

SMALL FARMER CREDIT USE IN A DEPRESSED  
COMMUNITY OF SÃO PAULO, BRAZIL

DISSERTATION

Presented in Partial Fulfillment of the Requirements for  
the Degree Doctor of Philosophy in the Graduate  
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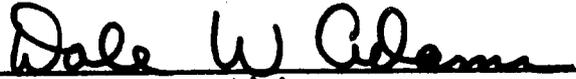
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Professor Dale W Adams, Adviser

The study was based on a 1971 farm survey conducted in a depressed region in the State of São Paulo. A sample of 150 farms were interviewed representing a cross-section of farm types in the municipalities of Itapetininga and Guaréí. The region was characterized by many small producers who demonstrated various degrees of subsistence living. The sample was dominated by these small producers, though large producers were also included.

The objectives of this study were: (1) to determine how farmers were served by the agricultural credit market, (2) to identify the economic factors which determine how credit was allocated, and (3) to suggest changes in credit policy that would increase efficiency of resource use in agriculture. The constraints under which the banking sector operates and the interaction of this sector with non-bank or informal lenders were stressed. The major features of the Brazilian credit program were (a) it was administered by the banking sector and (b) the interest rates were much lower than the non-regulated or informal rates.

To determine how farmers were served by the credit market, the supply of credit was examined. Farm-level data were used to determine the credit-use patterns of farmers and the sources of this credit. It was shown that informal lenders dominated the small loan business, serving both small and medium-sized farmers. The primary advantage of dealing with small lenders was that the money was available on request.

To identify the economic factors determining the allocation of credit, both farm-level data and bank interviews were used. It was shown that small bank loans were costly both to the banks and to the farmers. They were costly to the banks because of the administrative red tape that was necessary to process them. They were costly to the farmer because of the many bank visits, delays in time, and fixed costs he had to pay. It was concluded that informal lenders were highly competitive in price on small-sized loans, even though the formal interest rate was one-half to one-fourth as high as the informal rate.

To suggest policies that would increase resource productivity in Brazilian agriculture, a production function analysis was conducted. A Cobb-Douglas function was used in its logarithmic form. Functions were estimated for small farmers, large farmers, farmers who borrowed formal credit, and non-borrowers.

Based on this analysis it was shown that small farmers did not have significant opportunities to increase their use of profitable agricultural inputs. The opportunities that did exist were primarily on larger farms and farms that already were participants in the subsidized credit program. This result tended to support the argument put forth by several researchers that opportunities for major increases in productivity in traditional

agricultural sectors must be accompanied by structural change in the economy. This kind of change has not been promoted in Brazil. The subsidized credit program as presently designed could serve as one tool to assist in a structural transformation. Without a policy for change, however, the credit program primarily serves those farmers who already have access to formal credit.

Based on this research, it was recommended that (1) the interest rates on agricultural credit be increased substantially, (2) lending procedures be streamlined, (3) more risky clients be included in the clientele of banks, and (4) more meaningful technical assistance be coupled to credit specifically to service the small farmer.

## DEDICATION

There is no way that I can dedicate this dissertation to my wonderful wife Barbara for it is not worthy of representing the level of sacrifice which she has made during the course of my doctoral studies. Thus, as I bring this phase of my life to a close, I dedicate myself to repaying her for all that she has given to me during this period.

Gerald I. Nehman

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TABLE OF CONTENTS

	Page
DEDICATION . . . . .	ii
ACKNOWLEDGMENTS . . . . .	iii
VITA . . . . .	v
LIST OF TABLES . . . . .	viii
LIST OF FIGURES . . . . .	x
LIST OF TERMS . . . . .	xi
 Chapter	
I. INTRODUCTION . . . . .	1
Objectives of the Study	
Organization of the Study	
II. REVIEW OF LITERATURE . . . . .	4
Brazilian Agricultural Policy	
Formal Agricultural Credit Policy	
Informal Agricultural Credit Market	
Interaction Between Formal and Informal Lenders	
Allocation of Resources to Agricultural Production	
Summary	
III. AREA AND SAMPLE DESCRIPTION . . . . .	17
Sample Selection	
Location of Sample Farms	
Community Structure	
Soils and Topography	
Climate of the Region	
Agricultural Production	
Sources of Capital on the Sample Farms	
Summary	

Chapter	Page
IV. SOURCES OF AGRICULTURAL CREDIT . . . . .	38
Credit Available for the Sample of Farms	
Use of Agricultural Credit by Source	
Distribution of Agricultural Credit	
Summary	
V. HOW BANKS ALLOCATE AGRICULTURAL CREDIT . . . . .	60
Operational Procedures of Formal Lenders	
Decision-Making by the Informal Lender	
The Cost of Credit	
Summary	
VI. PRODUCTIVITY ANALYSIS . . . . .	81
Definition of Variables	
The Model	
Summary	
The Production Function	
Results of the Production Analysis	
Summary of the Production Analysis	
Marginal Value Productivity of Farm Resources	
Summary	
VII. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH . . . . .	108
Policy Recommendations	
Recommendations for Further Research	
Implications for Other Countries	
BIBLIOGRAPHY . . . . .	117

## LIST OF TABLES

Table	Page
1. Population of the State of São Paulo, Brazil, and the Study Region (Population in Thousands) . . . . .	18
2. The Distribution of Farms in the Study Region by Farm Size as Indicated by the 1960 Agricultural Census, the 1965 Data of the Brazilian Institute of Agrarian Reform, and the 1971 Sample of 150 Farms . . . . .	23
3. Distribution of Soil Types on the Sample of 150 Farms in São Paulo . . . . .	28
4. Estimated Value of the Production of Selected Crops in Itapetininga and Guaréi for the Agricultural Year 1970/71 . . . . .	31
5. Average Sales of Corn, Beans, and Rice by Farm Size in 1970 for the Sample of 150 Farms in São Paulo . . . . .	32
6. Sales of Cheese, Milk, and Eggs by 150 Farmers in São Paulo . . . . .	34
7. Various Sources of Income by Farm Size in 1971 for the Sample of 150 Farms in São Paulo . . . . .	36
8. Number and Contractual Value of Loans Outstanding During the 1970 to 1971 Agricultural Year by Source of Loan for the Sample of 86 Borrowers in São Paulo . . . . .	39
9. Schematic Showing the Hypothetical Scheduling of Loan Negotiations and Liquidations During the Production Cycle . . . . .	43
10. Various Measures of Loans Outstanding During the 1970 to 1971 Agricultural Year by Source of Loan for the Sample of 86 Borrowers in São Paulo . . . . .	45
11. Ratios Describing Relationships Between Various Measures of Credit . . . . .	47
12. Use of Formal and Informal Agricultural Credit by Source of Loan as Reported by the Sample of 82 Borrowers in São Paulo . . . . .	52

Table	Page
13. Value of Formal and Informal Loans by Farm Size for the Sample of 86 Borrowers in Sao Paulo . . . . .	54
14. Number of Formal and Informal Loans by Farm Size as Reported by the Sample of 86 Borrowers in Sao Paulo . . . . .	56
15. Registration Rates Reported by Loan Size for the Sample of 86 Borrowers in Sao Paulo . . . . .	71
16. Number of Bank Visits Required to Obtain Formal and Informal Loans in 1965 for Farms in Sao Paulo . . . . .	72
17. Average Number of Days Waited for Formal and Informal Loans in the Study Region and Other Regions of Southern Brazil, 1965 . . . . .	74
18. Estimated Loan Costs, Including Explicit and Implicit Loan Costs, for Three Average Loan Sizes from Formal Credit Sources in 1971 . . . . .	78
19. Regression Coefficients and Statistics for the Production Function Analysis by Various Farm Categories . . . . .	95
20. Geometric Means and Standard Deviation of Variables Used in the Analysis of the 1971 Production Year for the Sample of 150 Farms . . . . .	100
21. Marginal Value Products of Production Inputs by Farm Category in the Analysis of the 1971 Production Year for the Sample of 150 Farms . . . . .	102
22. Observed Rates of Pay for Various Services Reported in the Sample of 150 Farms in Sao Paulo . . . . .	103

LIST OF FIGURES

Figure	Page
1. Outline Map of the State of São Paulo, Brazil Showing the Location of the Study Area . . . . .	19
2. Schematic Diagram Showing Loan Size and Risk as a Determinant of Interest Rate . . . . .	63

## LIST OF TERMS

- Cruzeiro (Cr\$)** . . . Brazilian monetary unit. One cruzeiro was equal to approximately U.S. \$0.20 during the harvest in July, 1971.
- Formal credit** . . . Credit from banks at concessional rates of interest and administered under the Rural Credit Act of 1965.
- Hectare (ha)** . . . Measure of land area equal to 10,000 square meters. One hectare is equal to about 2.47 acres.
- Informal credit** . . . Credit from lenders not covered by the Rural Credit Act of 1965. This includes moneylenders, merchants, dealers, friends, and relatives.
- Município** . . . A political subdivision similar to a county in the United States.

## CHAPTER I

### INTRODUCTION

During the past two decades various types of agricultural credit programs have been started in less developed countries. These programs have involved billions of dollars of domestic and international resources. The principal objective of credit programs usually has been to stimulate agricultural output. This objective has been met in a number of cases. A second objective has been to redistribute credit so that more would be available to small farmers.<sup>1</sup> While much less information is available on the distribution of credit, recent research suggests that improvements in distribution have been modest. This apparent lack of redistribution of credit is a central concern of this study.

The Brazilian experience provides an excellent opportunity to assess the results of aggressive agricultural credit policies. During the last decade the real amount of agricultural credit in Brazil expanded very rapidly at the same time that agricultural growth rates accelerated. This has been accompanied by highly concessional interest rates on agricultural credit. The emphasis has been to provide credit to all farmers

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<sup>1</sup>An excellent review of recent efforts to spread credit to a broader rural clientele can be found in the studies and papers prepared for the 1973 Spring Review on Small Farmer Credit Programs sponsored by the Agency for International Development, Washington, D.C.

through normal banking channels.<sup>2</sup> In this way it was intended that all farmers, including the small producers, would benefit. As a result, special credit programs for the small farmer have not been promulgated.

### Objectives of the Study

This study had three major objectives. First, to determine how farmers in a depressed area of Southern Brazil were served by various types of lenders. Second, to identify the economic factors which determined how lenders allocated credit among farmers. Finally, to suggest changes in credit policy that would increase the efficiency of resource use in agriculture.

Four hypotheses were treated in this study in an attempt to realize the above objectives:

- (1) Overall credit policy discourages bank lending to small farmers.
- (2) Informal lenders provide unique services to farmers that are not being provided by formal lenders.
- (3) The real borrowing costs from informal and formal sources are similar for small loans.
- (4) The demand for credit by small farmers is constrained by the lack of profitable investment alternatives at the farm level.

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<sup>2</sup>Richard L. Meyer, Dale W Adams, and Norman Rask, "Rural Capital Markets and Small Farmers in Brazil, 1960-1972," Small Farmer Credit in South America, Country papers prepared for the Agency for International Development Spring Review of Small Farmer Credit, Vol. III (Washington, D.C.: Agency for International Development, 1973), p. 1.

### Organization of the Study

The following discussion is organized around the three general objectives. In Chapter II the Brazilian credit program is examined. This includes discussion of the legislation and the directives under which the banking sector operates. In addition, the relationship between the formal and informal credit markets is discussed.

Chapter III describes the region in which the field work was carried out, the sampling procedure used, and the farm level and bank data assembled for use in the analysis. Chapter IV uses farm level and bank information to describe the supply of credit in the study region, as well as the regional make-up of the rural credit market. In Chapter V real costs of borrowing for small farmers from different sources is calculated. The criteria used by banks to allocate credit among farmers are identified. Analysis in Chapter VI focuses on the economics of credit use at the farm level. Cross sectional, production function analysis of sample farm data is used to determine the profitability of credit use. The final chapter presents a summary, policy recommendations, and suggestions for further research.

## CHAPTER II

### REVIEW OF LITERATURE

This literature review is divided into four subject areas. First, a discussion of the legislative mandate that directs Brazil's agricultural credit is presented. Second, a discussion of the lending behavior of banks operating under this legislative mandate follows. Third, a summary of research in the agricultural credit field as it relates to the role of formal versus informal sources of funds, the problem of risk and timing of credit, and the characteristics of borrowers and non-borrowers is next. A discussion of the efficiency of resource use at the farm level in Brazil as reported by various researchers concludes the Chapter.

#### Brazilian Agricultural Policy

Brazil has benefited from an export-oriented agricultural sector. Revenues from various agricultural exports such as coffee, cotton, sugar, cocoa, and tobacco have provided capital for industrial growth throughout its history. This has been especially true during the 1950's and 1960's.<sup>1</sup> Price controls and export limits on food products contributed to depressed prices in the agricultural sector during this period. Value of output per agricultural worker in 1960 was calculated to be only

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<sup>1</sup>G. Edward Schuh, Research on Agricultural Development in Brazil (New York: Agricultural Development Council, Inc., 1970).

\$229. This compared unfavorably to other Latin American countries such as Mexico--\$369, Venezuela--\$500, and Argentina--\$1,080.<sup>2</sup> Low levels of productivity also were observed on Brazilian farms in 1963.<sup>3</sup>

During the 1950's and early 1960's relatively little attention was paid to agricultural development in Brazil. Programs that did exist were of four general types: construction of marketing facilities, fertilizer price subsidies, commodity price supports, and low-interest rate credit. In addition, major land reform legislation was written in 1964. The Brazilian Institute of Agrarian Reform (Instituto Brasileiro de Reforma Agraria or IBRA) was formed to administer a tax-incentive program to encourage small farms. This program has not resulted in any noticeable change in the distribution of land ownership, however. Furtado suggests that land reform has not been promoted as a way to increase output because new, unsettled lands have been available.<sup>4</sup> This is reflected in the present policy to settle landless farmers in the Amazon Region. As less frontier land becomes available for development there may be increased pressure on Brazilian policy makers to affect real increases in productivity.<sup>5</sup>

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<sup>2</sup>Kenneth Frederick, "United States Contributions to Agricultural Development in Brazil," Unpublished manuscript, Annex H to Brazil Program Analysis, February 1970 (Washington, D.C.: United States Agency for International Development, 1970).

<sup>3</sup>William H. Nichols and Ruy M. Paiva, "The Structure and Productivity of Brazilian Agriculture," Journal of Farm Economics, XLVII (May, 1965), pp. 347-364.

<sup>4</sup>Celso Furtado, Economic Development of Latin America, A Survey from Colonial Times to the Cuban Revolution (Cambridge, Mass.: Cambridge University Press, 1970).

<sup>5</sup>Peter T. Knight, Brazilian Agricultural Technology and Trade: A Study of Five Commodities (New York: Praeger Publishers, 1971), pp. 13-18.

Over the past two decades, the credit program has continued to be the most important agricultural policy instrument.<sup>6</sup> In 1970, agricultural credit was 25 percent of all bank credit, representing about \$1.8 billion in value.<sup>7</sup>

There are a number of reasons why credit became a major program for stimulating agriculture. First, it was easy to administer. Alternative policies such as price supports and marketing programs required that new administrative agencies be set up. These agencies were never very effective. Price supports were generally set too low; marketing facilities were used primarily for speculation. By contrast, the credit program was administered by a well organized banking sector. Second, the credit program was more encompassing. It was used to provide incentives for promoting other programs. These included the fertilizer program, dissemination of new seed varieties, and increased mechanization.<sup>8</sup>

#### Formal Agricultural Credit Policy

The Rural Credit Act of 1965 and its amendments are the main governing legislation for the present credit program. Under this program all banks in Brazil must loan 10 percent of their funds to farmers at

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<sup>6</sup>Ibid., p. 45. Gordon W. Smith, "Brazilian Agricultural Policy, 1950-1967," in Howard S. Ellis (ed.), The Economy of Brazil (Berkeley and Los Angeles: University of California Press, 1969), pp. 213-65.

<sup>7</sup>Dale W. Adams, Harlan Davis, and Lee Bettis, "Is Inexpensive Credit a Bargain for Small Farmers? The Recent Brazilian Experience," Inter-American Economic Affairs, XXVI, No. 1 (1972), pp. 47-58.

<sup>8</sup>Ralph Von Gersdorff, "Agricultural Credit Problems in Brazil," The Indian Journal of Economics, XVI, No. 161 (1960), pp. 151-71.

concessional interest rates.<sup>9</sup> The maximum rate permitted is 75 percent of the commercial rate (included in Resolution 69 in the Rural Credit Act). During 1970/71, interest rates on production loans were 13 percent; on fertilizer loans they were 7 percent. This was substantially below the rate of inflation in Brazil during the same period. For the 1972/73 agricultural year, the rates were lowered to 12 percent and 6 percent respectively.<sup>10</sup> Lowering the interest rate has been the mechanism used to increase credit use. Use has increased but perhaps not to the same extent for all types of borrowers. The research examines the impact on small and medium farmers who were meant to be one of the principal beneficiaries of the program.<sup>11</sup> In addition, it has attempted to serve all of the agricultural sector in the following three ways:

- (1) To stimulate rural investment in production, storage, and processing by the producer or producer cooperatives;
- (2) To improve agricultural production and marketing techniques; and
- (3) To introduce new production methods, improve living standards of rural persons, and conserve the soil.

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<sup>9</sup>There are private, state, and Federal banks. The state and Federal banks are semi-public institutions. All bank credit is defined as institutional or formal credit. Credit from other sources such as dealers, retailers, and money-lenders is referred to as non-institutional or informal credit in this study.

<sup>10</sup>"A Taxa de Juros Será Menor, Anuncia Delfim" ("Delfim, Minister of Finance, announced that interest rates will be lower"), O Estado de São Paulo (January 1, 1972), p. 46.

<sup>11</sup>The program requires that no less than 10 percent of the loans be small in size (50 times minimum salary which was about Cr\$11,000, or \$2,200 in August, 1971).

Since 1965, several important amendments have been made to the original legislation. First, so-called "non-economic" activities were not to be funded. This affected consumption loans, both for maintenance of the family and for emergency expenditures. Second, formal proposals had to be submitted which specified how the money was to be used. Third, funds were not to be used for speculation and proposals were not to be for projects where the probability of success was low.

Fourth, banks were required to hire and train agricultural loan officers. All major banks now have these officers. They are responsible for evaluating proposals and assisting farmers in completing applications. Finally, banks were permitted to charge up to 1 percent of the loan balance for technical assistance.<sup>12</sup> This helped to defray some of the overhead costs for agricultural loans.

In addition to changes in administrative procedures, the list of qualified recipients was increased. Only farmers and farmer cooperatives could receive agricultural credit under the original legislation. The expanded list included experimental farms, animal and plant breeders, and machinery rental agencies. This was consistent with the program's objectives of increasing rural investments and introducing new production methods.

While not specifically mentioned in the legislation, many of the loans went for marketing projects. This served the program's objective of improving marketing techniques. In 1969, marketing loans were

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<sup>12</sup>Jose Kleber Leite de Castro, Legislação de Crédito Rural (Rio de Janeiro: Editora de Informação Bancária LTDA, 1970), p. 17.

restricted to no more than 75 percent of a bank's portfolio in an attempt to de-emphasize this aspect of the credit program (Resolution 97).<sup>13</sup>

In summary, the agricultural credit program is administered by banks. The interest rates are below commercial rates and below the rate of inflation. While the objectives of the program are to increase and transform agricultural production, it was also intended to benefit small and medium farmers.

#### Informal Agricultural Credit Market

The informal agricultural credit market includes all lenders not covered under the Rural Credit Act. They are regulated only by common law and laws of commerce.<sup>14</sup> The main differences between the formal and informal lenders are their operating procedures. The informal lenders usually have higher interest rates than banks, the loans are unsecured, and there is no lengthy paper work.<sup>15</sup> Informal credit may be a cash loan, a line of credit at a retail store, or a time purchase for consumption or production goods. It is possible to define four roles that this credit serves as distinguished from bank loans.

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<sup>13</sup>Judith Tendler, "Agricultural Credit in Brazil" (unpublished manuscript prepared for United States Agency for International Development, Washington, D.C., October, 1969), p. 49.

<sup>14</sup>Castro, Legislação de Crédito Rural, p. 7.

<sup>15</sup>Charles T. Nisbet, "The Relationship Between Institutional and Informal Credit Markets in Rural Chile," Land Economics, XLV, No. 2 (1969), pp. 162-173. John N. Stitzlein, "The Characteristics and Significance of the Non-Institutional Credit Market in Rural Ecuador" (unpublished M.S. thesis, Department of Agricultural Economics and Rural Sociology, The Ohio State University, 1962), pp. 55-59.

First, informal credit is used for unexpected events. These events may be emergencies (e.g., sickness or a death in the family) or unique market situations that require quick action (e.g., a price decline requiring prolonged storage of the crop). The justification for acquiring the money and the system of repayment are usually flexible. They will depend on how the unexpected event is resolved. Second, informal credit is used to even out consumption patterns and income flows. When the family works the farm, a portion of household expenditures are in lieu of labor expenses. These first two uses of informal credit are more unique to the small farmer. Their uniqueness should be recognized in designing national credit policy.<sup>16</sup>

A third use for informal credit is for risky investments. Risk from the lenders viewpoint is caused by lack of collateral and the uncertainty of the investment being successful. Informal lenders are distinguished from banks because they generally lend without collateral. This is most important for landless farmers or farmers who do not have legal certification of their land ownership.<sup>17</sup> In this case, personal friendship between the borrower and lender is the only security. This restricts the farmer to seek funds inside his community. The lender is similarly constrained to only deal with people he knows.<sup>18</sup> The second

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<sup>16</sup> M.L. Dantwala, "Institutional Credit in Subsistence Agriculture," International Journal of Agrarian Affairs, V, No. 1 (1966), p. 61.

<sup>17</sup> It was common to find unregistered land on small farms in the Study Region.

<sup>18</sup> Anthony Bottomley, "The Cost of Administering Private Loans in Underdeveloped Rural Areas," Oxford Economic Papers, V, No. 2 (1963), pp. 154-163.

kind of risky loan, namely for an innovative project, has not been well discussed in the literature. Cases are cited where funds were borrowed at high interest rates to buy "green revolution" type inputs. This research shows that the combination of high payoff, new technology, and favorable factor and product prices are sufficient for stimulating investment in the new technology.<sup>19</sup>

A fourth use of non-institutional credit is for simplifying transactions. Most non-institutional lending involves no exchange of money. The farmer receives the goods immediately from the creditor as in a time purchase. Additionally, the farmer may sell his harvest through the same lender, or have other business dealings with the lender that are only marginally related to the loan transaction. These relationships may be complex, including kinship ties, rental of land or machinery, or exchange of labor during harvest. There has been little study to see how these interrelationships affect the economic relationships, in particular the interest rate, of the loan transaction.<sup>20</sup>

In summary, there are three features of the informal lender that distinguish him from the formal lender. First, there is little red tape. The farmer does not waste any time getting the money and he can depend on it for emergencies. Second, the loans are unsecured and the system of repayment is often not specified. Finally, the loans generally are joint transactions such as a time purchase where the credit and

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<sup>19</sup>Lester Brown, Seeds of Change (New York: Praeger Publishers, 1970).

<sup>20</sup>Lionel Caplan, "Interdependence: The Economic Context," Land and Social Change in East Nepal (Berkeley and Los Angeles: University of California Press, 1970), pp. 76-123.

the purchase are negotiated jointly. Based on this kind of evidence, several authors have concluded that formal and informal lenders serve two different markets.<sup>21</sup>

#### Interaction Between Formal and Informal Lenders

An examination of credit use patterns in Brazil from 1965-69 have hinted that informal credit has declined in importance in rural Brazil. These observations were taken from repeat surveys of 289 farms.<sup>22</sup> This was attributed to the policies of the Federal government which set formal interest rates 18 to 25 percent below the informal rates and increased the volume of the credit program. The apparent result has been a decline in informal business overall. It has probably caused a change in the distribution of loans as well because the informal lender has lost those customers who could qualify for a bank loan. There is a tendency for him to handle the smaller, more risky customers.<sup>23</sup>

Several authors have suggested that the formal credit program in Brazil caters primarily to the larger commercial farmer. In fact, the

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<sup>21</sup>Charles T. Nisbet, "Informal Lenders as Suppliers of Development Credits to Small Farmers in Developing Countries: Attractive or Deceptive Alternative," Paper prepared for the United States Agency for International Development Spring Review of Small Farmer Credit (Washington, D.C.: United States Agency for International Development, 1973).

<sup>22</sup>Joseph L. Tommy, "Credit Use and Capital Formation on Small to Medium Sized Farms in Southern Brazil, 1965-69" (unpublished M.S. thesis, Department of Agricultural Economics and Rural Sociology, The Ohio State University, 1971), pp. 68-69.

<sup>23</sup>Anthony Bottomley and Donald Nudds, "A Widow's Cruse Theory of Credit Supply in Underdeveloped Rural Areas," The Manchester School of Economic and Social Studies, No. 2 (1969), pp. 131-140.

program as administered through banks does not appear suited to serve small farmers.<sup>24</sup> If this is the case, then income transfers to agriculture via credit may be going mainly to the higher income farmers. This conclusion has been suggested by research in Brazil as well as Costa Rica.<sup>25</sup>

Besides interest rates, the differences in services provided by the two credit sources also should influence the way credit is distributed. While these differences have been enumerated in the literature, there have been few attempts to evaluate these services in a way that would allow comparison between various creditors. To make this comparison the "real" borrowing costs, including time lost by the farmer in completing his application, must be considered.

#### Allocation of Resources to Agricultural Production

Ultimately the Brazilian credit program has tried to stimulate growth of the agricultural sector. A public policy decision has allocated capital toward this end. The role of the banks is to divide up

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<sup>24</sup>Judith Tendler, "Agricultural Credit in Brazil--Part II" (unpublished manuscript prepared for the United States Agency for International Development, Berkeley, Center for Latin American Studies, University of California, January, 1970).

<sup>25</sup>Rodolfo Hoffmann, "Contribuição a Análise da Distribuição da Renda e da Posse da Terra no Brasil" ("Contribution to the Analysis of the Distribution of Income and the Ownership of Land in Brazil"), Livre-Docente thesis presented to the Superior School of Agriculture "Luiz de Queiroz" of the University of São Paulo, 1971. Claudio Gonzales-Vega, "Small Farmer Credit in Costa Rica: The Juntas Rurales," Paper prepared for the United States Agency for International Development Spring Review of Small Farmer Credit (Washington, D.C.: United States Agency for International Development, February, 1973).

this capital. Ideally, the distribution of capital should encourage investment in the most productive resources available to farmers. Whether the credit system is supervised or *laissez faire*, its economic role is always to direct funds toward best uses.<sup>26</sup>

Production analysis has been conducted on several types of farms in Brazil. These studies have tried to identify opportunities for reallocating resources. Schultz's position is that these opportunities are very limited. He argues that income already has been maximized in traditional agriculture.<sup>27</sup>

Mellor phrases this argument in terms of the return to labor. A labor surplus implies low wages.<sup>28</sup> If new inputs are introduced that substitute for labor, the returns to the new inputs will be depressed by the labor surplus. To cite an example, the rental price for a machine will be influenced by the alternative of doing the job by hand. If labor becomes scarce because of a structural change in the economy the returns on the machine will increase. This is either because the traditional input is no longer a good substitute for the new input or the traditional input becomes scarce. Schuh has indicated that labor has not become scarce in Brazil. Industry has not expanded rapidly enough to absorb surplus labor migrating from the rural areas.<sup>29</sup>

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<sup>26</sup>R.H. Tuck, "A Reconsideration of the Theory of Agricultural Credit," British Journal of Agricultural Economics (June, 1956), pp. 20-40.

<sup>27</sup>Theodore W. Schultz, Transforming Traditional Agriculture (New Haven: Yale University Press, 1964), p. 37.

<sup>28</sup>John W. Mellor, "The Subsistence Farmer," in Clifton R. Wharton, Jr. (ed.), Subsistence Agriculture and Economic Development (Chicago: Aldine Publishing, 1969), pp. 209-227.

<sup>29</sup>G. Edward Schuh, "Effects of Some General Economic Development Policies on Agricultural Development," American Journal of Agricultural Economics, L, No. 5 (1968), pp. 1291-92.

Several farm level production studies appear to support this position. Nelson conducted a farm level production study in Ribeirão Preto, São Paulo (Brazil). He found that farmers could not increase income by applying more fertilizer.<sup>30</sup> Steitieh studied production functions of mechanized farms in Southern Brazil. He concluded that these farms were realizing low returns to medium-term capital investments.<sup>31</sup> When he analyzed farms that rented machinery services to others, he found that returns to capital were satisfactory. This suggested that there was excess machinery capacity in the region. Better utilization by some farmers because of rental agreements resulted.

This result is not surprising. Interest rate policy, as well as inflation, encourages those who have access to formal credit to over-invest in capital. Given an interest rate of 13 percent and inflation of around 20 percent, high returns are guaranteed by any purchase which maintains its real value.

#### Summary

While Brazil has had various agricultural policies over the years, the most important program has been the bank-administered credit program. Several features of this legislation are directed at assisting small farmers.

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<sup>30</sup>William Nelson, "An Economic Analysis of Fertilizer Utilization in Brazil" (unpublished Ph.D. dissertation, Department of Agricultural Economics and Rural Sociology, The Ohio State University, 1971).

<sup>31</sup>Akram M. Steitieh, "An Analysis of Input Productivity and Productivity Change on Crop Enterprise in Southern Brazil" (unpublished Ph.D. dissertation, Department of Agricultural Economics and Rural Sociology, The Ohio State University, 1971).

The informal lender competes for the business of farmers. These lenders provide a unique service, particularly to small farmers who have little collateral to secure their loans. The interest rates charged for these services in Brazil are two to four times higher than the rates charged by banks under the subsidized credit program. Because of this price differential, there appears to have been a decline in the importance of informal lenders during the 1960's.

There have been attempts to evaluate the Brazilian credit program using production function analysis. These studies have attempted to show how effectively capital goods have been used. The results of this research indicate that there are misallocations of resources at the farm level in several regions of Brazil.

## CHAPTER III

### AREA AND SAMPLE DESCRIPTION

Farms interviewed for this research were located in the southern quadrant of the State of São Paulo. The State is the economic center of Brazil and a major concentration of the Brazilian population. While São Paulo is the center for industrial activity in Brazil, it is also an important agricultural area. The bulk of this agricultural industry is highly commercial.

The major crops are export oriented. They include sugar cane, coffee, cotton, and peanuts. In addition, São Paulo is a major producer of fruits and vegetables, shipping these crops throughout Brazil.

The field data for this research was collected in the municípios of Guaréi and Itapetininga, two adjacent municípios in the agricultural District of Sorocaba (Divisão Integral Regional Agrícola de Sorocaba).<sup>1</sup> The District had a population of 220,000 in 1970, which was only 1.2 percent of the State's population. It is sparsely settled, with over one-half of the residents living in rural areas (Table 1).

The main city in Sorocaba is Itapetininga. It is situated approximately 100 miles west of the City of São Paulo (Figure 1). Itapetininga was one of the more densely populated areas in Sorocaba. The two municípios together accounted for almost half of the District's population.

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<sup>1</sup>For the definition of "município," see "list of terms."

TABLE 1  
 POPULATION OF THE STATE OF SÃO PAULO, BRAZIL,  
 AND THE STUDY REGION (POPULATION IN THOUSANDS)

Geographic Area	Population in 1970					
	Urban		Rural		Total	
	(#)	(%)	(#)	(%)	(#)	(%)
State of São Paulo	14,000	78	3,700	21	18,000	99
Sorocaba	103	47	116	53	220	100
Study Region <sup>a</sup>	45	63	27	38	72	101

<sup>a</sup>Municípios of Itapetininga and Guaréi.

Source: Preliminary Summary of the Demographic Census, Eighth General Census, 1970, São Paulo, Brazil.

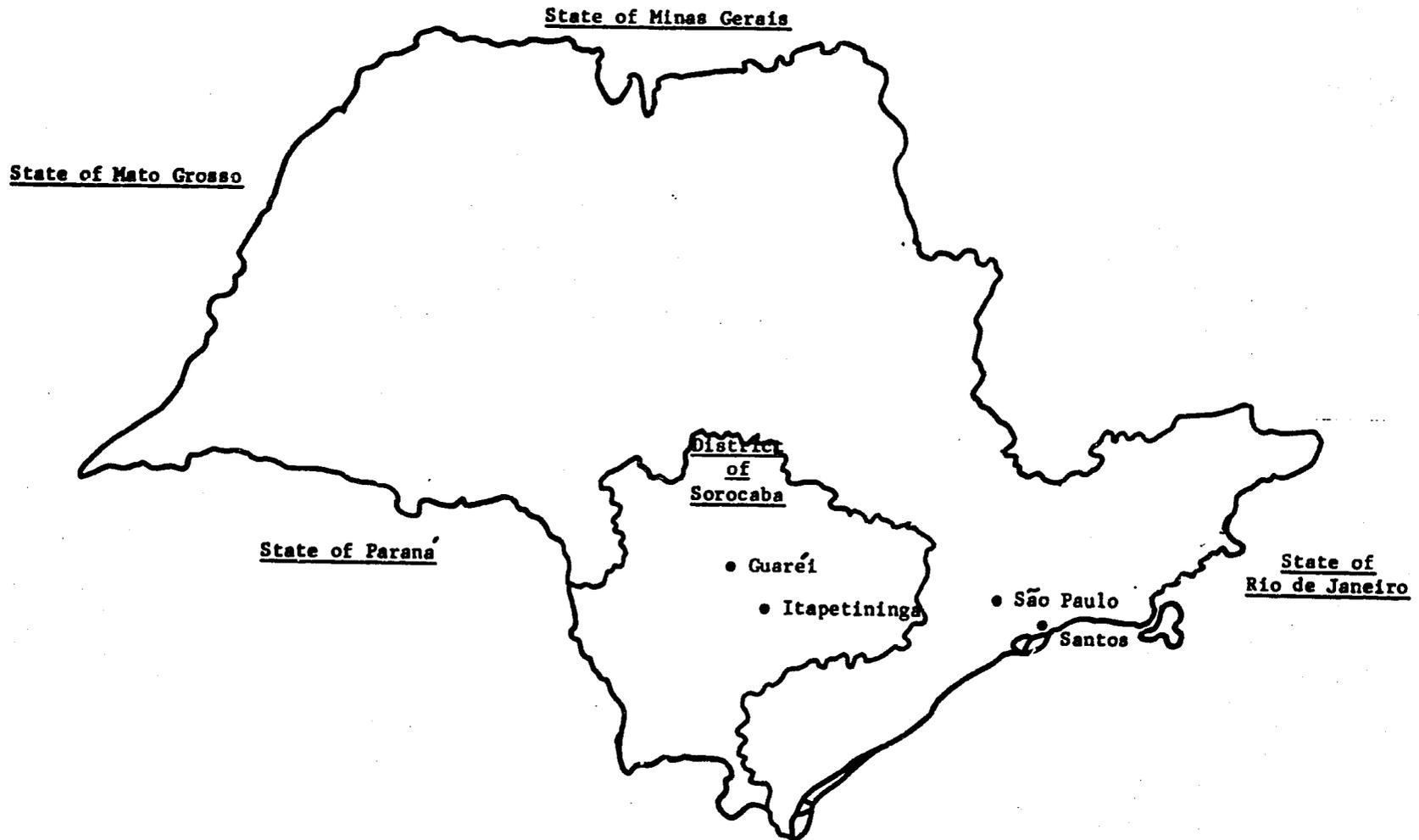


FIGURE 1. Outline Map of the State of São Paulo, Brazil  
Showing the Location of the Study Area

While the District of Sorocaba was one of the poorest regions in the State of São Paulo, it had relatively good financial ties with the rest of the State's economy. Fertilizer could be bought; roads were open to motor vehicles; phones, radios, and television were present in many homes. The cities of Itapetininga and São Paulo were the principal markets.

The most valuable commercial crops raised by small farmers were potatoes and tomatoes. They were assembled by cooperatives and shipped to the City of São Paulo. These crops were raised primarily by farmers of Japanese decendancy and not by other Brazilians. Small farmers generally raised traditional crops of beans, rice, and corn. These crops were important for on-farm consumption and were also sold in the local market. The juxtaposition of progressive Japanese farmers and traditional Brazilian farmers added special interest to the region as a place to study agricultural development.

#### Sample Selection

The sample was selected to be representative of small and medium-sized farms in the region. It included some larger farms (all over 50 hectares) that had been interviewed in 1965.<sup>2</sup> These farms were included specifically to explore the potential for introducing a time series component to the analysis. The larger farms were commercial operations

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<sup>2</sup>Paulo F. Cidade de Araujo, "An Economic Study of Factors Affecting the Demand for Agricultural Credit at the Farm Level" (unpublished M.S. thesis, Department of Agricultural Economics and Rural Sociology, The Ohio State University, 1967).

using both traditional and modern technology in their production practices. These farms made up 20 percent of the final sample.

Serious problems were encountered in the attempt to reinterview farmers. Addresses and names were not clearly noted on the 1965 questionnaires. This was done to reassure farmers that their responses were confidential. The lack of addresses made it time consuming and costly to find each interviewee. The search was aided by the local agricultural agent and a former researcher who identified some of the farmers in the previous sample from memory. They were all located in Guaréí. At the completion of the field work, a comparison was made between the new questionnaires and those from 1965. The lack of names on the 1965 questionnaires made it impossible to determine which farms had been reinterviewed. Thus, matching the two questionnaires to conduct a time series analysis was not feasible within the scope of this research.

To include a cross-section of small farms, a random sample was drawn from the files of farms registered with the Brazilian Institute of Agrarian Reform (Instituto Brasileiro de Reforma Agraria or IBRA). Farms that had declared between 5 and 50 hectares were randomly selected. However, the actual farm size distribution resulting from this selection process was greater than the 5 to 50 hectare range. This occurred for two reasons. First, the registration data was five years old and had not been updated to include new land declarations. Second, the farmers were motivated to under-report their land holdings. They anticipated that the records would be used for tax assessments and for land reform.

The resulting sample included interviews with 150 farms. They were conducted in August, 1971. The selection technique was not completely random and the population was not well defined by IBRA data. This distorted the attempt to stratify the sample by farm size. Nevertheless, the resulting farms represented a broad range of sizes and types located in all parts of the study region.

How did the sample size distribution of farms compare with that of the region? The data available to make this judgment was incomplete. The 1960 agricultural census reported that 50 percent of the farms in the study region were under 10 hectares.<sup>3</sup> The sample included only 21 percent in this category. One reason for this was that farms under 5 hectares were excluded from the sample. This decision was made on the recommendation of local bank and agricultural agents, and after several unsuccessful interviews with farms of this size. In general, these farms were found to be places of residence and not producing units. In terms of percent of total area, the sample and the census are almost identical in the relationship of property and size distributions (Table 2).

For farms under 100 hectares, the census and the sample had almost the same size distribution and area represented. The IBRA definition of minifundio (average area = 15 hectares) seemed comparable to the census and sample definitions under 100 hectares. The larger proportion of farms in IBRA's small farm category may have been due partly to under-reporting by farmers.

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<sup>3</sup>The 1970 agricultural census was conducted concurrently with this field work. At this writing the 1970 census data was not available for use in this study.

TABLE 2

THE DISTRIBUTION OF FARMS IN THE STUDY REGION BY FARM SIZE AS INDICATED BY THE 1960 AGRICULTURAL CENSUS, THE 1965 DATA OF THE BRAZILIAN INSTITUTE OF AGRARIAN REFORM, AND THE 1971 SAMPLE OF 150 FARMS

Farm Size Category	Census - 1960		IBRA - 1965		Sample - 1971	
	Distribution of Farms (%)	Area of Farm Land (%)	Distribution of Farms (%)	Area of Farm Land (%)	Distribution of Farms (%)	Area of Farm Land (%)
Less than 10 ha <sup>a</sup>	50	5	b	..	21	2
Minifundio (Ave. = 15 ha)	..	..	77	22	..	..
10 to 100 ha	39	20	..	..	63	21
101 to 1,000 ha	10	40	..	..	15	77
Latifundio (Ave. = 156 ha)	..	..	24	78	..	..
Over 1,000 ha	<u>1</u>	<u>35</u>	<u>..</u>	<u>..</u>	<u>0</u>	<u>0</u>
Total	100	100	101	100	99	100

<sup>a</sup>ha = hectare = 2.47 acres.

<sup>b</sup>Comparable data were not available for all farm size categories.

Source: Brazilian Institute of Geography and Statistics, 1960 Census; Brazilian Institute of Agrarian Reform (IBRA); and the Farm Interviews.

For farms over 100 hectares, the three data sources appeared to be close in terms of percent of area controlled. The sample had 15 percent of the farms in this group which was slightly higher than the 11 percent reported by the 1960 census.

In summary, the sample appears to be a reasonable representation of the size of farms found in the study region. This result was obtained partly by chance since it was not possible to follow pre-set criteria for selecting the sample.

#### Location of Sample Farms

The sample farms were located from 10 to 60 kilometers from Itapetininga. Farmers mostly used buses to go to the city. On the average, they were 4.5 kilometers from bus lines; 12 percent were on a bus line, 73 percent were up to 10 kilometers from a bus, and 15 percent were over 10 kilometers from a bus line. Thus, about three-fourths of the sampled farmers were within a one-hour walk of a bus. Fifteen percent required more than a two-hour walk. Persons this far from a public transportation system were quite isolated from the city. To travel there and back would have taken a full day or more depending on bus connections.

Private cars and trucks were not common for several reasons. First, the roads were rough on cars. Some examples of problems encountered because of bad roads may be drawn from the research team's experience. One jeep broke through a small wooden bridge. One four-wheel drive vehicle became stuck in a pothole and had to be dug out. Several two-wheel drive vehicles became stuck, one on a hill, another in a

stream that crossed the roadway. In addition, vehicles had mechanical problems, primarily with steering, which was aggravated by the driving conditions.

Second, there were very few auto service facilities outside of the city. This lack of service was handled by auto owners in various ways. One farmer only used his truck for trips to the market. Another stored his truck in the city. His father would drive out and pick up produce to be sold in the Sunday street market. A third farmer related all the problems and expense he had with a truck before he sold it. It constantly broke down on the road and had to be towed to the city for service.

A final related problem was the lack of experience on how to fix and maintain cars. Farmers in the developed countries do most of their own minor repairs on vehicles. Farmers in Brazil were not raised with cars and do not have this knowledge.

These problems--bad roads, no service stations, and lack of training in auto maintenance--made it difficult for farmers isolated from the city to operate their own motor vehicles.

#### Community Structure

The City of Itapetininga is the major market and financial center for the region. It contains over 60 percent of the population of the municipios of Itapetininga and Guaréi. The two municipios were selected for study because they included an area of small farms. This area has been identified as one of two depressed areas in the State of São Paulo by the State's planning agency. Local political leaders have petitioned

government help to initiate development programs.<sup>4</sup> The only new non-agricultural investment has been for reforestation. The Estado de São Paulo (the most important daily newspaper in Brazil) said, "Reforestation today is the great hope of the municipios in the southern region of the state, which to date have been marginalized from any extensive economic progress."<sup>5</sup>

The City of Itapetininga provided almost all of the services required by the agricultural sector. The following agriculturally related agencies were found:

- (1) Three large grain storage firms.
- (2) Two major marketing cooperatives: one specialized in tomatoes and potatoes, the other in milk.
- (3) Offices or representatives of all the major fertilizer dealers including a large mixing plant.
- (4) Various firms selling mechanized and non-mechanized machinery.

There were several other agriculturally related factories that provided employment for about 1,500 persons--a pulp mill, a milk plant, a small tool manufacturer, and several pinga factories (sugar cane rum).

Itapetininga was 20 miles from a four-lane highway. It was a two-hour drive to São Paulo. The inter-city roads were paved; all others were dirt, but fairly well maintained. Most areas were served by daily

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<sup>4</sup>G. Bonadio, "Sorocaba Planeja a Produção Agrícola" ("Sorocaba Plans Agricultural Production"), O Estado de São Paulo (August 8, 1971), p. 50.

<sup>5</sup>S. Coelho, "Região Sul Decide Vencer Estagnação" ("Southern Region Deciding to Fight Stagnation"), O Estado de São Paulo (June 29, 1971), p. 27.

rural buses. During the rainy season, most dirt roads were passable only with four-wheel drive vehicles. Gas stations were only found in Itapetininga.

### Soils and Topography

The municipio of Itapetininga has three principal soil types: two-thirds of the region has dark red Latosol (LE) soils, 30 percent is red podzolic-Laras (PVL), and the remainder is red podzolic-Piracicaba (PVP). LE is chemically poor but has good physical characteristics. It drains well, making it suitable for growing potatoes and tomatoes when heavily fertilized. It is also good pasture land and suitable for reforestation. The topography of this soil is level or gently rolling and well suited to mechanization. PVL and PVP are found in more mountainous areas. These soils are generally more fertile than LE. When the organic content of these soils is high they are called black soils and are excellent for crops such as beans.<sup>6</sup>

The majority of the farms interviewed were located on the podzolic soils (Table 3). Most of these farms were not mechanized and were involved in bean culture. About one-third of the farms were on the LE-type soils. The distribution of soil types suggests that the sample was located on the hillier land in the region. While this was generally the case, the larger farms were found on flat lands. The smallest farms tended to be on rolling land. Medium farms were hillier. They usually included flat areas for cultivation and hilly areas that were used for pasture.

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<sup>6</sup>Based on discussions with extension agents of the agricultural extension service in Itapetininga, São Paulo.

TABLE 3  
 DISTRIBUTION OF SOIL TYPES ON THE SAMPLE  
 OF 150 FARMS IN SÃO PAULO

	Number of Farms Reporting	Red Latosol (%)	Laras Podzolic (%)	Piracicaba Podzolic (%)
Farms with One Soil Type	64	31	52	16
Predominant Soil on Farms with More Than One Type	19	36	49	16

Source: Farm interviews.

### Climate of the Region

Annual rainfall in this region is around 50 inches. In contrast to the rest of the state, rainfall is fairly well distributed throughout the year. The driest months are April through August but they are usually not severely dry. This is specifically advantageous for pasture. Most areas appear to have ample surface water for diversion into irrigation and for watering livestock. Rainfall was unusually heavy in the fall of 1971 during the time of field interviewing. This affected the timing of the harvest and caused some reduction in corn, bean, and rice yields.

The average temperature is around 65° F. July is the coldest month. Frost is common in May, June, and July and will sometimes affect bananas, coffee, and late beans. The region is too warm for apples, and grapes sometimes have to be defoliated to encourage fruit growth.

### Agricultural Production

Overall, the most important agricultural activities in the region were corn production and dairy cattle. Corn was produced as a cash crop by almost all farms. Also, corn was used for home consumption and for livestock. Many of the larger farms had dairy herds. They produced milk or cheese depending, to some extent, on how easy it was to get to the main highway for milk pickup.

Two additional crops raised on most farms for home consumption were beans and rice. These two crops were not considered cash crops. Only the surplus over consumption was sold. The value of their production as reported by the State Secretary of Agriculture, appears low, perhaps

because of high home consumption and low sales (Table 4). Eggs also were produced on almost all the farms in the region, but they were mainly consumed at home.

Potatoes and tomatoes were two cash crops grown in the region, mostly by Japanese farmers.<sup>7</sup> These farmers were members of a cooperative located in Itapetininga. The cooperative marketed the production and acted as an agent for introducing modern technology.

#### Sources of Capital on the Sample Farms

This section examines the sources of capital for use in production. Capital is either generated from internal savings by the farmer or is borrowed from capital markets. Farmers generated capital by agricultural sales, from off-farm investment income, by off-farm employment, and by sales of other capital stock. They borrowed capital from banks and informal lenders.

#### Agricultural sales

Almost all of the farms in the sample sold some crops. The three crops sold by the majority of farmers were corn, beans, and rice. Of these three important crops, corn sales generated over one-half of the revenues (Table 5). Most of this corn was sold for animal feed. For the farms which had large herds, corn was fed to animals and was a less important sale crop. Valued the most important crop for these farms was potatoes (Table 5 ff).

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<sup>7</sup>Several of the sampled farms had tried unsuccessfully to raise tomatoes. One of the few Brazilians who did raise them was a partner with a Japanese farmer.

TABLE 4  
 ESTIMATED VALUE OF THE PRODUCTION OF  
 SELECTED CROPS IN ITAPETININGA AND GUARÉI  
 FOR THE AGRICULTURAL YEAR 1970/71

	Production	
	Value (Cr\$)	Distribution (%)
Corn	15,888,000	64
Beans	475,000	2
Rice	542,000	2
Potatoes	5,250,000	20
Tomatoes	1,920,000	8
Oranges	560,000	2
Bananas	121,000	1
Coffee	123,000	1
Total	24,879,000	100

Source: The Institute of Agricultural Economics and Coordinator of Technical Assistance, Secretary of Agriculture, State of São Paulo. (Estimates based on unpublished tabulations of production data dated June, 1971, and average prices for the region.)

TABLE 5

AVERAGE SALES OF CORN, BEANS, AND RICE BY FARM SIZE IN 1970  
FOR THE SAMPLE OF 150 FARMS IN SÃO PAULO

Farm Size <sup>a</sup> (hectares)	Number of Farms	Corn		Beans		Rice		Total Sales <sup>b</sup>	
		Value (Cr\$)	Distribution (%)	Value (Cr\$)	Distribution (%)	Value (Cr\$)	Distribution (%)	Value (Cr\$)	Distribution (%)
Under 11	32	14,000	5	3,700	4	30	4	17,700	4
11-20	38	70,600	26	17,600	17	940	2	89,100	21
21-50	40	47,700	18	21,500	21	1,200	2	70,400	17
51-100	17	37,600	14	14,300	14	870	2	52,800	13
101-200	13	42,000	16	13,100	13	5,600	12	60,700	14
Over 200	10	55,800	21	33,100	32	40,000	82	128,900	31
Total	150	267,800	100	103,300	100	48,600	100	419,600	100

<sup>a</sup>One hectare = 2.47 acres.

<sup>b</sup>Three farms over 200 hectares had combined potato sales of Cr\$170,000. In addition there were sales of tomatoes (Cr\$24,600), peanuts (Cr\$118), and onions (Cr\$3,170).

Source: Farm interviews.

Corn and beans were the most important crops on the majority of farms in the sample. Potatoes were the second most valuable crop in the study region (Table 5). This crop was mainly raised by land renters. Since the sample was drawn from the IBRA list of land owners, potato farmers were under-represented. Farms with less than 10 hectares appeared to have very low sales, especially in beans and rice. There was high on-farm consumption of these crops. In the case of rice, 94 percent of the sales were made by farms with over 100 hectares. Corn and bean sales were relatively more important on the smaller farms.

Twelve percent of the farms sold dairy products (Table 6). Many had egg production, but only 12 of the farms sold eggs. No specialized egg producers were in the sample though there were several in the region. The dairy farmers who sold cheese usually were located far from milk pick-up points.<sup>8</sup> Most of these farmers were small as shown by their low average sales (Table 6).

#### Income from off-farm employment

Off-farm employment was an important source of cash income for subsistence-oriented farmers in the region. Off-farm jobs provided income in slack farming periods and employment for family members who were not needed on the farm full-time. Opportunities for off-farm employment in Itapetininga were limited.

Three types of off-farm work were observed in Itapetininga: agriculture, handicrafts, and reforestation. Off-farm agricultural work

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<sup>8</sup>Milk was picked up along the main road by trucks from a commercial dairy or a dairy cooperative.

TABLE 6  
 SALES OF CHEESE, MILK, AND EGGS  
 BY 150 FARMERS IN SÃO PAULO

Product <sup>a</sup>	Farms		Value of Sales	Average Sales
	No.	(%)	(Cr\$)	(Cr\$)
Cheese	10	7	24,771	2,477
Milk	8	5	76,060	9,500
Eggs	12	8	1,692	141
No Sales	120	80	..	..
Total	150	100	102,623	..

<sup>a</sup>Lard was also produced but only sold by a few farms.

Source: Farm interviews.

included working for other farmers and making sales in the central market. Most work for other farmers did not generate cash. Payment was an exchange of labor, part of the harvest, or the use of machinery. Some farmers sold their produce in the central market (a biweekly street market). However, most venders were non-farmers.

There were few handicrafts sold in the region. Baskets were made to carry produce from the fields and for groceries. One family made small straw cups that were used to start tomato plants. They worked for a buyer on consignment who supplied all raw materials and marketed the product.

The most important off-farm employment opportunities was in reforestation. Jobs were available to plant seedlings, manage the forest, and harvest trees. One small farmer bought a four-wheeled wagon--an unusual piece of equipment in the region--which he used in his reforestation work. For many farmers, day labor in the forests was their only source of cash income.

In a study on India, Schluter discussed the role of off-farm employment as a way to reduce risk by stabilizing the income of small farmers.<sup>9</sup> In the present study, off-farm income was much more important to small farms under 11 hectares than to large ones. Almost three-fourths of these small farms had off-farm employment income and it was the single most important source of cash for them (Table 7). Most of the farms with off-farm income were under 20 hectares. Income from

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<sup>9</sup>Michael Schluter, "Differential Rates of Adoption of the New Seed Varieties in India: The Problem of the Small Farm," unpublished Occasional Paper No. 47 (Ithaca, N.Y.: Department of Agricultural Economics, Cornell University, August, 1971).

TABLE 7  
 VARIOUS SOURCES OF INCOME BY FARM SIZE IN 1971  
 FOR THE SAMPLE OF 150 FARMS IN SAO PAULO

Farm Size (hectares)	Total Number of Farms	Average Off-Farm Employment Income		Average Gross Sales Per Farm						Average Income from Other Agricultural Sources		Average Non- Agricultural Income	
				Crops		Animals		Animal Products					
		Responses (#)	Value (Cr\$)	Responses (#)	Value (Cr\$)	Responses (#)	Value (Cr\$)	Responses (#)	Value (Cr\$)	Responses (#)	Value (Cr\$)	Responses (#)	Value (Cr\$)
Under 11	32	23	1,200	19	1,000	20	600	11	200	1	60	9	1,000
11-20	38	17	700	34	3,200	21	2,200	11	500	4	300	1	1,100
21-50	40	11	1,100	33	2,300	29	1,400	22	700	4	700	12	2,500
51-100	17	3	300	15	3,900	15	2,400	11	2,400	4	1,900	4	1,500
101-200	13	1	400	12	5,200	10	7,400	11	5,200	2	2,600	1	800
Over 200	10	2	12,400	6	82,900	10	16,600	7	14,600	4	7,700	2	16,600
<b>Total</b>	<b>150</b>	<b>57</b>	<b>1,300</b>	<b>117</b>	<b>6,900</b>	<b>105</b>	<b>3,600</b>	<b>73</b>	<b>2,800</b>	<b>19</b>	<b>3,600</b>	<b>29</b>	<b>2,800</b>

Source: Farm interviews.

other agricultural sources (e.g., land and machinery rental) and from non-agricultural sources (e.g., rental income from a house) were not very important in the region. For most farmers, crop sales were the principal source of income.

Some of the farms had off-farm businesses that increased their use of farm machinery. These included corn threshing, trucking, and a small flour mill. One farmer had a small brick factory which he said he bought instead of farm machinery. The farmer said that he was better off investing in the brick factory than in mechanizing his farm.

#### Summary

This research was conducted in a depressed region of the State of São Paulo. The region was a small-farm, low-income area where most of the agriculture was traditional. The sample was selected to reflect the importance of small farms in the area, though it included a broad range of farm sizes.

The central city of the region provided all of the infrastructure required by a developing economy. However, there were few employment opportunities either in the city or in the rural areas. This had a depressing effect in all aspects of the economy, including agriculture. A positive economic influence has been the influx of Japanese farmers--producing tomatoes, potatoes, and other cash crops--and the increase in reforestation. Reforestation was an important source of off-farm income for small farmers.

## CHAPTER IV

### SOURCES OF AGRICULTURAL CREDIT

The purpose of this chapter is to discuss the supply conditions of agricultural credit in the study area. As mentioned earlier, the financial center serving the farmers in this study was the City of Itapetininga. Banks, dealers, and merchants in and around the city were important sources of agricultural credit. The Bank of Brazil and the State Bank of São Paulo dominated the credit market. It was estimated that they lent 75 percent of the value of formal agricultural loans.<sup>1</sup> This refers to the value of contracts negotiated in any one year. It does not include contracts negotiated in previous years and still in force. Eighty percent of the value of formal loan contracts in the sample were from these two banks (including all contracts still in force during the study year) (Table 8).

#### Credit Measures

Before discussing the sample data, a word is in order about how credit was measured. There are at least four different measures which might be used in credit studies. The first is the contractual value referred to above. It is the face value of the loan. This value describes the size of the original contract. It is a useful descriptor of the size of loans being negotiated. It can show which lenders are

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<sup>1</sup>Based on interviews with four banks in Itapetininga who were responsible for about 85 percent of the region's formal agricultural credit.

TABLE 8

NUMBER AND CONTRACTUAL VALUE OF LOANS OUTSTANDING DURING THE 1970 TO 1971  
 AGRICULTURAL YEAR BY SOURCE OF LOAN FOR THE SAMPLE  
 OF 86 BORROWERS IN SÃO PAULO<sup>a</sup>

Source of Loan	Loans					
	Number			Value		
	Contractual Value		Distribution by Type of Loan (%)	Contractual Value		Distribution by Type of Loan (%)
	(Cr\$)	(%)		(Cr\$)	(%)	
<b>Formal Credit</b>						
Bank of Brazil	24	16	34	174,094	32	38
Bank of the State of São Paulo	38	25	53	189,047	35	42
Other banks (six different institutions)	9	6	12	92,073	17	20
Total formal credit	71	47	100	455,214	84	100
<b>Informal Credit</b>						
Family	9	6	11	7,486	1	8
Friends	13	9	16	16,771	3	19
Neighbors	10	7	13	7,550	2	8
Money lenders	2	1	3	1,100	..	1
Merchants	22	15	27	7,050	1	8
Land mortgages held by former owner	5	3	6	34,450	6	38
Dealers	19	13	24	16,784	3	18
Total informal credit	80	53	100	91,191	16	100
Total formal and informal loans	151	100		546,405	100	

<sup>a</sup>Only 55 percent of the sample were borrowers.

Source: Farm interviews.

handling the largest loans and which borrowers are receiving them. This value is often used in credit studies. It is most frequently tabulated in published sources and is usually easy to obtain from bank files. However, it does not always reflect the amount of money actually available to the farmer during the production year.

On contracts negotiated prior to the production year, the contractual value of a loan may not reflect its availability. This will be the case if the loan is partially liquidated by the start of the year. This obligation is a second measure of credit and is usually referred to as the unpaid balance. It is defined as the contractual value minus the portion liquidated. Where payments have not been made on loans before the start of the study period, the contractual value and the unpaid balance are equal. Where payments have been made, the contractual value will overstate the credit in use by the farmer. The unpaid balance, however, will include only funds which the farmer controlled at some time during the year.<sup>2</sup> He may not have controlled all of these funds for the entire production year.

The unpaid balance is most useful as a measure of available credit if all new loans are negotiated at the beginning of the year and run through the year. However, many loans in Brazil are negotiated during or near the end of the year and are not available for use during the entire production cycle. For this reason, temporally pure measurements taken at a point in time are useful. The third and fourth type of

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<sup>2</sup>A loan may not be entirely available when it is negotiated if it is released to the lender in installments. This is a common practice of banks in Brazil. Presumably the release of funds during the year should reflect the timing of expenditures. This may not always be the case. One major exception will be discussed in the next chapter.

measures are the year beginning balance and the year ending balance. These measures include the unpaid balance on all loans in force at the beginning and the end of year respectively. The following section will utilize these four definitions to explain credit use on the sample farms. The advantages and disadvantages of the various measures will be discussed.

#### Credit Available for the Sample of Farms

This section examines the credit that the sample of farms had available for use during 1970/71. Credit was defined as loans and time purchases that had outstanding balances during 1970/71.<sup>3</sup> The availability of this credit for use was defined in several ways, each providing a slightly different perspective on the credit supply. These definitions are discussed below.

#### Measurement of credit supply for the sample

The data for describing the use of credit was generated from the following questions:

- (1) What was the face value of all loan contracts that were in force during any part of 1970/71? This was called the contractual value.
- (2) What was the unpaid balance of all the active loans in September, 1970 (the beginning of the study year)? This was called the year beginning balance.

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<sup>3</sup> Excluded from this definition were accounts paid monthly in food stores. The time period on this credit was too short to have much effect on the farm firm's production possibilities. Where these accounts accumulated for over three months, however, they were considered as time purchases.

(3) What was the unpaid balance of all active loans in July, 1971 (the end of the study year)? This was called the year end balance.

(4) When was the loan negotiated and how many months did it run?

Loans which were described by one or more of the three measurements--namely contractual value, year beginning balance, and year end balance--may have been available for use before, during, and/or after the study period. This depends on when the loan was negotiated and how much was paid back prior to the beginning of the year. There are four general cases (Table 9):

Case I. The loan was negotiated prior to the start of the production year.

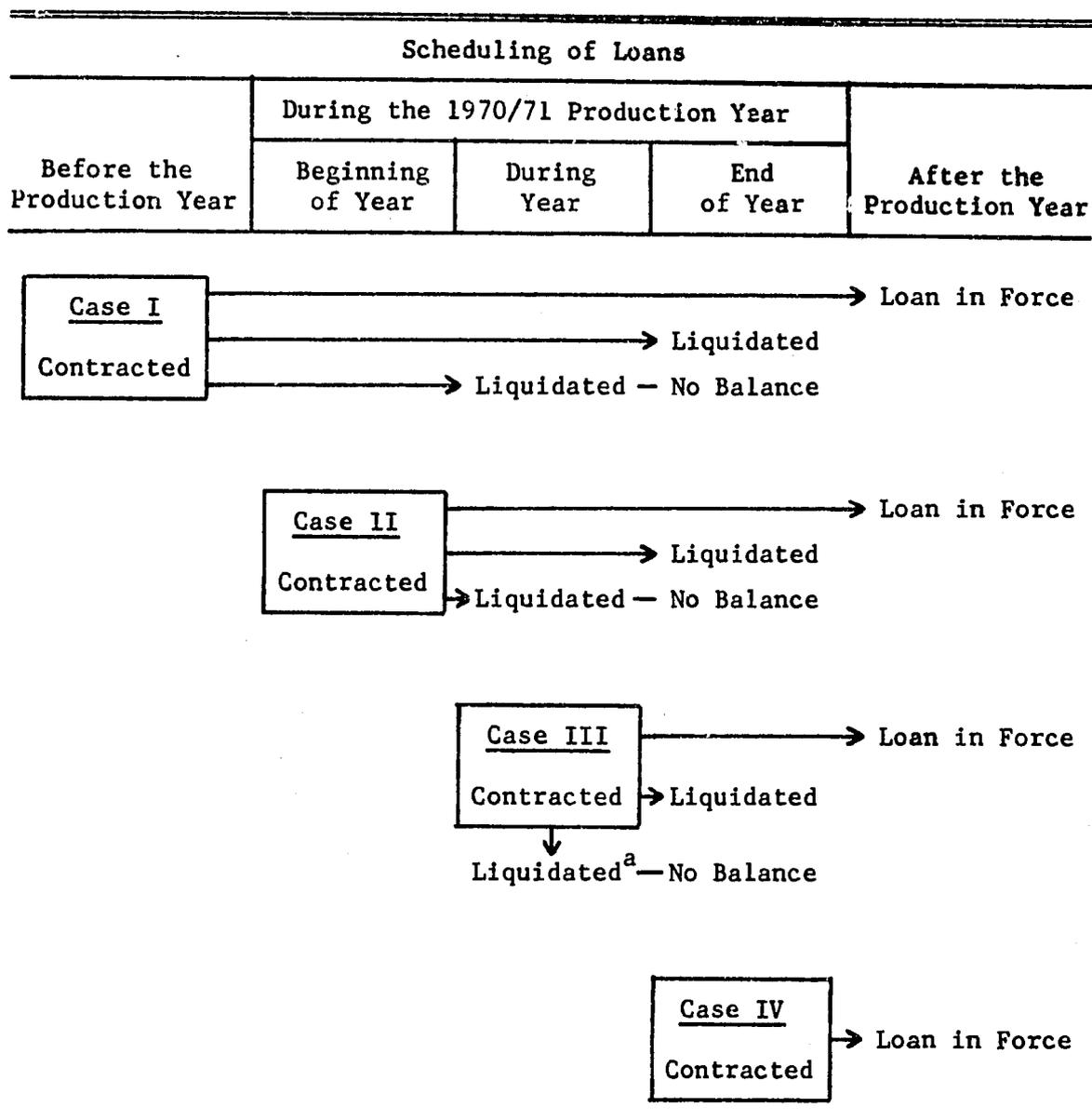
Case II. The loan was negotiated at the beginning of the production year.

Case III. The loan was negotiated during the production year.

Case IV. The loan was negotiated at the end of the production year.

Contractual value--As mentioned before, the contractual value is the face value of a loan. As shown in Table 9, this includes all four cases of loans, whether negotiated prior, during, or at the end of the production year. Conceptually, it could include money that the farmer never had for use during the year. This applies to all Case IV loans, and Case I loans that were partially liquidated prior to the beginning of the production year (Table 9).

TABLE 9  
 SCHEMATIC SHOWING THE HYPOTHETICAL SCHEDULING  
 OF LOAN NEGOTIATIONS AND LIQUIDATIONS  
 DURING THE PRODUCTION CYCLE



<sup>a</sup>Elapsed time greater than or equal to three months.

While contractual value is not a perfect measure of funds available during the year, it is useful to describe the size of loans that each farmer may acquire from various credit sources. In credit supply studies, this value is often used to measure the annual volume of credit from a particular source. It shows to what extent farmers have had borrowing experience from the various types of lenders. In Brazil, where agricultural credit is usually short-term, only a small proportion of the contractual value will be loans negotiated prior to the production year. In the sample, 7 percent of the loans fell into this category (not shown). Of the loans contracted prior to the beginning of the year only 2 percent of the contracted value was actually liquidated by the start of the year in September (Table 10). (This is calculated as  $[\text{Contractual Value} - \text{Sum of Loans in Force}] / \text{Contractual Value}$ .) Thus, in countries where agricultural credit is short-term, the contractual value of loans is a useful statistic for showing loan size and volume of loans going into the agricultural sector.

Year beginning balance.--Year beginning balance is the value of all outstanding obligations in September, 1970. As shown in Table 10, this included the loans in force (i.e., unpaid balance) on Case I loans and the contractual value of Case II loans. Loans negotiated after September are excluded. Year beginning balance is one of two temporally homogeneous measures of credit that is usually available for farm-level research (the other is year end balance). It is a measure of the credit the farmer had in hand at the start of the year upon which to base his production plans.

TABLE 10

VARIOUS MEASURES OF LOANS OUTSTANDING DURING THE  
1970 TO 1971 AGRICULTURAL YEAR BY SOURCE OF LOAN  
FOR THE SAMPLE OF 86 BORROWERS IN SAO PAULO

Type of Loan	Number of Farms	Loans Outstanding During Production Year									
		Contractual <sup>a</sup> Value		Year Beginning Balance		Sum of Loans <sup>b</sup> in Force		Year End Balance		Loans Received During 1970/71	
		(Cr\$)	(%)	(Cr\$)	(%)	(Cr\$)	(%)	(Cr\$)	(%)	(Cr\$)	(%)
Formal	43	454,500	83	212,700	89	445,700	83	277,800	80	373,600	82
Non-Bank	22	16,800	3	3,500	1	16,800	3	8,800	3	11,900	3
Time Purchases	32	74,800	14	23,000	10	74,600	14	60,600	17	67,800	15
Total Informal <sup>c</sup>	52	[91,600]	[17]	[26,500]	[11]	[91,400]	[17]	[69,400]	[20]	[79,700]	[18]
Total Loans <sup>c</sup>	86	546,100	100	239,200	100	537,100	100	347,200	100	453,300	100

<sup>a</sup>Contractual value of all loans in force, including those received prior to September, 1970.

<sup>b</sup>Excludes portion of loans liquidated prior to September, 1970.

<sup>c</sup>Does not equal sum of the above because some farms had more than one type of loan.

Source: Farm interviews.

September is also when most production loans take effect in this area of Brazil. The value of the year beginning balance for all farms studied was Cr\$239,000 (Table 10). About Cr\$9,000 was unpaid from previous years so that new obligations in September were around Cr\$230,000. While September appeared to be the month when most loan contracts began, these contracts represented less than one-half of the credit held by farmers during the year (year beginning balance/unpaid balance) (Table 11). Considerably more of the formal loans were liquidated than were the informal loans. As a result there was considerably more carry-over of informal credit relative to the quantity of credit from the two sources.

A carry-over of credit from one year to the next is a natural phenomenon resulting from long-term investments. These investments are in land and machinery. A carry-over may also be caused by an emergency situation such as a crop failure. A crop failure would delay the timely liquidation of the loan.

There were some farmers who suffered high crop losses at the end of the 1970/71 season. Unseasonal rains in the fall (the months of June and July) destroyed some rice and bean crops and delayed the harvest of corn. Farmers who were dependent on timely transport also suffered because farm roads were sometimes impassable. This primarily affected tomatoes.

It is difficult to speculate what is normal credit carry-over and what is excessive for an agricultural area like Itapetininga. Only 24 percent of the informal credit was paid off at the end of the year. This seems low. It may have been that farmers borrowed to meet their formal loan obligations, but this is not obvious from the data.

TABLE 11

## RATIOS DESCRIBING RELATIONSHIPS BETWEEN VARIOUS MEASURES OF CREDIT

Type of Loan	Percent of Contractual Value Liquidated in 1970/71	Loans Received During the Year ÷ Unpaid Balance (in percent)	Credit Availability <sup>a</sup>		Credit Availability ÷ Unpaid Balance (in percent)	1 - (Unpaid Balance ÷ Contractual Value) <sup>b</sup> (in percent)	Beginning Year Balance ÷ Unpaid Balance (in percent)
			(Cr\$)	(%)			
Formal	40	84	367,700	89	76	2	48
Non-Bank	48	71	10,800	3	64	.. <sup>c</sup>	21
Time Purchases	19	91	31,900	8	43	.. <sup>c</sup>	31
Total Informal	24	87	42,700	11	47	.. <sup>c</sup>	29
Total	35	84	379,400	100	71	2	43

<sup>a</sup>Credit availability = unpaid balance ÷ months available during year.

<sup>b</sup>This is the proportion of the contractual value liquidated prior to the beginning of the year, on loans negotiated before the year but still in force.

<sup>c</sup>Value smaller than 0.01.

Source: Farm interviews and calculations of data in Table 10.

Credit availability.--All of the above measures do not fully describe the availability of credit during the year. For example, a loan available for one-half of the year does not fill as much of the credit needs of farmers as a loan available for the ten-month production cycle. To incorporate the impact of credit, the sum of loans in force during the year was weighted by the proportion of the year it was unpaid. A loan made in August or September, 1970, and running through July, 1971, was assumed to be available for the entire production year and counted at 100 percent. If negotiated in July, 1971, the loan was not counted (weight = 0). This measure was called credit availability. The result of these calculations is shown in Table 11. The total value of credit available is 9 percent higher than the year end balance and 59 percent higher than the year beginning balance. Thus, considerably more credit was actually in use during the year than was shown in the year beginning balance. Year end balance appeared similar in magnitude, perhaps because (a) credit obligations were not liquidated immediately after sale of crops or (b) a less than average crop in 1970/71 and a late harvest delayed payments. It is not clear which was the case.

It is interesting to examine the distribution of this availability measure. The proportional distribution of credit availability and the ratio of credit availability to unpaid balance indicate that formal loans were available during a greater part of the year than were informal loans. This can be interpreted in two ways. First, it could mean that a given loan from a bank was worth more than an informal loan of the same amount because the farmer had longer use of the funds. A second interpretation is that the farmer was indebted for a longer period of

time per application of credit when he dealt with a bank rather than an informal lender. This second interpretation recognizes that a farmer may not realize returns from credit during the entire period of his loan. His use of inputs purchased with credit in production is cyclical. An ideal loan would be credited to him the day he buys and applies his inputs. He should be able to liquidate the loan on the day he sells his harvest. Conceptually, a time purchase comes closest to this ideal. In this case, a farmer does not have borrowed cash in hand prior to his need for it. When the ratio of credit availability to the unpaid balance was calculated, it showed that time purchases were less available than any other credit source. It appeared that time purchase credit would not be in the hands of the farmer when he did not need it.

If this interpretation is correct, then availability is really a measure of timeliness of credit. The more timely a loan, the less time the borrower will be paying carrying charges on uninvested funds, and the less available the funds will be during the year. While formal credit appears to be 33 percent more available than informal credit, it may indicate that one-third of the interest charges are being spent during periods when the funds are not actually in use. This conclusion contradicts that of Feaster who argued that the longer the period the better the loan. Whether long or short, the best loan conforms to the farmer's investment requirements.<sup>4</sup> To confirm this hypothesis would require more detailed

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<sup>4</sup>John Gerald Feaster, "An Analysis of the Relationship Between Infrastructure and Agricultural Development in Caqueta, Colombia" (unpublished Ph.D. dissertation, Department of Agricultural Economics, University of Kentucky, 1970), p. 81.

data on the flow of credit and internal funds in the farm business than was available in this study.

#### Use of Agricultural Credit by Source

Much has been said in the literature about the differences in use between formal and informal credit. The assumption that the uses of credit can be differentiated is also very much a part of the Brazilian formal credit program. This is seen by (a) the fact that applications for consumption credit are not funded, (b) the special low rates on fertilizer loans, and (c) the special fund for machinery purchases. While it is true that one lender might lend for consumption uses and another lend for production uses, that does not mean that the final use of those dollars is as stated. This is because the final application of funds results from a decision by the farmer, not from a reason stated in the application form.

A simple example will illustrate the point. One farmer has \$100 in savings and borrows \$100 from a bank for fertilizer. He buys food with his savings and fertilizer with his loan. A second farmer has \$100 in savings. He cannot obtain a formal loan so he buys fertilizer with his savings. He then allows his credit account to accumulate up to \$100 in the local store. This illustrates the fungibility of money; that is, the substitution between uses of borrowed capital for internal resources. Thus, it is not quite correct to say that informal lenders provide farmers with consumption credit. Rather, they provide a high interest-bearing credit service that increases the discretionary resources the farmer has available to him.

The same concept of fungibility applies to the substitution of family labor for hired labor in the production processes of subsistence farmers. One farmer needs funds to pay wages, the other needs funds to feed and clothe his working family. Thus, on a subsistence farm, consumption expenses are in lieu of production expenses.<sup>5</sup> The formal lender does not fund these two types of expenditures in the same way. Indirectly they are rejecting farmers who are not commercial enough to justify obtaining a loan for a production use. Farmers are also making parallel decisions based on the cost and convenience of obtaining loans for the various stated reasons.

There were 160 different uses specified for the 151 loans in the sample (Table 12).<sup>6</sup> Twenty-three percent of these loans were for consumption. There was large variation between the types of lenders granting consumption loans. Banks and dealers knowingly granted few loans directly for consumption. Merchants granted over 50 percent of the consumption loans in the sample. One-fourth of the loans from friends, relatives, and neighbors (i.e., "other") were labeled for consumption. Thus, there were no clear patterns between formal and informal lenders in the use of funds for consumption. In particular banks were not much different from dealers based on the consumption criteria.

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<sup>5</sup>Rudolf Blitz and Millard F. Long, "The Economics of Usury Legislation," The Journal of Political Economy, LXXIII (February - December, 1965), pp. 608-619.

<sup>6</sup>The use of credit told to an interviewer and that told to the lender may have differed. The most likely discrepancy was that formal credit was not for consumption. The same discrepancy was probably used on the loan application. In any event the low number of consumption loans from banks was as expected.

TABLE 12

USE OF FORMAL AND INFORMAL AGRICULTURAL CREDIT BY SOURCE OF LOAN  
AS REPORTED BY THE SAMPLE OF 82 BORROWERS IN SÃO PAULO

Use of Credit	Source of Loans										Total Formal and Informal Loans	
	Formal Loans		Informal Loans									
			Dealer		Merchant		Other		Total			
	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)
Investment (land, machinery, animals)	30	39	1	5	2	9	14	35	17	20	47	29
Production (seeds, fertilizer, pesticides, operating expenses)	40	53	19	86	1	5	16	40	36	43	76	48
Consumption	6 <sup>a</sup>	8	2	9	19	86	10	25	31	37	37	23
Total	76	100	22	100	22	100	40	100	84	100	160 <sup>b</sup>	100

<sup>a</sup>Includes four loans for which the primary use was not consumption.

<sup>b</sup>Total of nine loans were double counted because of multiple use.

Source: Farm interviews.

Seventy-seven percent of the loans were for investments and production uses (Table 12). Production was the dominant use. This was influenced by the lack of long-term credit due to bank policy and high inflation rates. Dealers and merchants were especially sensitive to inflation and apparently could not compete with the low interest rate policies of the banks. Other lenders mostly operated under terms where inflationary adjustments could be included in the lending agreements. Loans that sometimes included these adjustments were for land purchases and improvements. They were responsible for 82 percent of the informal investment loans.

Banks were the most important source of investment loans. These were short-term loans of no more than five years. The investment loans from banks were mainly for mechanized equipment. Thus, formal loans overall were most important for production and investment. Informal loans also served these functions though the informal credit was used mostly for land purchase while the formal credit was for tractors.

#### Distribution of Agricultural Credit

It has been shown that informal credit was a relatively small part of the value of agricultural loans. However, the impact of this credit was large since it was the primary source of funding for small farmers. Seventy-eight percent of the contractual value of the credit to farmers with up to 20 hectares was informal (Table 13). For large farmers, only 14 percent of the value of their credit was from informal sources.

The small loan business (defined as loans up to Cr\$1,000) was dominated by informal lenders. The value of small loans from informal

TABLE 13

VALUE OF FORMAL AND INFORMAL LOANS BY FARM SIZE FOR THE  
SAMPLE OF 86 BORROWERS IN SÃO PAULO

Farm Size (hectares) <sup>c</sup>	Formal Loans						Informal Loans						Total Formal and Informal Loans	
	Small Loans <sup>a</sup>		Large Loans <sup>b</sup>		Total Formal Loans		Small Loans <sup>a</sup>		Large Loans <sup>b</sup>		Total Informal Loans			
	(Cr\$)	(%)	(Cr\$)	(%)	(Cr\$)	(%)	(Cr\$)	(%)	(Cr\$)	(%)	(Cr\$)	(%)	(Cr\$)	(%)
0-20 [Percent]	6,782 [18]	63	1,375 [4]	..	8,157 [22]	2	10,374 [28]	46	18,571 [50]	18	28,945 [78]	23	37,102 [100]	6
21-50 [Percent]	3,293 [6]	31	29,434 [49]	7	32,727 [55]	7	9,331 [16]	41	17,800 [30]	17	27,131 [45]	22	59,858 [101]	10
Over 50 [Percent]	640 [..]	6	408,290 [85]	93	408,930 [86]	91	2,855 [1]	13	65,850 [14]	64	68,705 [14]	55	477,635 [100]	83
Total [Percent]	10,715 [2]	100	439,099 [76]	100	449,814 [78]	100	22,560 [4]	100	102,221 [18]	99	124,781 [22]	100	574,595 [100]	99

<sup>a</sup>Small loans were less than or equal to Cr\$1,000.

<sup>b</sup>Large loans were greater than Cr\$1,000.

<sup>c</sup>One hectare = 2.47 acres.

Source: Farm interviews.

sources was about double those from formal sources. While this was only 22 percent of the total value of loans from informal lenders and 2 percent from formal lenders, small loans were relatively more important for some farmers.

Forty-six percent of the value of loans to small farmers was small loans of up to Cr\$1,000. Eighteen percent came from formal sources and 28 percent from informal sources. Thus, for the small farmers, small loans were considerably more important than they were for the sample as a whole. While this was not surprising in itself, it was surprising that 18 percent of this credit came from banks. That is, while banks only supplied 2 percent of the money to the sample in the form of small loans, small farmers got most of it.

This observation raises two questions. First, why did banks negotiate small loans? While small loans represented only 2 percent of formal credit, they were almost one-third of the number of loans granted (Table 14). The source of these small formal loans was the two state banks (Bank of Brazil and Bank of the State of São Paulo). They were the only banks that issued small loans (less than Cr\$1,000). They did so as part of their obligation to lend 10 percent of their portfolio out as small loans defined as 50 times the minimum salary or about Cr\$10,000 (Resolution 97).

The second question is why did banks negotiate small loans with small farmers? While some of these loans went to medium and large farmers, small farmers dominated the small loan business. This is shown both in terms of the value of the loans (Table 13) and the number of loans (Table 14). It is obvious from the data that both small and

TABLE 14

NUMBER OF FORMAL AND INFORMAL LOANS BY FARM SIZE AS REPORTED  
BY THE SAMPLE OF 86 BORROWERS IN SÃO PAULO

Farm Size (hectares) <sup>c</sup>	Formal Loans						Informal Loans						Total Formal and Informal Loans	
	Small Loans <sup>a</sup>		Large Loans <sup>b</sup>		Total Formal Loans		Small Loans <sup>a</sup>		Large Loans <sup>b</sup>		Total Informal Loans			
	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)
0-20 [Percent]	12 [24]	63	1 [2]	2	13 [26]	19	31 [62]	47	6 [12]	40	37 [74]	46	50 [100]	33
21-50 [Percent]	5 [11]	26	12 [26]	24	17 [37]	24	27 [59]	41	2 [4]	13	29 [63]	36	46 [100]	30
Over 50 [Percent]	2 [4]	1	38 [69]	74	40 [73]	57	8 [14]	12	7 [13]	47	15 [27]	18	55 [100]	36
Total [Percent]	19 [13]	100	51 [34]	100	70 [46]	100	66 [44]	100	15 [10]	100	81 [54]	100	151 [100]	100

<sup>a</sup>Small loans were less than or equal to Cr\$1,000.

<sup>b</sup>Large loans were greater than Cr\$1,000.

<sup>c</sup>One hectare = 2.47 acres.

Source: Farm interviews.

medium-sized farmers negotiated small loans. However, most of these loans were obtained from informal sources. Just looking at medium-sized farms in isolation, it would appear that most of their small loans, especially when considering number of loans, were from informal sources (Table 14). In fact, 59 percent of the loans to medium-sized farmers were informal loans that were not over Cr\$1,000. Add to this the five small formal loans and one finds that 70 percent of the loans to medium-sized farmers were small loans. It is not self evident why more of these loans were not from formal sources.

The following patterns may be observed from this data. First, small farmers primarily dealt with informal lenders (78 percent of the value of loans). This applied to both small and large loans. Second, medium-sized farmers dealt with both formal and informal lenders fairly equally. Sixty-three percent of their loan contracts were with informal lenders (Table 14). This only accounted for 45 percent of the value of the loans however (Table 13). The medium-sized farmers tended to acquire their small loans from informal sources and their large loans from the banks (Table 14). This was contrary to what was expected. Banks were required to make small loans but these could have gone to large farmers instead of small ones. The medium-sized farmers generally did not have institutional barriers to acquiring formal credit. Why then did they choose to borrow small loans from informal sources? The lack of an institutional explanation, such as lack of clear land title or lack of financial experience, suggests that market forces may have influenced this pattern. That is, the market for credit may justify the

observation that medium-sized farmers choose to acquire small loans from informal sources. This phenomenon will be discussed in Chapter V.

The third pattern observed was that the large farmers received 73 percent of their loans and 86 percent of the value of their credit from formal sources. Small loans were much less important to these farmers. However, ten small loans were contracted by these farmers, which was 28 percent of their loans. Two-thirds of these were from informal sources.

#### Summary

Forty-seven percent of the number of loans and 83 percent of the contractual value of loans were from formal sources. Thus, in terms of value, informal loans were a small part of the credit market. In terms of number of transactions, informal loans were more important than formal loans.

Informal transactions were enhanced by their timeliness. Based on a measure of credit availability, it was concluded that time purchases probably resulted in the lowest carrying charges per application of credit. The conclusion that this credit was timely is tentative. It presumes that the farmer was not forced to liquidate his loan prematurely.

The assertion that informal credit was for consumption uses was not supported when type of informal lender was examined separately. Dealers, for example, lent only 9 percent of their loans for consumption. This was comparable to banks. This feature applied only to merchant credit.

The business of making small loans of up to Cr\$1,000 was dominated by informal lenders. These small loans went to small and medium-sized farms. While small loans were only 6 percent of the value of all loans, they were almost 46 percent of the value of loans to small farmers. In terms of number of observations, small loans were 86 percent of the loans to small farmers, 70 percent of the loans to medium-sized farmers, and 18 percent of the loans to large farmers. Medium-sized farmers received twice as many of their small loans from informal sources as did small farmers. This evidence is contrary to previous research that identified small farmers as the principal beneficiaries of informal lending activity.

## CHAPTER V

### HOW BANKS ALLOCATE AGRICULTURAL CREDIT

The previous chapter discussed the farm level distribution of agricultural credit. This chapter will discuss how this distribution was achieved. The chapter focuses on the operation of the banking system and how borrowers react to this system. The first part will discuss how banks make decisions to lend. The second part will discuss how these decisions affect borrower's credit costs.

#### Operational Procedures of Formal Lenders

The administration of the agricultural credit program is directed by the Rural Credit Act of 1965 (Law number 4829). The legislative constraints and operational procedures of the Act were discussed in Chapter II. Also influencing how formal credit is allocated are the bank managers who are trying to run a profitable institution. This section will discuss how banks decide who their farmer clients will be and under what terms they lend to farmers.

#### Choosing the client

There are two principal decisions being made by the bank agent about a prospective client. First, whether or not the client is a good credit risk. Since banks must lend agricultural credit at fixed rates,

they cannot overtly charge more to risky clients. Their strategy, therefore, is to minimize losses by selecting the "best" clients. They make this selection by (a) evaluating the loan application and appraising its chances of success and (b) subjectively evaluating the character, reputation, and management skills of the client to decide if he is likely to repay his loan.<sup>1</sup>

The second decision being made about the client is whether or not he will be a good customer for other bank services. Since the banks make much less money on agricultural loans than other less regulated business, they try to sell other services to farmers. This includes checking and savings accounts, commercial loans, trips to Europe, car buying clubs, etc. Thus, banks in Brazil view agricultural credit as a "loss-leader" which brings in customers. An attractive customer is one who keeps an account in the bank, buys inputs and sells produce, and has off-farm business dealings. He is generally commercial enough to require the broad services of a bank. Subsistence farmers have little financial business and do not require many banking services.

In summary, a desirable client for a formal agricultural loan should fit the following description. First, the project he proposes should be capable of generating sufficient cash flow to liquidate the loan. Second, he should fit the banker's stereotype of a good credit risk. Third, he should presently be a customer and user of other bank services or show potential for being a good customer.

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<sup>1</sup>Dale A. Arahood, "A Credit Scoring Approach to the Commercial Lending Credit Decision Process" (unpublished Ph.D. dissertation, Department of Industrial Engineering, The Ohio State University, 1971).

### Terms of the loan

The terms of a loan in a competitive money market are determined by the available supply and demand. In a free market system, interest rates rise and banks become choosy in selecting customers when the supply of money is low relative to demand. In Brazil, the banks cannot vary the interest rate but they can become more selective when the demand for money exceeds the supply.

The costs of an agricultural loan to the bank are a function of (a) the interest given up by not being able to loan for non-agricultural uses, (b) the bank services required to administer the loan, and (c) losses due to defaults. In a non-regulated case, the bank tries to deal with large and safe borrowers. This minimizes service costs per dollar loaned and reduces defaults. The bank passes on some of these savings to the borrower by reducing interest rates. If there is a large supply of money, the borrower expects the bank to pass on more of these savings. The supply and demand conditions in a free money market determine how much of the savings are passed on to the borrower. While the small and/or risky borrower also pays interest according to the market conditions, he would generally face a higher interest rate schedule.<sup>2</sup>

The four quadrants diagramed in Figure 2 illustrate the relationship between loan size, interest rate, and risk. The conditions in each of the quadrants are as follows:

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<sup>2</sup>William G. Murray, "Farm Credit Institutions," in Emanuel L. Baum, Howard G. Diesslin, and Earl O. Heady (eds.), Capital and Credit Needs in a Changing Agriculture (Ames: Iowa State University Press, 1961), pp. 195-203.

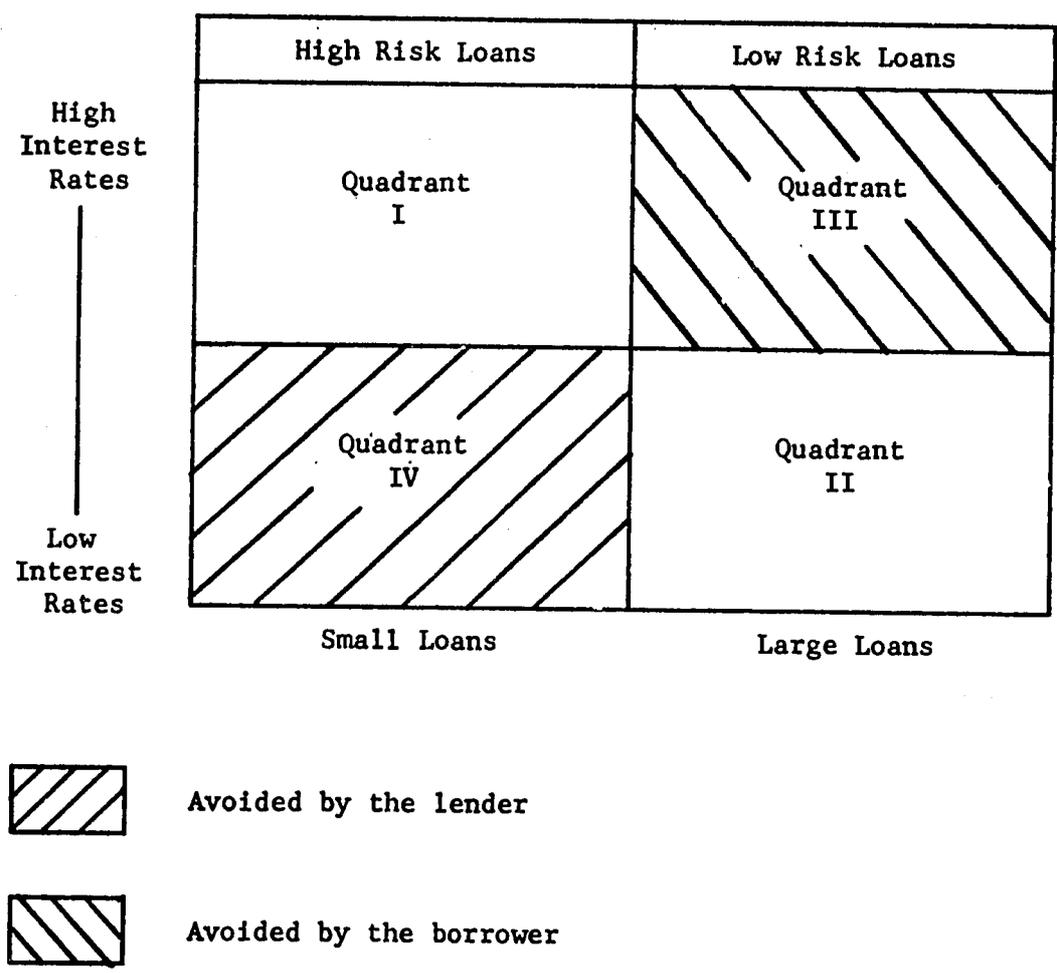


Figure 2. Schematic Diagram Showing Loan Size and Risk as a Determinant of Interest Rate

Quadrant I. A high-risk client is charged a high interest rate and will only be allowed small quantities of money.

Quadrant II. A low-risk client will be encouraged to borrow a large quantity of money. He will be offered a low interest rate as an inducement.

Quadrant III. A low-risk client will be encouraged to borrow a large quantity of money. The bank offers no inducement, either because money is very scarce or interest is regulated.

Quadrant IV. A high-risk client is offered a small loan. The interest rate is low, either because money is abundant or the interest rate is regulated.

In the Brazilian case, Quadrants I and III are not possible because all interest rates are low. Quadrant IV, while possible, is undesirable for the bank because the low interest rates do not compensate for the high risk and high administration costs. Thus, the banks try to deal almost exclusively with Quadrant II type loans.

Tendler suggests that the banks use two devices to avoid Quadrant IV type loans. First, they fulfill the letter of the law by making several small loans to large farmers in lieu of one large loan. This avoids the intent of Resolution 97 which was to force the banks to give loans to small farmers. Second, they add service charges to shift as much of the costs as possible to the small farmer. This is because of the high cost of administering these small loans.<sup>3</sup>

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<sup>3</sup>Ibid., p. 202.

### Decision-Making by the Informal Lender

Informal lenders are not constrained by centrally determined fiscal or operational procedures as are formal lenders. They adjust the terms of the loan to suit the customer being served. Because of their flexibility, the informal creditors play a unique role in agricultural finance. The way in which they conduct their business will be discussed below.

#### Operational procedures of informal lenders

The main feature of the informal lender's operation is very little red tape. He usually does not require written applications, lengthy investigation, or legal registration of the loan. All this combines to make loans available quickly. It also keeps some of the borrower costs low.

A second feature of informal loans is that a repayment schedule is usually not specified. Based on the experiences of the sampled farmers, there was no pre-set date for repayment except on fertilizer loans. The fertilizer loans were paid when the crop was sold. This feature allows the farmer to wait for favorable price movements. This may affect substantially the profitability of his credit.<sup>4</sup>

A third feature of informal credit is high and flexible interest rates. Informal interest rates in the sample were found to range between 29 and 40 percent (when they were stated). This was two to four

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<sup>4</sup>Feaster cites livestock loans which come due before the animals attain optimum weight in John G. Feaster, "An Analysis of the Relationship Between Infrastructure and Agricultural Development in Caqueta, Colombia" (unpublished Ph.D. dissertation, Department of Agricultural Economics, University of Kentucky, 1970).

times higher than the rates on formal credit. Nevertheless, when the rate of inflation is deducted, the real informal interest rate ranged from less than 10 percent to about 20 percent. This is not much different from rates in the U.S. on comparable types of loans.

### The Cost of Credit

Chapter III showed the importance of informal credit for making small loans. These small loans were made to both small and medium-sized farmers. The purpose of this section is to examine the explicit and implicit costs of informal credit. If these costs are similar to non-regulated informal interest rates it will indicate that informal creditors are competing effectively for some of the farmer's credit business. Three explicit costs were considered: interest rate, cost of bank services, and cost of loan registration. The one implicit cost considered was time spent visiting the lender.

### Interest rates

Nominal interest rates on formal credit are set by the Brazilian government, and apply to all banks. During the 1970/71 agricultural year, the rates were 7 percent on loans for fertilizer and improved seeds ("modern inputs") and 13 percent on production loans. Some loans were made from special funds financed by the International Development Bank at rates of 16 percent. These were to purchase machinery. Informal credit carried nominal interest rates of 29 to 40 percent.

The carrying charges on informal credit were stated in various ways. On consumer durables, the interest rate usually was not specified.

Instead a cash price and a time purchase price were quoted. A second system was to quote the time purchase price as the true price of the item. This was the system employed by one fertilizer dealer in the area. His price assumed that payment on the fertilizer would be made at the time of the harvest. If the buyer paid at the time of purchase, he received a discount from the quoted price.

Almost all farmers had charge accounts in the local stores. Usually they paid these accounts monthly or at the end of the four-month production cycle. The convenience of these accounts for small farmers was the overpowering reason for their use. Also visits to the small rural store were a social event. They had benches out front, alcoholic beverages, and sometimes a pool table. Very little information was obtained about interest rates on these credit accounts.

#### Services of credit sources

Formal lenders.--Banks were required to make an on-farm appraisal of the loan application and supervise the use of funds. The on-farm appraisal was usually paid for by the farmer. The cost differed between banks, but was generally a combination of fixed appraisal cost plus mileage. Four different formulas were used by each of the four banks visited:

- (1) The cost varied for each case. Cr\$100 was advanced by the farmer to cover costs.
- (2) The cost was 0.2 percent of the loan with a minimum of Cr\$30 and maximum of Cr\$70. In addition, the farmer paid Cr\$0.35 per mile for the agent's transportation. The bank agent could visit several farms on each trip

and divide the costs between the customers. That is where he could juggle numbers to please his customers or to increase his earnings. These charges were deducted from the loan.

(3) There was a fixed fee of Cr\$50.

(4) There was no fee.

The sample had very few observations of appraisal costs. Often they were hidden as unspecified deductions from the outstanding loan balance. It was the exception that a bank did not charge for an appraisal. The bank charging no fee had only large farmers as customers. The agricultural program was just a way to encourage farmers to do business with them, which was why there were no appraisal charges.

Only one of four banks interviewed had their own agricultural agents in Itapetininga. One bank hired a private firm to provide appraisals and supervision. Two banks used services provided by their central offices. Both of these systems were deficient: the first because the private firm provided no assistance to the farmer (a criticism put forth by Tendler), and second, the agents sent to the region to do appraisals were not familiar with local conditions.<sup>5</sup>

One additional service provided by the banks was fiscal control. The bank agent visits the farm prior to the harvest to approve release of the last loan installment. These funds are to pay for harvesting costs. If the potential harvest looks poor, the funds are not released. This is a way for the bank to minimize losses on the loan. One banker

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<sup>5</sup>Tendler, "Agricultural Credit in Brazil," p. 63.

responding on this point said that an amount proportional to the size of the expected harvest would be released.

The services of the bank, in terms of supervision, were to protect the interests of the bank, not the farmer. The bank agent was not required to assist the farmer in his use of funds or in his farming practices. The farmer may have benefited from advice given to him by the agent, but this was only a secondary outcome of the visit. The agronomists are really bank agents with some knowledge of agriculture, not agricultural experts.

Informal lenders.--The reasons for dealing with informal lenders as expressed by farmers were:

- It is difficult to work with the banks.
- The time period of bank loans is very short (no long-term loans).
- The farm is not registered (does not have clear title) and the bank won't lend in this case.
- It is more convenient.

Informal lenders generally did not require registered land as collateral. The loans did not have to be registered and application forms were not required. The money was available immediately and repayment terms were flexible. Credit from dealers was very convenient because the credit and the purchase were acquired simultaneously. Borrowing from a moneylender who lived in the rural area saved time and costs of transportation to the city (there were no banks located in the rural area).

### Loan registration costs

Loan registration is required only on formal loans. The amount that can be charged for this service is regulated by law. It varies depending on the type of investigation requested by the bank and the number of persons included in the loan application (e.g., husband and wife, or partners). The average cost appears to be about 0.5 percent of the value of the loan with a maximum permissible fee of about 56 cruzeiros.

The ceiling on payments and minimum fees set by the registering agencies distort the proportionality between registration cost and loan size. As a result, the burden of registration costs do not fall evenly on all borrowers. This distortion was observed in the study where the registration rate varied from 0.3 to 9 percent (Table 15). The largest loans consistently received low percentage rates. They averaged around 1 percent. The highest rates were on loans under Cr\$2,000. Over 60 percent of the farmers with loans under Cr\$4,000 paid registration rates from 3 to 9 percent.

### Time spent to acquire the loan

Time lost by the farmer, either in visits to the bank or in delays, directly affect his business. This time may be substantial, especially because of the value of certain critical days during the agricultural year. Data collected in Brazil in 1965 indicated that an average of three visits were required to obtain a formal loan in Itapetininga (Table 16). By contrast, most informal loans in and outside of the study region were obtained in one visit.

TABLE 15

REGISTRATION RATES REPORTED BY LOAN SIZE FOR  
THE SAMPLE OF 86 BORROWERS IN SÃO PAULO

	Registration Rates in Percent			
	For Loans Cr\$ 0 - 2,000	For Loans Cr\$ 2,001 - 4,000	For Loans Cr\$ 4,001 - 20,000	For Loans Over Cr\$ 20,000
	0.3	0.4	0.3	0.7
	1.5	0.7	1.0	0.7
	1.7	4.5	1.0	0.8
	2.8	5.1	1.0	0.8
	3.2	..	1.1	0.8
	3.2	..	1.2	1.1
	3.6	..	1.3	..
	5.9	..	1.7	..
	8.9	..	..	..
<b>Average Registration Rate</b>	<b>3.5</b>	<b>2.7</b>	<b>1.1</b>	<b>0.8</b>

Source: Farm interviews.

TABLE 16  
 NUMBER OF BANK VISITS REQUIRED TO OBTAIN  
 FORMAL AND INFORMAL LOANS IN 1965  
 FOR FARMS IN SÃO PAULO

Number of Visits to Lender by Farmer per Loan	Formal Loans		Informal Loans	
	(#)	(%)	(#)	(%)
1	94	28	201	87
2	92	27	18	8
3	46	13	5	2
4	31	9	..	..
5	19	6	5	2
6	16	5	2	1
7	5	2	..	..
8-12	20	6	..	..
Over 12	12	4	..	..
Totals	335	100	231	100
Average Number of Visits	3.0		1.1	

Source: Unpublished data collected under the auspices of the United States Agency for International Development sponsored Capital Formation Project at The Ohio State University, 1965 and 1960.

Visits to banks and the required paper work caused time delays in approving loans. In 1965, farmers waited an average of 23.5 days for approval of formal loans in Itapetininga (Table 17). Farmers waited considerably less time for informal loans; about 10 days based on the average of all farms surveyed.

Banks were surveyed in Itapetininga to determine the reason why so many visits were required. There was considerable variation in the number of visitations, depending on whether the bank was a public or private institution. Also, some of the visits were optional depending on the discretion of the bank. The visits and their function are discussed below.

For the two large state banks in Itapetininga some farmers made up to seven visits for each loan approval. The first visit was to obtain proper forms and to find out what documentation was required to complete the application. If the farmer was a steady customer and had an up-to-date file, the forms usually were completed on the first visit.

The second visit was to bring in the completed application forms. If the applicant was a new client, the application was reviewed prior to signing. This usually took two to three days, requiring that the farmer return to the bank to sign his application. One banker said that the forms were usually incomplete, requiring that the farmer return to complete the application.

The third visit was primarily to sign the approved loan application. Applications made during planting time were often held up by back-logs in the banks. Often the loans were not ready on the agreed date. If so, the farmer had to make an additional visit to sign

TABLE 17  
 AVERAGE NUMBER OF DAYS WAITED FOR FORMAL AND  
 INFORMAL LOANS IN THE STUDY REGION AND  
 OTHER REGIONS OF SOUTHERN BRAZIL, 1965

Location	Days Wait <sup>a</sup>			
	Bank Loans		Non-Bank Loans	
	Days	Number of Observations	Days	Number of Observations
Itapetininga - Guaréi	23.5	35	2.5	8
Other municípios <sup>b</sup>	17.9	278	10.1	248
Total	18.5	313	9.9	256

<sup>a</sup>All waits over 75 days were excluded from the averages. It was assumed that these loans were received during the next production period. Included in this excluded category were 72 observations or 11 percent of the sample.

<sup>b</sup>The number of days wait for bank loans in other municípios is low because 22 percent said they waited only 1 day. This response is dubious under the best of banking conditions. Excluding these days, the average wait for bank loans in other municípios would be 23 (almost identical to Itapetininga-Guaréi). Other municípios include: Alegrete, Carazinho, Ibiruba, and Lajeado in the State of Rio Grande do Sul, and Concórdia, Timbó, and Tubarío in the State of Santa Catarina.

Source: Unpublished data collected by P. Araujo, 1965, and Capital Formation Project Staff, 1970.

documents. After signing, the loan was usually registered. While this is not required on small loans, it was the accepted practice in Itapetininga.

The fourth visit was to pick up the registered loan agreement and submit it to the bank for funding. One banker said that the lender did not have to make a special trip to register his loan. He could go to the registrar the same day he signed his papers and get them approved immediately. This might apply to large well-known farmers. It was not commonly the case. In an interview with the registrar (called the Cartório de Imóveis), it was learned that registration usually took three days. In either case, during this bank visit, the farmer received his money. Production loans, if for fertilizer, were assigned directly to the dealer. If for general production expenses the loans were usually allocated in three parts: for planting, during the year, and for harvesting.

The fifth visit was to receive the second installment on the loan. Most farmers liked to receive their loan in cash. If so, this visit was required. If they had a checking account in the bank this visit was not required. The funds were transferred automatically on a prespecified date. This practice was common for several private banks. On loans from one of the state banks, this second installment was often delayed significantly until an agent from the bank could visit the farm and authorize the release of funds. In many cases, the agent waited until the farmer came to the bank to request the second installment. If the farmer was in a hurry for the money he had to make this visit.

The sixth visit was to receive the third loan installment. In this case, the agent had an incentive to visit the farm. He had to ascertain if the soon-to-be-harvested crop would cover the value of the loan. If not, he would decide not to release the third payment. This is a way for the banks to minimize their losses during a bad agricultural year. The seventh visit by the farmer was to repay the loan.

Based on this information it was concluded that up to seven visits might be required to obtain bank loans from the state banks. The private banks automatically credited loan installments to the accounts of clients, reducing the required number of visits to five.<sup>6</sup> This is a larger number of visits than was reported in the 1965 farm level data. There were two reasons for this. First, the data in Table 16 does not include a trip to repay the loan. Second, there were many respondents who said that they made only one visit to acquire their loans. This reduced the average and distorted a comparison of the two data sets since it was not possible to obtain a loan that quickly in 1970/71.

#### Total estimated formal loan costs

Several categories of costs which the formal borrower must assume have been shown above. First, he must expect to visit the bank from five to seven times to obtain and liquidate a loan. Second, he must pay interest and/or service charges of 7 to 13 percent. Third, he must pay

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<sup>6</sup>The private banks only loaned to farmers who were already clients of the bank.

for cost of appraisal, around Cr\$50, prior to the acceptance of his application. Fourth, he usually must register the loan, ranging in cost from 1.0 to 4.7 percent of the loan value. These costs are summarized below:

Visits . . . . .	5 - 7
Interest . . . . .	7 - 13 percent
Appraisal . . . . .	Cr\$ 50
Registration . . . . .	1 - 4.7 percent

To calculate the hypothetical carrying charges for three loan sizes, the following assumptions were made:

- (1) The small farmer visited the bank seven times, the medium-sized farmer six, and the large farmer five. Each trip required four hours: one and one-half hours to travel by foot and bus to town, one hour at the bank, and one and one-half hours to return. Wages foregone were assumed to be Cr\$5 (on the low side for a farm owner).
- (2) All loans were at 13 percent interest.
- (3) Appraisal cost was the same for all loans.
- (4) Registration costs were 4 percent for small loans and 1 percent for medium and large loans.

Table 18 summarizes the data for three farm categories and three average loan sizes. Loan averages by farm size category were based on the sample averages. The calculated real interest rates to the farmer were 29, 16, and 15 percent for small, medium, and large loans.

TABLE 18

ESTIMATED LOAN COSTS, INCLUDING EXPLICIT AND IMPLICIT LOAN COSTS,  
FOR THREE AVERAGE LOAN SIZES FROM FORMAL CREDIT SOURCES IN 1971

Farm Size (hectares)	Average Loan Size (Cr\$)	Travel Cost (Cr\$)	Appraisal Cost (Cr\$)	Cost of Loan Registration (Cr\$)	Interest Payments for One Year (Cr\$)	Total Real Loan Costs (Cr\$)	(%)
0-20	680	35	50	28	88	200	29
21-50	3,665	30	50	37	477	594	16
Over 50	6,871	25	50	69	893	1,037	15

Source: Estimates based on bank and farm interviews.

This helps to explain the distribution of loans shown in Table 13. Farmers seeking small loans faced similar total costs per cruzeiro borrowed from either the formal or informal credit markets. Their decisions were apparently influenced by lack of loan cost differentials. They went to the most convenient and familiar source. This generalization applied even more so to medium-sized farmers. Their time was more valuable, increasing the cost of visiting banks for formal credit. Also, they had better contact with informal lenders, increasing the convenience of informal loans. For their intermediate and large loans, they dealt with banks at a real interest rate of around 16 percent. This was considerably below the informal interest rate and below inflation. The large farmers only held large loans. Their loan costs were 15 percent. They also dealt exclusively with banks.

#### Summary

The issue raised by Nisbet and Stitzlein was whether or not there are two distinct markets for credit. To defend this argument, it must be shown that credit from formal and informal sources are not competitive and that they serve different functions in the agricultural enterprise.

The data on financial transactions in Itapetininga has not shown formal and informal credit to be distinct markets. First, the data indicated that farmers with access to both sources of credit selected the informal sources for small loans. The analysis was able to explain this behavior by price differences between the two sources for small loans. Second, the uses of formal and informal credit were similar. Most formal

credit was for fertilizer and machinery. Many of these loans went directly to the dealers, never being handled by the borrower. Similarly, most of the informal loans were time purchases from dealers.

The major difference between the two types of credit was the administered interest rate. Since all banks used the same rate, they operated like public utilities. Not being able to use price to differentiate between types of loans and types of customers, they used other mechanisms. These included the requirement that farmers have clear title to their land, lengthy applications, and registration requirements.

These mechanisms made banks less convenient places for small farmers to acquire credit. Once it was acquired, however, it could not be differentiated from credit received in any other way.<sup>7</sup>

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<sup>7</sup>This argument may not be as valid in cases where credit is tied to technical assistance. In this case, the product would be an integrated package differentiated from other sources not offering assistance.

## CHAPTER VI

### PRODUCTIVITY ANALYSIS

The purpose of this chapter is to present the results of the estimation of production coefficients and to analyze the efficiency of resource use on the sample of farms. The analysis attempts to determine if the demand for small farmer credit is constrained by the lack of profitable investment alternatives at the farm level.<sup>1</sup>

To answer this question, the sample was disaggregated by size and by source of credit. Two size groups were used: small farms having up to 26 hectares of land in production and large farms with over 26 hectares. Three disaggregations based on credit were used: farms with formal credit, farms with informal credit, and farms with no credit. The purpose of the analysis is to compare the productivity of capital inputs most directly influenced by credit policy.

Capital investment may be differentiated on the basis of short, medium, and long-term commitment of funds. First, short-term capital investments are made and liquidated during the agricultural year. They include the operating expenses of the firm. Second, medium-term capital investments are those which are longer than a year, but liquidated usually within three to five years. These are the machinery and livestock working assets of the firm. Lastly, long-term capital investments are investments in buildings and land.

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<sup>1</sup>See Hypothesis 4, Chapter I.

### Definition of Variables

This analysis was conducted for one agricultural year and all capital variables were aggregated on a one-year basis. Operating expenses were defined to be costs incurred for crops harvested during the year. Expenses for crops sold this year but harvested in previous years were not included. On the other hand, expenses incurred in previous years for inputs used during the study year were included in this variable.

Working assets were defined to be the costs of using machinery and livestock during the year. These costs included both maintenance and depreciation of the machinery and livestock. The calculation of depreciation was based on estimates of the useful life of the inputs. A fixed proportion of the value of the input, based on its useful life, was then assumed to be the depreciation cost.

Long-term capital investment in land was defined as the total land actually used in production during the year. Land was assumed to be homogeneous throughout all the farms in the region. This assumption understates the contribution of high quality land to the production process and overstates the contribution of low quality land. To partially account for differences in productivity, pasture land was adjusted to reflect its low intensity of use. Further adjustment of this variable would have required detailed information on the quality of the soils being cultivated. This information was not available.

Buildings represented a relatively small investment on farms in the study region. Farm buildings were usually open sheds or pole barns that provided shade from the sun and rain. The house was a multi-purpose shelter used for the family (i.e., family consumption) and for storage.

The house provided a dry area to store grain, seed, insecticides, and fertilizer; and a secure place to keep hand tools and harness. Because of this multiple use of the house, the value of farm buildings grossly understated the value of the contribution of buildings to the production process. On the other hand, the value of the house, while making a contribution to production, was mostly a facility for use by the family. Rather than introduce the measurement errors that would have resulted from some arbitrary division of buildings into production-related and consumption-related contributions, it was decided not to include the value of buildings in the analysis.

The labor input was defined as the number of days that persons worked on the farm. This is essentially a measure of the quantity of labor. Differences in level of effort by family members was assumed to be related to the age of the person so that a child working full time was not equated with a full-time adult. The quality of the worker was not well defined in the research. Such factors as unique skills and training were recognized as being very important to the success of the farm but were difficult to quantify.

#### The Model

A Cobb-Douglas production function was used to examine the resource allocation questions. The production processes of the sampled farms generally produced three types of outputs: crops, animals, and animal products. Each type of output posed unique measurement problems and will be discussed below.

### Output of crops

Crops included in this variable were those harvested during the 1970/71 agricultural year. The interviews were conducted after the harvest during the Brazilian winter (August, 1971). There were heavy rains in June and July which delayed the 1971 harvest to some extent. In cases where the harvest had not been completed, estimates were made based on the standing crop. Crops not included in this variable were those consumed by livestock or set aside for seed. They were considered as intermediate products embodied in other production processes.

Crops were expressed in value terms. Valuation was based on prices received by the individual farmer. If a farmer had not sold his crop, an average regional price was used to evaluate the harvest.

### Output of livestock

Output of livestock included what was sold during the year and the increase in herd value. This value was difficult to calculate in all but the simplest cases. It is instructive to illustrate the nature of the measurement problem by an example. A herd with only one animal would have an output equal to the increase in value of the single animal during the year. If it was bought and sold during the year, output was the difference between the sale and purchase price. If it was bought but not sold, the output was the difference between the end-of-year value and the purchase price. Similarly, if the animal was sold during the year but

purchased before the year, output was the sale price minus the value at the beginning of the year.<sup>2</sup>

The above considerations were used to develop an aggregate model for evaluating the output from animal production. The calculation was as follows:

$$\left| \begin{array}{c} \text{Animal} \\ \text{Output} \end{array} \right| = \left| \begin{array}{c} \text{Sales} - \\ \text{Purchases} \end{array} \right| + \left| \begin{array}{c} \text{Value of} \\ \text{Ending} \\ \text{Inventory} \end{array} \right| - \left| \begin{array}{c} \text{Value of} \\ \text{Beginning} \\ \text{Inventory} \end{array} \right|$$

A further adjustment was made in the case of mortality. If an animal died during the year, it was included in the ending inventory. Even though it was no longer an asset of the farm, it had generated expenses which appeared in the independent variables of the equation.

#### Output of livestock products

Livestock products include eggs, lard, milk, and cheese. These products were valued at the average selling prices for the sample.

#### Land

Land was defined as that part of the farm used directly in production. To combine crop and pasture land into one measure, a land equivalent concept was used. It was defined as the sum of cultivated land, improved pasture, and one-third of natural pasture. This measure attempted to incorporate the intensity of land use by reducing the contribution of pasture land to production.

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<sup>2</sup>The purchase and sale price was affected by the intrinsic value of the animal and inflation. Inflation was ignored because the value of beginning inventory was recalled by the farmer at the end of the year. Thus, it was assumed he used the value of the cruzeiro at the end of the year when he recalled the beginning year value (i.e., that the farmer automatically made the currency adjustment).

The measure of land for production function analysis is the least cumbersome of the independent variables to define. Cultivated land is fairly homogeneous throughout the region. Thus, differences in quality of land between farms were ignored. The alternative scheme would have been to rank land by its contribution to production.

Two alternative measures were examined to evaluate land on a farm-by-farm basis. The first was land value as expressed by the farmer. Land value was influenced by location and by the farmer's reluctance to disclose the value of his property. Taxes were based on land values. Therefore, the answers to this question were prejudiced by the desire of the farmer to protect his own financial interests. For this reason, the farmer's estimate of the value of his property was not used in the production analysis.

An alternative measure of land quality could have been a combination of soil type and topography. There were two reasons why this data was not usable. First, it wasn't specific for the cultivated land. Thus, if two types of topographical features were present, it was not known which applied to the crop and pasture land. Second, topography is a better measure of the potential of the land than the quality of the land. Quality is determined by the composition of the soil. Some of the better geomorphic areas had run down soils because they had been farmed for many years. Detailed analysis of the present conditions of the soil were not available.

### Labor

Labor was the sum of hired and family labor measured in man-equivalents. A man-equivalent is the daily output from one man aged 13-60. Each day of hired labor is assumed to be a man-equivalent day.

Family labor is an estimator of the number of man-equivalents contributed by the family. The estimate is based on age, sex, and student status. An equivalency factor was used to reduce the number of days worked to man-equivalents as follows:

<u>Age</u>	<u>Sex</u>	<u>Proportion of Man-Equivalent</u>
10-14	Male and Female	0.5
Student <sup>3</sup>	" " "	0.5
15-17	" " "	0.8
18-60	Male	1.0
18-60	Female	0.8
Over 60	Male	0.8
Over 60	Female	0.5

The man-equivalency factor was an estimate of the relative productivity between adults, children, and females. While somewhat arbitrary, it is more realistic than lumping men, women, and children together on an equal contribution basis. These factors have been standardized for use on the Ohio State University research project in Brazil.

An agricultural year was assumed to be 300 days, allowing 65 no-work days for Sundays and vacations. The transformation of the proportionate of man-equivalents factor times 300 days was made for all dependents who worked full-time on the farm. Where family members had off-farm employment, the number of days was adjusted downward to reflect this other commitment.

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<sup>3</sup> Students were generally in the 10-14 age group. Some were also found in the 15-17 age group as well.

### Operating expenses

Operating expenses were the costs of inputs used in production during one agricultural year. They included three categories of costs: crop expenses, machinery maintenance expenses, and livestock expenses.

Crop expenses included fertilizer, lime, chemical agents, and seeds. An attempt was made to adjust these cost items to include only those inputs used during the agricultural year. Included were stocks of fertilizer carried over from the previous year and costs incurred by partners or by landowners who provided land preparation services as part of rental agreements. The cost of fertilizer varied to some extent because of different means of financing the purchase. When financed by a dealer, financing charges were not explicit. The cost usually overstated the real market value. The same applied to the transport of fertilizer. Some dealers transported without stating the transport charges explicitly. Some farmers transported the fertilizer themselves. These implicit charges for services introduced some specification errors into the operating expense calculations.

Machinery maintenance included costs of gas and tires. These were the costs required to actually operate the machines. Machinery repairs were not included in this account for they were implicitly part of the intermediate term capital account of "working assets."

Livestock expenses included feed, salt, medication, and veterinary services. Feed that was grown on the farm was included in this account for it was considered as an input to livestock production.

### Working assets

Working assets were the implicit costs incurred by using machinery and livestock in production during the year. They may be thought of as the rental costs or the annual depreciation. This cost was calculated as the present value divided by the useful remaining life of the machine. The present value of a machine as reported by the farmer reflects the care and refurbishing of the machine. The future life is his estimate of when he will junk it or refurbish it again.<sup>4</sup>

The services of livestock were their production of animal products and their use as draft animals. Services of dairy cattle, horses, and mules were included in this account. To calculate the flow of livestock services, the farmer's estimate of the present value of the entire herd was used. For draft animals, age was not available so that young stock could not be deleted from this calculation. To compensate for this overstatement of the value of productive animals, a five-year working life was assumed (i.e., 20 percent of present value). Alternative assumptions between three and seven years did not affect the calculation significantly. This phenomenon was also observed by Yotopoulos.<sup>5</sup>

Present value was the only reliable measure of the productivity of livestock available. This is because farmers did not report a change in

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<sup>4</sup>An alternative method of calculating depreciation is to estimate the life of a machine and its price when new. The annual depreciation is then equal to the price divided by the machine's estimated life span. This system is particularly deficient when applied to non-mechanized equipment because farmers easily refurbish this equipment. A refurbished machine may function like new but by age alone appear useless.

<sup>5</sup>Pan A. Yotopoulos, Allocative Efficiency in Economic Development, Research Monograph Series, Vol. 18 (Athens: Center for Planning and Economic Research, 1967).

value for working livestock that did not change in productivity. A better measure would have been value and age. For example, a four-year-old mule valued at \$400 was reported to be worth the same amount as a five-year-old. If age was available, we could have reconstructed a depreciation curve for livestock based on age and value to determine analytically what the value change was during the year. This limitation was not felt to be serious, however.

### Summary

To summarize, the choice of variable definitions was influenced by data constraints and by the focus of the research. The region is typified by mixed farming so the production function being specified included crop and animal enterprises. Output included all final products of the farm. Land was specified in land-equivalents which adjust unimproved pasture to reflect its low intensity of use. Labor was expressed in man-equivalents to reflect the lower productivity of women, children, and the aged.

Capital was categorized into two accounts: operating expenses and working assets. The operating expense account included all costs for annual production inputs. In addition, it included two intermediate products--animal feeds and seeds. Animal pasture was excluded from this account as it was specified under land. Working assets were the annual flow of services from the intermediate-term assets of the farm. The annual flow of livestock services was calculated at 20 percent of the present value of the livestock. Depreciation of machinery was equal to present value divided by future useful life.

The Production Function

The Cobb-Douglas production function was fitted in the following general form using least squares regression techniques:

$$Y = aN^{b_1} L^{b_2} (O/N)^{b_3} (W/N)^{b_4}$$

where,

Y = Gross value of output

N = Land equivalents

L = Family and hired man-equivalents

O = Crop and animal operating expenses

W = Annual flow of working assets

a = A constant

The capital variables were on a per hectare basis to reduce multicollinearity that was observed between land and capital accounts when the non-reduced form of the model was used.

The logarithmic transformation of the generalized production function was used in the analysis. In this form, the regression coefficients are the elasticities of production for each of the respective independent variables.

Marginal value products were calculated directly from the production elasticities. The elasticity of output (Y) to a particular input ( $X_i$ ) was defined as:

$$b_i = \frac{\partial Y}{\partial x_i} \times \frac{\bar{x}_i}{\bar{y}}$$

where  $\bar{x}$  and  $\bar{y}$  are geometric mean values. The marginal value product (MVP) of  $x_i$  was obtained directly by:

$$MVP(x_1) = b_1 \frac{\bar{Y}}{\bar{x}_1}$$

The specific model used herein was:

$$\ln Y = a + b_1 \ln N + b_2 \ln L + b_3 (\ln O - \ln N) + b_4 (\ln W - \ln N)$$

The reduced value of the elasticity of output to land was calculated as:

$$b_1^* = b_1 - b_3 - b_4$$

### Results of the Production Analysis

This section discusses the results of resource allocation decisions on the sample farms. Cobb-Douglas production functions were used to examine a one-year cross section of these decisions. Marginal analysis of these functions serve as a guide for improving the efficiency of resource use.

This type of static analysis has several limitations. First, the analysis must be tempered by the assumption made in defining the dependent and independent variables. Defining working assets and labor were particularly troublesome. Second, the analysis only shows the potential for change and not the magnitude of change that is necessary. It is possible, for example, that the optimum point on the production function may be reached with relatively small increments of capital. Finally, the analysis is based on a one-year cross section of the economic behavior of farm firms. The 1971 agricultural year may not have been "typical" due to factors both internal and external to the firm, and to

market conditions.<sup>6</sup> Given these limitations, however, it is felt that the results of the production function provides a framework for examining some of the resource constraints facing farmers in the study region.

Based on two criteria the sample farms were disaggregated for the production analysis: the independent variable land area used in production and source of credit.<sup>7</sup> The disaggregation by land area in production was based on the value of the dependent variable "land" in the production equation. Two groups were used: farms above and farms below the average value of "land."<sup>8</sup> Farms were disaggregated by source of credit into three groups: those farmers who financed all production with internal funds (i.e., non-borrowers), those farmers who borrowed from banks (i.e., formal borrowers), and farmers who borrowed from informal sources.<sup>9</sup>

The criteria were applied one at a time. Cross-classification using more than one criterion, such as land area and credit, was not possible because of the small number of observations in each of the subgroups. At the same time there was some relationship between farm size and credit use since the larger farms tended to have more of the formal credit.

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<sup>6</sup>One example of atypical conditions was the occurrence of heavy rainfall just before and during the harvest in June and July of 1971. This delayed the corn harvest, caused spoilage to the bean crop, and made it difficult to move equipment and trucks involved in the harvest.

<sup>7</sup>Additional criteria were used for disaggregation, but they did not provide much insight into the observed relationships.

<sup>8</sup>The average value of "land" was 26.0 hectares.

<sup>9</sup>Three formal borrowers also had informal loans. They were classified as formal borrowers.

The overall significance of each of the regression equations was tested using the F-ratio. The F-ratio is defined as the regression sum of squares divided by the residual sum of squares; both numerator and denominator divided by their respective degrees of freedom. Based on this criterion, all equations were significant at  $\alpha = 0.01$  (Table 19).

The t-test (i.e., the regression coefficient divided by its standard error) was used to determine the significance of the individual regression coefficients. The coefficient for land was not significant in two cases: small farms and formal borrowers. The coefficient for labor was not significant in three cases: large farms and both formal and informal borrowers. The coefficient for operating expenses was not significant for non-borrowers of credit. The coefficient for working assets was significant in two cases: large farms and formal borrowers.

#### Aggregate production function and disaggregation by farm size

The  $R^2$  for the aggregate production function for all farms was 0.56 (Table 19). The regression coefficients, or elasticities, indicated that a 1 percent change in the labor input would have resulted in the largest change in output (0.39 percent); a change in working assets would have generated minimal response in output (0.08 percent).

The discussion in Chapters I to V focused on the differences between small and large farmers in their use and acquisition of credit.

TABLE 19

REGRESSION COEFFICIENTS AND STATISTICS FOR THE PRODUCTION  
FUNCTION ANALYSIS BY VARIOUS FARM CATEGORIES

Farm Category	Number of Observations	F	R <sup>2</sup>	b <sub>0</sub>	Variables							
					Land		Labor		Oper. Exp.		Work Assets	
					b <sub>1</sub>	t	b <sub>2</sub>	t	b <sub>3</sub>	t	b <sub>4</sub>	t
All farms	150	46.7	0.56	2.94	0.26	3.7 <sup>a</sup>	0.39	2.5 <sup>a</sup>	0.26	3.3 <sup>a</sup>	0.08	1.3
Small farms	76	9.2	0.34	2.37	0.16	0.3	0.60	2.7 <sup>a</sup>	0.22	2.5 <sup>a</sup>	0.02	0.4
Large farms	74	20.5	0.54	2.69	0.08	2.6 <sup>a</sup>	0.36	1.1	0.30	2.1 <sup>a</sup>	0.20	2.2 <sup>a</sup>
Borrowers of credit	86	49.2	0.71	3.31	0.25	3.3 <sup>a</sup>	0.22	1.1	0.45	4.8 <sup>a</sup>	0.06	0.8
Borrowers of formal credit	43	20.5	0.68	2.67	-0.01	0.1	0.12	0.4	0.47	2.9 <sup>a</sup>	0.32	2.7 <sup>a</sup>
Borrowers of informal credit	43	21.2	0.69	2.82	0.38	3.1 <sup>a</sup>	0.30	1.1	0.48	4.5 <sup>a</sup>	-0.11	1.3
Non-borrowers of credit	64	9.3	0.39		0.22	1.7 <sup>b</sup>	0.51	1.9 <sup>b</sup>	0.01	0.0	0.12	1.2

<sup>a</sup>Significant at  $\alpha = 0.05$ .<sup>b</sup>Significant at  $\alpha = 0.10$ .

Source: Analysis of farm interviews.

Here also, it was hypothesized that production functions differed by size of farm. To test this hypothesis it was necessary to compute the regression equations for various sub-groups of the sample. Two were used: farms with up to 25.9 land-equivalent hectares and farms with 26 or more land-equivalent hectares.<sup>10</sup>

Before attaching any economic importance to the production functions for small and large farms, it was necessary to determine if they were significantly different from the aggregated function. If they were not significantly different, then the aggregate function would have been used as the best representation of production alternatives for all farms, both small and large.

To determine if the aggregate and disaggregate functions were the same, the equality of the coefficients was tested using an F-test. The hypothesis to be tested was that the coefficients for the aggregate function (B) were equal to the coefficients for the disaggregate functions ( $B_1$  and  $B_2$ ) or  $B = B_1 = B_2$ . If

$Q_1$  = sum of squared residuals for the aggregate function,

$Q_2$  = the sum of the sum of squared residuals from each of the two disaggregate functions computed separately,

$$Q_3 = Q_1 - Q_2,$$

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<sup>10</sup> Breakdowns into other smaller size groups were attempted (e.g., 0-20 hectares, 21-50 hectares, etc.). The explanatory power of these functions was very low and they were not used.

$K$  = the number of independent variables, and

$n_i$  = number of observations in each of the  $i$   
disaggregate functions

then:

$$F = \frac{Q_3/K}{Q_2/(n_1 + n_2 - 2K)}$$

If  $F$  calculated is greater than  $F$  tabulated then the hypothesis that  $B = B_1 = B_2$  is rejected.<sup>11</sup>

Based on this analysis, the disaggregate functions were found to be significantly different from the aggregate function. Thus, the aggregate function was not included in the marginal analysis presented below. The production function for small farms had an  $R^2$  of 0.34; for large farms  $R^2$  was 0.54 (Table 19).

The production function disaggregated  
by source of credit

To address the question of differences in credit use, farms were disaggregated into two groups: those with credit and those without credit. Farmers with credit were further disaggregated into formal and informal borrowers.

The production function for all borrowers was the best fit of all the relations examined in terms of its ability to explain gross output ( $R^2 = 0.72$ ). The production function for formal borrowers

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<sup>11</sup>J. Johnston, Econometric Methods (New York: McGraw-Hill Book Company, 1963), p. 137.

explained 68 percent of the variation in gross output. The production function for informal borrowers explained 69 percent of the variation in gross output. The production function for non-borrowers explained 39 percent of the variation in gross output.

The relatively low  $R^2$  for non-borrowers indicated a poor fit for this function. The reason may be that it included both good and bad credit risks. Good credit risks may have preferred to use internal funds and not the credit available to them. Bad credit risks may not have been able to obtain a loan. Reasons for this may have been a poor borrowing record, lack of collateral, or non-economic production practices that would have made them unattractive borrowers.

As with the farm size disaggregation, the F-test was used to determine if the disaggregated credit models were significantly different from the aggregate model. The disaggregate functions were significantly different. Thus, it was decided not to consider the aggregate function for all borrowers. The remaining functions analyzed were as follows: formal borrowers, informal borrowers, and farms with no loans.

#### Summary of the Production Analysis

Examination of the production coefficients indicated that land and operating expenses were the most significant variables statistically. The coefficient for labor was close to zero.

Using an F-test, it was found that the disaggregated functions based on farm size and credit use were significantly different from

the respective aggregate functions. For this reason, the aggregate functions, namely all farms and all borrowers, were not used in the marginal analysis that follows.

#### Marginal Value Productivity of Farm Resources

This section examines the opportunities for changing the present distribution of farm inputs. The objective is to determine (a) if additional resources can be used profitably on farms in the study region and (b) how they should be allocated. If the marginal return from an input is greater than its market price, it is presumed a profitable agricultural investment. This analysis is dependent on the assumption that the farms studied were profit-maximizing firms. A further assumption is implied throughout this discussion. That is, that a national policy objective is to allocate resources according to economic efficiency criteria. Very little is said in the discussion about national objectives to reduce income disparities, increase agricultural exports, improve the domestic market for capital-intensive inputs, etc.

The various regression statistics presented in the previous section are presumed to hold for all farms in each of the delimited groups. The analysis is based on the average farm as defined by the geometric mean level of inputs. Other measures are possible and will not give significantly different results if the variables are more or less normally distributed. The geometric means of the variables are shown in Table 20 for all functions calculated.

TABLE 20

GEOMETRIC MEANS AND STANDARD DEVIATION OF VARIABLES USED IN  
THE ANALYSIS OF THE 1971 PRODUCTION YEAR FOR THE SAMPLE OF 150 FARMS

Farm Category	Number of Farms	Output		Land		Labor		Operating Expenses		Working Assets	
		Mean (Cr\$)	Std. Dev.	Mean (ha)	Std. Dev.	Mean (Days)	Std. Dev.	Mean (Cr\$)	Std. Dev.	Mean (Cr\$)	Std. Dev.
Size of Farm											
All farms	150	7,110	3.8	26	3.7	909	1.7	1,251	2.6	621	3.7
Small farms	76	3,653	3.1	10	2.3	722	1.7	547	2.9	169	4.3
Large farms	74	14,090	3.1	74	2.4	1,150	1.6	2,925	2.3	2,354	2.8
Borrowing Behavior											
Non-borrowers of credit	64	4,885	3.3	19	3.7	755	1.8	773	2.8	20	4.0
Borrowers of credit	86	9,620	3.9	33	3.6	1,046	1.6	1,802	2.5	903	3.4
Borrowers of formal credit	43	17,141	3.6	61	3.3	1,278	1.6	3,432	2.2	2,236	2.8
Borrowers of informal credit	43	5,297	3.0	19	2.8	852	1.5	927	2.7	362	3.8

Source: Analysis of farm interviews.

### Marginal productivity of land

The marginal value product of land ranged from a negative value to a high of Cr\$109 (Table 21). Two of the coefficients were not significant. All the remaining three marginal value products were greater than the observed rental value (Table 22). The farms which were formal credit users had high potential returns from increasing land use. This increase could be realized by using their land more intensively (changing from pasture to crops), or by buying more land.

### Marginal productivity of labor

The labor variable includes man-year equivalents of the family and hired labor. The man-year equivalent concept is a measure of labor supply in the sense that it is not related directly to economic activities. To derive this measure, it was necessary to assume that full-time meant 300 days, that school-age children helped at one-half time, and that a housewife, unless otherwise specified, spent 80 percent of her time at farm-related activities. In general, and based on this definition, there appeared to be a surplus of labor on farms in the study region. The marginal value in the two significant cases was about Cr\$3. This was considerably below the agricultural wage rate of around Cr\$6 in the region during 1970/71.

### Marginal productivity of capital

The marginal productivities of the two capital accounts were greater than one, except for three calculations which were not significant at

TABLE 21

MARGINAL VALUE PRODUCTS OF PRODUCTION INPUTS BY FARM CATEGORY IN THE  
ANALYSIS OF THE 1971 PRODUCTION YEAR FOR THE SAMPLE OF 150 FARMS

Farm Category	Number of Observations	F	R <sup>2</sup>	Variables			
				Land	Labor	Operating Expenses	Working Assets
Small farms	76	9.2	0.34	18.88	3.36 <sup>a</sup>	1.74 <sup>a</sup>	0.86
Large farms	74	20.5	0.43	57.22	3.18	1.30 <sup>a</sup>	1.26 <sup>a</sup>
Borrowers of formal credit	43	20.5	0.68	-2.57	1.63	2.33 <sup>a</sup>	2.43 <sup>a</sup>
Borrowers of informal credit	43	21.2	0.69	109.47 <sup>a</sup>	1.89	2.73 <sup>a</sup>	-1.61
Non-borrowers of credit	64	9.3	0.39	55.61 <sup>b</sup>	3.27 <sup>b</sup>	0.08	1.50

<sup>a</sup>Significant at  $\alpha = 0.05$ .

<sup>b</sup>Significant at  $\alpha = 0.10$ .

Source: Analysis of farm interviews.

TABLE 22  
OBSERVED RATES OF PAY FOR VARIOUS SERVICES  
REPORTED BY THE FARMERS IN THE SAMPLE  
OF 150 FARMS IN SÃO PAULO

Service	Rate (Cr\$)
Man-day of labor	6.3
Average annual rent for land/hectare	50.0
Man-day of labor with animals and wagon	22.0

Source: Farm interviews.

$\alpha = 0.10$ . The marginal value product of capital represents the potential return on a one cruzeiro investment in the input.

While the interest rate on subsidized credit was either 7 or 13 percent, the real rate on the informal market ranged from 29 to 40 percent.<sup>12</sup> Thus, the marginal value product of operating expenses on large farms does not appear sufficiently high to justify additional short-term investment. This applies as well to working assets on both small and large farms. The marginal value product of operating expenses on small farms of 1.74 implied that additional capital resources were justified on these farms.

The results for farms with borrowed capital, both formal and informal, were considerably different. Farms with formal credit showed very high potential returns on new investment in operating expenses and in working assets. This tempers, to some extent, the results above on large farms since the group of formal borrowers included many of the large farms. High potential returns were also shown on operating expenses of informal credit borrowers. However, the coefficient for working assets of informal credit users was not significantly different from zero.

Farmers that had no credit did not appear to have much opportunity for further investment in capital items. Working assets were greater than one however (Table 21). Opportunities may exist for investment in livestock and machinery--that is, working assets--but the estimate was not very significant.

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<sup>12</sup>Based on a limited number of observations in the sample.

### Summary

Opportunities for investment were noted in operating expenses on the sample farms. These opportunities were greatest on small farms and farms that already were credit users. Farms not using credit during 1970/71 did not appear to have the potential to increase their investment levels.

There were high marginal value products for medium-term capital investment on farms borrowing formal credit. Most of these farms were livestock farms and were mechanized.

There are several issues to be considered. First, it is expected that farmers would exploit highly profitable ventures. If these ventures existed, they would have stimulated borrowing by farmers. The analysis showed that farmers who had not borrowed did not have investment alternatives. Those who had borrowed had high marginal value products for capital investment. This implies that their decision was correct and that additional investments could be made.

Second, the potential of new profitable investment is a function of (a) the expected rate of return and (b) the probability of achieving that rate. The expected rate of return implies knowledge of the opportunity. In a depressed economy, the existing managerial skills may not be sufficient to exploit opportunities.<sup>13</sup> Low probability of achieving a high rate of return implies a high risk.

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<sup>13</sup>R.A.J. Roberts, "The Role of Money in the Development of Farming in the Mumbua and Katete Areas of Zambia," Farm Management Bulletin, No. 1 (Sutton Bonington, Loughborough: University of Nottingham, October, 1972).

There are several reasons why new investments were risky in the study region. For one, the region was depressed. There were few opportunities for investment outside of agriculture, or for off-farm employment. There was very little home industry (e.g., basket or rug making) to supplement income. Therefore, success in the farm business was necessary for survival. In addition to the general depression, there was little adoption of modern techniques. Vaccination of herds or soil testing was not practiced. Since new inputs were not used properly, the returns on these inputs were constrained. There may have been opportunities for expanding fertilizer use, but the marginal productivity of "haphazard" applications was low.<sup>14</sup>

Third, many farms in the sample were relatively isolated from markets. The marginal returns from expanding production might have been constrained by their inability to successfully market their output. A good example of this was in the dairy industry. Some of the dairy farms marketed cheese because of the difficulty of shipping fresh milk daily. They were constrained by labor and space to produce more cheese.

Fourth, some farms were in a state of transition. Thirty years ago, Japanese began to farm in this area. Many of them are now well established and produce tomatoes and potatoes primarily. These farmers created a poor environment for investment in traditional crops. That is, among small farmers, the tomato-potato producers were the best credit risks. They constantly kept abreast of new technology, were members of cooperatives, irrigated their fields and tested their soils.

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<sup>14</sup>Schluter, "Differential Rates of Adoption of the New Seed Varieties."

The small farmers not involved in tomato-potato agriculture were severely limited in the extent to which banks would extend them credit.

## CHAPTER VII

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH

This research examined the results of Brazil's agricultural credit policy in one community in São Paulo, Brazil. The purpose was to determine if agricultural credit services of the formal banking system have had much impact on small farmers. While the Brazilian agricultural credit program has expanded in volume dramatically, changes in the distribution of this credit to small farmers have been modest.

In various countries around the world credit has been used to improve the economic position of small farmers. Most of these programs have been specifically tailored for the small farmer by including education and technical assistance to help him manage his resources. In Brazil, a different approach was taken. This approach increased dramatically the amount of credit available to all farmers and minimized the cost of technical services.

The first major finding of the research was that the delivery system via the formal banking sector for subsidized credit discouraged participation by small farmers. There were several reasons for this. First, many small farmers did not qualify because they did not have their land properly registered. Second, banks lost money on their agricultural loans. This encouraged them (a) to keep down per cruzeiro

costs by making large size loans and (b) to lend to farmers who had the potential for becoming good bank customers and therefore generating other more profitable business. Finally, banks did not loan money for consumption uses even though consumer goods on these farms went to family members in lieu of wages.

The second major research finding was that informal lenders provided unique services to small farmers. First, the informal lender was able to supply credit when it was needed for he was not constrained by time consuming administrative procedures. This was shown by developing an alternative way to measure the timeliness of credit. This measure weighted the unpaid balance of a loan by the proportion of the year the loan was in force. Summing the weighted balances resulted in a measure that reflected how long during the year the money was useable to the borrower. For example, a loan received prior to planting and paid at harvest was given a weight of one. A loan received at the same time but paid in mid-year was given a weight of one-half. Thus, a farmer receiving one loan of Cr\$100 for ten months would have had the same credit available as a farmer receiving two consecutive five-month loans of Cr\$100 each.

While this method provided a measure of credit actually available for use, it did not include a parallel measure of need. That is, it assumed that the longer the time period the better the loan. This may not be the case. A long time period may not be the best terms for a loan if it exceeds the period during which the money actually will be used productively. As was pointed out earlier, an ideal loan should take effect on the day it was needed to make a purchase and be liquidated

on the day the harvest was sold. Time purchases come closest to this ideal; when the farmer needs an input he can simultaneously conduct the credit negotiations and the purchase negotiations.

The second important service provided by the informal lender was negotiating small loans. In terms of value, these loans were only a small part of the total loans in the sample. In terms of number of contracts, however, they were substantial. Forty-four percent of all loans were small loans from informal sources. Both small and medium-sized farmers were customers for these loans. In fact, the medium-sized farmers had five times as many small loans from informal lenders than from formal lenders. This implied that informal lenders competed effectively with formal lenders in the small loan business.

The third major finding was that small formal loans had fixed costs which substantially increased the percentage of carrying charges on these loans. These fixed costs included both explicit and implicit costs of the lender. The explicit costs included the cost of appraisal, the cost of supervision, and the cost of loan registration. The one implicit cost considered was time spent visiting the lender. Based on these costs, plus the bank interest rate, the real interest rate was calculated for the average loan received by small, medium, and large farmers. It was shown that the average burden for a small formal loan was 29 percent, close to what farmers paid for informal loans. This rate is more than double the official subsidized interest rate. This finding helped to explain why so many of the medium-sized farmers sought out small informal loans.

The above discussion has described some of the behavioral aspects of the agricultural credit market. The effectiveness of this program can be judged on two accounts. Its effectiveness can be evaluated by determining (a) whether or not it increases welfare by more evenly distributing income and (b) whether or not it improves the productivity of resources. This dissertation did not address the first question on welfare. It is a question that needs to be addressed in Brazil, where there are many small farms and large urban slums filled with rural migrants. While agricultural credit policy is not adequate to eliminate rural poverty, it could be one part of a more comprehensive approach to deal with this problem.

The second question concerning productivity of resources was tested by examining the production practices of the sample farms. Cobb-Douglas type production functions were used. The analysis showed that capital inputs were being effectively used on large farms and by farmers with borrowed capital. However capital inputs were not being effectively used on the smaller farms which had the lowest potential return on increases in operating expenses and no potential for increasing working assets. This result tended to support the position of several writers who claim that returns to capital are low on traditional farms.<sup>1</sup> It suggested that economic opportunities for increasing credit use on small farms were limited under existing production techniques.

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<sup>1</sup>Schultz, Transforming Traditional Agriculture, p. 80.

### Policy Recommendations

On the basis of this research five recommendations were made for altering the Brazilian credit policy.

- (1) Increase the interest rate on formal credit.

This policy would (a) reduce the capital erosion in banking institutions, (b) allow informal lenders to be more competitive in their small and medium-size loans business, and (c) reduce some of the distortions in use of resources encouraged by the special rates on machinery purchases.

- (2) Streamline the lending procedures to reduce other borrower costs and the number of visits required to obtain credit.

This would reduce the overhead costs to banks and the waiting time of farmers to receive credit. This could be done by simplifying paper work, having the bank handle the loan registration procedures (already done by one of the private banks interviewed), and by automatically transferring installments of the loan to an account of the farmer's.

- (3) Encourage the lending of small loans by informal lenders.

While banks may be able to streamline lending procedures, they are unsuited to issue small loans. Their overhead costs are generally too high to justify writing loans of this scale. This does not apply solely to the agricultural credit system in Brazil, but to banks in

general. Informal lenders, on the other hand, use personal knowledge of the borrower to protect their investments instead of lengthy legal documents and procedures.

(4) Lend to more risky clients.

The banks in this study had no defaults, though they had some refinanced loans. This implies that they were lending only to the safest clients. Farmers with innovative ideas or desire to change current practices were often not funded. One approach to this problem would be to apply higher interest rates to higher risk clients. In this way, high risk farmers would have better access to the banks. This could apply to consumption credit as well.

(5) The coupling of more meaningful technical assistance to the loan.

The present assistance is really a fiscal control mechanism of the bank. The bank's agricultural agent is not expected to provide technical expertise to the farmer and in most cases he is not trained to do so. The result is that there is little effort on the part of the government to assist in generating a more profitable investment climate. It is within reason to expect that opportunities exist for such an investment since Japanese farmers and their cooperatives seem to be successfully adopting new techniques.

### Recommendations for Further Research

This research has generated several questions for further study. First, additional work is required on the measurement of credit. In particular, data should be gathered on the relationship between credit flow from the bank and its use in the production process. It has been argued in the literature that the best loan is a long-term loan. This may be true if the farmer is able to delay the sale of the crop to wait for a good price. It may not be true if the farmer often acquires his loan one or two months prior to his purchase with the money.

Second, there has been little study of how the informal lender operates. Credit policies such as those operating in Brazil are directed against the informal lender. Are the lenders making exploitive profits? What is the value of the services provided by these lenders? An innovative research program should be designed to acquire insight into this highly business-sensitive topic. This research has suggested that size of loan, not use of funds or size of borrower, should be examined.

Third, this research has identified size of loan as an important factor in lending costs. High interest rates on informal credit might appear to be justified if the service of providing small loans is taken into account. If we can assume that informal lenders are going to remain a viable source of agricultural credit, then research should be directed at determining how these lenders could be regulated to make them conform to societal norms. In particular, programs may be designed whereby the informal lender serves as a distributor of credit.

Fourth, it has been assumed in this research and in the research of others that the banks have high administrative costs for agricultural loans. The economics of the bank's role under the program should be examined. Both the state banks and the private banks should be examined to see how they try to offset these costs and how this in turn affects the credit allocation process.

Finally, it was felt during this research that the production analysis was not able to test some of the most important issues. First, it did not adequately describe subsistence behavior in that no distinction was made between production for home consumption and for sale. This may have distorted the results in that small farmers tend to consider consumption constraints ahead of market conditions. Second, it did not address differences in risk avoidance between farmers. Some farmers seemed much more capable of experimenting or of growing riskier crops than others. One obvious way farmers in this sample avoided risk was to minimize their purchase of production inputs. They rented land that others had fertilized, they entered partnership agreements to exchange labor and machinery, and they entered into rental agreements where the owner supplied fertilizer in exchange for a proportion of the crop. A case study approach would be most appropriate for examining these kinds of interrelationships and the motivations for negotiating them.

#### Implications for Other Countries

The Brazilian agricultural credit program is unique in the world. Described as the "filter down approach" it has tried to reduce the high

overhead costs usually associated with agricultural credit programs. It has done this by using banks to administer the program, by virtually giving away the money so that no new distribution network has been necessary, and by not providing technical assistance to farmers.

This strategy has been successful in transferring money into agriculture. For countries where this is the objective, the Brazilian approach would probably be appropriate. It would be applicable to any country that had a reasonably well organized banking system. The program has not performed the development role of shifting income to the low-income farmers. This is a major limitation of the program in Brazil and would be in other countries where large income differences exist. This would be the case in most of the less developed world.

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