defined granted financial resources. For this, the following specification was used:

$$\text{LOG } Q = \beta_1 + \beta_2 \text{ LOGASSETS} + \beta_3 \text{ EDUCATION} + \beta_4 \text{ OWNERSHIP}$$

where Q = Quantity transacted, and LOGQ its logarithm

LOGASSETS = the logarithm of the value of farmers' assets (in Cr#1,000)

EDUCATION and OWNERSHIP are as defined in the previous model.

Regression results show the following values and signficance of parameters and variables:

$$\text{LOGQ} = -1.2529 + 0.642195 \text{ LOGASST} + .39 \text{ ED} + .666 \text{ OWN}$$
$$\qquad\quad (1.90) \qquad\qquad (5.19) \qquad (1.69) \qquad (1.61)$$

Values in parentheses are t statistics.

Number of observations = 139

$R^2 = 0.24$

Again, ASSETS are positively related with quantity and significant. What is enlightening is that the amount granted by institutional lenders is proportionally decreasing as the amount of assets increase. EDUCATION and OWNERSHIP are again positively related and significant at the 90 percent level of confidence. OWNERSHIP being significant implies that renters do not get the same treatment as owners, ceteris paribus.

Low R^2 indicate that there is more to be explained regarding the institutional system's resource allocation process. Existing farmers' debts, length of time operating within the system, past repayment behavior and other institutional requirements were not available within the sample data set, which could have improved results.

Statistical analysis show that assets, ownership and education are

important variables in the decision making process of who is getting institutional credit and how much. When regression results are compared to the legal framework presented in Chapter 1, as well as to regional and local Census and sample results, it becomes clear that goals are not accomplished, primarily regarding small farmers, given that specific attention is recommended by the legal framework. As may be observed, both the source selection (likelihood) and quantity equations have a negative intercept value meaning that certain minimum conditions must be fulfilled by farmers to be incorporated or absorbed into the institutional lending system.

Table 50 shows a comparison of sample averages with regression predictions, by size-class, for institutional borrowers, regarding class attendance, asset values and quantities granted, against probability of attendance and quantities predicted. Probabilities and quantities predicted by regression equations were calculated for educated and non-educated farmers, assuming that the average distance for any farmer to the nearest institutional source is 35 kilometers. Non-owners were not considered.

Comparisons show that the probability model describes fairly well the percentage of attendance in each group, with exception of the smallest and the 100-200 ha-group whose probabilities are overestimated compared to actual attendance. Transacted quantities predictions, on the other hand, are worse for the three middle range groups, being all consistently underestimated by the model. As may be seen, standard deviations within each class increase up to the last class, denoting the presence of heteroscedasticity. To account for this, weighted least squares were used, but predictions still underestimated allocations to these groups. Considering

TABLE 50 - Regression Results Compared to Observed Sample Data

Class	Percentual attendance by institutional system of total farmers in class as given in sample	Probability of attendance as predicted by regression model to a farmer with asset value equal to average class value, educated and not		Average institutional loan granteded to attend farmers in class, in Cr$1,000	Average predicted loan for educated and non-educated farmer in class with same average asset value	Sample standard deviation of granted loans to class	Average asset value in class, in Cr$1,000
0-10	28	40	58	9.143	7.373 10.883	3.676	56
10-25	48	48	65	17.263	10.283 15.178	9.158	94
25-50	71	54	71	17.928	17.125 25.277	10.745	208
50-100	84	69	83	51.571	16.591 24.490	43.698	203
100-200	77	86	96	87.615	24.183 35.696	116.684	352
200-500	100	98	99	98.286	29.260 43.190	125.231	479
500 >	100	100	100	81.666	63.788 94.155	18.930	1612

the purposes of these models, i.e., to infer non-institutional as well as institutional behavior, mainly for small farmers, which are the predominant non-institutional borrowers, no further improvements were made in the model.

The Non-Institutional Credit Model

Originally, the non-institutional credit market was the predominant source of financial funds in the rural sector of the study-region. From the mid-sixties onwards government decided to divert a substantial quantity of financial resources at negative rates of interest into the sector, through the institutional banking system. This changed considerably the existing patterns of financial resource allocation. Non-institutional lenders' clientelle was reduced to that part of the financial market which was not attended by the institutional system.

Non-institutional lenders, nonetheless, were not all pure financial agents involved exlcusively in money lending activities, but could be divided into four types of transactors:

- moneylenders, which engaged in pure financial transactions with farmers;
- truckers or merchants, which usually lended their financial resources as part of a larger deal involving the purchase of produce from the farmer at the harvest season;
- relatives or friends, which lend resources for future repayment in terms of other or same type of favors;
- grocers, who did not lend financial reosurces as such but sell goods on credit.

It becomes obvious that for the purposes of this study, only money lender transactions become interesting given that all other forms were of the mixed type involving financial credits only as part of the deal. As mentioned in the introduction to this chapter, one basic difference between institutional and non-institutional markets is the existence of different pricing mechanisms. Prices in the non-institutional market were free to vary and always positive in real terms. As a consequence quantities transacted were assumed to be equilibrium ones.

It was also observed that pure financial transactions in the non-institutional market were scarce, as may be observed by the number of such transactions detected in the sample (16 out of 307 questionnaires, and only half of them with declared rate of interest).

Moneylenders, the type of lender involved in such transactions were usually grocery store owners or established merchants who bought and sold agricultural produce (cotton, corn, beans, coffee, etc). The basic market characteristic of such financial transactions was the person-to-person aspect of loan negotiation suggesting some form of monopolistic price setting conditions and involving take-it-or-leave-it deals, in some cases.

Finally, stagnant economic conditions as well as a certain uniformity in economic and financial behavior characteristics were observed, suggesting that an "average" farmer (borrower) and an average lender could be idealized for analytical purposes, mainly in the lower income groups. This typology regarding agents' homogeneity was tested by introducing it into the model building process as such and, as will be shown, generated specific individual demand and "supply" functions.

Following this argument, the next step would consist of specifying supply and demand functions, in which quantities offered and demanded by this "average", individual, lender and borrower would be explained by a set of variables representing transactor's behavior.

Given these functions, an additional assumption was made, i.e., that transactions were only possible if lenders and borrowers agreed, simultaneously, on the price to be paid and on the quantity to be transacted, this meaning that observed transactions expressed in price and quantity terms were equilibrium ones. At the mutually conventioned price both parts agreed in borrowing and lending the specified amounts of financial resources.

Regarding the specification of such functions, two alternative demand function hypotheses were submitted to statistical analysis, based on two distinct decision making characteristics. The first assuming that farmers borrow resources in the non-institutional market after institutional sources have been exausted, i.e., the amount of actual institutional loans received determine the quantity to be demanded in the non-institutional market. The second outlook assumes that the decision of borrowing in the non-institutional market is relatively independent of what farmers may actually get from the institutional source, i.e., the demand of resources in the non-institutional market is a function (besides other variables) of an expected institutional loan. Beside these variables, demand functions were also including price and the number of family members belonging to farmer's household. Supply or transaction functions were uniquely specified as depending on price and the yearly commercialized value of production of the borrower.

For the specification of the second demand function, i.e., involving an uncertain amount of institutional loans, the first variable included, price, represent real costs in terms of income forgone. The higher its value the lower is the demand for loans supposed to be. Its parameter sign is expected to be negative if the hypothesis is correct.

The second variable, the expected institutional loan, should reflect an intermarket effect on the demand of individual farmers. The larger the expected institutional loan, the lower their demand for more expensive non-institutional loans, expectation being the product of the probability of access to the institutional market times the quantity received once accepted by the system. Regression results should show a negative sign for this variable if the hypothesis is correct. The use of this variable assumes that farmers have some knowledge of who and, approximately, how much a certain type of farmer receives from the institutional system in terms of loans. The significance of this variable also reflects borrowers' alternatives in terms of financing sources or, at least, his capability of getting cheap loans. As mentioned before, small farmers are discriminated against having access to the institutional system, this discrimination being tested in this model in terms of price and quantity effects.

The third variable, family size, reflects the needs of farmers in financing consumption during production periods when cash flows run at negative levels if farm income schedules are concentrated in time or if alternative income generation opportunities outside the farm are not available. The expected sign of this variable in the regression is positive, i.e., the larger the family size, the larger the need for

financial resources as well as the demand for loans. On the supply side of the model, prices are again introduced for the same reason as before but with the opposite meaning, i.e., prices reflect a gain in income, or payment for an opportunity forgone by lending resources to farmers instead of using them somewhere else. The expected sign of its parameter in the regression is, therefore, positive, meaning that the larger the price or payment, the larger the quantity of resources a lender is willing to surrender, ceteris paribus.

The second variable included in the supply formulation is the level of commercialized production by borrowers. This variable was included because it seemed to be a better hedge against default than assets given that non-institutional loans have no legal backing, like institutional loans. A second reason to include this variable was that lenders usually are product merchants and may be preferring borrowers who may sell their produce to them at a later stage guaranteeing their supply in this market. It should be emphasized that the type of relation is different than the one observed among truckers and farmers. There is an obligation of farmers to sell their produce to truckers while this is not so with money lenders. The expected sign of this variable is positive meaning that the larger its value, the more financial resources a lender is willing to surrender, ceteris paribus. Formally, demand and supply equations are written as follows:

$$Q^D = a + b[R] + e[E] + d[F]$$

$$Q^S = e + f[R] + g[C]$$

$Q^{D,S}$ = Quantities demanded (D) and supplied (S), in Cr$1,000

R = monthly rate of interest or price of loan

E = expected institutional loan = probability of institutional acceptance X Quantity of institutional loan

F = family size

C = log of commercialized production (in Cr$1,000)

As may be seen, interest rates (R) appear in both demand and supply equations generating an identification problem if additional, exogenous, variables are not included. Included, exogenous to the system, variables are the expected value (E), family size (F) and commercialized production (C).

Regarding the method of parameter estimation, two-stage least squares were utilized, with a variant. Considering that from the 307 available farmer questionnaires only 16 reported moneylender transactions, and from these, only 8 stated the rate of interest as well as quantities transacted, the two-stage estimation method used the first 8 (with both, quantity and price observations) cases in the interest rate parameter estimation regression; afterwards all the 16 observations were used to estimate the demand and supply functions substituting the observed rates of interests by estimated ones.[2]

- Econometric Analysis of Non-Institutional Transactions

The following regression results were observed regarding the first non-institutional model:

Demand Function:

$$Q^D = \underset{(2.24)}{9.26} - \underset{(1.91)}{1.12[R]} + \underset{(1.66)}{.383[F]} - \underset{(1.744)}{.738[E]}$$

Values in parenthesis are t statistics

Number of observations: 16

F statistic = 1.64

Supply Function:

$$Q^S = \underset{(.95)}{-3.94} + \underset{(1.39)}{.319[R]} + \underset{(1.92)}{2.13[C]}$$

Values in parenthesis are t statistics

Number of observations: 16

F statistic = 2.26

As may be seen in the demand regression, rates of interest got a negative sign, as expected, and the variable is significant at the 95 percent confidence level.

The expected value of institutional loans (variable E) received also a negative sign, as expected, and is significant at the 90 percent confidence level.

Family size was positively signed, as expected, and significant at the 90 percent confidence level.

F statistics were relatively low indicating that more was to be explained.

Regarding the supply equation, prices were positively signed,

as expected, and significant at the 95 percent confidence level. F statistics were also low, the later improving when compared to demand regression results.

The second experiment, regarding the certainty model, i.e., the demand for non-institutional loans being a function of prices, family size and the actual loan received from institutional sources, presented the following regression results:

Demand Function:

$$Q^D = \underset{}{3.74} - \underset{(2.39)}{.527[R]} + \underset{(2.27)}{.437[F]} - \underset{(1.88)}{.067[DIC]} \quad \underset{(2.21)}{}$$

Values in parentheses are t statistics

F statistic = 1.95

Variable DIC is the value of the institutional loan actually received, while the other variables having the same meaning as in the first experiment.

Supply Function:

$$Q^S = \underset{}{-3.29} + \underset{(1.12)}{.269[R]} + \underset{(1.86)}{2.01[YPL]} \quad \underset{(2.47)}{}$$

Values in parentheses are t statistics

F statistic = 3.16

All variables have the same meaning as in the first experiment.

As may be seen, in the demand regression rates of interest are negatively signed as expected and the variable is significant at the 97.5 percent level. Variable DIC (actual institutional loan) was also negatively

signed as expected and significant at the 97.5 percent level. Family size was positively signed as expected and significant at the 95 percent level.

Regarding the supply equation, prices are positively signed as expected and significant at the 95 percent level, while commercialized production is also positively signed as expected and significant at the 95 percent level. F statistics are low, but better than for the first experiment.

Conclusions

Statistical results improved considerably when actual instead of expected institutional loans were used to explain demand and supply behavior in the non-institutional market. This may be interpreted as supporting the hypothesis that the non-institutional market gets the marginal preference of borrowers and that transacted quantities are marginal, as suggested in the first two chapters of this study.

These chapters have also indicated that small farmers are the least contemplated by the institutional system, while the non-institutional market is predominantly attending these farmers. When the reasons for these results were examined on a person-to-person basis through a probabilistic model, the institutional rationing procedures were found to be explaining a good deal of the phenomena.

Consequently, the following question would refer to the feasibility of extending credit to small farmers as a group and under what conditions, given that potential benefits to borrowers are considerably large as shown in the next chapter, and farmer economic performance may

be improved with reflections on local economic and social conditions in the study area.

Finally, Table 51 shows the 16 farmers included in the non-institutional regression analysis and their characteristics. As may be seen, only the first 8 had declared interest rates.

TABLE 51 - Observed Farmer Sample Points

Farmer Number	Area of Prop. (ha)	Distance of Bank(Km)	Commer. Production Cr$1000	Institut. Loan Cr$1000	Non-Inst. Loan Cr$1000	Non-Inst. Rate of Interest	Family Size	Educa-tion	Value of Assets Cr$1000	Probab. of Inst. Loan
1	10	15	4	0	2	10	6	0	22	.24
2	12	42	3	0	2	10	4	0	69	.06
3	66	48	9	0	3	4	5	0	155	.64
4	39	3	5	0	2	5	5	0	133	.66
5	7	52	20	0	7	6	7	1	73	.66
6	9	53	13	6	5	5	7	0	37	.40
7	12	62	20	2	2	4	5	0	78	.69
8	14	55	25	4	1	4	5	0	98	.53
9	132	30	235	240	2	NA	8	1	470	.99
10	53	18	48	29	6	NA	14	1	93	.61
11	58	18	35	12	1	NA	5	1	270	.83
12	8	21	42	10	10	NA	6	0	143	.54
13	42	2	16	12	2	NA	4	0	115	.42
14	4	38	20	0	5	NA	11	0	89	.47
15	15	13	15	0	2	NA	3	0	75	.37
16	192	63	797	74	7	NA	4	1	791	1.00

Source: Serra do Baturity Sample, 1977

Footnotes for Chapter IV

1. Estimation and Inference in Nonlinear Structural Models; Berndt, E.K., Hall, B.H., Hall, R.E., and Hausman, J.A., Annals of Economic and Social Measurement, 3/4, 1974

2. This method was also used by Hall, R., and by Kalachek and Raines when dealing with a similar problem of missing observations. Hall's reference is "Wages, Income and Hours of Work in the U.S. Labor Force." Kalackek, E.D. and Raines, F.Q. in "Labor Supply of Income Workers and Negative Income Tax," Technical Studies, Presidents Commission of Income Maintenance Programs, Washington, D.C., 1970, pp. 159-185.

CHAPTER V

COST - BENEFIT ANALYSES

As mentioned in Chapter III, individual credit demand functions, at any point in time, incorporate all types of benefits and costs to farmers of resource use alternatives, given existing credit conditions.

In the model regarding farmer behavior in the long-run (the dynamic programming model) borrowing of resources was a complement to available own resources, and prices of credit as well as returns from it determined the amount to be demanded. In this study, borrowers' net benefits are equivalent to their consumer surplus. Therefore, for the purpose of benefit calculations the concept of consumer surplus is crucial. It is the difference of what a given borrower would be willing to pay for an additional unit of resources and the price actually paid for that unit. The difference comes from the fact that the price paid for all resource units is equal to the price paid for the last (marginal) unit. Given that an ordinary well-behaved demand function is declining from left to right, i.e., unit prices fall the larger quantities are acquired (or borrowed), the price paid for the last unit is always lower than for any previous unit. The area under the demand schedule up to the price paid for the given borrowed quantity, is the consumer surplus.

One peculiarity in this market is that borrowers may be paying two different prices for a given borrowed quantity, i.e., they may be borrowing in two credit markets (or sub-markets) simultaneously (the institutional and non-institutional). Given that prices are different in

each, their total benefits are composed of two distinct consumer surplus regions under a same demand schedule.

A consequence of this peculiarity is that for the analytical purpose of demand curve construction and interpretation, an a priori assumption is made, i.e., borrowers will first be willing to borrow from the institutional source and afterwards from the non-institutional one. This may also be restated by saying that the marginal quantity borrowed is always the non-institutional one, unless borrowers' requirements are completely satisfied in the institutional market. If the farmer is rationed by the institutional source at a quantity which is compatible with an additional loan in the non-institutional market, he will be borrowing in this second market as well.

Demand schedules, as seen, define where and how much to borrow, given supply conditions. Figure 4 presents the above discussion in a graphical version.

As may be seen, quantity Q_I is the amount borrowed in the institutional market at price P_I. Non-institutional market conditions state that, given borrowers' characteristics, no quantity will be lent for less than the price of P_1. This means that given the demand schedule and the supply transaction conditions, quantity $(Q_2 - Q_I)$ will be borrowed in the non-institutional market, at price P_2. If non-institutional transaction conditions are such that the zero-quantity price is P_3 or larger, the borrower is only getting his resources in the institutional market. On the other hand, he may be getting such large amounts in the institutional market that there is no positive real price which would induce him to transact in the non-institutional market. As may be seen in Figure 1, the

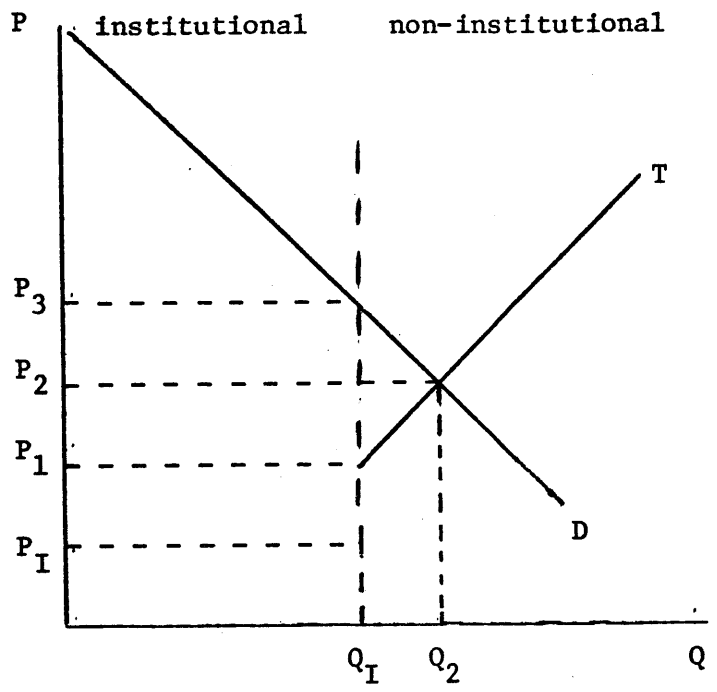


Figure 4

non-institutional part of the demand function or schedule, is extended to the institutional part of the graph by a semi-hatched line $D^1D^2D^3$ (in Figure 2) representing the borrowers' full demand schedule. To represent the same demand schedule on the same set of non-institutional axis, it is projected over to the non-institutional part of the graph as shown in Figure 5.

To use the same form of equations in the price-quantity space as estimated econometrically, the following algebraic derivation shows how the total demand is derived from the non-institutional one.

Initially, non-institutional market equations are written:

(1) $Q^D_{NI} = a + gF + dQ_I + bP_N$ (demand, non-institution)

(2) $Q^S_{NI} = \alpha + \gamma YPL + \beta P_N$ (supply or transaction equation)

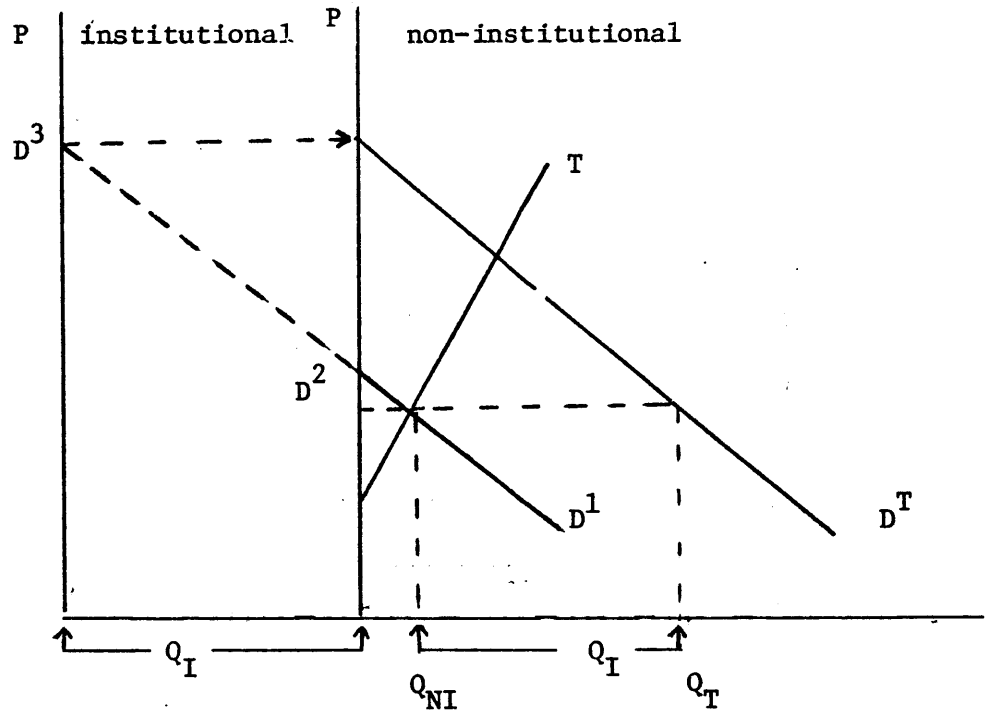


Figure 5

$Q^D_{NI} = Q^S_{NI}$ = quantities demanded and supplied in the non-institutional market (individual)

F = number of family members

P_N = non-institutional transaction price

YPL = commercialized production of borrower

Q_I = quantity of institutional loan received by borrower

As shown graphically, total demand schedules are equal to the sum of the institutional loan plus the non-institutional one, i.e.,

$$(3)\quad Q_T = Q_{NI} + Q_I \qquad \therefore\ Q_{NI} = Q_T - Q_I$$

Substituting Q_{NI} by its equation,

$$a + gF + dQ_I + bP_N = Q_T - Q_I$$

$$\therefore \quad Q_T = a + gF + dQ_I + bP_N + Q_I$$

$$Q_T = a + gF + (d + 1)Q_I + bP_N$$

Making $d + 1 = c$, we get:

$$(4) \quad Q_T = a + gF + cQ_I + bP_N, \text{ or}$$

$$Q_{NI} + Q_I = a + gF + cQ_I + bP_N$$

The same parameter values found in the non-institutional demand regression analysis may be used for the total demand equation, with exception of the Q_I's one which must be added by one unit.

Regarding the calculation of the values of consumer surpluses of individual farmers, they may be expressed as a sum total of geometrical figures which compose the area under the demand schedule corresponding to the consumer surplus.

Figure 6 shows the area (hatched) of total net benefits obtained by the farmer when borrowing in both markets. For the quantity borrowed in the institutional market, the area (consumer surplus) under the demand curve up to the price paid for the given quantity Q_I is AP_IBE. For the quantity borrowed in the non-institutional market, the area (consumer surplus) is equal to ECG. Total net benefits are equal to the area AP_IBE plus area ECG, which is equal to area AP_IBCG.

The consumer surplus is composed of the following areas for calculation purposes as shown in Figure 7:

- area A, corresponding to the area under the demand curve up to the maximum price (P_4) a farmer (borrower) is willing to pay

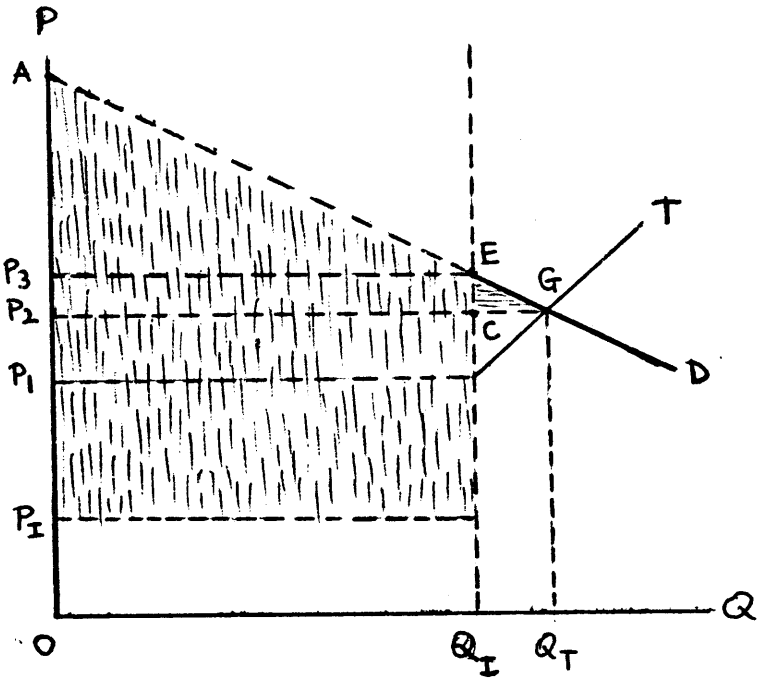


Figure 6

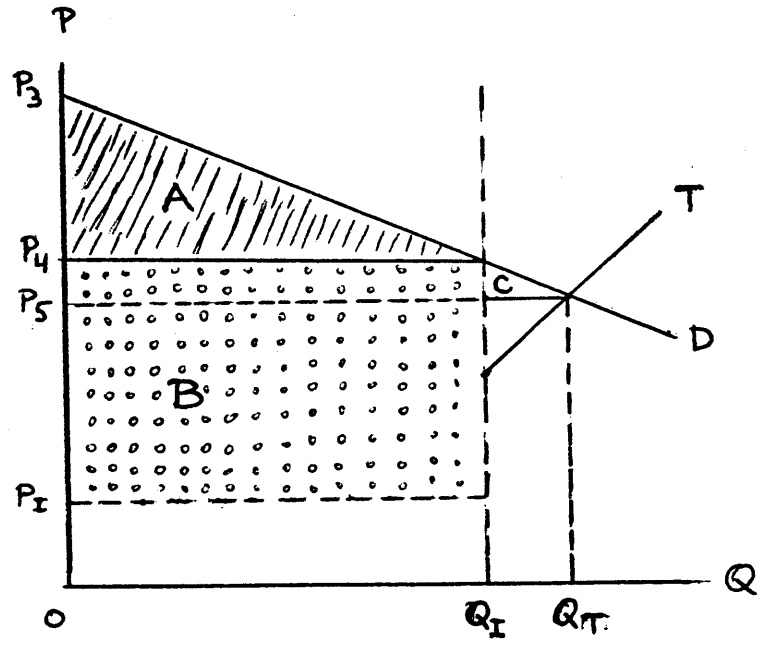


Figure 7

for the borrowed quantity in the institutional market, Q_I, i.e.,

$$(P_3 - P_4)Q_I / 2$$

- area B, corresponding to the subsidy riped by the farmer when borrowing in the institutional market at a price of P_I. This area is equal to:

$$(P_4 - P_I)Q_I$$

- area C, corresponding to the consumer surplus originated from transacting in the non-institutional market the quantity $Q_T - Q_I = Q_{NI}$ at a price of P_5. This area is equal to:

$$(P_4 - P_5)Q_{NI} / 2$$

This model calculates the maximum possible benefits riped by a borrower in both markets. It is an upper-bound because institutional transaction costs are not included, i.e., only the rate of interest is considered. The lower bound benefits would be corresponding to the area A plus C if transaction costs plus the rate of interest are equal to P_4.

Policy Simulations

In the previous chapter, on econometric analysis, two alternative non-institutional demand models were presented and tested, i.e., a certainty model in which farmers knew what their status regarding the institutional system was in terms of borrowing availabilities, afterwards adjusting their demands in the non-institutional system; and an uncertainty model, in which they do not know exactly what they were apt to in the institutional system and be borrowing in the non-institutional system on the basis of

an expected loan from the institutional one. Statistical results show that the first hypothesis is more consistent with empirical observations than the second, i.e., non-institutional demand is better explained by the amount actually received by farmers from the institutional system than by what they expect to receive. This is also consistent with the hypothesis that the non-institutional demand is an "adjustment" type of demand, i.e., farmers first go to the institutional system and, depending on their needs and resource availabilities, adjust in the non-institutional market their remaining borrowing requirements.

For policy analysis purposes, the first question of interest would refer to the type and amount of costs and benefits that a given farmer generates when absorbed by the institutional credit system. Alternatively, what amount of costs and benefits are generated when a group of farmers have their attendance ratio in the institutional system, expanded.

The first experiment would consist of analyzing a given farmer which is not in the institutional system and would hypothetically be absorbed by it. The prescribed amount to be lent would correspond to the existing policy rationing system.

The second experiment would consist of a group analysis in which an average farmer (representing this group) would have his probability of acceptance increased, this meaning that more farmers in this group are attended by the institutional system, while the quantity allocated to each is reduced.

Transferring a Farmer to the Institutional System

This exercise would basically consist of the following steps:

a) Select a non-institutional borrower from the existing sample.

b) Determine his demand schedule and equilibrium price-quantity transaction combination.

c) Increase his institutional loan from zero to the institutionally prescribed amount, given his characteristics

d) Determine his new demand schedule as well as quantities transacted in the non-institutional system.

e) Determine the net benefits and costs of transferring him to the new position and compare these with the original ones.

Referring to the first step, farmer number 3 of Table in the previous chapter, was selected. This farmer has the following characteristics:

- size of property: 66 hectares
- value of commercialized production in 1977: Cr$9,000 (YPL = 2.2)
- value of assets in 1977: Cr$155,000
- education level: 0 (not formally educated)
- family size: 5 members
- value of institutional loans received in 1977: nil

Given his individual characteristics, his demand equation in the non-institutional market may be written, in a price-quantity space as:

(1) $Q^D = 5.93 - .527(P)$ $\quad P = 11.25 - 1.898(Q^D)$

Q = quantity borrowed

P = price of loan

Equation (1) is derived from the following estimated relation:

(2) $Q^D = 3.74 - .527(P) + .437(F) - .067(DIC)$

Equilibrium price-quantity combinations in the non-institutional market may be calculated through the following system:

(3) $P = 8.83 + .549(F) - .084(DIC) - 2.525(YPL)$

(4) $Q = -.915 + .148(F) - .0226(DIC) + 1.33(YPL)$

Given farmer characteristics, the following equilibrium price-quantity combination results:

- Quantity transacted in the non-institutional market before the farmer is absorbed by the institutional system: Cr$2,747
- Price paid for non-institutional loan before being absorbed by the institutional system: 6 percent a month.

If this farmer is absorbed by the institutional system, he will be receiving an average loan of Cr$13,791, as predicted by equation (5). See Chapter IV for details.

(5) $LogQ = -1.253 + .642(\log \text{assets}) + .39(\text{education}) + .667\ (\text{owner})$

As absorbed by the institutional system, the farmer would be adjusting his actual demand (equation 1, above) in the non-institutional market according to what he gets in the institutional one, and be shifting his schedule as predicted by equation (2). This revision generates the

following, new, non-institutional demand schedule:

$$(6)\quad Q^{D}_{NI} = 5. - .527(P) \qquad P = 9.49 - 1.898(Q^{D}_{NI})$$

Given that his characteristics have not changed, the non-institutional transaction schedule would not be shifting and the new equilibrium price-quantity combination becomes:

$$Q^{D}_{NI} = \text{Cr\$2,435} \qquad P_{NI} = 4.87 \text{ percent a month}$$

His total demand schedule (equation 7, below) shifts from the non-institutional position to an independent one given that he is receiving an institutional loan of Cr$13,791.

$$(7)\quad Q^{T} = a + g(F) + c(Q_{I}) + b(P), \text{ for } c = d + 1 = -.067 + 1 = .933$$

$$Q^{T} = 18.97 - .527(P) \qquad P = 35.65 - 1.898(Q^{T})$$

The shifting of partial and total demand schedules may be graphically visualized as follows (See Figures 5 and 6).

Figure 8 presents the original, non-institutional equilibrium combination before the farmer is absorbed by the institutional system. Demand schedule D_o and supply transaction schedule T_1 determine the non-institutional price-quantity combination (P^{1}_{NI}, q^{1}_{NI}). As the farmer is absorbed by the institutional system there will be a backward shift in his non-institutional demand schedule represented by the new D_1 curve, as shown in Figure 8A, This shift reduced the equilibrium quantity and price combinations in this market to P^{2}_{NI}, q^{2}_{NI}. The reduction comes from the fact that the farmer (borrower) has now access to the institutional market, substituting institutional for non-institutional quantities.

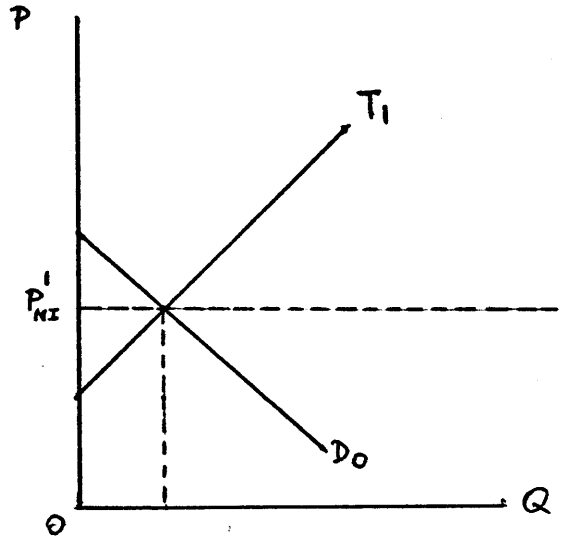


Figure 8

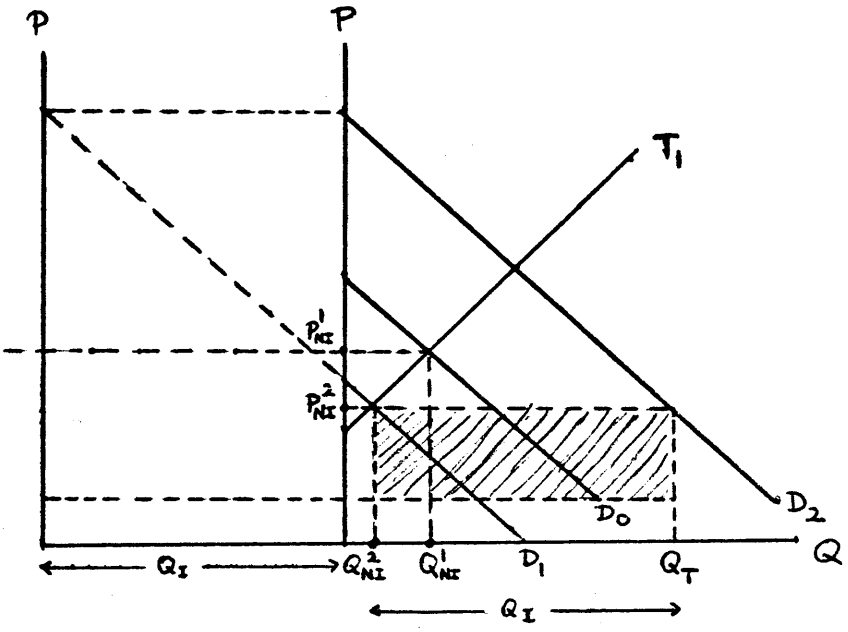


Figure 8-A

The downward movement of the non-institutional demand schedule reflects a substitution and an income effect, and the upward movement of the total demand schedule a wealth effect.

Figure 8A shows only a total price effect, which includes a substitution and an income effect in the non-institutional schedule, and the wealth effect is perceived by the shift of the total demand schedule D^o to the D^2 position.

Benefits may now be calculated as discussed before.

- Area A benefits:

  $(P_3 - P_4)Q_I / 2 = Cr\$641.3$ / month

  $P_4 = 9.49$ (from equation 6)

  $P_3 = 18.79$ (from equation 7)

  $Q_I = 13.791$ (from equation 5)

- Area B benefits:

  $(P_4 - P_I)Q_I = Cr\$1,157.1$ / month

  $P_I = 1.1$ (as defined by the institutional system - rate of interest)

- Area C benefits:

  $(P_4 - P_5)Q_{NI} / 2 = Cr\$56.25$ / month

  $P_5 = 4.87$ (from equations 3 and 4)

The shifting of this farmer to the institutional system generates a total net benefit of Cr$1,854.7 / month.

Financial revenue losses of the institutional system from borrowing

resources at subsidized rates correspond to the price difference of commercial to subsized rural loans times the quantity lent, which is equal to Cr$262.03 / month. As mentioned before, administrative costs are not included in this total. The difference of farmers' benefits to institutional system's losses is Cr$1,592.67, per month.

Considering that the average lending period of production loans is 10 months, this generates a total net gain of Cr$15,926.7, which is larger than the amount lent by 15.5 percent and is equivalent to the average opportunity cost of capital in the economy.

The difference of net benefits generated by borrowing, to the farmer, from the new to the original position is equivalent to the new and old consumer surpluses plus the subsidy, corresponding to Cr$1,782.6 per month, or 96 percent of the gain.

As may be seen, net benefits to recipients are considerable if transaction costs are exclusively composed of the rate of interest. Considering that the difference of benefits to the borrower and revenue losses to the lender are also large when administrative expenses are excluded, it becomes obvious that credit distribution costs should be as small as possible, for lending programs to be worthwhile. The larger these transaction costs are, the larger the minimum loan per farmer must be to compensate for these costs. Expensive distribution systems tend to concentrate resources in the hands of few.

The second experiment consists of a group analysis in which the group attendance by the institutional system increases but total lending funds remaing constant. The purpose is to examine to what extent welfare results are improved by a larger attendance and lower resource concentration.

For this, the following steps are undertaken:

a) selection of a group of farmers

b) determination of average characteristics and demand schedules, total and non-institutional

c) increase of institutional attendance, to all members of the group and decrease of the amount of loans received by attended farmers

d) determination of new demand schedules

e) comparison of old and new positions

The first step is to select a group of farmers. This is the sampled 0 - 10 hectares one, whose characteristics are presented in Chapter II, Tables 1, 2 and 4. These characteristics may be summarized as follows:

- value of average yearly commercialized production: Cr$12,603
- average family size: 6.17 members
- average institutional loan: Cr$7,400
- number of farmers attended by institutional system: 10
- total number of farmers belonging to group: 63

The average individual non-institutional demand schedule, given groups' characteristics may be written as:

$$(8)\quad Q_1^D = 5.94 - .527(P) \qquad P = 11.27 - 1.898Q^D$$

for those with institutional loans; and

$$(9)\quad Q_2^D = 6.44 - .527(P) \qquad P = 12.22 - 1.898Q^D$$

for those without institutional loans.

The total demand schedule for those <u>with</u> institutional loans differ from their non-institutional one, and may be written as:

(10) $Q^T = 13.34 - .527(P)$ $\quad P = 25.31 - 1.898Q^T$

Demand schedules for those without institutional loans are the same as the non-institutional ones. Benefits and losses may be calculated as before.

- Area C benefits, for those without institutional loans are:

  $(P_4 - P_5)Q_{NI} / 2 =$ Cr$214.40 / month

  $P_4 = 12.22$ (from equation 8)

  $P_5 = 5.84$ (from equation 9)

  $Q_{NI} = 3.36$ (from equation 4)

- Area A benefits for those with institutional loans are:

  $(P_3 - P_4)Q_I / 2 =$ Cr$76.60 / month

  $P_4 = 11.27$ (from equation 8)

  $P_3 = 13.34$ (from equation 10)

  $Q_I = 7.4$ (as defined by the sample)

- Area B benefits, for those with institutional credit, are:

  $(P_4 - P_I)Q_I =$ Cr$752.58 / month

- Area C benefits for those with institutional credit are:

  $(P_4 - P_5)Q_{NI} / 2 =$ Cr$193 / month

  $P_4 = 11.27$ (from equation 8)

P_5 = 5.22 (from equation 8)

Q_{NI} = 3.319 (from equation 4)

Total net benefits for the group: Cr$21,583.2/month, decompose as follows:

-53 x Cr$214.4 = 11,363.2 (for non-institutional lenders)

-10 x Cr$1022.0 = 10,220 (for institutional lenders)

Revenue losses of institutional system: Cr$1,406 / month

The second part of the experiment consist of extending individual institutional loans to all farmers in the group without increasing the total amount to be allocated for the group, what gives a per-capita loan of Cr$1,175. Here it is assumed that no farmer had any institutional credit before. The demand schedule in the non-institutional market becomes:

(11) $Q_D = 6.36 - .527(P)$ $\quad P = 12.07 - 1.898(Q_D)$

The total demand schedule in both markets is:

(12) $Q_T = 7.53 - .527(P)$ $\quad P = 14.29 - 1.898(Q)$

Area A benefits, per farmer, will be:

$(P_3 - P_4)Q_I / 2$ = Cr$13.04 / month

P_3 = 14.29 (from equation 12)

P_4 = 12.07 (from equation 11)

Q_I = 1.175

Area B benefits, per farmer, will be:

$(P_4 - P_I)Q_I$ = Cr$128.9/month

Area C benefits, per farmer, will be:

$$(P_4 - P_5)Q_{NI} / 2 = Cr\$211.17 / month$$

$P_5 = 5.74$ (from equation 11)

$Q_{NI} = 3.336$ (from equation 4)

Total monthly net benefits for group: Cr$22,246, which is composed of 63 x Cr$353.11, i.e., the total number of farmers times the individual benefits type A, B and C received by each.

As may be seen, gains are larger for the group if all are attended with small amounts of credit. But given that transaction costs are excluded the result is probably worse than if some concentration exists or if total amounts borrowed are expanded, given that transaction costs, excluded from the rates of interests, are fixed.

The main conclusion is that small farmer credit programs are only feasible when the distribution of loans is relatively inexpensive and amounts to be allocated reasonable. This argument reinforces the conclusions reached by the first experiment.

CONCLUSIONS

As mentioned in the introduction to this study, the rural credit market in the Northeast of Brazil may be divided into an institutional, or formal, sub-market and a non-institutional, or informal, one.

As shown in Chapters I and II, the non-institutional sub-market handles that part of the demand for loans which is not attended by the institutional market, chiefly the unsatisfied demand of institutional borrowers plus the great majority of smaller farmers which were not attended by the formal system at all.

Econometric analyses showed that the hypothesis regarding the role played by the non-institutional sub-market was sustained, i.e., that non-institutional quantities and prices are marginal, indicating that farmers' shadow-prices were these non-institutional prices.

The same analysis also indicated that there are intermarket effects, i.e., that the institutional rationing process affects the behavior of borrowers in the non-institutional market.

Therefore, it may be said that given intermarket effects, the institutional borrowing mechanism affects farmer shadow prices and the decision making process of how to allocate their resources.

By estimating individual demand schedules, one outcome was that subsidized credit generates substantive income transferences to institutional loan receivers, while small price-effects, indicating that there is little incentive to expand production per se, unless other types of incentives are given, or exist, at the time.

A second aspect mentioned in the introduction to this study was the methodological as well as policy error commonly made regarding rural credit programs implemented by the government. These programs are, usually, justified solely by the amounts of benefits generated by increased agricultural production. A consequence is to allocate resources primarily to those farmers which are believed to generate the largest agricultural surpluses.

This study shows that this miopic view of credit programs' outcomes is doomed to failure because farmers are also consumers and may be willing to invest their resources outside the sector as well, unless specific incentives are devised to avoid these drains.

Given that income effects are considerably larger than price effects, benefits from institutional credit should not be accounted for by increased production as such, but mainly by increased consumption and income redistribution.

In Brazil, financial resources are heavily concentrated on larger farmers, while migration and underemployment in the sector are a broadly observed phenomenon. This miopic view seems, again, to foreclose broader policy outcomes of such programs, mainly in the Northeast of the country.

In this study, benefits were, methodologically, derived from individual farmer demand curves. As shown in Chapter V, total farmer benefits are larger when resources are spread over a number of farmers, instead of concentrated. It was also shown that the feasibility of entire programs depended basically on processing costs, i.e., on loan distribution costs. The larger these costs, the greater the concentration of credit

ought to be for making any specific program feasible. Therefore, for credit programs to be deconcentrated, relatively inexpensive distributive systems ought to be devised.

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BIOGRAPHICAL NOTES

Heinz D. Besser was borne on July 8, 1941, at Rio de Janeiro, R.J., Brazil. He was educated at the Colegio Sto. Agostinlio, Colegio Brasil-America and Colegio Guanabara, in Rio de Janeiro. In 1960 he entered the Faculdade Candido Mendes, and in 1962 he transferred to the Faculdade de Ciencias Economicas of the Universidade Federal do Rio de Janeiro, receiving, in 1965, the degree of B.S. in Economics. In 1965 he joined GEIPOT, the Brazilian Transport Planning Agency, and became Head of the Economic Sector in 1970. In 1969 he went to M.I.T. for a year, as a SPURS fellow; and in 1972 he started the Ph.D. program at the same institution. In 1976 he went to Brazil for research work in the area of rural credit. In June 1978 he was a consultant for a mixed Banco-Central-Sudene working group, in charge of preparing guidelines for a rural-credit project for the Polonordeste Program to be financed by the World Bank. In August 1978 he returned to M.I.T. to write his dissertation for the Ph.D. program, which he finished in September of 1979.