

1. SUBJECT CLASSIFICATION	A. PRIMARY	Agriculture	AF10-0000-G514
	B. SECONDARY	Agricultural economics--Brazil	

2. TITLE AND SUBTITLE
 An evaluation of the CNCR fertilizer loan program in Brazil

3. AUTHOR(S)
 Sorensen, D.M.; Rask, Norman; Dias, W.O.; Gevaerd, C.J.

4. DOCUMENT DATE 1967	5. NUMBER OF PAGES 41p.	6. ARC NUMBER ARC BR332.71.S713
---------------------------------	-----------------------------------	---

7. REFERENCE ORGANIZATION NAME AND ADDRESS
 Ohio State

8. SUPPLEMENTARY NOTES (*Sponsoring Organization, Publishers, Availability*)
 (In AFC research pub. no. 118)

9. ABSTRACT

10. CONTROL NUMBER PN-RAB-526	11. PRICE OF DOCUMENT
12. DESCRIPTORS Brazil CNCR? Evaluation Fertilizers	13. PROJECT NUMBER
	14. CONTRACT NUMBER CSD-463 Res.
	15. TYPE OF DOCUMENT

AFC Research Report 118

**AN EVALUATION OF
THE CNCR FERTILIZER LOAN PROGRAM IN BRAZIL**

**Donald M. Sorensen, Norman Rask
Wilmar O. Dias and Carlos J. Gevaerd**

December, 1967

**Agricultural Finance Center
Department of Agricultural Economics and Rural Sociology
The Ohio State University**

**Under Research Contract AID/csd-463
between
The United States Agency for International Development
and
The Research Foundation, The Ohio State University
Columbus, Ohio**

CONTENTS

	PAGE
FOREWORD	iii
INTRODUCTION	1
Objectives.	2
Methods and Procedures.	3
EVALUATION OF FERTILIZER LOAN PROGRAM.	5
Use of Commercial Fertilizer.	5
Effect of Fertilizer Use on Agricultural Production	6
Credit Aspects.	9
Previous Credit Experience	9
Sources of Loan Repayment and Income	11
Principal Source of Income	11
Acceptability of Credit Terms.	12
Alternatives to Fertilizer Program	13
An Example of Credit Substitution.	13
Operational Aspects of the Fertilizer Loan Program.	15
SUMMARY AND CONCLUSIONS.	18
POLICY IMPLICATIONS.	20
Productivity.	20
Credit Terms.	21
Farmer-Participant Selection.	22
APPENDIX I - PROGRAM DESCRIPTION AND OPERATIONAL PROCEDURE OF THE FERTILIZER LOAN PROGRAM	24
APPENDIX II -CHARACTERISTICS OF MUNICIPIOS (COUNTIES) SELECTED FOR STUDY	27
APPENDIX III-FERTILIZER USE AND SUPPLEMENTAL SAMPLE FARMER- BORROWER INFORMATION.	31

TABLES

	PAGE
Table 1 Indicated Effect of Fertilizer Use on Crop Production, 1964-1965 268 Participants - Fertilizer Loan Program	7
Table 2 Comparison of Selected Crop Yields of 268 Participants, With 1964 Municipio Averages CNCR Fertilizer Loan Program	8

FOREWORD

The Agricultural Finance Center of The Ohio State University, through a contract with the United States Agency for International Development is conducting a world-wide research project on "An Analysis of Programs for the Development and Improvement of Agricultural Credit Institutions and Services ". This project is designed to develop principles and guidelines useful to AID and developing countries in the establishment and operation of permanent and effective institutions and systems for providing agricultural credit in developing countries.

During the field phase of the research project in Brazil, The Ohio State University in cooperation with the Institute of Economic Studies and Research of the Federal University of Santa Catarina conducted this initial evaluation of the agricultural credit phase of the CNCR (Coordenação Nacional de Crédito Rural) fertilizer loan program. Substantive support for this evaluation was given by the Brazilian Ministry of Agriculture through the Escritório Técnico de Agricultura, Central Bank of Brazil - CONTAP III and USAID/Brazil.

The Institute of Economic Studies and Research (IPEE) of the Economics Department of the Federal University of Santa Catarina cooperated with The Ohio State University in collection of data and preliminary data processing in Brazil. Staff members of IPEE assisting in data collection were José Itamar de Sá, Plínio Francisco Hohn, and David Gevaerd Filho.

AN EVALUATION OF
THE CNCR FERTILIZER LOAN PROGRAM IN BRAZIL

Donald M. Sorensen, Norman Rask,
Wilmar O. Dias, Carlos J. Gevaerd^{1/}

INTRODUCTION

The developing nations are confronted with the necessity of stimulating increased production of basic agricultural commodities in the face of rapidly growing populations the majorities of which depend upon agricultural pursuits for their livelihoods. Policymakers and technicians are urgently concerned with drafting and implementing programs designed to stimulate output and efficiency. These programs have as their objectives, the establishment, modification or co-ordination of production, marketing, financial, and technical activities in the agricultural sector. Programs and policies designed to achieve increased output take various forms. Some are all-inclusive in that they embrace the whole agricultural sector. Others are implemented to affect a particular part such as agricultural production. Further, certain programs can be oriented toward a particular aspect of one of the parts such as those designed to stimulate the use of improved seed, fertilizer, or insecticides. Regardless of the form a particular program may assume, evaluation in terms of objectives is essential to determine its effectiveness and success. The program serving as a basis for the present study was designed to affect two parts of the agricultural sector; namely, finance and production.^{2/} It provided for the use of credit financing as a technique to encourage increased use of fertilizer in the production of basic food crops in Brazil.

The program under study originated through an inter-governmental loan involving the co-operation of the Governments of the United States and Brazil. This inter-governmental loan, provided by the United States, in the amount of 15 million dollars was designed to increase the amount of fertilizer imported into Brazil for the production of basic food crops.

^{1/} Donald M. Sorensen and Norman Rask are respectively research associate and assistant professor in the Department of Agricultural Economics and Rural Sociology at the Ohio State University. Wilmar O. Dias and Carlos J. Gevaerd are respectively Director and professor of Economics at the Institute of Economic Studies and Research in the Economics Department of the Federal University of Santa Catarina, Brazil.

^{2/} Program description, Appendix I.

The financial institution initially responsible for administering the program was the Bank of Brazil, however, responsibility was later transferred to the Central Bank of Brazil. The Central Bank, as depository for the funds, provided the foreign exchange for fertilizer importers interested in augmenting the amount of fertilizer imported from the United States. Terms of the contractual agreement specified that 15 million dollars were to represent a net increment in fertilizer imports into Brazil, specifically fertilizer imported from the United States.

In an attempt to more fully utilize the use of funds involved in the loan, provisions of the agreement provided for establishment of a cruzeiro^{3/} fund within the Central Bank. This cruzeiro fund was to be used for financing rural fertilizer promissory notes granted to farmer-borrowers and their cooperatives for the purchase of composition fertilizers from participating distributors. The rural fertilizer promissory note was drawn up between the fertilizer distributors and the farmer, then taken to a participating bank to be discounted through the fund established at the Central Bank. In effect, the distributor became the rationing agent, determining which farmers would be eligible to receive fertilizer loans and the amount of each loan.

Objectives:

The general purpose of this study is to evaluate the operation of the rural credit aspects of the CNCR fertilizer loan program.^{4/} Rather than attempt a comprehensive appraisal of all aspects of the program, emphasis is directed toward the operation of the program at the local level as it involves farmer-borrowers, fertilizer distributors, and participating banks. Of primary concern is the impact of the fertilizer program on the farmer-borrowers. The second area of attention is the operational procedure at the local level; i.e., the process of negotiating the fertilizer promissory notes as it included the farmer-borrowers, the fertilizer distributors and the bank.

The specific objectives of this study are the following:

- 1) To evaluate the impact of the program upon the use of commercial fertilizer. Did the farmer-borrowers participating in the program use fertilizer for the first time, increase their use of fertilizer or make no change in their use of fertilizer?
- 2) To evaluate the effect of the program in stimulating increased production of basic agricultural commodities.

^{3/} Brazilian monetary unit.

^{4/} CNCR - Coordenação Nacional de Crédito Rural.

- 3) To evaluate the impact of the program upon the farmers' use of credit. Did the program introduce the use of credit to farmers, increase their use of credit, and thus augment the total amount of resources available to finance agricultural production or did they substitute this source of credit for previously used alternative sources?
- 4) To evaluate the operational procedure for negotiating fertilizer sales under terms of the program. How were farmers informed concerning accessibility of credit for fertilizer purchases? What was the experience of the banks and distributors in administering the fertilizer loan program at the local level?

Methods and Procedures:

This study was directed toward the local level to determine the impact of the program on the producer of basic agricultural commodities and the facility with which the program was administered. To obtain information relative to the objectives above, the study was designed to include interviews with farmers, fertilizer distributors, banks, and additional discussions with local authorities who were knowledgeable of agricultural and economic conditions in their respective areas. In determining the selection of areas to be included in the study, information was obtained from the Central Bank of Brazil. This information served to identify the participating banks, the extent of their involvement, the areas in which they operated, and the crops for which fertilizer loans were granted. Information concerning the rural fertilizer promissory notes rediscounted by the Central Bank revealed that the States of Sao Paulo, Rio Grande do Sul, Parana, and Minas Gerais were the four states with the largest concentration of fertilizer sales under the program. According to information supplied by the Central Bank, the four states accounted for 90 per cent of the total cruzeiro value of rural fertilizer sales with Sao Paulo representing 56%, Rio Grande do Sul, 13%, Parana 11%, and Minas Gerais 10%. Rio Grande do Sul was selected for the pilot study and a report was submitted to USAID Brazil in the spring of 1966. The other three states are included in this evaluation of the fertilizer program.

Two of the principal participating banks in each state were selected for interview to determine their role and experience in the program. In addition, their records provided the basis for the selection of areas where fertilizer distributors and farmers who received the fertilizer loans would be interviewed.

The individual municipios (counties) selected for study represented major basic food crop production areas in these states. The municipios chosen were representative of diverse cropping patterns as well as different scales of farm operation. Among the crops for which loans for fertilizer were made available, the most important in terms of total cruzeiros involved were sugar cane, corn, potatoes,

rice, and vegetables. In all, a total of eight municipios were included in the study; three each in the States of Sao Paulo and Minas Gerais, and two in Parana.^{5/}

Lists of all farmer-borrowers in the selected municipios were compiled in respective banks serving the area. From these lists, a random sample of farmer-borrowers was drawn for the purpose of interviewing. Within each municipio, the survey team interviewed the branches of participating banks, fertilizer dealers, and local authorities in addition to interviews with farmer-borrowers.

In a further attempt to evaluate more closely the net effect of the fertilizer loan program, attention was given to the Bank of Brazil agricultural credit activity during 1965 in the municipios selected. Restricted lending activity by the Bank of Brazil in 1965 suggested the possibility of a reduced impact from the fertilizer loan program.^{6/} As a consequence of this reduced loan activity, certain agricultural producers were confronted with the problem of obtaining alternative sources for financing their productive activity. Concern centered around the possibility that rather than providing an increment to credit resources available for agriculture, the fertilizer loan program may have provided only a substitute source of financing for these agricultural producers.

It was expected that inclusion of a limited number of former Bank of Brazil clients would contribute to the evaluation of the fertilizer loan program. Interviews with some former Bank of Brazil clients were conducted to determine their reason for not having a loan with the Bank of Brazil in 1965, and the alternative source of financing they employed.

^{5/} A description of the municipios selected is included in Appendix II.

^{6/} The Bank of Brazil, in co-operation with the recently established Central Bank of Brazil, is responsible for implementing federal monetary credit and related policies. Implications of being an instrument for carrying out policy decisions are partially revealed by the relative decline in the Bank's share of agricultural lending during 1965. Traditionally, the Bank of Brazil has been the most important institutional source of agricultural credit in Brazil. As recent as 1964, it extended 68% of all bank credit for crop production and 60% of all bank credit for livestock production. However, from the 1964 level, the relative share from this source declined to 53% of all bank credit extended for crop production and 48% extended for livestock production in 1965. The emerging importance of "other bank" agricultural credit provides an alternative view of the constraint exercised by the Bank of Brazil in 1965. While "other banks" were experiencing an increase in cruzeiros loaned for crop and livestock production of 105% and 103% respectively, Bank of Brazil credit for these purposes reveals an increment of only 11% for crop production and 33% for livestock production.

Thus, information for the study was obtained from banks participating in the CNCR program, the Bank of Brazil, fertilizer distributors, local authorities and agricultural producers. In all, 268 farmer-borrowers who obtained CNCR fertilizer loans were interviewed in the eight municipios selected for study.^{7/} Further, ten banks, 23 fertilizer distributors, 7 branches of the Bank of Brazil and 14 former borrowers from the Bank of Brazil were interviewed. Nineteen local authorities were interviewed to establish the agricultural and economic conditions in their respective municipios during the 1964-65 crop year.

EVALUATION OF THE FERTILIZER LOAN PROGRAM

Use of Commercial Fertilizer:

The principal objective of the CNCR fertilizer loan program was to encourage increased use of commercial fertilizer for basic food crop production in Brazil. Programs designed to stimulate increased use of inputs (in this study, fertilizer) are expected to generate a dual response. First, those farmers presently acquainted with the use of fertilizer may be expected to increase total fertilizer used by increasing application on a given unit of land and/or increasing total area fertilized. Secondly, it is expected that fertilizer application will be introduced to some agricultural producers who have not used fertilizer previously.

Interviews with 268 farmer-borrowers confirmed, in both respects, that positive responses resulted from the fertilizer loan program. In the first place, many farmers acquired fertilizer in amounts greater than previously used and applied fertilizer to a larger number of hectares. Secondly, fertilizer was introduced to other agricultural producers who had not previously used fertilizer.

A comparison of fertilizer use in 1965 with the base year, 1964,^{8/} reveals that 157 of the farmer-borrowers interviewed experienced a positive change in total quantity of fertilizer applied. Of this number, 123 increased the total amount of fertilizer used and 34 applied fertilizer for the first time. Combined, the 123 farmer-borrowers who increased fertilizer use over previous levels purchased 3,046 metric tons of fertilizer, an increase of 72% over the 1964 level. In addition, 42 farmer-borrowers maintained prior levels of fertilizer application while 55 decreased total quantity used in 1965. The combined responses from those indicating equal or increased use of fertilizer included three-fourths of all farmer-borrowers interviewed. The comparative change in fertilizer use from 1964 to 1965 is presented in Table A of Appendix III.

^{7/} Appendix II - Interviews taken by municipio and source.

^{8/} Most farmers previously using fertilizer indicated that 1964 applications were representative of their normal fertilizer applications.

The total number of hectares fertilized is a second, and closely related, indication of change in total fertilizer used. Using 1964 as a base year for comparison, more than one-half of the 268 farmer-borrowers interviewed increased total hectares fertilized in 1965. This information is summarized in Table B of Appendix III. Of those farmer-borrowers increasing hectares fertilized, 112 had made prior fertilizer application and were expanding total area fertilized in 1965. The remaining 34 represented those farmers making their initial application of fertilizer. Forty-six farmer-borrowers continued to apply fertilizer to the same amount of land while 63 others indicated total area fertilized had declined.

Effect of Fertilizer Use on Agricultural Production:

The purpose of the CNCR fertilizer loan program was to encourage expanded use of commercial fertilizer in order to stimulate basic food crop production. Thus, it is important to determine if farmer-borrowers, through the use of fertilizer, have in fact achieved increased crop yields. Measurement of the impact of fertilizer use is difficult since crop yields in any given year are dependent upon many factors. Particularly, the effect of a single application of fertilizer is difficult to determine due to the complexities arising from the presence of residual fertilizer from previous applications, year-to-year variation in the use of complementary inputs, and other factors that could not be isolated within the design of this study. As a result, no attempt was made to determine precisely the specific relationship between fertilizer use and resulting increases in crop production. The evaluation is limited to a general response by farmer-borrowers concerning the observed effects of fertilizer use on their crop production.

Two hundred forty-two farmer-borrowers indicated that fertilizer use augmented their crop production, 14 were uncertain concerning the effect of fertilizer, and 8 stated that fertilizer use had no effect on their yields. Thus, 90 per cent of the farmer-borrowers realized and were cognizant of the gains resulting from fertilizer use.

Data presented in Table 1 represent the range of production responses arising from fertilizer use for farmer-borrowers interviewed. Most significant is that 72 farmers considered crop production unfeasible without the use of fertilizer. Of those farmers who indicated a specific percentage increase in production (the greatest number), 65 obtained 31-60 per cent increases. Thirty-nine farmers indicated that yields increased 91-120 per cent, 33 indicated a 61-90 per cent increase, and 26 farmer-borrowers reported that their crop production increased up to 30 per cent as a result of fertilizer use. Regardless of the percentage increases reported, the important finding is that fertilizer is a productive input yielding positive physical returns and that producers are aware of the effect of fertilizer on crop production.

TABLE 1

INDICATED EFFECT OF FERTILIZER USE ON CROP PRODUCTION, 1964-1965
268 PARTICIPANTS - FERTILIZER LOAN PROGRAM

STATE	PARANA		SAO PAULO			MINAS GERAIS			TOTAL
MUNICIPIO	ARAUCARIA	CASTRO	LENCOIS PAULISTA	TAQUARITINGA	BRAGANCA PAULISTA	UBERABA	PASSOS	VARGINHA	
	NUMBER OF OBSERVATIONS								
Up to 30 % Increase.	4	0	2	1	3	4	8	4	26
31-60% Increase.	11	4	5	12	5	4	12	12	65
61-90% Increase.	4	5	0	4	10	4	3	3	33
91-120% Increase.	6	3	1	6	8	10	1	4	39
Without Fertilizer, Production Would Not Be Feasible.	3	29	0	14	5	9	3	9	72
No Response	3	0	0	0	0	4	0	0	7
Did Not Increase.	5	3	0	0	2	7	5	4	26
Total	36	44	8	37	33	42	32	36	268

TABLE 2

COMPARISON OF SELECTED CROP YIELDS OF 268 PARTICIPANTS,
WITH 1964 MUNICIPIO AVERAGES^{1/}
CNCR FERTILIZER PROGRAM

Município and Crop	Production Per Hectare				
	1964	1964		1965	
	Município Average	CNCR Participant Average		CNCR Participant Average	
	(Kilos)	Amount	% Difference	Amount	% Difference
	(1)	(2)	(3)	(4)	(5)
<u>ARAUCARIA</u>					
Potatoes	5,000	8,962	+ 79	8,172	+ 63
Corn	1,362	1,427	+ 5	1,602	+ 18
Wheat	1,000	2,225	+ 123	1,500	+ 50
Rice	1,500	1,721	+ 15	2,148	+ 43
<u>CASTRO</u>					
Potatoes	16,100	16,142	+ 2	19,716	+ 22
Corn	1,320	2,086	+ 58	2,052	+ 55
Sweet Potatoes	15,000	22,420	+ 49	19,386	+ 29

^{1/} Departamento Estadual de Estatística, Governo do Estado do Paraná,
Estimativa da Produção Agrícola Ano 1964.

Further evidence of possible positive effects of fertilizer use was revealed by a comparison of average crop yields per hectare for agricultural producers included in the study with municipio crop production data. In order to make a representative comparison, 1964 production data from two municipios, Araucaria and Castro in the State of Parana, are compared with farmer-borrowers' yields, Table 2. For the principal crops produced in these two municipios, farmer-borrowers' production exceeded the municipio average. Column (1) contains municipio data for the 1964 crop year. Columns (2) and (4) present average crop yields in 1964 and 1965 respectively for the farmer-borrowers interviewed. The percentage representation of the differences in production reported by the Ministry of Agriculture for 1964 and farmer-borrowers interviewed is presented in Columns (3) and (5). This comparison points out the relatively higher productivity obtained by farmer-borrowers included in the study and suggests that fertilizer use may have contributed to this favorable result. However, it should be noted that the farmers interviewed demonstrated a greater than average use of technology. Thus part of the relatively higher productivity observed on these farms may be attributable to a favorable combination of resources and techniques employed in production and not solely to fertilizer use.

One further indication of the productive benefits arising from fertilizer use is provided by farmer-borrower responses concerning future use of this input. When questioned concerning their future intentions relative to fertilizer use, 125 farmer-borrowers indicated they plan to use the same amount as applied in 1965, 103 intend to increase fertilizer use while only 17 plan to reduce application. The remainder did not indicate their intention relative to fertilizer use in the future. In all, 85 per cent of the 268 farmer-borrowers interviewed, indicated their intention to maintain or augment present levels of fertilizer use.

Credit Aspects:

Previous credit experience: Credit financing served as the vehicle for implementing the CNCR fertilizer loan program. To encourage the use of increased quantities of fertilizer for basic food production in Brazil, interest and other loan charges established for the program were sufficiently low to induce farmers to take advantage of this source of financing. The interest rate of 12 per cent plus 1 per cent service charge was well below the opportunity cost of funds committed to the program. As a consequence, this relatively inexpensive source of financing - in effect, extended at a negative real rate of interest-^{9/} enabled some farmers to increase total resources at their disposal, others used the fertilizer loan program as alternatives to previously used sources of financing and some farmers were induced to use credit financing for the first time.

^{9/} The estimated inflation rate during calendar year 1965 was approximately 40%.

Each of 268 farmer-borrowers interviewed provided information relative to their past use of credit (if used), purposes for which they had previously borrowed, and the sources from which they had obtained their loans. All but 45 of the farmer-borrowers interviewed had used credit for one or more purposes prior to purchasing fertilizer under terms of the CNCR program. Alternatively stated, this indicates that 17 per cent of farmers included in the study were using credit for the first time. A number of the farmers using credit for the first time indicated that the loan program enabled them to free personal funds for hiring additional labor for agricultural production. Of the 45 farmers making their initial use of credit financing, 27 were found in two municipios, Araucaria in the State of Parana and Varginha in the State of Minas Gerais. In both municipios, relatively small farms are the general pattern which suggests that credit from commercial sources may not have been readily available previously due to inherent problems of loans involving small-scale producers. In Araucaria alone, one-half of the farmers included in the study indicated the fertilizer loan program provided their initial introduction to credit use. In Varginha, one-fourth of the farmers contacted were making use of credit for the first time. This finding lends credence to the belief that credit terms of the program were sufficiently attractive to induce farmers not previously familiar with credit to use this means for financing fertilizer purchases.

For the 223 farmer-borrowers who had previously used credit financing, commercial and government banks had been the principal source of credit. The bank most often mentioned was the Bank of Brazil which has a long tradition as the primary institutional lender to agriculture in Brazil. Three-fourths of all farmer-borrowers interviewed had used bank credit exclusively or in conjunction with credit obtained from commercial firms. Only a relatively small number of farmer-borrowers indicated that commercial firms or other non-bank sources had been their principal source of credit financing.

Closely related to the source of previous loans is the purposes for which credit financing was used by the farmers. Two-thirds of the farmer-borrowers had included fertilizer as a component of their input package previously financed by credit thereby suggesting that some farmer-borrowers were using the CNCR loan program in lieu of previous credit sources. On the other hand, some farmers were augmenting total resources at their disposal by taking advantage of credit financing for fertilizer purchases. This result, however, depends on the assumption that prior levels of complementary inputs were maintained.

Of the farmer-borrowers who previously used credit financing for fertilizer as a component of their input package, most also used additional credit financing for such purposes as construction of farm buildings, agricultural equipment, and hired labor. Only a limited number of farmer-borrowers used credit previously solely for the purchase of fertilizers.

The purposes for which credit was used in former years by the farmers interviewed reflected the predominate short-term nature of agricultural credit in Brazil. The majority of agricultural loans correspond to particular crop production cycles allowing a given time period for marketing the commodity.

Sources of loan repayment and income: An important consideration in the successful use of credit financing is the means whereby the loan will be retired upon maturity. In the present study, a wide range of sources was indicated for debt retirement. As expected, the source for loan repayment most often indicated was the sale of fertilized crops exclusively or in conjunction with the sale of livestock and livestock products. A total of 150 farmer-borrowers repaid their fertilizer loans directly from receipts following sale of fertilized crops. Receipts from crop sales together with livestock and livestock product sales provided income for repayment by 26 farmer-borrowers while receipts solely from the sale of livestock and livestock products served to repay fertilizer loans for 55 farmer-borrowers. Livestock producers often acquired fertilizer for pasture improvement, thus repaying their fertilizer loans indirectly through the sale of livestock and livestock products. Wages earned in off-farm work also were a source for the repayment of 15 loans and 19 farmer-borrowers found it necessary to procure an additional loan from another source to repay their fertilizer loans. The remaining 4 did not respond concerning source of funds for repayment.

Most of those repaying their loans from income arising from off-farm employment were professional people residing in towns and cities. Those farmer-borrowers finding it necessary to obtain additional credit financing to repay their fertilizer loan generally were faced with the rigid time constraint for repayment dates. In these cases, the loan due date arrived prior to the harvest and sale of crops intended to provide funds for loan repayment.

In summary, two-thirds of the farmer-borrowers used receipts derived directly from the sale of fertilized crops for part or all of their loan repayment. The remaining one-third repaid their fertilizer loan indirectly through the sale of livestock, livestock products, and other means.

Principal source of income: Closely related to the source of funds for repayment of a particular loan is the principal source(s) of income for the farmer-borrowers. Information regarding principal sources of income again served to underline the relative importance of cash crop farming. Of the 268 farmer-borrowers interviewed, 98 derived their income principally from crops receiving fertilizer while an additional 114 listed crop receipts as an important component of their total income. Combined, 212 farmer-borrowers relied on crop receipts to provide part or all of their income. Livestock and livestock products were the principal source of income for 28 farmer-borrowers while an additional 104 included livestock receipts as an important component of total income. Off-farm work provided the primary source of income

for only 5 farmer-borrowers although off-farm employment was an important component of total income for nearly 65 of the farmer-borrowers. Thus 98 farmer-borrowers derived their income mainly from crop production, 28 from livestock production, 5 from off-farm employment, and the remaining 137 derived their income from some combination of these activities.

Acceptability of credit terms: The credit terms of the fertilizer loan program were established to provide economical and uncomplicated credit financing for fertilizer purchases. To determine the suitability and acceptability of the credit terms, evaluation of the program includes the expressed opinion of farmer-borrowers in regard to the credit terms. Those farmers who used credit previously indicated what, if any, specific terms of the fertilizer loans were considered advantageous in relation to credit terms of previous loans. One hundred ninety-one of 223 farmer-borrowers who were familiar with credit use stated that the program did, in fact, afford advantages over previously known and familiar credit terms. The remaining 32 previous borrowers either indicated that no advantage was afforded by the credit terms of the CNCR program or that they were unaware of any advantages. The 45 farmer-borrowers without prior credit experience did not have a basis for comparison.

An important consideration in any program using credit as the vehicle for implementation is the relative cost of the credit to the recipient. To fulfill its intended role, credit must have a relatively low cost, i.e., interest and other loan charges must be sufficiently economical to attract desired participation in the program. In this respect, the fertilizer loan program was successful. One-hundred twelve of the 258 farmer-borrowers interviewed indicated, directly or indirectly, that the favorable interest rate was a major feature of the program. Forty referred directly to the interest rate while 72 referred indirectly to the interest rate by citing the advantage afforded by the discount provision.

Not only the cost of credit, but also other terms and conditions of a loan program must be acceptable to prospective and actual participants. One of the most important of these is the time period for the loan; does the time period allow sufficient time to achieve the desired return from the particular productive enterprise? One-hundred nineteen farmer-borrowers indicated that the time period granted under terms of the fertilizer loan program was sufficient for the production, harvesting, and marketing of fertilized crops. A further important provision of the loan program was the absence of a maximum cruzeiro limit for any given loan. As a result, some farmer-borrowers indicated this condition of the loans to be advantageous. Closely related and often indistinguishable from the credit terms is the actual procedure established for loan application and processing. The facility with which the fertilizer loan program was administered at the local level prevented undue delays and loss of valuable time for farmer-borrowers. Many farmer-borrowers substantiated this by indicating that a major feature of the loan program was the ease with which credit transactions

were completed. In addition to favorable terms, several farmer-borrowers mentioned the ease with which their loans were transacted as being advantageous.

In all, the credit terms of the program appear to have afforded definite advantages to those agricultural producers finding it necessary to use credit financing for fertilizer purchases.

Alternatives to the fertilizer program: The fertilizer program created a source of credit financing that had not been available prior to its implementation. As previously indicated, agricultural producers were either substituting this source of credit financing for previously used sources, using credit for the first time, or using this source in the absence of alternatives. To further evaluate the net impact of the program on fertilizer and credit use, farmer-borrowers were asked what they would have done had the fertilizer loan program not been available to them. Three-fourths (203) of the farmer-borrowers indicated that fertilizer purchases would have been made anyway. Of this group, 155 would have used an alternative source of credit financing. The most common alternative source of credit mentioned was distributor credit. A significant number also indicated that commercial and government bank credit would have been used. Twenty-one farmers had no alternative credit source available to them and 27 did not know if alternative credit sources would have been available.

In addition to identifying the source, if any, of credit for fertilizer that would have been used in the absence of the CNCR fertilizer loan program, farmer-borrowers also indicated the quantity, type, and source of fertilizer they would have used. More than one-half of the farmer-borrowers stated that they would have used the same quantity and type of fertilizer as used under the CNCR fertilizer loan program and that they would have made their fertilizer purchase from the same distributor.

In summary, the analysis of available alternatives to the fertilizer program revealed that: (1) A majority of the farmer-borrowers interviewed would have purchased fertilizer in the absence of the CNCR fertilizer program, (2) Of this group, all but 21 farmer-borrowers had alternative sources of credit financing that would have been available had the fertilizer loan program not existed, and (3) A majority would have used the same quantity and type of fertilizer and would have purchased this input from the same distributor through whom they obtained their CNCR fertilizer loan.

An example of credit substitution: To further examine the extent to which the CNCR fertilizer loan program may have served as a substitute for previously used sources of credit financing, officers were interviewed in seven branches of the Bank of Brazil located in the municipios selected. In addition, 14 farmers were interviewed who had previously obtained Bank of Brazil credit, but did not have Bank of Brazil loans in 1965. Selection of the Bank of Brazil for inclusion in the study is based on its tradition as the most important source of institutional credit for Brazilian agriculture. During 1965, however, Bank of Brazil credit extended to agriculture was restricted due to the

Bank's responsibility for implementing certain governmental fiscal, economic, and agricultural policies. The significant restriction was in the total number of loans granted. Although there was a substantial decline in number of loans granted, average loan size increased in 1965. The restriction in number of loans granted indicates that some former clients of the Bank of Brazil were faced with the necessity of finding alternative sources for financing their agricultural production.

Information provided by branches of the Bank of Brazil located in the municipios reveals that total number of loans granted by these branches declined 31 per cent from 1964 to 1965. To obtain an indication of the effect of this reduction, former clients of the Bank were interviewed. Of the former clients interviewed, most had used Bank of Brazil credit for several years prior to 1965. Bank of Brazil loans had been granted for crop production to all previous borrowers interviewed while a number of agricultural producers had been granted Bank of Brazil loans for purchases of machinery, tractors, and irrigation equipment.

Fertilizer had been a component of most of the crop production loans. Therefore, of interest to the present study was the alternative means by which former Bank of Brazil clients purchased their production inputs, particularly fertilizer. Five of the fourteen former clients interviewed had found and used multiple sources for financing their agricultural production in 1965. Three had obtained fertilizer loans under terms of the CNCR fertilizer loan program. Fertilizer distributors provided credit financing for two of the producers while private, commercial and state banks extended loans to seven of the former clients interviewed. In addition, four producers had relied only on personal funds while two indicated their agricultural activity was reduced due to lack of sufficient sources of financing. Although the sample of former Bank of Brazil clients is limited, it does provide an indication that some farmers were confronted with the problem of seeking alternative sources for financing agricultural production. Further, it illustrates that some farmers were substituting the CNCR loan program as well as other sources of financing for previously available sources. This brief appraisal of alternatives used by former Bank of Brazil clients points out the difficulty encountered in attempting to quantify precisely the net leakage from the program caused by program credit substitution for previously used sources. To fully evaluate the extent of leakages from the program, more precise measures of former credit use is required.

The third effect expected to arise from the CNCR fertilizer loan program was that it would increase total resources available to some farmers. This effect is closely related and often indistinguishable from the other two. On the one hand, those farmers transferring from other sources of financing to the fertilizer loan program may have used their previous sources of credit to finance other aspects of their agricultural activity. Similarly, those farmers making use of credit for the first time were able to use credit financing for their fertilizer purchases, thereby releasing personal funds to acquire additional inputs. Data relative to farmer-borrowers' prior and

present use of credit indicate that the CNCR fertilizer loan program augmented the total resources available to a considerable proportion of those interviewed.

Operational Aspects of the Fertilizer Loan Program:

In addition to evaluating the direct effects of the fertilizer loan program on agricultural producers, the scope of the study was extended to include some considerations of an indirect nature regarding the operational procedures of the program at the local level. Participating banks, fertilizer distributors, and farmer-borrowers constituted the parties involved in the fertilizer loan transactions; consequently information gained through interviews with representatives of selected banks and distributors served to complement information relating to this subject acquired through the survey of farmer-borrowers.

First, considering the methods of promotion used to inform potential borrowers about the special fertilizer loan provisions, fertilizer distributors indicated that a number of methods had been employed. The most frequently mentioned technique was the use of representatives or salesmen of the fertilizer distributor in direct contact with agricultural producers, either individually or in group meetings. Additional methods employed in promotional efforts with varying degrees of emphasis included newspaper advertisements, published pamphlets, and radio commercials. To give a further indication of the prevalence of direct contact as the principal means for notifying potential borrowers of the availability of the fertilizer program, 216 of the 268 farmer-borrowers interviewed stated that they learned of the program directly through contact with their distributor or cooperative. The remainder of the farmer-borrowers learned of the program through other means including radio, newspapers, neighbors, local agronomists or bank representatives. The use of radio and newspaper advertising was limited since the amount of credit available was not sufficient to serve all who might have requested a loan in response to greater promotional efforts. The relative importance of personal contact between distributor, representatives and agricultural producers as the method of acquainting the latter with provisions of the program underline the strategic role played in the operation of the program by the distributor. In his role as the rationing agent, he was able to determine who would be able to acquire CNCR fertilizer loans and who would not.

With the capacity to make this determination, several distributors revealed that former customers comprised the bulk of their sales under terms of the fertilizer loan program. The distributors stated that they were aware of the character, ability, and repayment capacity of those farmers previously served and gave preference to these accounts. As expected, rationing by cooperatives included in the program limited fertilizer sales to member farmers. Although former fertilizer customers were given preference in most cases, half of the distributors interviewed indicated that a substantial number of sales under terms of the program had been made to new accounts. Some distributors

pointed out that the limited amount of resources available through the program did not permit them to offer this special credit financing to additional agricultural producers. Other distributors suggested that the limited number of banks participating in the program resulted in some areas with a tradition of fertilizer use not being covered by the program due to lack of a participating banking agency. Only in the State of Minas Gerais was emphasis given to soliciting farmers who had not financed fertilizer previously. This was done through the state agency CAMIG (Companhia Agricola de Minas Gerais S/A). CAMIG, except for areas bordering Sao Paulo, maintained a virtual monopoly of fertilizer sales in the state. In addition to attracting new accounts, CAMIG attempted to provide fertilizer to farmers who had limited or no alternative means of financing. Distributors in Parana acknowledged the problem of the small farmer in seeking financial assistance, particularly those not belonging to a cooperative organization.

The second area of interest concerning operational aspects of the CNCR fertilizer loan program is the processing of the loan transaction itself. Generally, all bank and distributor representatives interviewed expressed the view that the mechanics of completing the loan transaction were much simpler and involved less bureaucratic delays or problems than any alternative credit scheme available. Distributors pointed out that farmers generally considered this lack of bureaucratic problems to be one of the strong points of the program. Prolonged delays or repeated trips to the bank or fertilizer dealer were not required. The facility with which the transactions were carried out is substantiated by further information obtained from the farmer-borrowers interviewed. Two-thirds of the farmer-borrowers indicated they obtained their supply of fertilizer on the same day they submitted their request. A few farmers received their fertilizer within two weeks after requesting it and the remainder, for a number of reasons, received their fertilizer more than two weeks after their requests were made.

The third consideration included in the evaluation of operational aspects of the program is the opinion of all participants concerning terms and conditions specified for the fertilizer loans. Turning initially to the subject of the interest rate specified in the program, all distributor and bank representatives interviewed stated that the interest charge was more favorable for farmer-borrowers than most previously used alternatives. Distributors generally reacted favorably to the interest rate and asserted that the loan program afforded farmers the most economical credit financing available. While some banks did not feel their earnings were sufficiently large, they were aware of the benefits accruing to the farmer-borrowers. As pointed out in the previous section of this report, a substantial number of farmer-borrowers indicated that the low interest rate was one of the major features of the program.

The time period on the loans was generally considered adequate given normal climatic and marketing conditions. Those farmer-borrowers involved in truck gardening were thought to have adequate time for

producing, harvesting, and marketing their crops. However, some fertilizer distributors as well as farmers indicated that the time period was not always of sufficient length for the production of cereal crops.

The main criticism centered around the rigidity of contract terms established for a particular crop which did not allow sufficient flexibility to account for varying crop production periods due to variations in regional climatic, growing, and marketing conditions. In addition to the farmer-borrowers, banks and distributors considered this inflexibility as a cause for concern. Conditions preventing planting crops at specific times which delayed crop maturity would push the due date on the loan up to the harvest date, allowing little time to market the crops produced.

The discount provision was considered of particular significance to the success of the program by the distributors and banks. Nearly all of those interviewed expressed the view that the positive incentive provided by inclusion of this provision greatly facilitated prompt repayment when fertilizer loans were due. The threat of forfeiting the discount due to late repayment provided a positive incentive for farmer-borrowers to avoid this penalty. Both bank and fertilizer distributors believed the disciplinary effect served to insure prompt repayment of CNCR loans, thus being one of the essential features in the success of the program.

As pointed out previously, the discount constituted a real saving to those farmers finding it necessary to use credit financing. In regard to retiring the fertilizer loans on the due date, a problem arose when some farmers in outlying areas were late in getting their payments to the bank. With mail service not completely reliable and for other reasons, a one or two day delay occasionally occurred before the payment reached the bank. In most cases the distributor and banks made allowance for this contingency and did not force the farmer-borrowers to forego the discount.

Finally, the fourth consideration is the effect of the program on the overall operation of distributors involved in the program in terms of reaching their quotas, possible further sales that could have been made and total sales made on credit. The criticism most often voiced was that the program was of insufficient size to serve all those farmers who might have benefited, had it been possible for them to acquire a fertilizer loan. Both banks and distributors stated that more loan funds should have been made available so that fertilizer sales could have been expanded. To lend support to this contention, all but one of the distributors indicated that they had exhausted the total quota allocated to them under the program. Further, this group of distributors asserted that additional sales would have been realized if additional loan funds had been available. Nevertheless, given the existing amount of funds available under terms of the program, both fertilizer sales made on credit and fertilizer sales in total were increased.

In summary, the operational aspects of the fertilizer loan program generally were favorably received. On the positive side, low cost of money, minimum delay in receiving the fertilizer and the general facility with which the transactions were completed were considered as favorable aspects by all parties concerned. The discount provision and the inherent inflexibility it necessarily contained received mixed responses. The banks and distributors finding it a central consideration in the timely repayment of loans, the farmers expressing the opinion that it did not allow sufficient flexibility to account for the variability in the agricultural production and marketing process.

Finally, the method of farmer selection was necessarily restricted to certain areas and individuals. First, for the program to operate, a branch of a participating bank must exist in an area and because of the limited funding, most of the financing went to the more reliable and trusted past customers of the fertilizer distributors.

SUMMARY AND CONCLUSIONS

The objective of the program evaluated in this study was to stimulate basic food crop production in Brazil by encouraging increased use of commercial fertilizer. The incentive to increase fertilizer use was provided by special credit financing. This evaluation of the program was directed toward the local level where operation of the program involved the farmer-borrowers, fertilizer distributors, and participating banks. A sample of farmer-borrowers included in the special program in 1965 and representatives of the participating entities were selected for interview to determine the impact of the program on fertilizer and credit use and resulting changes in agricultural productivity. Further information obtained from these sources permitted an evaluation of the operational aspects of the program. Increased fertilizer consumption, positive changes in agricultural productivity, expanded use of agricultural credit, and the general facility with which the program operated were all positive aspects.

First, the loan program served to encourage increased application of commercial fertilizer in Brazil. More than one-half of 268 farmer-borrower participants included in the study increased the total amount of fertilizer used in 1965 over previous levels. Fertilizer distributors and participating bank representatives substantiated this conclusion, indicating that fertilizer use did, in fact, increase with the implementation of the program. Although the program was generally well received, its full potential impact was tempered necessarily by such factors as traditional farming methods, actual and anticipated commodity prices, and technical problems involved in agricultural production. For example, instability in commodity prices, which for certain crops reached rather low levels in 1964 due to bumper yields, discouraged some farmers from increasing the use of purchased inputs, particularly fertilizer for the 1965 crop year. Nevertheless, fer-

tilizer use expanded during the 1965 crop year, owing both to implementation of the fertilizer loan program and other contributing factors.

The design of the study did not permit a specific cost-benefit analysis to measure the economies of fertilizer use, however, indications that physical production increases result from fertilizer use are amply documented. More than 90 per cent of the farmer-borrowers interviewed realized and were cognizant of gains in crop production attributable to fertilizer applications. Further credence is given to the conclusion that fertilizer use stimulates crop production by comparing the yields attained by farmer-borrowers interviewed with overall municipio crop production averages. This comparison indicates that farmer-borrowers included in the study achieved higher per hectare yields on major crops fertilized. Again, caution must be taken in attributing the total differential to fertilizer use since those farmer-borrowers included in the program demonstrated a greater use of technology in other complementary inputs as well.

Credit financing provided the vehicle for implementing the fertilizer loan program and proved to be an effective means of encouraging increased use of fertilizer. As such, it served to introduce credit use to 45 of the farmer-borrowers interviewed in addition to providing others with alternative sources of credit financing for fertilizer. Those using the fertilizer loan program as an alternative to previously used sources of credit financing did so either to supplement total resources at their disposal or to replace prior credit sources no longer available to them.

The credit terms of the program provided an economical and uncomplicated means of credit financing, thereby, reducing the effective price of fertilizer for agricultural producers finding it necessary to use credit financing. The low rate of interest charged on the loans enabled the agricultural producer to make a substantial saving over the costs of other credit sources available. In addition to the favorable interest and loan charges of the program, farmer-borrowers interviewed pointed out other features of the credit terms they considered advantageous. With the exception of some cereal grain producers, the time period allowed on the loans was considered to be sufficiently long to permit production, harvesting, and marketing of the fertilized crops. Absence of a maximum limit (in cruzeiros) on the amount of the loans appealed to some of the larger producers. The use of the discount provision under terms of the fertilizer loan program served as a disciplinary factor to encourage prompt loan repayment and contributed greatly to the success of the program.

Administration of the program at the local level facilitated the credit transactions for fertilizer purchases. Many of the farmer-borrowers interviewed indicated that the uncomplicated means for securing the fertilizer loans prevented undue delays or loss of valuable time in concluding fertilizer loan arrangements.

The fertilizer distributor occupied the strategic position in the operation of the program at the local level in that he determined the distribution of fertilizer under terms of the program. Thus, in his role as the rationing agent he was able to determine who would and who would not be granted fertilizer loans. In many cases, therefore, fertilizer loans went to established customers whom the distributor recognized as being reliable and capable of repaying the fertilizer loan.

The overall program was generally well received by fertilizer distributors and banks. Distributors stated that the loan program augmented fertilizer sales. Further, they indicated that fertilizer sales would have expanded more if a greater amount of funding had been available. Some bank representatives believed the amount of financing available was not sufficient. Others suggested that earnings from discounting the fertilizer loans were minimal, thus not proving particularly profitable for them.

POLICY IMPLICATIONS

The preceding evaluation of the fertilizer loan program demonstrates that a program designed to encourage increased use of a particular input can be an effective means of stimulating increased agricultural production. It further demonstrates that any one particular program or procedure cannot satisfy equally the multiple objectives that may comprise an overall development plan.

The specific program under study was designed to operate with a minimum of administrative burden. This decision resulted in certain operational efficiencies and a possible reduction in potential impact of the program on total productivity. This section of the study considers these aspects of the program and examines the effect of a modification of objectives on program emphasis and procedure.

Productivity:

Agricultural production is a function not only of the particular input in question (fertilizer) but of a combination of factors including the kind and quantity of other components of the total input mix. That is, the expected results from a given level of fertilizer application are dependent on whether and to what extent other complementary inputs such as hybrid seed and pesticides are employed. This may be an extremely important consideration in more traditional systems of agriculture where limited amounts, if any, of such inputs are used. In these situations, the utilization of increased quantities of a specific input, without recognition of its relationship with complementary inputs may result in less than optimum returns. Thus, in order to assure a significant response, the structure of a program designed to encourage the use of a particular input may need to be enlarged to include some emphasis in promoting complementary input use.

Credit Terms:

Low cost credit financing proved to be effective as a means of encouraging increased input use. However, to provide the benefits of low cost credit financing to borrowers means that certain implicit and explicit costs involved must be borne by someone else. The relative reduction in credit costs is a direct function of the willingness of the government to subsidize the program. Thus, the degree of incentive that can be provided agricultural producers through favorable credit terms is regulated by the cost the government is willing to absorb.

The present program provided low cost credit and covered operational costs by transferring certain functional responsibilities from credit institutions to distributors (see following section). However, it is conceivable that a program could be implemented which would not be expected to cover costs of administration. Thus, to insure the full participation and cooperation of agricultural credit institutions in programs designed to improve the general welfare, public funds may be necessary to cover part of the operational expenses.

Although the program under study covered operational costs, there is another cost that probably was not covered by interest and charges on the loans. This latter cost is due to the deterioration in the real value of loanable funds committed to the program. This deterioration is caused by a rate of inflation in an economy that surpasses the rate of interest. In the interest of public welfare goals, the government necessarily absorbs this cost.

In addition to the relative costs of credit financing, other credit terms are important to the success of a given program. For example, the penalty for late loan repayment imposed by the discount provision of the present program provides a positive inducement for prompt loan repayment. The success of this provision suggests that it may be a useful device in similar credit schemes. By imposing a penalty for loans that are not repaid when due, collections are facilitated considerably.

Closely related to the discount provision is the time period granted for the loans. Establishment of the time period to correspond to one regional crop production cycle or repayment date set for a particular calendar date results in excess rigidity. When unknown contingencies arise such as delayed crop planting, or delays at harvest, insufficient time is granted if the rigid schedule is maintained. This problem is further complicated by the varying regional climatic and geographical conditions that do not allow crop maturity to occur at the same rate in all areas. Thus, the time period granted on loans should be determined by credit institutions servicing the different regions so that repayment dates more realistically coincide with the various crop production cycles.

Farmer-Participant Selection:

Fertilizer distributors occupied a strategic position in the operation of the fertilizer loan program at the local level. In their role as rationing agents, they determined the distribution of fertilizer to agricultural producers. This arrangement contributed to operational efficiency of the program. However, its effect on total program impact is less clear and depends somewhat on policy objectives. For example, the assignment of responsibility to the fertilizer distributor for receiving and evaluating loan applications and making collections has implications for the credit institutions participating in such a program. Transferring this responsibility to the distributors enables the participating credit institutions to realize a substantial saving in loan processing costs in that implementation of such a program does not substantially affect manpower and facility requirements. In addition, giving major responsibility to the fertilizer distributor probably enables the program to operate more efficiently in that distributors are likely to be more familiar with the majority of agricultural producers served than are the credit institutions.

However, assigning this responsibility to the distributor logically leads to the selection of those farmers who are financially secure and who purchase fertilizer in relatively large quantities. Under the CNCR program, one-fifth of the farmer-borrowers included in the study received two-thirds of this group's total fertilizer purchases. Inevitably this means that some transfer of former credit and fertilizer users to the new program occurs. The contribution of this group of farmer-borrowers does not add to the net impact of the program unless they make significant increases in their level of use. Nevertheless, if policy objectives are directed toward minimizing program operational costs and maximizing output response, then this system may be preferable.

However, if public policy objectives are oriented toward a more equitable distribution of limited productive inputs such as fertilizer, then substantially different implications for program operation emerge. If a program is designed primarily to promote adoption of technology or to provide small producers with productive inputs, then someone other than distributors may need to be responsible for determining agricultural producer eligibility for participation in the program. To insure a more equitable distribution of program benefits, credit institutions for example may be required to assume major responsibility for loan evaluation, servicing, and collection. The implications of this increased responsibility for the credit institutions are that their costs will quite likely be higher. A considerable amount of operational efficiency will be foregone in that the increased work load will create delays and may require additional personnel and facilities. Further, an anticipated relatively smaller average loan size means that costs per monetary unit outstanding is higher than would be the case if fewer but larger loans are granted.

Consequently, public policy decisions contain implications for the role of credit institutions in servicing agriculture. If the

public welfare objective is limited to increased food supplies, then a fertilizer program operated for this restricted purpose may be the most economical and efficient. On the other hand, for policy decisions oriented toward an equitable distribution of the scarce input or toward upgrading the levels of smaller, less efficient producers, it may be necessary for other institutions to perform the allocative function.

In summary, the fertilizer loan program as conceived and carried out was expected to operate with a minimum of cost and administrative burden at the local level. It has been shown that this was, in fact, a very positive feature of the program. Specific areas of possible loss of efficiency in relation to ultimate program objectives have been pointed out, particularly in regard to the selection of farmer participants in the program. The magnitude or actual existence of a problem in this regard would depend heavily on the specific program objectives. However, it should be recognized that additional program control and direction can be achieved only by incurring added cost. The cost must be evaluated in each instance with the anticipated improvement in the functioning of the program.

APPENDIX I

PROGRAM DESCRIPTION AND OPERATIONAL PROCEDURE OF THE FERTILIZER LOAN PROGRAM

The Governments of Brazil and the United States in August, 1964, signed an agreement whereby 15 million dollars were to be provided by the United States to finance fertilizer imports into Brazil. To insure that fertilizer imports would be increased by the full 15 million, terms of the agreement specified that funds provided could not be substituted for normal importation from Europe, Asia, and the United States. Normal fertilizer imports were estimated to be 20 million dollars of which 5 million originated in the United States. The increment of 15 million as provided by the agreement was to represent a 75 per cent increase in total value of fertilizer imports. Further, the amount imported under provisions of the agreement was to represent a net increment in fertilizer imports from the United States. To satisfy this requirement, one normal import dollar was to be combined with three importation agreement dollars to provide the full 15 million dollar increment.

The fertilizer loan program was designed to operate in the following manner. The Bank of Brazil established import quotas for fertilizer importers registered with its Export-Import Department eligible to participate in the program.^{10/} The importers were assured of obtaining foreign exchange for specified fertilizer purchases up to the amount of their quota providing they adhered to the provisions of the general agreement. On the import transactions conducted under the program, the importer was required to deposit, in cruzeiros, 25 per cent of the dollar amount of the respective exchange contract, with the remaining 75 per cent financed by the Central Bank. Thus, on all exchange transactions involving the United States, the normal imports from the U. S. were protected by the provision that one normal dollar be combined with three import agreement dollars.

Further provisions of the agreement called for the establishment of a cruzeiro fund by the Central Bank. This fund was to be used for financing fertilizer sales to rural producers. The fund was established by matching each of the import dollars used for fertilizer imports with cruzeiro funds corresponding to 75 per cent of each import transaction up to the limit of the 15 million amount in the agreement. The cruzeiro fund was to be used for financing fertilizer purchases by rural producers and their cooperatives through the rediscounting of sales contracts issued by the fertilizer distributor. The Central Bank, or Bank of Brazil at the time, extended these funds to the banks participating in the fertilizer loan program at the discounted rate of 5 per cent.

^{10/} Administration of the fertilizer loan program passed to the Central Bank of Brazil after it was organized in 1965.

A prerequisite for state, private, and state savings bank participation in the program was the existence of an agricultural credit department within their organizational structure. Those banks meeting the specified requirements for inclusion in the fertilizer loan program were assigned a quota for rediscounting purposes by the Central Bank. In turn, each of the participating banks assigned quotas regulating the amount of fertilizer sales each distributor could sell under provisions of the program.

The operation of the rural credit aspects of the fertilizer program was established in the following manner. The fertilizer sales contract consisted of a specially prepared form completed by the farmer and the fertilizer dealer which stipulated the amount, type, price, and total cost of the fertilizer. In addition, the due date, financial terms, and crop intended for the fertilizer application were included. No maximum limit was attached to the amount of fertilizer individual farmers might purchase. The distributors, however, determined which farmers were to receive loans and based their approval on an analysis of the moral, technical, and financial reliability of the applicant and also his ability for repayment and capacity for utilization of the fertilizer on his crops. Consequently, the fertilizer distributor occupied the key position in determining who would receive the fertilizer loans. He, in effect, was the rationing agent. In addition to being responsible for selecting the farmers to be included in the program, the fertilizer dealer under terms of the contract was to provide, through endorsement, security for the individual loan transaction.

Once the fertilizer sales contract had been drawn up between the dealer and the farmer, the dealer would take the fertilizer sales contract to a participating bank to be discounted. The banks were authorized to levy a maximum of 12 per cent interest and 1 per cent service charge on the loan, thus, receiving 8 per cent above the 5 per cent accruing to the Central Bank for use of the funds. The length of the loan period corresponded to the particular crop cycle in question and allowed 30 to 45 days for marketing the crop after harvest.

With the implementation of the fertilizer loan program, a third alternative method of financing fertilizer purchases was available to agricultural producers. Prior to introduction of the CNCR fertilizer loan program, fertilizer purchases normally were either on a cash basis or financed by the fertilizer dealer. The CNCR program thus provided a third option.

To more fully understand the operation of the CNCR program, it will be helpful to compare it with the other two options noted. First, if the farmer chose to pay cash for his fertilizer purchase, he would be charged only the list price of the fertilizer.

The second option open to the farmer appropriately could be termed dealer credit whereby the farmer was charged the list price for the fertilizer plus a 10 to 30 per cent per annum interest charge corres-

ponding to commercial bank rates of interest. This 10 to 30 per cent interest was charged when the fertilizer distributor was required to provide credit to the farmer for the purchase of fertilizer. The dealer would finance the farmer by going to his local bank and borrowing the money at rates reflecting the general inflationary conditions in the Brazilian economy.

The third option open to the farmer was the special loan provision of the CNCR fertilizer loan program. The fertilizer distributor quoted the farmer a price on the fertilizer, which included both the basic cash price plus an extra amount varying from 10 to 30 per cent. This total amount appeared on the fertilizer sales contract as the price of the fertilizer, then the extra amount was subtracted and termed a discount for farmers if repayment was made on or before the due date of the loan. Deducting this discount from the price quoted reduced the net balance to the list price of the fertilizer. Then, under terms of the CNCR fertilizer loan program, the 13 per cent interest charge was assessed against the list price of the fertilizer. This rate of interest was effective until the due date of the loan. However, certain conditions were included in the program terms concerning those farmers who were late in making repayment for their fertilizer loan contract. Most important was the stipulation that in the case of late or overdue loans, the dealer had the option of retaining the so-called discount. The dealers' option to retain this discount served as a positive incentive to farmer-borrowers for prompt loan repayment. The threat of foregoing the discount motivated borrowers to meet their loan commitments promptly.

Operationally, the fertilizer distributor had the responsibility for collection from the farmer-borrowers. For loans repaid on or before the due date, the distributor would remit to the bank the list price plus the 13 per cent interest and charges. For loans not paid on the due date, the distributor was still committed to remit this amount to the bank. In turn upon repayment by the farmer, the distributor would collect the list price plus 13 per cent charges from the farmer-borrowers and, in addition, was given the option to retain the discount.

All loans granted under terms of the fertilizer loan program were handled in the following manner. The loan contract was held by the bank until due date or until it was retired by the farmer or the dealer. On the date the loan fell due, the participating bank would remit the full 100 per cent face value of the loan to the Central Bank.

This program then provided the most advantageous alternative for those farmers finding it necessary to borrow funds to purchase fertilizer and who were capable of prompt repayment of their loans. For those farmers having insufficient resources to pay cash for fertilizer purchases, there was substantial incentive to use the special loan provisions under the fertilizer loan program.

APPENDIX II

CHARACTERISTICS OF MUNICIPIOS (COUNTIES) SELECTED FOR STUDY

Município selection was based on information obtained from the Central Bank which revealed that Sao Paulo, Parana, and Minas Gerais had extended a substantial proportion of rural fertilizer loans under terms of the program. It was expected that the municípios chosen would be representative of the principal crops for which fertilizer loans were granted in addition to their significance to the agricultural economy of Brazil.

In order to provide a frame of reference for analysis, it will be helpful to describe briefly the agricultural production and marketing characteristics of the areas chosen. Description of the study areas is based on interviews with local authorities, principally mayors, agronomists, bank managers, and local employees of governmental agencies.

Araucaria--The initial município included in the study was Araucaria, a município contiguous to Curitiba, the capital of Parana. The farms characteristically are small with potato production constituting the most important commercial crop. Most of the farmers engaged in potato growing display limited technological progress relying principally on traditional methods of cultivation. However, the recent in-migration of Japanese settlers has served to diversify agriculture by introducing truck gardening and commercial poultry production into the area. The latter group displays high levels of technology including mechanization and electrical power.

In terms of the market situation confronted by agricultural producers in Araucaria, Curitiba provides a readily accessible outlet for production. Nevertheless, there was a market contrast in the way agricultural products were marketed by the traditional smaller farmers and those of recent settlement in the município. The former generally sell their crops without leaving their farms to truck operators or local intermediaries while the Japanese farmers are members of a cooperative that is able to move their products effectively into the national market. Curitiba is connected by paved road with the large urban areas of Sao Paulo and Rio de Janeiro.

Castro--The second município in Parana, located approximately 100 miles from Curitiba, provided an area for study where dairying and larger scale mechanized crop production took place. The dairy producers exhibited a high level of technical competence in the development of registered holstein herds, their pasture improvement activities, use of artificial insemination, and extensive use of mechanization. Mechanized potato production was on a larger scale than found in Araucaria and the quality of the product was such that it warranted the name "Castro" in the national market. Both dairy producers and potato growers are well served by cooperative organizations which provide outlets for their products both in Curitiba and in the national market.

Lancois Paulista--The first municipio studied in Sao Paulo produced sugar cane as the predominant commercial crop. Land holdings were characteristically large with production of sugar cane being labor intensive. This municipio due to the recent establishment of quotas limiting sugar cane productions by the Federal Sugar and Alcohol Institute has begun to introduce dairy production and cattle grazing as alternatives to the pattern of monoculture that has been traditional. Three sugar refineries provide the means whereby the cane crop can be marketed and processed.

Taquaritinga--The second municipio in Sao Paulo was Taquaritinga characterized by diversified agriculture with tomato production emerging as the principal activity. The municipio once produced almost exclusively coffee and cotton, but has shifted to the production of a number of crops. In the municipios previously described, the given pattern of farming and level of technology tended to be associated with a particular ethnic group. However, in Taquaritinga the ethnic groups are not distinguishable in their operation and there tends to be a more uniform pattern of farming and level of technology. A tomato processing plant located in the municipio provides an outlet for much of the production. Construction of a new processing plant is under way which will increase capacity fivefold.

The citrus crop is marketed through wholesalers who readily reach the national market.

Braganca Paulista--Located less than 100 miles from the city of Sao Paulo is Braganca Paulista, traditionally a coffee producing area. In recent years, there has been a continuing shift to dairy and potato production. The introduction of improved pasture is bringing about a substantial increase in livestock production both for meat and milk products. The level of technology utilized by the long time residents of the area tends to be rather low. In contrast, the Japanese farmers provided technical assistance by their cooperative are highly mechanized and follow improved farming techniques.

The proximity of the Sao Paulo urban market easily reached by hard surfaced roads provides an ample market for agricultural production.

Uberaba--Uberaba located in the southern area of the Minas Triangle provided the first area of study in Minas Gerais. Typically the land holdings are large with cattle raising being the predominant agricultural activity. Dairy production is becoming a more important component of the agricultural picture. The producers generally are employing a high level of technology particularly in the improvement of pasture for their herds. In many cases, the producer will break up the land, analyze the soil, apply lime, fertilize and grow grain crops on the land for two to three years. The land is then returned to permanent pasture with a considerable increase in the quality over the original pasture. Belo Horizonte is expected to be an important market for the dairy producers of Uberaba.

Passos--The second municipio selected in Minas Gerais was Passos, which represents a municipio going through the transition from monoculture to diversified agriculture. Originally the area was an important coffee producer, later sugar cane became the dominate crop until the

recent past when cattle raising increased in importance. While a considerable amount of cane is still produced, livestock production both for meat and dairy products has been expanded in response to an available market in Belo Horizonte. Complementary to the increasing importance of cattle raising and dairy production has been the introduction of corn and other crops into the municipio. Two sugar refineries process the sugar cane while Belo Horizonte is the principal market for the livestock and dairy producer.

Varginha--Varginha was the final municipio studied in Minas Gerais. It is located in a rather mountainous area in the southwest part of the state. While the growing of coffee is an important activity in the municipio, the demand for meat and dairy products in the growing urban areas of Belo Horizonte and neighboring Sao Paulo is encouraging a shift to cattle and dairy production. Further, much of the farm land is being converted to grain production both to be used for cattle raising and as a cash grain crop. Fertilizer use has been an important practice for a considerable time in the area. The uniqueness of Varginha is that many of the land owners were professional persons living in the city and operating their farms as a supplemental activity. Their level of knowledge and use of technology are among the highest of any group included in the study. In addition, however, there is a substantial number of small scale farms in the municipio.

The coffee production moves into the national and international market while Belo Horizonte and other urban centers provide the market for other agricultural products.

CNGR FERTILIZER LOAN STUDY
INTERVIEWS TAKEN
BY MUNICIPIO AND BY SOURCE

MUNICIPIO AND STATE	FARMER- BORROWERS	PARTICI- PATING BANKS	FERTILIZER DISTRIBUTORS	LOCAL AUTHORITIES	BANK OF BRAZIL	PRIOR BANK OF BRAZIL BORROWERS	TOTAL
ARAUCARIA-PA.	36	--	1	3	--	--	40
CASTRO-PA.	44	1	4	1	1	--	51
LENCOIS PAULISTA-SP.	8	1	2	2	1	--	14
TAQUARITINGA-SP.	37	1	3	2	1	3	47
BRAGANCA PAULISTA-SP.	33	1	8	4	1	3	50
UBERABA-MG.	42	2	1	3	1	3	52
PASSOS-MG.	32	2	2	2	1	3	42
VARGINHA-MG.	36	2	2	2	1	2	45
TOTAL	268	10	23	19	7	14	341

APPENDIX III

FERTILIZER USE AND SUPPLEMENTAL SAMPLE FARMER-BORROWER INFORMATION

Tables A and B of Appendix III contain data relative to fertilizer applications of 268 farmer-borrowers interviewed. Further, Appendix III contains supplemental information about the 268 farmer-borrowers included in the fertilizer loan program study. Data are presented relative to selected characteristics including resources at the disposal of the farmer-borrowers, their agricultural enterprises, and marketing methods.

TABLE A

CHANGE IN TOTAL QUANTITY OF FERTILIZER USED, 1964-1965
268 PARTICIPANTS - FERTILIZER LOAN PROGRAM

STATE	PARANA		SAO PAULO			MINAS GERAIS			TOTAL
MUNICIPIO	ARAUCARIA	CASTRO	LENCOIS PAULISTA	TAQUARITINGA	BRAGANCA PAULISTA	UBERABA	PASSOS	VARGINHA	
	NUMBER OF OBSERVATIONS								
Increase in Total Quantity Used in 1965.	22	17	1	24	13	12	12	22	123
Same Amount Used in 1965 as Used in 1965.	6	10	2	4	9	3	3	5	42
Decrease in Total Quantity Used in 1965.	6	12	2	8	9	11	5	2	55
1965 was the First Year For Fertilizer Use.	2	3	2	0	2	11	9	5	34
No Response to Change in Total Fertilizer Used, 1964-1965.	0	2	1	1	0	5	3	2	14
Total	36	44	8	37	33	42	32	36	268

TABLE B

CHANGE IN TOTAL AREA FERTILIZED, 1964-1965
268 PARTICIPANTS - FERTILIZER LOAN PROGRAM

STATE	PARANA		SAO PAULO			MINAS GERAIS			TOTAL
MUNICIPIO	ARAUCARIA	CASTRO	LENCOIS PAULISTA	TAQUARITINGA	IRAGANCA PAULISTA	UBERADA	PASSOS	VARGINHA	
	NUMBER OF OBSERVATIONS								
Increase in Total Hectares Fertilized.	22	16	1	20	13	11	14	15	112
Fertilized Same Amount of Hectares as Previously.	6	10	2	4	9	5	1	9	46
Decreased the Number of Hectares Fertilized.	6	14	2	12	9	10	5	5	63
First Use of Fertilizer.	2	3	2	0	2	11	9	5	34
No Response.	0	1	1	1	0	5	3	2	13
Total	36	44	8	37	33	42	32	36	268

Table (C) Use of Selected Complementary Inputs by 268 Farmer-Borrowers

Input	Did Farmer Use?	Number of Farmers	
		Yes	No
Improved seed or hybrid seed		215	53
Insecticides		178	90
Fungicides and herbicides		115	153
Animal manure for crop fertilizer		124	144
Lime to neutralize acid in soil		69	199

Table (D) Source of Power Employed by 268 Farmer-Borrowers

Source	Number of Units Used							
	0	1	2	3	4	5	6	7 or more
Tractor	112	68	38	15	16	5	3	11
Motor (Irrigation, etc.)	95	92	37	23	6	5	1	9
Horse	56	37	56	23	20	12	11	49
Oxen	237	2	5	2	5	0	2	15
Mule	233	10	11	10	3	0	0	1

Table (E) Labor Resources Employed by 268 Farmer-Borrowers

(1) Permanent Workers

Number of Units	0	1	2	3	4	5	6-10	11-20	Over 20
Number of Farmers	102	37	18	22	14	11	30	19	15

(2) Seasonal Workers

Man Days Employed	0-10	11-100	101-200	201-300	301-400	Over 400
Number of Farmers	80	37	25	11	18	97

Table (F) Land Tenure

MUNICIPIO									
Type	ARAUCARIA	CASTRO	LENGOIS PAULISTA	TAQUARITINGA	BRAGAICA PAULISTA	UBERABA	PASSOS	VARGINHA	TOTAL
Number of Farmers									
Owner	20	26	6	22	7	35	30	27	173
Renter	7	8	0	5	13	2	2	2	37
Both Owner/Renter	9	10	2	10	13	5	7	7	58

Table (G) Total Land Resources

Hectares	Number of Farmers								
0- 10	9	0	0	0	3	2	0	1	15
11- 25	14	3	0	3	7	3	1	3	34
26- 50	6	8	0	9	7	1	2	1	34
51- 75	4	7	2	6	8	4	2	2	35
76- 100	2	8	0	5	3	3	2	3	26
101- 150	1	7	0	7	3	0	1	4	23
151- 200	0	3	0	5	0	2	8	3	21
201- 350	0	3	3	0	1	4	5	7	23
351-1000	0	3	1	1	1	10	8	9	33
1001 and up	0	2	2	1	0	13	3	3	24

Table (H) Cultivated Hectares

Hectares	Number of Farmers								
0- 5	11	3	0	0	6	4	1	1	26
6- 10	7	2	0	1	6	2	2	4	24
11- 15	5	1	0	3	2	3	2	5	21
16- 20	8	3	0	1	1	4	1	1	19
21- 25	1	3	0	6	2	2	3	3	20
26- 35	2	7	1	4	2	3	1	2	22
36- 50	2	6	0	5	6	4	1	7	31
51- 75	0	10	2	9	5	2	6	6	40
76-175	0	5	2	5	2	8	10	4	36
176 and up	0	4	3	3	1	10	5	3	29

Table (I) Crop Production in 1965^{1/}

Crop	MUNICIPIO								
	ARAUCARIA	CASTRO	LENCOIS PAULISTA	TAQUARITINGA	BRAGANCA PAULISTA	UBERABA	PASSOS	VARGINHA	TOTAL
	Number of Farmers								
Rice	5	12	1	30	0	36	28	13	125
Potato	30	22	0	4	30	0	0	0	86
Sugar Cane	0	0	8	1	0	3	10	5	27
Beans	20	1	1	0	1	2	7	13	45
Corn	30	29	6	30	11	36	29	34	205
Tomato	0	0	0	28	2	1	0	0	31
Wheat	11	3	0	0	0	0	0	0	14
Sweet Potato	2	6	0	0	0	0	0	0	8
Other	7	23	3	34	3	12	11	20	113

^{1/} Most Farmer-Borrowers had a combination of crop enterprises.

Table (J) Livestock Production in 1965

Type	Number of Head									
	0	1-2	3-4	5-6	7-8	9-10	11-15	16-25	26-50	51 &
	Number of Farmers									
Beef Cattle	247	1	0	0	0	0	1	1	3	15
Dairy Cattle	93	16	13	6	5	6	8	15	32	74
Swine	55	4	12	12	14	22	21	28	54	46
Poultry	55	0	0	0	0	5	26	35	57	90

Table (K) Means of Selling Fertilized Crops - 1965

MUNICIPIO

	ARAUCARIA	CASTRO	LENCOIS PAULISTA	TAQUARITINGA	BRAGANCA PAULISTA	UBERABA	PASSOS	VARGINHA	TOTAL
Number of Farmers									
Sold on Farm to Commercial Buyer	9	1	0	1	3	0	1	3	18
Sold to Cooperative	3	41	0	1	12	3	5	0	65
Commercial Firms in Município	19	0	8	23	10	25	21	24	130
No Sales-Crop Used for Livestock	1	0	0	0	0	2	7	8	18
Sold Both on Farm and to Firms in Município	4	2	0	12	6	0	2	8	34
No Response	0	0	0	0	0	0	2	1	3