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BRAZIL'S MINIMUM PRICE POLICY AND THE AGRICULTURAL SECTOR OF NORTHEAST BRAZIL

Roger Fox

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FOREWORD

The effect public policy has on the relative prices of agricultural commodities is a controversial topic in developing countries, developed countries, and international agencies alike. The controversy arises as a result of a lack of understanding of the conflicting effects of relative price changes on various producer and consumer income classes and, when the effects are understood, as a result of emphasizing the value of one producer or consumer income class over another. Unfortunately, there are few case studies available on the workings of the many and varied approaches taken to agricultural price policy in the developing countries. IFPRI was delighted to take advantage of Roger Fox's availability to make this study of the minimum price program of Brazil, as it applies to the low-income, agriculturally based Northeast region of the country. We are also grateful to the Bank of Northeast Brazil for its willingness to cooperate in conducting this study and its financial support of the effort.

IFPRI has completed related studies dealing with various aspects of two price systems in South Asia, with particular emphasis on the effect on consumer income, nutritional status, and public finance. These include *Impact of Subsidized Rice on Food Consumption in Kerala*, by Shubh K. Kumar; *Public Distribution of Foodgrains in Kerala—Income Distribution Implications and Effectiveness*, by P.S. George; *Foodgrain Supply, Distribution, and Consumption Policies within a Dual Pricing Mechanism: A Case Study of Bangladesh*, by Raisuddin Ahmed. A study of a similar system in Sri Lanka is being prepared for publication and an overview analysis is underway. The Institute is also commencing work on a broad agricultural price policy paper that will deal comprehensively with the topic and focus on the economic and political limitations of price policy, as well as the consequent role other policies can play in achieving analogous purposes.

Washington, D.C.
June 1979

John W. Mellor

PREFACE

In recent years, in both the Northeast and other parts of Brazil, the minimum price program has been criticized. It is charged that the benefits of the program are concentrated among a few large users; that unnecessary subsidies are associated with the operation of the program; that the program treats the symptoms rather than the causes of instability in prices and income; that regional disparities in the program reinforce rather than alleviate the regional inequalities in the rural sector; that government purchases and sales under the program are made for political reasons or for profit rather than to regulate domestic stocks; and that the exclusive operation of the storage loan program by the Bank of Brazil unnecessarily restricts its effectiveness.

Although the program and the charges have been evaluated in other parts of Brazil, no research has been completed on the program in the Northeast. This suggests that a broad review and evaluation of the program in this region is needed and will be useful for future development of the program. Also, it is thought that the Brazilian example might be useful for other countries contemplating or already operating agricultural price support programs. Consequently, this study was designed to describe and analyze the minimum price program in Northeast Brazil.

Chapters 3 and 4 describe the history and operation of the program, particularly during the 10-year period from 1968 through 1977. The legal history of the program is reviewed, and information on minimum price levels, storage loans, and acquisitions under the program is presented for the Northeast and four other regions of Brazil. Important insights into the performance of the program were obtained from this review. This is the first time that data on the program have been organized on the basis of the five major regions of Brazil.

Chapters 5 and 6 present the principal analytical data. They focus on the four commodities of traditional importance in the Northeast regions: beans, corn, cotton, and rice. The analyses in Chapter 5 concentrate on the primary objectives of the program by combining previous research and new analyses to evaluate the extent to which the program has met its objectives. Particular attention is given to the price stabilization objective. The unavailability of data on the management of government stocks precluded evaluation of the stock regulation objective. Because use of the program by producers has been considered inadequate, Chapter 6 contains analyses of some of the economic factors influencing program participation. Attention is given to the economic incentives for private storage under the program, the factors influencing the aggregate demand for storage loans, and the program's subsidy aspects.

Chapter 7 contains conclusions of the study. The appendices include some of the basic data on the program as well as additional and supporting results of the various analyses.

Rather than present them in a separate section, theory and method are integrated in each analytical section. Since several analytical techniques were used, discussing them separately would have reduced the cohesiveness of the study. In general, techniques were chosen which permitted initial analyses of the limited data. Where appropriate, suggestions are made for more complete analyses that might be conducted but were not attempted because of time and, in some cases, data constraints.

The research leading to this report was

conducted during 1977-78 while the author was on sabbatical leave from the University of Arizona. Financial support in addition to a sabbatical salary were provided by the International Food Policy Research Institute (IFPRI) and the Bank of Northeast Brazil (BNB).

The atmosphere and facilities at IFPRI were ideal for conducting the research, and the author appreciates the generous support and acceptance received during the course of the study. Discussions and seminars with IFPRI colleagues and others in the Washington, D. C. area proved quite useful.

Discussions with researchers in the Economic Research Department (ETENE) of the BNB and the Production Finance Commission (CFP) of the Ministry of Agriculture were also useful. Much of the data used in the study were obtained from these agencies, and preliminary drafts of the report were reviewed by researchers in both agencies. The author is especially grateful for the time and efforts of the many individuals who provided information and answered numerous questions. Without the support of these individuals, whose number is too great to list, this report would not have been possible.

An earlier draft of the report was formally reviewed by James Gavan, Panos Konandreas, and Robert L. Thompson. Their comments and suggestions resulted in several improvements in the manuscript, but they should not be held responsible for the remaining errors of commission or omission. A Portuguese version of this report is being published by the BNB as part of a major review of development policies for Northeast Brazil.

Special thanks are extended to Spiro Stefanou for his assistance during the latter stages of the research and to Ruth Rounds for typing the various drafts of the report.

Important editorial assistance was provided by Ruth Haas, Barbara Barbiero, and Jim Voorhees.

1

SUMMARY

Brazil's minimum price program operates under a set of minimum prices announced before the planting season. These prices are normally set below the expected market prices at harvest time. Producers, cooperatives, and private handlers may participate in the program either by selling their products directly to the government at the minimum price or by obtaining loans for storage based on the minimum price. The basic objectives of the program are to stimulate production of the supported commodities, reduce annual and seasonal price variations, and regulate stocks in a manner consistent with the price stabilization objective.

This study contains a review and analysis of the program, particularly as it works in the Northeast—Brazil's "problem" region. The program's policy background and history are reviewed. The program has undergone numerous changes both legally and in the way it has been applied. Since the early 1960s there has been a much more determined effort to make it a positive instrument of agricultural and economic policy.

Specific data on minimum price levels, storage loans, and acquisitions are presented and analyzed for the Northeast and four other regions of Brazil. The basic observations and conclusions of this largely descriptive analysis are:

1. There was more than a tenfold increase in the total real value of storage loans channeled through the program between 1968-69 and 1976-77; however, the share of loan funds going to the Northeast declined. More than two-thirds of the funds went to the South and Southeast regions. Inequity in the regional distribution of funds cannot be inferred from these figures.

2. Four commodities (cotton lint, rice, corn, and soybeans) accounted for 79 to 93 percent of the loan funds during the 1968 to 1977 period. Except for 1975 and 1976, cotton has been the major user of the loan program in the Northeast. Commodities with relatively well-developed national markets or important international market linkages received the bulk of the financing.

3. In the Northeast, producers and cooperatives, the target beneficiaries of the program, received less than 25 percent of the regional loan funds in all but the last three years, when their participation increased to more than 30 percent. Private processors and handlers captured the major benefits of the program.

4. Total producer and cooperative participation by commodity varied greatly among the five regions, which suggests that *general* changes in the loan program designed to increase their participation may not be successful and that consideration by commodity and region must be given to the specific conditions that limit participation.

5. Loans for storage, as reflected in the 1976-77 data for the state of Ceará, were concentrated among a few large producers and handlers. Only 683 contracts with producers were funded in a state that has over 245,000 farms.

6. Government acquisitions under the program were lower and more variable than storage loans. However, purchases of some commodities such as rice and corn represented a substantial proportion of total pro-

duction. The proportion of acquisitions in the more remote regions (North, Northeast, and Center-West) was greater than the comparable loan shares. The purchase program has been used primarily to supplement the loan program when market prices continued below minimum price levels.

7. Since 1967, minimum prices for most commodities in the Northeast have declined in relation to the general movement of agricultural prices. This implies *ceteris paribus*, that the program provided no increase in price incentives to shift resources to the supported commodities.

8. With the exception of rice, the government appears to have been more successful in reducing price risks in the Center-South than in the Northeast. Apparently this occurred because market prices were more variable in the Northeast and because the government did not want to accumulate stocks.

9. The recent move to fixing uniform minimum prices for large geographic regions (e.g., the entire Northeast) favors the more remote surplus producing areas (e.g., Maranhaõ rice). This could lead to greater program activity in these areas, particularly to increased acquisitions. The social costs of resource transfers associated with this change need further investigation.

Performance of the program in the Northeast was evaluated in terms of its basic objectives. Because data on the management of government stocks were not obtained, the primary focus was on stabilizing prices and expanding output. The evidence concerning annual and seasonal price stability was negative. That is, little evidence was obtained to demonstrate that annual price and income instability had been reduced. Specifically, the analysis suggested that the minimum price program and other price stabilization programs employed during the 1960s and early 1970s did not reduce annual price variations associated with fluctuations in total value per hectare.

The analysis of seasonal prices showed only a few cases of reductions in the spread between seasonal highs and lows. Furthermore, no evidence of the expected reduction in marketing margins was discovered. No empirical support was found for the theoretically valid proposition that minimum prices influenced the output of individual crops. Efforts to measure this phenomenon have been plagued by numerous problems with statistics and data.

Since expanded participation is considered necessary (but not sufficient) for the attainment of the program objectives, some of the factors influencing participation were analyzed. Expected returns from storage varied considerably among the markets analyzed but appeared high enough in many cases to encourage greater participation in the program. Some commodities such as dry edible beans, which have had little participation in the program, had relatively high expected returns from storage. This suggests that other factors have limited participation. The most likely are poor access to the Bank of Brazil, lack of knowledge of the program and its operation, unavailability or remoteness of storage facilities, inferior products that do not meet the requirements for loans, administrative and informal limits on the size of loans, liquidity needs of producers, aversion to indebtedness, and small volumes which increase the per unit transaction costs of using the program. Some of these constraints can be removed or lessened by changes in the operation of the program: for example, allowing other banks to handle EGF funds, increasing publicity about the program, and reducing the limits on the size of loans. Other constraints, such as small volume, are associated with the structure of production and marketing and cannot be reduced

without basic changes in the agricultural sector. Still others, such as the lack of storage facilities, require additional public and private investment. Changes in several areas are needed.

The aggregate (state and regional) demand for storage loans for rice, cotton, and corn was estimated. The empirical estimates for rice were consistent with the theoretical model and showed that the volume of loans was inversely related to the ratio of market to minimum prices and positively related to the rate of inflation and the quantity of production. Increasing the minimum price of rice would, as expected, increase the quantity of rice stored. The model did not perform as well for cotton and corn.

Estimates of the relative importance of the interest rate subsidy on storage loans were obtained. The amount of the direct subsidy is not large. Under partial equilibrium assumptions, raising the interest rate on storage loans for rice would have only minor effects on program participation in the Northeast. However, general equilibrium considerations suggest that if only the interest rate on EGF storage loans were increased, users of the program would shift to other sources of credit.

2

INTRODUCTION

The Government of Brazil has operated a minimum price program for selected agricultural commodities since the early 1950s.[1] Each year before the planting season, a set of minimum producer-level prices is announced for the forthcoming crop season. These prices support three important government programs in the agricultural sector. They are used to determine the value of production credit from official sources, of crops acquired by the government through direct purchase, and of storage loans available to producers, handlers, and cooperatives at harvest time.

Although Brazil's minimum price laws do not specifically state the objectives of the program, its rules and the manner in which it operates suggest three interrelated objectives: stimulating production of specific commodities to further national food policy goals, stabilizing annual and seasonal price variations to reduce producer and consumer price uncertainty, and regulating public and private stocks in a manner consistent with the price stabilization objective. If these objectives were met, some of the problems of the agricultural sector of Northeast Brazil, where instability in output and prices is associated with low levels of productivity and widespread poverty, might be resolved. Reduction of price and income risks and an increased, stable food supply have been basic goals of recent development strategy for the Northeast. Progress in attaining these goals has been generally unsatisfactory, in spite of the minimum price program and other development projects.[2]

Since Northeast Brazil is primarily rural; is subject to unstable output, prices, and income; and has long been considered a "problem" or "backwards" area, it provides a good setting for evaluating the minimum price program. A review of the basic characteristics of the region illustrates the magnitude of its problems and suggests that the

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[1] Research on Brazil's minimum price program in other regions of the country is discussed at several points in this study. Important analyses of the program are: Gordon W. Smith, "Brazilian Agricultural Policy, 1950-1967," in *The Economy of Brazil*, ed. Howard S. Eillis (Berkeley: University of California Press, 1969), pp. 213-265; João do Carmo Oliveira, "Observações Sobre a Política de Preços Mínimos no Brasil," Monografias No. 5, Universidade de São Paulo, Instituto de Pesquisas Econômicas, São Paulo, 1972; João de Carmo Oliveira, "A Política de Precos Mínimos no Brasil," *Preços Mínimos--Regiões Centro-Oeste, Sudeste, Sul: Safra 1975-76* (Brasilia: Ministério da Agricultura, Comissão de Financiamento da Produção, 1975), pp. 175-188; Guilherme Costa Delgado, "Uma Metodologia para Determinanção de Preços Mínimos" (M.S. thesis, Universidade Federal do Ceará, Fortaleza, 1977); and Tulio Arvelo Duran, "Brazilian Government Policies in Agriculture: The Case of Grains and Soybeans" (Ph.D. dissertation, University of Chicago, 1978).

[2] Pedro Sisnando Leite, "Panorama do Desenvolvimento Agrícola do Nordeste," *Revista Econômica do Nordeste* 9 (Abril/Junho 1978): 175-194.

minimum price program might help alleviate some of these problems.[3]

Northeast Brazil contains 9 of Brazil's 23 states (Figure 1). Its land area of 1,548,672 square kilometers is slightly more than half that of India. Table 1 gives an idea of the resource and income differences within Brazil. The Northeast, with 18 percent of the land area and 30 percent of the population, accounted for only 14 percent of the income in 1969. Per capita income of the region in 1969 was about one-third of that in the industrialized and agriculturally developed Southeast, and one-half of the average for Brazil. The population of the region in 1969 was predominantly rural (58 percent), with 43 percent of Brazil's economically active agricultural population residing in the region. These relationships have remained remarkably stable during the past two decades.[4]

Wealth and income within the Northeast is distributed unevenly. In 1965, for example, holdings of 10 hectares or less, about 45 percent of all rural holdings, represented 2.5 percent of the rural area; but holdings of 1,000 hectares or more, about 1 percent of all rural holdings, controlled more than one-third of the agricultural area.[5] Because of the unequal distribution of income, millions of Northeasterners live in severe poverty. One study of 1970 salary and wage income in the Northeast showed that the bottom half of the population more than 14 years old received only 15 percent of the income. The average money income of this group was less than the minimum salary specified for the region. At the other end of the distribution, the upper 10 percent of the population received about one-half of the income.[6]

Expanded land use rather than increased productivity was almost entirely responsible for the 4.5 percent average annual increase in crop production in the Northeast between 1948 and 1969.[7] Yields of some crops have declined while the productivity of others continues to lag behind other regions.[8] Although yield comparisons are misleading

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[3] For additional background information on the region not provided below see Celso Furtado, *The Economic Growth of Brazil—A Survey from Colonial to Modern Times* (Berkeley: University of California Press, 1968); Albert O. Hirschman, *Journeys Toward Progress, Studies of Economic Policy-Making in Latin America* (New York: Twentieth Century Fund, 1963), Chapter 1; Stefan H. Robock, *Brazil's Developing Northeast—A Study of Regional Planning and Foreign Aid* (Washington, D.C.: Brookings Institution, 1963); and Ruy Miller Paiva, Salomão Schattan, and Claus F. Trench de Freitas, *Brazil's Agricultural Sector—Economic Behavior, Problems and Possibilities* (São Paulo: 15th International Conference of Agricultural Economists, 1973).

[4] Leite, "Panorama do Desenvolvimento."

[5] George F. Patrick, *Desenvolvimento Agrícola do Nordeste*, Relatório de Pesquisa No. 11 (Rio de Janeiro: Instituto de Planejamento Econômico e Social, 1972), p. 299.

[6] Antônio Luiz A. Dantas, "Concentração de Rendas e Diferenças Estaduais no Nordeste em 1970," *Revista Econômica do Nordeste* 6 (Julho-Setembro 1974): 21-34.

[7] Patrick, *Desenvolvimento Agrícola*, p. 85. A similar pattern was verified in a more recent study which also suggested that because of land scarcity, the ability to continue output expansion primarily on the basis of increased land and labor is declining. See Jose Maria Eduardo Nobre, "Agricultura do Nordeste: Fontes de Crescimento," *Revista Econômica do Nordeste* 9 (Abril/Junho 1978): 195-212.

[8] Brasil, Ministerio da Agricultura, Directoria de Planejemento Agrícola (DIPLAN), *Perspectiva da Produção, Abastecimento, Insumos e Serviços Para a Agricultural Brasiliera 1976-77*, vol. 1 (Brasília, Junho 1976).

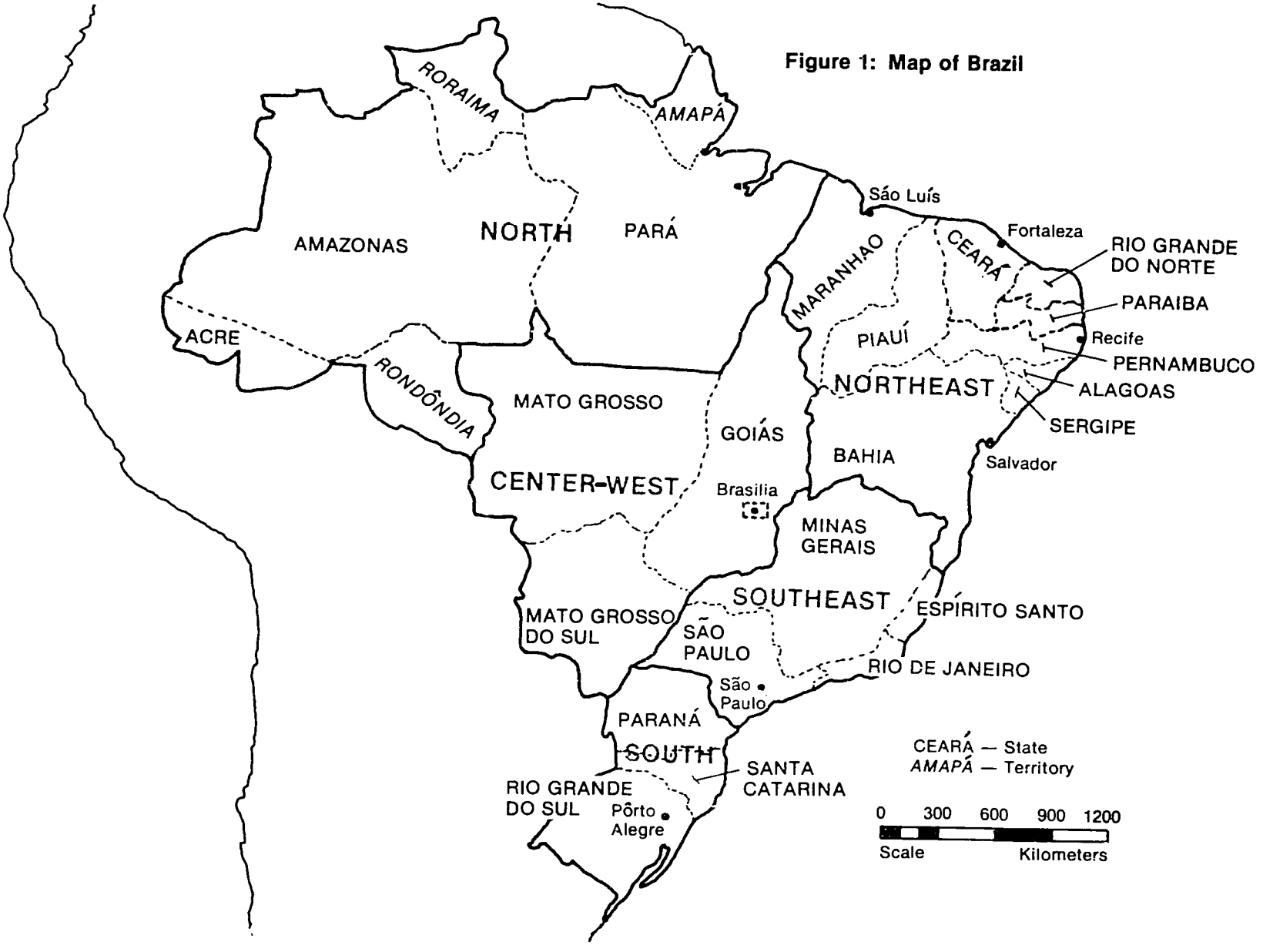

Figure 1: Map of Brazil

Table 1—Distribution of area, population, and income in Brazil by region

Item	North	Northeast	Center-West	Southeast	South
Area a/	42.1	18.2	22.1	10.8	6.8
Population (1970)					
millions	3.7	26.7	45.2	40.3	16.7
Total a/	3.9	30.3	5.5	42.7	17.6
Rural b/	54.8	58.2	51.8	27.2	55.5
Economically Active in Agriculture a/	5.4	42.9	5.2	23.1	23.3
Internal Income (1969)					
Total a/	2.1	13.8	3.1	62.8	18.2
Per Capita (Cr$)	606.4	513.4	655.5	1,660.9	1,170.3

Sources: Ruy Miller Paiva, Salomão Schattan, and Claus F. Tranch de Freitas, *Brazil's Agricultural Sector—Economic Behavior, Problems and Possibilities* (Sao Paulo: 15th International Conference of Agricultural Economists, 1973), pp. 280, 287, and 300; and Banco do Nordeste do Brasil Departamento de Estudos Econômicos do Nordeste (ETENE), *Manual de Estatísticas Básicas do Nordeste* 4 ed. rev., Fortaleza, 1977, pp. 53, 57.

a/ Percent of total Brazil.

b/ Percent of regional total.

because of widespread interplanting, there is no evidence of the "green revolution" in the Northeast. The agricultural situation is further complicated by periodic droughts that result in local crop failures, general reductions in regional output, and vast migration (some of it temporary) from the affected areas. The instability of output is often associated with rapid changes in prices and regional income. Primarily because of topography and soil characteristics, irrigation is considered inappropriate for most of the region.[9] Vast investments in water storage have benefited the more wealthy cattle producers but have had only minimal effects on crop production.[10]

The livestock sector of the Northeast normally contributes about one-fourth of the gross value of output of the agricultural sector.[11] Performance of this sector is also poor. High mortality indices, low reproduction rates, widespread disease, and improper feeding result in low productivity. The production of milk, eggs, and broilers, where considerable modernization has occurred in recent years, provides the only notable exception. But government retail price fixing, which has resulted in periodic milk shortages, disinvestment in dairying, and excess processing capacity, is inhibiting further increases in milk production.

Government efforts to alleviate the economic problems of the Northeast have been only partially successful. During the later 1950s and 1960s most government programs were directed toward industrialization. The regional development agency, SUDENE (Superintendência do Desenvolvimento do Nordeste), channeled vast quantities of domestic and foreign funds into industrialization projects that have had only minor effects on employment.[12] Roads and communications have been improved immensely, but further improvements are needed in the rural areas. Energy production and consumption is 10 times what it was 20 years ago. Urban water supplies, sanitation facilities, and housing have improved, but the rapid growth of cities and towns leaves a large portion of the population unaffected. In spite of increased school enrollments, illiteracy is prevalent. In the 1970s, a number of programs were initiated to restructure and modernize the agricultural sector. Yet, as the above data indicate, the agricultural sector remains extremely backward.

The minimum price program is expected to benefit both consumers and producers in the Northeast by providing producers with a set of guaranteed support prices useful in production planning, ensuring stable long-term minimum prices as a means of stimulating output expansion, encouraging the storage of excess production at harvest time for distribution during the interharvest period, providing a safety valve of government acquisitions for times of low prices,

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[9] William R. Cline, "Cost-Benefit Analyses of Irrigation Projects in Northeastern Brazil," *American Journal of Agricultural Economics* 55 (November 1973): 622-627; and Anthony L. Hall, *Drought and Irrigation in Northeast Brazil* (Cambridge: Cambridge University Press, 1978).

[10] Hirschman, *Journeys Toward Progress*, Chapter 1.

[11] Patrick, *Desenvolvimento Agrícola*, p. 60.

[12] D.E. Goodman and Roberto Cavalcante de Albuquerque, *Industrialização no Nordeste*, vol. 1, *A Economia Regional*, Relatório de Pesquisa No. 6 (Rio de Janeiro: Instituto de Planejamento Econômico e Social, 1971); and D.E. Goodman and Roberto Cavalcante de Albuquerque, *Incentivos à Industrialização e Desenvolvimento do Nordeste*, Relatório de Pesquisa No. 20 (Rio de Janeiro: Instituto de Planejamento Econômico e Social, 1974).

providing relief to consumers from excessively high prices through the release of government stocks, and assisting livestock producers who use purchased feed (e.g., broiler and milk producers) by ensuring more stable prices and supplies. However, the program does not treat the basic problem of variations in output, which are largely attributable to climatic irregularities.[13] Income instability can only be partially restrained by influencing prices. Thus, the program is directed more toward symptoms than the basic causes of output and income instability in the Northeast. And, as will be shown in subsequent sections, there has been very little reduction of instability in the region. Furthermore, use of the minimum price program in the Northeast has been minimal and concentrated among a few participants.

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[13] John Louis Dillon and Teobaldo Campos Mesquita, *Atitudes dos Pequenos Agricultores do Sertão do Ceará Diante do Risco*, Série Pesquisa No. 12 (Fortaleza: Universidade Federal do Ceará, Departamento de Economia Agrícola, Junho. 1976).

3

POLICY BACKGROUND

Most students of Brazil's economic and agricultural policies divide the post-World War II years into two distinct periods.[14] The years from 1947 to 1963 are generally called the import substitution period.[15] During this time the government initiated the first deliberate strategy to industrialize by stimulating domestic production of previously imported finished manufactured goods first, and of capital goods later. This process of economic change was carried out in an environment of open, competitive party politics and direct elections, with the government giving more attention to urban industrial interests than to agricultural interests.

The primary agricultural goal in the first period was to produce an adequate supply of reasonably priced food for urban wage earners. A secondary goal was to generate foreign exchange to finance the importation of industrial raw materials and capital goods. Agriculture was not considered a vital growth sector, but rather a reservoir for surplus labor not absorbed by rapid industrialization. From 1961 to 1963, food shortages, high food prices, and near hyperinflation forced the government to give more attention to the agricultural sector. The inability to cope with these problems and concern over leftist politics resulted in the military-led revolution of 1964 and the subsequent military governments.

The second period (1964 to present) is a phase of economic growth characterized by export expansion and diversification. Emphasis on industrial growth and import substitution, state economic planning, and participation of foreign capital were carried over from the earlier period. However, these features were developed in an entirely different political-economic context. Nonmarket planning and intervention techniques were replaced by a more explicit strategy of controlling relative prices through market mechanisms.

The military governments after 1964 advocated a completely different role for the agricultural sector. The relative backwardness of the sector was acknowledged, but the causes and cures were perceived quite differently. Farmers were believed to be responsive to prices, and the distortions and disincentives created in the earlier period were gradually removed. New government investments and incentives emphasized modernization of agriculture. Large quantities of subsidized credit were tied to the

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[14] Excellent reviews of Brazil's economic and agricultural policies are contained in Dale W. Adams et al., *Farm Growth in Brazil* (Columbus: Department of Agricultural Economics and Rural Sociology, Ohio State University, 1975); Paiva, Schattan, and Freitas, *Brazil's Agricultural Sector;* G. Edward Schuh, *The Agricultural Development of Brazil* (New York: Praeger, 1970); and Smith, "Brazilian Policy, 1950-67." Chapter 2 of the volume by Adams et al. includes a bibliography of over 100 items dealing with Brazil's economic policy.

[15] Adams et al. *Farm Growth,* Chapters 2 and 3.

purchase of "modern" inputs such as improved seed, fertilizers, chemicals, and machinery. These inputs were made more easily available by exchange rate controls, overvalued exchange rates, tax exemptions, and direct government distribution. Low interest loans for operating costs and investment expenditure encouraged farmers to produce certain crops and livestock. Investments to improve marketing and transportation facilities were made, in part, to benefit the agricultural sector. Frequent "mini-devaluations" which kept the cruzeiro more in line with foreign currencies made export prices more attractive. Exporting became even more profitable after tax reductions and rebates. Agricultural research and extension received more attention as the development and adaptation of technology became important in the face of stagnant yields.

Although the post-1964 policies are basically the same today, the rapid increase in petroleum prices since 1973 has altered the way in which they are applied. Because Brazil depends on imported petroleum for about 80 percent of its supplies, severe inflation and balance of trade problems have developed. Since 1974, the government has tried to follow a narrow path of export expansion based largely on agricultural products (mostly processed), import controls, and price fixing and manipulation. This has resulted in recent efforts to reduce some of the incentives (e.g., subsidized credit)to the agricultural sector, particularly if they are thought to be inflationary. However, protection of some agricultural industries such as wheat has increased.[16]

The management and use of the minimum price program follows rather closely the changes in economic and agricultural policies outlined above. During the 1950s, the minimum price program was used rarely. Minimum prices, often announced after the planting season, were set well below market prices, resulting in few acquisitions and loans. Before 1963, the only significant purchases were of cotton during the 1952-53 harvest season.[17] Aggressive use of the minimum price program was proposed in reaction to the food supply crisis of the early 1960s. Relatively high minimum prices for the 1963 season were fixed for rice, corn, and beans, the principal food crops covered by the program.[18]Large year-to-year changes in the minimum prices for food crops reflected the political and economic instability of the early 1960s. These changes followed a pattern that Smith called perverse: "they were raised when past market stimuli would already have led to increases in planned production, and they were lowered when low market prices would in themselves generate considerable production declines."[19]

During the early years of the military government, several changes in the program were made. Since 1967, the government has moved away from a policy of annually manipulating minimum prices to influence short-run production levels, to one of stabilizing prices in the longer run and consequently reducing producer price risks.

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[16] James A. Truran, "U.S. Producers Watching Brazil's Wheat Autarky Policy Review," *Foreign Agriculture* (October 3, 1977): 4-5.

[17] Smith, "Brazilian Policy, 1950-67."

[18] Ibid., p. 245.

[19] Ibid., pp. 246-247. For an opposing interpretation, see Oliveira, "A Política de Preços Mínimos," p. 177.

At the same time, the real value of total storage loans under the progam has increased more than tenfold (see Chapter 4 for details).

In spite of the petroleum crisis, the program has continued to expand at an impressive rate. From 1974 through 1976 the real value of loans under the program more than doubled. The program increased its proportion in the federal budget from 2.7 percent in 1974 to 6.1 percent in 1976.[20] Likewise, since 1973 the minimum price program has represented an increasing proportion of total agricultural credit.[21] However, some effects of the petroleum crisis are evident. Compared to the index of crop and livestock prices, minimum prices have declined since 1974 and 1975. Also, the percentage of the minimum price used to determine storage loans was reduced during part of 1977, thereby reducing the flow of loan funds. At the same time, much more attention has been given to the control of retail food prices through price fixing and selective import controls (quotas and licenses).

Nature and Evolution of Brazil's Minimum Price Program

As explained in Chapter 2, the program operates under a set of minimum prices, fixed at the producer level and announced annually before the planting season. The preannounced prices can be and are revised when unexpected events, such as a rapid price rise, occur.

In order to guarantee that market prices do not fall below the minimum price levels, two basic instruments are used: government acquisition (Aquisição do Governo Federal, [AGF] and government loans (Empréstimo do Governo Federal, [EGF]). Under the AGF program, the government can purchase, at the minimum price, all of the commodity that is offered for sale and store it with the appropriate classification and certification. Payment is received through the local agencies of the Bank of Brazil. The commodities are delivered to approved warehouses and are classified and certified by local agents. These stocks, which the government considers to be buffer stocks, can be sold in the internal market or released for export when prices are more favorable.

There are two types of loans under the EGF program: those with the option to sell to the government and those without it. With the first type the commodity is handled as if a direct sale to the government through AGF was intended. However, the owner of the commodity receives a loan from the bank based on 100 percent of the minimum price and for a maximum period (e.g., 180 days in the case of corn). If the market price rises during the period of the loan, the owner of the commodity may sell it on the open market and pay off the loan plus interest (18 percent per year) and storage costs. If, on the other hand, the price remains low, the owner of the commodity "sells" it to the government by not paying off the loan. In this case, the owner does not pay the interest or storage costs. For some commoditites, individual loans greater than a predetermined value *(maior valor de referência)* must be accompanied by periodic repayments during the loan period.[22] For loans of less value, repayment

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[20] Jayme Ramos de Almeida, "Política de Preços Mínimos: Alguns Ajustes Necessários," *Terra* 2 (Abril 25, 1977): 12.

[21] João do Carmo Oliveira and Claudia Ponte de Albuquerque, *Avaliação da Política de Preços Mínimos*, Coleção Análise e Pesquisa, vol. 2 (Brasilia: Ministério da Agricultura, Comissão de Financiamento da Produção, 1977).

is made when the commodity is taken out of storage. It is not necessary that all of the commodity be removed from storage at the same time; removal for sale can occur anytime after the first month.

With the second type of EGF loan, the product is stored on the owner's farm and receives no official classification. Under these conditions, a loan for up to 80 percent of the minimum price can be obtained. However, the government will not purchase the commodity in the event of low prices, and the principal plus interest must be paid by the end of the loan period.

The current policy of the government is to attempt to fix minimum prices between expected market prices and production costs. For this reason market price behavior and production costs are important criteria in determining minimum prices.[23] Minimum prices for a given commodity vary between different geoeconomic zones, reflecting primarily differences in production and transportation costs. Quality differences are accounted for through a set of discounts and premiums for each commodity.

With this background it is now possible to review briefly the historical evolution of the program. The Production Finance Commission (Comissaõ de Financiamento da Produção, [CFP]) was established in 1943 under Decree Law No. 5212.[24] The original purpose of this commission was to finance, acquire, store, and dispose of certain strategic raw materials and commodities; however the lack of regular financial support rendered the commission virtually inoperative.[25] Its one major "success" involved the purchase and sale of cotton during World War II. The profits from the cotton sales were used to create a rotating fund that provided the initial capital for the minimum price program established in December 1951 by Congressional Law No. 1506.[26]

This law provided the basic rules for the operation of Brazil's minimum price program and initiated what Oliveira calls the "experimental phase" in the execution of the program.[27] The basic provisions of the current program as outlined above are evident in the 1951 law. The Ministry of Finance, through the CFP, remained responsible for the program, but much of its execution was assigned to the Bank of Brazil and other public and private organizations.

The specific provisions of Law 1506 have been modified many times since 1951. Some of the changes affected the operation

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22 In 1977, for example, loans for cotton lint greater than Cr$87,770 (approximately US$ 5,850) required scheduled repayment during the loan period.

23 For a discussion of the criteria used in fixing minimum prices, see Oliveira, ' A Política de Preços Mínimos," p. 185.

24 For a complete listing of the important legislation pertaining to the program as well as a compilation of interesting interviews with former directors of CFP, see Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *A Política de Garantia de Preços Mínimos--Documentário Legal* (Brasilia, 1976). The establishment of the CFP was based on the operation and experience of the Commodity Credit Corporation, a U.S. agency set up during the 1930s as part of the effort to assist U.S. farmers in coping with the Great Depression (Ibid., p. 11).

25 Oliveira, "A Política de Preços Mínimos."

26 Comissão de Financiamento da Produção, *A Política de Garantia–Documentário*, p. 11.

27 Oliveira, "A Política de Preços Mínimos," p. 175.

of the minimum price program, and hence make its evaluation more difficult. First, eligibility for participation in the program changed in 1962 from a "preference" for producers and their cooperatives to "exclusive" favor of this group (Delegate Law No. 2, September 26, 1962). This provision continued until 1965. It was then modified so that handlers and processors could receive financing under the program if they showed proof that they had paid at least the existing minimum price to producers or their cooperatives (Decree No. 57,391, December 7, 1965). The potential for expanded participation in the program is clear, and, in fact, handlers and processors have been major participants in recent years (see Chapter 4).

Second, commodity coverage under the program has changed to make some 45 commodities eligible for benefits, either directly or indirectly (Table 14, Appendix 1). Not all of the listed commodities receive financing regularly or are purchased under the program, and some, such as sugar, coffee, and cocoa, as well as wheat, a key import crop, are not within CFP's jurisdiction but fall under separate programs and agencies.[28] Although sugar and cocoa are important crops in the Northeast, they are not discussed in this study.

Third, uniform minimum prices were changed in 1967 so that the announced prices represent the actual price on which loans and purchases can be effected (Decree Law No. 79, December 19, 1966). Previously, participants received an amount less than the uniform minimum price, with the decreased amount depending on a set of discounts used for freight, taxes, etc. The new system was accompanied by a set of geoeconomic zones within which the minimum price was the same for all producers. These zones were generally smaller than an individual state. Experience with them recently led to a substantial reduction in their number. The immediate impact of this change in uniform minimum prices is to give greater price protection to producers in the more remote surplus areas where market prices tend to be lower.

Fourth, the limit on loans for storage and marketing was increased in 1966 from 80 percent of the minimum price to 100 percent (Decree No. 57,660, January 24, 1966). The 80 percent limit remains for loans made for on-farm storage without the option of selling to the CFP.

Fifth, interest rates on minimum price loans have changed. Prior to January 1977 the rate was 10 percent per year for cooperatives and 15 percent per year for all other users of the program. The current rate is 18 percent per year for all users. With average annual inflation of greater than 25 percent during the past decade, negative real interest rates have been the rule rather than the exception.

Sixth, a number of changes have occurred in the organization and control of CFP. Most important are its transformation to a federal autarky (Delegate Law No. 2, September 26, 1962), and its shift from the Ministry of Finance to the Ministry of Agriculture (Decree No. 60,900, June 26, 1967), where it is one of several agencies responsible for administering national food and agricultural policies.[29]

Most of the changes in the program have made it more accessible to producers and

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[28] Paiva, Schattan, and Freitas, *Brazil's Agricultural Sector*, Chapter 7.

[29] Most of the modifications of the 1951 law and subsequent decrees were consolidated in Decree Law No. 79 of December 19, 1966. Decree Law No. 79 is considered the basic law under which the minimum price program now functions (Oliveira, "A Política de Preços Mínimos").

other users. There appears to have been a concerted but gradual effort to make the program a positive instrument of pricing policy available for a wide range of products in all parts of the country. Data in subsequent sections illustrate the successes and failures of these efforts. Moreover, changes continue to be introduced in the operation of the program (e g., scheduling loan repayments to coincide with expected interharvest requirements, thereby influencing the release of commodities into the market) that are designed to help it better attain the basic expansion of output and stabilization objectives.

4

HISTORICAL OVERVIEW OF THE MINIMUM PRICE PROGRAM

This chapter describes the storage loan (EGF) and purchase (AGF) operations of the minimum price program. The information is summarized by region and selected commodities for 1968 through 1977.[30] Data on storage loans in one Northeastern state, Ceará, are presented to further illustrate the concentration of loans in terms of size and type of borrower. Also, past minimum price levels are reviewed and analyzed. The study of the data on the recent operation of the program provided several important insights concerning the attainment of the basic program objectives.

Loans for Storage (EGF)

Data on the regional distribution of storage loans indicate that several changes occurred between 1968 and 1977 (Table 15, Appendix 1). First, there was more than a tenfold increase in the real value of total loans under the program.[31] However, this increase was not uniformly distributed among the five regions. The South and Center-West increased their share, while the proportion going to the North, Northeast, and Southeast declined. Second, two regions, the South and Southeast, consistently accounted for more than two-thirds of the total loan funds. This regional concentration is further reflected in the proportion of total funds that went to the three southern states of São Paulo, Paraná, and Rio Grande do Sul. This proportion ranged from 53 to 72 percent.

It is difficult to establish an objective basis for comparing the regional distribution of storage loans. In fact, most comparisons are meaningless. For example, the regional distribution of loans in 1968-69 was similar to the distribution of the value of crop and extractive vegetable production. However, many of the commodities included in the crop and extractive vegetable category are

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[30] Calendar year identification is used throughout this chapter, even though various production and marketing years are used in Brazil. Crop year identification is confusing because of the differences among regions and the harvesting of two crops per year in some areas. This problem is evident in the operations and data series of the CFP where both calendar and split year identifications have been used. The operating year currently used by CFP for the Center-South regions (Center-West, Southeast, and South) is a split year, with the bulk of the purchase and loan operations occurring in the second half of the split year. For example, most of the loans for the 1976-77 season occurred during the first half of 1976, whereas in the North and Northeast most of the operations occur during the latter part of the calendar year. Consequently, for the purposes of this report, the 1975-76 season in the Center-South was combined with the 1976-77 season for the North and Northeast and identified as 1976. This procedure recognizes that purchases and loans occur throughout the year, and that the "year" 1976 includes some operations that actually occurred during the end of 1975 and the beginning of 1977.

[31] For an idea of the absolute magnitude of the program, the current value of loans in 1977 was Cr$17.5 billion or approximately US$ 1.2 billion. Price support loans to U.S. farmers on the 1976 crop totaled US$ 3.1 billion. See U.S. Department of Agriculture, *Agricultural Statistics 1978* (Washington, D.C.: U.S. Government Printing Office, 1978).

not eligible to participate in the minimum price program, and some of these crops, such as coffee, are concentrated in particular regions. Efforts at comparing the amount of storage loans for a commodity with its production, on a regional basis, what Oliveira and Albuquerque call the "penetration ratio,"[32] are difficult to interpret for two reasons. First, there are wide variations among regions in on-farm consumption, both animal and human, that influence the amount of production that might logically be stored under the program. Second, because most commodities move between regions, a portion of a commodity from one region may be stored in another and credited to the region it was stored in rather than to the region that produced it. In fact, a given commodity may be stored several times, under different financing arrangements, before it is finally consumed. At best, estimates of program penetration give an indication of the regional use of the program, but they are not acceptable measures of equity among regions.

Although some 36 commodities are directly supported by the program, concentration of loans among a few is evident (Table 2). Four commodities (cotton lint, rice, corn, and soybeans) accounted for most of the loans from 1968 to 1977. Some important food crops, such as beans and manioc, although covered by the program and widely produced in Brazil, have received only a small proportion of the loan funds.

The aggregate data on commodity concentration obscure some important regional variations. Table 16, Appendix 1 contains data on commodity participation in the program by region. In all but two instances more than 80 percent of the regional loan funds are represented by the commodities listed;[33] in many cases they represent more than 90 percent.

Except for 1975 and 1976, cotton has been the major user of the program in the Northeast. Loans for sisal storage were highly variable with no participation during 1971-74. Yet, in 1975, more than 53 percent of the total EGF funds for the Northeast were used for sisal storage. The wide fluctuations in participation for most commodities in the Northeast suggest that users of the program have responded to market conditions when deciding whether or not to store. This behavior is investigated in Chapter 6.

Participation in the minimum price storage program (EGF) can also be characterized by the type of user. As pointed out in Chapter 3, the minimum price legislation emphasizes that producers and their cooperatives should be the primary beneficiaries (users) of the program. Since 1965, private processors and handlers have been allowed to participate in the program if they could prove they paid at least the minimum price for the commodity. The data in Table 3 indicate the percentage of total regional financing that was directly received by producers and their cooperatives. Program participation has increased in the Northeast during the past three years partly because participation of cooperatives has increased, particularly for cotton.

The average level of producer and coop-

[32] Oliveira and Albuquerque, *Avaliação da Política.*

[33] Brazil nuts received 31.3 percent of the North's financing in 1975, and seed cotton, which is stored for short periods prior to ginning, accounted for 29.2 percent of the North's financing in 1977. See Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico - 1977* (Brasilia, 1977), and Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico--1978* (Brasilia, 1978).

Table 2—Minimum price loans (EGF) for four commodities, Brazil, 1968 to 1977 a/

Year	Cotton Lint	Rice	Corn	Soybeans	Sum
1968	33.2	36.6	10.6	5.9	86.3
1969	26.8	44.9	5.3	8.6	85.6
1970	16.9	46.3	12.1	12.1	87.4
1971	24.6	32.0	6.7	25.4	88.7
1972	30.1	30.1	6.0	26.8	93.0
1973	24.7	51.9	13.0	0.3	89.9
1974	30.0	17.7	14.5	31.3	93.5
1975	14.0	17.0	7.7	42.4	81.1
1976	9.8	26.0	11.1	34.3	81.2
1977	18.3	16.6	9.9	34.5	79.3

Source: Table 17, Appendix 1.

a/ Percent of total annual loan funds (EGF) allocated to each of the four commodities and their sum.

Table 3—Producer and cooperative participation in the minimum price loan program (EGF) by region, Brazil, 1968 to 1977 a/

Year	North	Northeast	Center-West	Southeast	South	Total Brazil
1968	0.4	10.2	47.0	51.1	64.6	43.9
1969	1.4	22.0	60.1	30.6	66.9	46.7
1970	1.1	24.6	76.4	54.7	66.2	58.4
1971	0.1	17.6	54.4	32.0	60.9	48.0
1972	0.4	10.1	71.4	39.8	56.2	48.3
1973	1.6	14.5	66.3	49.1	56.8	50.3
1974	0.0	13.0	78.1	43.9	51.3	45.8
1975	47.0	37.6	84.0	46.6	71.4	62.1
1976	18.0	33.7	87.7	51.0	68.8	63.1
1977	23.7	39.3	78.9	37.1	70.3	60.7

Source: Table 17, Appendix 1.

a/ Percent of total loan funds (EGF) for each region and all Brazil that was received by producers and their cooperatives. The remainder was received by private processors and handlers.

erative participation for all Brazil has risen and a statistically significant positive linear trend (5 percent level) was established on the basis of the data in Table 3. This indicates that the legal mandate to make producers and their cooperatives the primary beneficiaries of the program has improved participation.

Additional insights into user participation in the EGF program can be obtained from the loan data for particular commodities. The share of funds received by producers and cooperatives for three commodities (cotton lint, rice, and corn) was investigated on a regional basis (Table 18, Appendix 1) and showed considerable annual and regional variation for the same commodity. The observed differences suggest that general changes in the program to increase producer and cooperative participation may not be successful and that consideration must be given, on a commodity and regional basis, to the specific conditions that limit their participation.

The final bit of evidence on participation in the loan program was derived from the 1976-77 data for the Northeast state of Ceará (Table 4). Information was obtained on the number of contracts and their value by type of user and commodity. The allocation of loans among users is consistent with the previous data in that 80 percent of the funds went to private handlers and processors. Of more interest and significance is the information on the average values of the contracts. As expected, in most cases the size of the average contract is lowest for producers, increases for cooperatives, and is the highest for private handlers. More importantly, the average contract values are quite large, even for producers. Corn provides a good example. The average producer contract was Cr$37,323 or approximately US$ 2,500, or the equivalent of about 97 hectares of corn.[34] This occurred in a state where in 1970, 68 percent of the corn was produced on farms of less than 20 hectares. Not only were the average loans large, they were few in number when compared with the number of farms in the state. In 1970, there were 245,432 farms in Ceará (159,004 with less than 20 hectares of land) and more than 57 percent of these produced corn in that year.[35]

The data on user participation support the charge that the potential direct benefits of the program, particularly in the North and Northeast, are concentrated among a few private handlers of a restricted number of commodities. Furthermore, those few producers in the Northeast that do participate, are primarily large-scale operations. It is not clear to what extent the general increase in producer and cooperative participation has benefited the medium- and small-scale producers. However, their participation appears minimal in the Northeast. Although private handlers must certify that they paid producers at least the minimum price in order to qualify for storage loans, Brazilians concerned with the program believe that it is easy to falsify the certifi-

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[34] Based on a minimum price of Cr$54.00 per 60 kg. sack in 1976-77 and a 1976 yield of 7.1 sacks per hectare (the longer term average yield is 12.5 sacks).

[35] Fundação Instituto Brasiliero do Geografia e Estatística (FIBGE), *Censo Agropecuário–Ceará*, vol. 3, tomo 7, *8 Recensamento Geral–1970*, Rio de Janeiro, 1975. Data drawn from other sources, although more aggregated, support the conclusions from the Ceará data. For example, in all Brazil during the period from January through September 1975, there were 30,725 EGF contracts with an average value of Cr$251,000. Loans for corn storage for all classes of users averaged Cr$67,000 per contract, while the 2,521 cotton lint contracts averaged Cr$478,000. See Fundação Getúlio Vargas, *Conjuntura Econômica*, Rio de Janeiro, Fevereiro 1976, pp. 33-37.

Table 4—Minimum price loans in Ceará, Brazil, 1976/77 [a]

Commodity	Producers			Cooperatives			Others [b]		
	Number of Contracts	Average Contract	Percent of Total [c]	Number of Contracts	Average Contract	Percent of Total [c]	Number of Contracts	Average Contract	Percent of Total [c]
		(Cr$)			(Cr$)			(Cr$)	
Seed cotton	6	20,833	[d]	7	790,143	8	26	2,324,615	91
Cotton lint	0	...	0	43	1,124,999	16	192	1,290,188	84
Rice	15	35,440	23	1	731,555	32	2	506,500	45
Corn (grain)	78	37,323	19	11	546,757	40	21	287,333	40
Carnauba Wax	553	43,604	37	4	172,460	1	116	345,155	62
Others	31	104,358	25	3	206,030	5	10	918,079	70
Total	683	45,265	7	69	897,968	14	367	992,975	80

Source: Bank of Brazil, Fortaleza, Ceará, Brazil.

a/ July 1976 through July 1977.

b/ Private handlers and processors.

c/ Percent of the total value of loans by commodity for each type of user. Thus, 80 percent of the seed cotton loans went to cooperatives.

d/ Less than 0.5 percent.

cate. Data are not available to directly test this assertion. Moreover, as will be shown later, average prices received by producers were frequently above minimum prices, so that in many years the requirement was meaningless.

The reasons for the concentration of funds among particular users and commodities were not formally investigated. However, they appear to involve such things as the organization of production, the characteristics of the market for the commodity, proximity to storage facilities and agencies of the Bank of Brazil, administrative and informal constraints on the size of loans, liquidity needs of producers and handlers, knowledge of the program and its operation, attitudes about indebtedness, and knowledge of and confidence in future price changes.[36] More understanding of these and other factors is required before certain inequities in the program can be eliminated.

Government Acquisitions

Government acquisitions under the minimum price program occur as a result of direct purchases (AGF) and defaults on storage loans (EGF loans with option to sell). Commodities acquired under the program form a part of the national stocks and are sold on the domestic market or exported. Unfortunately, data on the disposition of these stocks were not available to the author. This precluded analysis of the stock regulation (supply management) aspects of the program. Also, no reports were discovered on the proportion of acquisitions from direct purchases versus the amount from defaults on storage loans. The general impression obtained was that the latter accounted for most of the acquisitions. This is not surprising since direct purchases generally occur only under extreme conditions of low market prices and inadequate storage facilities. Otherwise, as will be shown later, users of the program will select the loan option because of its low costs and small risk.

The regional distribution of acquisitions changed more from year-to-year than the loan operations of the program (Tables 15 and 19, Appendix 1). Year-to-year changes in the real value of total acquisitions also were large, primarily because of abrupt changes in market conditions (Table 19, Appendix 1).

For the period from 1969 through 1976, the percentage distribution of storage loans and acquisitions by region was as follows:

	Loans	Acquisitions
North	1.1	3.6
Northeast	14.0	39.8
Center-West	10.0	32.5
Southeast	20.6	10.4
South	54.3	13.7
	100.0	100.0

These percentages illustrate that in the remote regions (North, Northeast, and Center-West), the proportion of acquisi-

[36] These issues for the case of small-scale corn producers in Mexico were investigated in Philip Garcia, "Market Linkages in Small Farms: A Study of the Maize Market in Vera Cruz, Mexico" (Ph.D. dissertation, Cornell University, 1978).

[37] Rice production provides a good example. Data for three states, Maranhão in the Northeast, Mato Grosso in the Center-West, and Rio Grande do Sul in the South were analyzed for the 17-year period, 1960-1976. The coefficient of variation of output was greater in Maranhão (24.5 percent) and Mato Grosso (64.7 percent) than in Rio Grande do Sul (17.8 percent). All three states had significant upward trends in production, but the ratio of trend to the mean was greater in the more remote states of Maranhão and Mato Grosso.

tions was greater than for loans. This greater percentage of acquisitions for the remote regions reflects, in part, the greater variation and rapid growth in the output of some crops in the remote regions.[37] Thus, when the capacity of storage and transportation facilities was strained by a large crop, prices fell below the minimum levels and the government was "forced" to acquire the excess production and move it out of the area for storage and eventual resale. The corollary explanation is that the loan program did not function as well in the more remote regions because of lack of knowledge, inadequate storage facilities, greater price variability, etc., thereby resulting in proportionately fewer storage loans.

In general, the absolute value of acquisitions was usually less than 20 percent and frequently less than 5 percent of the value of loans (see Tables 17 and 20, Appendix 1). The principal exception occurred in 1970, when total acquisitions equaled 45.5 percent of the minimum price loans. On a regional basis, there has been only one case during the 1969-76 period where the value of acquisitions exceeded the value of loans. This occurred in the Center-West in 1970.

Although small in comparison with the loan program, acquisitions of certain commodities have been quite large (Table 21, Appendix 1). For example, in 1965 and 1977, acquisitions of rice under the program represented 26 and 13 percent of Brazil's total production, respectively The relative importance of the three basic food crops (rice, corn, and beans) suggests that acquisitions occurred in response to internal market conditions. They also occurred because of the government's desire to maintain stocks and "regulate" their prices in order to appease consumers in the large metropolitan areas of the Center-South.

In the Northeast, acquisitions were generally concentrated in the extractive crops, sisal and carnauba wax (Table 20, Appendix 1). Even in years when rice and corn represented an important share of regional acquisitions (1969, 1972, and 1973), their importance relative to regional production was small.[38] This is not unexpected as the Northeast is usually a net importer of grain.

A final observation is that cotton lint and soybeans, two export commodities of major importance in the loan program, were of only minor importance in the acquisition program (see Tables 2 and 21, Appendix 1).

Minimum Price Levels

Data on minimum prices were studied to determine how they changed through time, how they differed relative to other minimum prices within the Northeast and between regions, and what their relationship was to producer and wholesale market prices.[39]

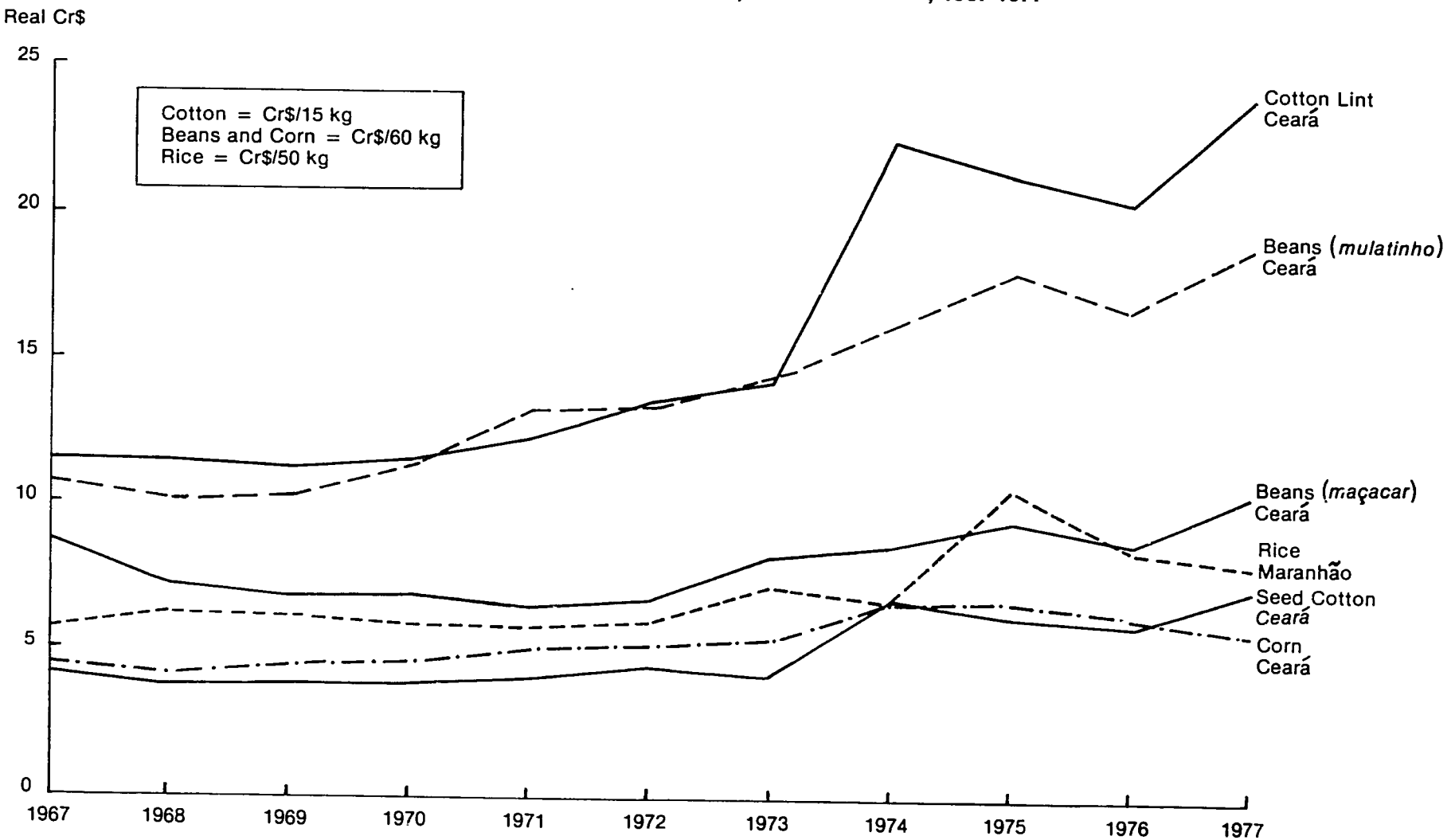
Relative to the general price index, real minimum prices in the Northeast tended to go up, as Figure 2 shows, with the increase in the price of cotton lint being the most pronounced. All of the price trends reflected in Figure 2 are statistically significant at the 5 percent level as determined by linear trend equations (Table 23, Appendix 2).

Before discussing the differences in the movement of real minimum prices through time, it is necessary to point out that since the early 1970s the product terms of trade in Brazil have moved in favor of agricultural

[38] For example, in 1973 when acquisitions of rice accounted for 67 percent of the total value of acquisitions in the Northeast, they represented less than 1 percent of regional rice production.

[39] This part of the study used average zone prices by state, as published by the CFP. The states selected were those that have been major producers of cotton, corn, beans, and rice.

Figure 2: Real minimum prices for selected commodities and states, Northeast Brazil, 1967-1977



Note: Based on the Fundação Getúlio Vargas' annual Consumer Price Index No. 2, 1965-67 = 100.

goods. Consequently, the measurement of real minimum prices using an agricultural price index yields a considerably different picture from that given when using the general price index. This is illustrated for cotton lint in Figure 3. Instead of a significant upward trend (R_1), the minimum price of cotton lint relative to agricultural prices (R_3) demonstrated no significant trend and in 1976-77 was about 15 percent below the 1967-68 level. Inflation in agricultural prices introduces corresponding changes in the price trends of the other commodities represented in Figure 2. For example, the real minimum price of corn in Ceará, as determined by the agricultural price index, declined significantly. The general conclusion is that relative to other agricultural prices, minimum prices in the Northeast did not increase but, in fact, declined significantly for some commodities. This implies, *ceteris paribus*, the program provided no increase in price incentives to shift resources to the supported commodities.

However, changes in relative minimum prices did occur. The minimum price of seed cotton did not increase as rapidly as the lint price, reflecting in part the increased cost of ginning associated with the higher energy costs following the 1973 oil crises. Furthermore, the differential between the minimum prices of the two common bean varieties *(mulatinho and macaçar)* in the Northeast increased significantly betwen 1967 and 1977.[40] It is possible that producers of *macaçar*, generally low income farmers, bore more price risks and therefore had less incentive to expand production than producers of *mulatinho*. Such an outcome would be counter to the low consumer price goal as well as any goal to reduce price risks of low income producers.

Changes in minimum prices between selected states in the Northeast and the Center-South have not followed a uniform pattern (Table 24, Appendix 2). The ratio of minimum prices for cotton lint in Ceará and São Paulo increased by 19 percent from 1968 to 1977.[41] However, the changing price ratio has not brought about significant changes in the proportion of loans for cotton lint storage between the Northeast and the Center-South.[42] Only small changes have occurred in the interregional minimum price ratios for rice and beans.

The systematic comparison of minimum prices with market prices provided additional information about the price guarantees of the program, incentives for producers to obtain loans under the program, and pressures for government acquisitions via the EGF or AGF modes of operation. The ratios of prices received by producers at harvest time to minimum prices in Table 5 show that except for rice, mean and standard deviations of the ratios for the Northeast, represented by Ceará were larger than

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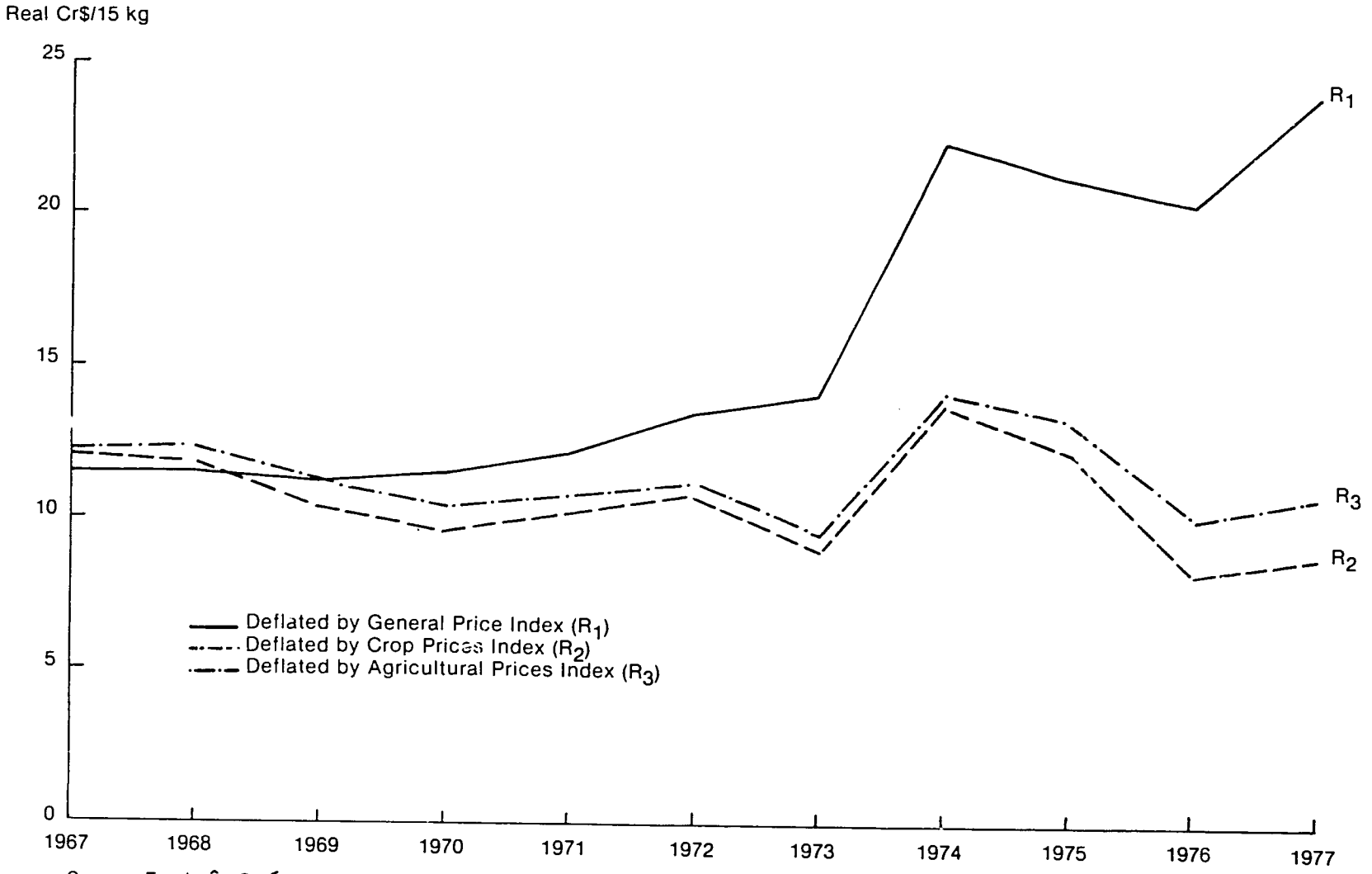
[40] A significance test of the difference between the two trend coefficients for beans (Table 23, Appendix 2) verified that they are significantly different from each other at the one percent level.

[41] Since in 1972 the "basic" lint price changed to a lower priced fiber in Ceará (34/36 mm to 32/34 mm) and a higher priced fiber in São Paulo (28/30 mm to 30/32 mm), the increase in the ratio, on a constant quality basis would have been larger than represented in Appendix 2, Table 24. The changes in the "basic" quality were made by CFP in an effort to reflect changes in average quality within the states.

[42] Based on a nonsignificant linear trend coefficient of the Northeast's proportion of total storage loans for cotton lint, 1968 to 1977.

Figure 3: Real minimum prices of cotton lint, Ceará, Brazil, 1967-1977



Source: Fundação Getúlio Vargas, Centro de Estudos Agricolas, *Conjurata Econômica* Rio de Janeiro, February 1978, p. 8.

Note: Indices of crop and agricultural prices reflect prices received by producers.

Table 5—Ratios of prices received by producers at harvest time to minimum prices for selected commodities and states, Northeast and Center-South Brazil, 1967 to 1977 a/

Year	Seed Cotton		Rice		Beans			Corn	
					Macaçar	Mulatinho	Mulatinho		
	Ceara	São Paulo	Maranhão	Rio Grande do Sul	Ceará	Ceará	Paraná	Ceará	Paraná
1967	1.03	1.16	1.03	1.26	1.18	1.20	...	1.29	...
1968	1.18	1.15	0.94	1.45	1.31	1.06	0.93	1.07	1.08
1969	0.95	1.20	0.74	1.14	1.78	1.12	1.16	1.25	0.98
1970	1.92	1.18	1.14	1.02	4.00	2.91	1.58	1.99	0.86
1971	1.33	1.40	1.04	1.17	1.69	0.92	1.33	1.61	1.13
1972	1.01	1.18	1.14	1.27	1.92	1.04	1.13	1.51	1.13
1973	1.98	1.38	0.74	0.97	2.13	1.32	1.63	1.11	1.15
1974	1.08	1.24	1.31	1.26	2.36	1.32	1.10	1.21	1.05
1975	1.11	0.99	0.99	1.42	1.90	0.96	0.97	1.03	1.06
1976	2.56	1.86	0.93	1.11	5.54	2.50	1.63	1.46	1.06
1977	0.93	1.15	0.67	0.95	1.48	1.12	1.64	0.98	0.87
Mean	1.37	1.26	0.97	1.18	2.30	1.41	1.31	1.32	1.04
Standard deviation	0.54	0.23	0.20	0.17	1.31	0.66	0.29	0.30	0.10

Source: Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico–1977*, Brasilia, 1977; and Brazil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico–1978*, Brasilia, 1978.

a/ Seed cotton: Ceará, Sept. – Nov.
São Paulo, May – July

Rice: Maranhão, May – July
Rio Grande do Sul, April – June

Beans: Ceará, June – Aug.
Paraná, Jan. – Mar. (all beans)

Corn: Ceará, June – Aug.
Paraná, May – July

For minimum price quality specification, other than *macacar*, see Appendix 2, Table 24.
Beans *(macaçar)* Ceará, Type 3, small reddish, 1967 to 1977.

for the same commodities in the major producing states of the Center-South.[43] At least two interpretations of this pattern are possible. The government might have been more successful in stabilizing prices (one of the program objectives) in the Center-South than in the Northeast. A somewhat more complete explanation is that the government, recognizing the greater variability of producer prices in the Northeast and not wanting to accumulate large stocks, purposely maintained minimum prices in the Northeast further below average market prices than in the Center-South.[44] Both explanations are consistent with the expectation that the lower ratios in the Center-South would be associated with greater participation in the program, a hypothesis that was at least partially substantiated by the data on loans for storage.

The one exception to the above pattern was rice, where the average ratio in the Northeast state of Maranhão was 0.97 compared to 1.18 for Rio Grande do Sul. There were very few other commodities in the Northeast for which the minimum price was above the price paid to producers at harvest time. In fact, with the exception of rice in Maranhão and corn in Paraná, the average price ratios in Table 5 are significantly greater than one, suggesting that the government fixed prices conservatively.

The ratios of wholesale prices to minimum prices created a pattern quite similar to that observed for the ratios of prices received by producers to minimum prices in that the mean and standard deviations of the ratios for the Northeast locations were larger than for the same commodities in the major markets of the Center-South (Table 26, Appendix 2). With the exception of rice, the variability of wholesale prices proved to be greater in the Northeast markets than in the Center-South (Table 27, Appendix 2). The implications of these results are the same as for the producer level analysis.

Summary

The data on loans for storage, acquisitions, and minimum price levels yielded a number of insights and implications concerning the operation of the program in the Northeast. The principal ones are:

1. The total real value of storage loans has increased, but the proportion going to the Northeast has declined from the 1968-69 levels.

2. Except for 1975 and 1976, cotton has been the major user of the loan program (EGF) in the Northeast. The large variability in annual participation by most commodities in the Northeast suggests that users of the program have responded to market conditions when deciding whether or not to store.

3. For the Northeast, total producer and cooperative participation in the loan program has increased in recent years but still lags considerably behind the rest of Brazil.

[43] Although the minimum price program was designed to prevent the price ratio from falling below one, producer prices have fallen below minimum prices because of administrative delays, inadequate storage, shortage of loan funds, etc. Furthermore, the producer prices used in Table 5 represent an average for all grades and classes, whereas the minimum prices are for a specific quality. Thus, in years when the average quality is low, the ratio may be less than one. For example, some of the commodity experts at the CFP feel that quality differences account for the low price ratios for rice in Maranhão. Unfortunately, producer price series for specific qualities are not available.

[44] The variability of producer-level prices was measured by the standard deviation of the percentage deviations from trend derived from a natural log equation ($LnP_t = a + bT$). In *all* cases the variability of prices in the Northeast states was greater than for the same commodities in the Center-South (Table 25, Appendix 2).

4. Producer and cooperative participation by commodity varied greatly among the five regions. This suggests that general changes in the loan program designed to increase their participation may not be successful and that consideration by commodity and region must be given to the specific conditions that limit participation.

5. Loans for storage, as reflected in the data for the state of Ceará, have been highly concentrated among a few large producers and handlers.

6. In general, the value of government acquisitions under the program was low in comparison to the value of the loans given. The regional distribution of acquisitions showed much more annual variation than the loan operations, which supports the belief that acquisitions occur mainly under the extreme conditions of sustained low market prices and inadequate local storage facilities. Pressures for acquisitions appear to be greater in the more remote regions such as the Northeast.

7. In the Northeast acquisitions were generally concentrated in the extractive crops, sisal and carnauba wax.

8. Since 1967, minimum prices for most commodities in the Northeast have declined in relation to the general movement of agricultural prices. This implies, *ceteris paribus*, that the program provided no increase in price incentives to shift resources to the supported commodities.

9. Changes in relative minimum prices, both within the Northeast and between the Northeast and the Center-South, have occurred that seem to favor certain commodities (e.g., *mulatinho* beans over *macaçar* beans in the Northeast) and regions (e.g., cotton lint in the Northeast over the Center-South).

10. With the exception of rice, the mean and standard deviations of the ratios of market to minimum prices were greater in the Northeast than the Center-South, which suggests that the government has been more successful in reducing price risks in the latter region. Apparently this occurred because market prices were more variable in the Northeast and the government did not want to accumulate stocks.

Overall, the results detailed in this section suggest that, with the possible exception of cotton and rice, the minimum price program did not help develop the agricultural sector of Northeast Brazil from 1967 through 1977.

5

PERFORMANCE OF BRAZIL'S MINIMUM PRICE PROGRAM IN THE NORTHEAST

The data interpreted in the previous chapter yielded several important insights concerning the past operation of Brazil's minimum price program. In this section the performance of the program in the Northeast is evaluated in terms of its basic objectives. Because data on the management of government stocks were not obtained, the primary focus is on the price stabilization and output expansion objectives. Price stability is viewed in terms of annual and seasonal prices. The discussion of supply response is based largely on a synthesis of previous studies.

Program's Effect in Reducing Variability in Prices and Income

The stabilization objective of Brazil's minimum price policy has been interpreted as price stabilization[45] and as a combination of price and gross income stabilization.[46] The usual rationale for employing a minimum price program to reduce fluctuations in producer gross income is based on the existence of price inelastic demand for most agricultural commodities.[47] Given stable, inelastic demand, random fluctuations in output caused by climate and other factors will be inversely related to gross revenue and prices. Guaranteeing minimum prices, even at levels below the longer run equilibrium, will, *ceteris paribus*, result in in higher gross income in years of large crops than would be obtained in competitive markets. In years of small crops, gross revenue will be even higher because of the inelastic demand.[48] Consequently, fixing minimum prices on a regular basis in advance of the planting season reduces the price and income risks faced by producers and, over time, should lead to an expansion of output. However, there are costs associated with these benefits. The amount of social and administrative costs involved in operating the program depends on the instruments used (storage loans, direct payments, etc.) and the characteristics of supply and de-

[45] Smith, "Brazilian Policy, 1950-67."

[46] Oliveira, *Observações.*

[47] The price elasticity of demand for a region's or country's exports may be elastic at world market prices. However, unstable export demand may encourage an exporting country to use minimum prices to protect producers against abrupt declines in world market prices. Of the four Northeast commodities treated in this study, only cotton is exported, and its minimum price is normally set near the expected long-run world market level. The Northeast is traditionally an importer of rice, corn, and beans, and the price elasticity of demand for these commodities, especially at the farm level, is likely to be inelastic.

[48] Different combinations of large and small domestic and world crops (e.g., large domestic and small world) will, in a free trade environment, change the domestic price and income situation. However, as long as the aggregate commodity demand is price inelastic, guaranteeing minimum price will mitigate the negative impacts on gross income of supply-induced price decreases.

mand (elasticities, growth, etc.).

The principal problem of "excessive" price instability is that producers may make short- and long-run range of resources.[49] The short-run problem is illustrated by the cobweb model, in which alternatively too many and too few resources are used relative to those suggested by the equilibrium price. Longer run misallocations result because some producers emphasize short-term investments, flexibility, and diversification. Both internal and external capital rationing may occur. Producers maintain "excess" liquidity to meet the possibility of a low price and are reluctant to borrow. Those controlling outside capital may hesitate to make loans when prices are uncertain. Furthermore, excessively high prices may attract resources that become "trapped" in certain production activities and lead to overexpansion. Although overproduction has been more of a problem in developed countries, it does occur in developing countries, as the production cycles of coffee and sugar show.

In spite of the above arguments, the desirability of price stabilization from both consumer and producer points of view is not universally accepted.[50] Actual conditions are not as stable and homogeneous as in the theory presented above. Important social and administrative costs may be involved in operating the stabilization program. Output and price changes do not affect the incomes of different income classes in the same way.[51] Market price variations are the result of many factors that affect supply and demand, and most price stabilization schemes treat the symptoms rather than the causes of instability. No attempt was made during this study to resolve the debate on stabilization. Rather, the price (both annual and seasonal) and gross income stabilization objective of Brazil's policy was taken as given, and analyses were conducted to de-

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[49] This paragraph draws heavily on William G. Tomek, *Stability for Primary Products: Means to What Ends*, Occasional Paper 28 (Ithaca, N.Y.: Cornell University, Department of Agricultural Economics, September 1969).

[50] For a theoretical treatment of the conditions under which price instability can be beneficial to consumers or producers, see Frederick W. Waugh, "Does the Consumer Benefit from Price Instability?" *Quarterly Journal of Economics* 58 (August 1944): 602-614 and W.Y. Oi, "The Desirability of Price Instability Under Perfect Competition," *Econometrica* 29 (January 1961): 58-64. For a contrary theoretical view, see Paul Samuelson, "The Consumer Does Benefit from Feasible Price Stability," *Quarterly Journal of Economics* 86 (August 1972): 476-493; Benton F. Massell, "Price Stabilization and Welfare," *Quarterly Journal of Economics* 83 (May 1969): 284-298; Darrell Hueth and Andrew Schmitz, "International Trade in Intermediate and Final Goods: Some Welfare Implications of Destabilized Prices," *Quarterly Journal of Economics* 86 (August 1972): 351-365; and Jurg Bieri and Andrew Schmitz, "Export Instability, Monopoly Power, and Welfare," *Journal of International Economics* 3 (1973): 389-396 explored the aggregate welfare implications of price stabilization within a closed economy, open economy, and an economy with marketing intermediaries. For the policy arguments supporting price stabilization, see Dale E. Hathaway, "Grain Stocks and Economic Stability: A Policy Perspective," in *Analyses of Grain Reserves, A Proceeding*, Economic Research Service Report 634, compiled by David J. Eaton and W. Scott Steele (Washington, D.C.: U.S. Department of Agriculture, August 1976), pp. 1-11. Tomek, "Stability for Products" treats both sides of the argument, and Richard E. Just, *Theoretical and Empirical Possibilities for Determining the Distribution of Welfare Gains from Stabilization*, Giannini Foundation Paper No. 469 (Berkeley: University of California, July 1977) offers a good review and evaluation of the welfare effects of stabilization.

[51] John W. Mellor, *Agricultural Price Policy and Income Distribution in Low Income Nations*, World Bank Staff Working Paper 214 (Washington, D.C.: International Bank for Reconstruction and Development, September 1975).

termine to what extent the objective could and was being attained. As Tomek emphasizes, the sources and nature of price and income fluctuations must be understood before the desirability and potential of increasing stability can be determined.[52]

The lack of reliable estimates of price elasticities of demand at the farm level required a different approach to study variations in prices and returns. The method selected was based on the mathematical identity between the total value per hectare (TV) of a commodity and its unit price (P) and yield (Y). Burt and Finley showed that for an identity of this type it is possible, using a Taylor's series expansion, to decompose the variance of total value per hectare into price and yield components.[53] The expansion gives the direct effects of price and yield and various first and second order interaction effects. Burt and Finley argued that for empirical purposes the higher order interaction terms can be ignored. Thus an estimate of the variance in total value is obtained,

$$\mathrm{Var}(TV) \cong \bar{Y}^2 \,\mathrm{Var}(P) + \bar{P}^2 \,\mathrm{Var}(Y) + 2\,\bar{P}\bar{Y}\,\mathrm{Cov}(P,Y). \qquad (1)$$

For the purposes of interpretation, Burt and Finley suggested dividing the three terms on the right-hand side of equation (1) by the sum of the first two right-hand side terms. Thus,

$$\frac{\bar{Y}^2 \,\mathrm{Var}(P) + \bar{P}^2 \,\mathrm{Var}(Y) + 2\,\bar{P}\bar{Y}\,\mathrm{Cov}(P,Y)}{\bar{Y}^2 \,\mathrm{Var}(P) + \bar{P}^2 \,\mathrm{Var}(Y)} = R_p + R_y + R_{py}\,, \qquad (2)$$

Where both R_p and R_y, the direct effects of price and yield, are positive and sum to unity, while the interaction term R_{py} can take either sign. In this application, a negative sign means that the interactions of price and yield tend to reduce the variance of total value per hectare, while a positive sign means the opposite. The presence of trends in price and yield means that the estimates of R_p, R_y, and R_{py} become functions of time. Where significant trends existed, they were eliminated and the estimates of R_p, and R_y, and R_{py} were based on the deviations from trend and the trend (mean) values for 1973 (derived from the trend equation).

The above procedure was used to partition the variances of the real value of production per hectare for cotton, rice, corn, and beans. Estimates of the direct and interaction effects were made for the major producing state of each commodity and for the Northeast as a whole (Table 6). Annual time series data from 1947 to 1973 were used. A shorter, more recent period (1960 to 1973) was analyzed separately to determine whether the recent period, during which the minimum price program was more

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[52] Tomek, *Stability for Products.*

[53] Oscar R. Burt and Robert M. Finley, "Statistical Analysis of Identities in Random Variables," *American Journal of Agricultural Economics* 50 (August 1968): 734-744.

Table 6—Decomposition of total value per hectare variances, selected commodities and states, Northeast Brazil

Commodity and Area	Time Period	Estimated Var (TV) Cr$/ha a/	Price R_p	Yield R_y	Interaction R_{py}	Significant Trends b/
Seed Cotton						
Northeast	1947-73	1015	0.79	0.21	−0.29	Price (−)
Northeast	1960-73	1168	0.84	0.16	0.12	Yield (−)
Ceará	1947-73	1345	0.53	0.47	−0.41	Yield (−)
Ceará	1960-73	854	0.58	0.42	0.15	Yield (−)
Rice						
Northeast	1947-73	464	0.62	0.38	−0.32	None
Northeast	1960-73	567	0.68	0.32	−0.14	None
Maranhão	1947-73	773	0.69	0.31	−0.06	None
Maranhão	1960-73	918	0.70	0.30	0.10	None
Corn						
Northeast	1947-73	138	0.72	0.28	−0.40	None
Northeast	1960-73	177	0.72	0.28	−0.30	None
Ceará	1947-73	186	0.47	0.53	−0.76	None
Ceará	1960-73	250	0.41	0.59	−0.52	None
Beans						
Northeast	1947-73	1202	0.80	0.20	−0.27	Price (+)
Northeast	1960-73	1995	0.89	0.11	−0.21	None
Ceará	1947-73	589	0.65	0.35	−0.67	None
Ceará	1960-73	[illegible]14	0.65	0.35	−0.60	None

a/ Estimated from Var (TV) = $\bar{Y}^2$ Var (P) + $\bar{P}^2$ Var(Y) + $2\bar{P}\bar{Y}$ Cov (P,Y).

b/ Indicate series (price or yield) for which the linear trend coefficient was significant at the 5 percent level of significance. Trends were eliminated as explained in the text.

vigorously applied, varied in any way from the entire period.[54] Implicit current prices were derived from the published data on total value and total production. The derived current prices were converted to real terms using the annual general price index. Yields were derived from the published data on total production and area.

Except for corn in Ceará, more than 50 percent of the variability in total value per hectare was attributed to price fluctuations.[55] For Ceará corn, the equivalent figure was 41 percent or 47 percent, depending on the time period. The linear interaction term was negative in most cases, indicating that price and yield interactions have tended to reduce the variance in total value per hectare. Also, with the exception of corn, the proportion of variability attributable to price was greater from 1960 to 1973 than from 1947 to 1973. This suggests that the minimum price program and other price stabilization programs employed during the 1960s and early 1970s did not successfully reduce annual price variations associated with fluctuations in total value per hectare. Furthermore, with the exception of cotton in Ceará, estimated variances in real total value per hectare were greater from 1960 to 1973 than for the entire period from 1947.

Since the direct effects of price variation were large, the analysis provides some support for the goal of stabilizing per hectare gross values by stabilizing prices. Reducing annual price variations should stabilize crop values per hectare. However, at least three factors limit the extent to which they do. First, the total value figures refer to the value of total production per hectare and not to the gross income from a marketed surplus, the proportion of which varies among farms, usually in direct relation to farm size. Hence, stabilizing prices may have a different effect on a small farm with a small marketed surplus than on a large farm with a high proportion of marketed surplus.[56] Second, the measurement of total value per hectare is more complicated than the one postulated in this analysis because interplanting is common in the Northeast and the estimates used do not represent the "actual" total values when several crops are grown on the same parcel of land. Changes in the variance of total value associated with interplanting were not captured in the analysis. Third, elimination of part of the historical variation in prices (say 50 percent) would still leave considerable variation in total value per hectare. Thus, the minimum price program is potentially only a partial means of stabilizing annual per hectare crop values, and has been relatively ineffective in the Northeast.

In a largely theoretical study, Oliveira evaluated the potential of the minimum price program for stabilizing agricultural income and reducing price risks by comparing it with other policies such as forward contracts, production quotas, and direct payments.[57] He also compared the alterna-

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[54] A discussion of the quality of the data series, often criticized because of their inconsistency with census data, is contained in Patrick, *Desenvolvimento Agrícola*, Apêndice A. Where annual time series are required, as in the analysis, the researcher has no alternative data source. Data for the years since 1973 were excluded because a change in the collection procedure introduced obvious discontinuities in some of the series.

[55] These percentages are estimates of the net influence on total variability attributable to price (or yield) after compensating for the covariance between variables and for significant trends.

[56] John W. Mellor, *Agricultural Price Policy*.

[57] Oliveira, *Observações*.

tives on the basis of minimizing public sector expenditures and net social costs. Since the results depended upon the elasticities of supply and demand, the expected effects varied among commodities. For example, using the social cost criterion, Oliveira concluded that in order to stabilize gross returns from rice production, social costs were minimized by a program of minimum prices and production quotas, whereas for stabilization of gross returns from corn, social costs were minimized by a program of minimum prices and direct payments.[58] Consequently, no overall conclusion could be reached because a program that appeared "best" for attaining one objective might not be the best for attaining another.

Program's Effect in Reducing Seasonal Price Variations

Brazil's minimum price program also attempts to stabilize seasonal prices by providing loans for short-term storage, periodic repayment of some large loans, and acquisition of commodities at harvest time for subsequent resale.

The arguments in favor of reducing seasonal price instability are frequently cited in the literature on agricultural development and are well known in Brazil.[59] Unstable seasonal price patterns may result in incorrect resource allocations. For instance, while prices for seasonally produced crops may rise on the *average* by an amount necessary to cover storage costs, the rise may be much larger than storage costs in some years and much smaller in others. Hence, storers are uncertain about seasonal price changes in any particular year. A reduction in this price uncertainty may improve the seasonal distribution of supplies, i.e., lead to a more nearly "correct" quantity stored each year and improve distribution throughout each year.

Where handlers and others in the marketing chain possess monopsony or monopoly power, as is frequently charged in Brazil, market distortions may work to the disadvantage of producers, particularly small-scale operators who must sell most of their marketable surplus at harvest time when prices are normally at their lowest. The minimum price storage program is designed to increase producer liquidity at harvest time, reduce the price risks of storage, and allow producers to gain from storing their own products. However, as shown in Chapter 4, few of the loans in the Northeast went to producers and those were concentrated among the largest operators.

In this section the instability of seasonal prices in the Northeast is examined and trends in seasonal prices at the producer and wholesale level are investigated to determine if the trends for some of the important Northeastern commodities show a decline. The section concludes with a brief examination of producer-wholesale-marketing margins.

State-level monthly prices for the major producing states in the Northeast were used to describe the past movements of seasonal producer prices.[60] The year-to-year variation in seasonal prices referred to above is evident in the producer prices of the major commodities in the Northeast. In order to illustrate this variation, monthly real pro-

[58] Ibid., p. 42.

[59] Tomek, *Stability for Products.*

[60] Monthly prices for the years 1966-77 were available in most cases. Where real prices were required, the monthly general price index (Fundação Getúlio Vargas, Column 2; 1965-67=100) was used to adjust current prices.

ducer prices for corn in the state of Ceará as a percentage of the annual price were plotted for selected years (Figure 4). In 1971, real corn prices varied from about 35 percent above average to 65 percent of average, with the high prices early in the calendar year and the low prices in the second semester. The seasonal pattern for 1966, on the other hand, was nearly bimodal, beginning low and ending high.

Table 7 contains postharvest changes in real producer prices during an arbitrary storage period that begins with the final month of harvest and terminates with the end of the maximum EGF loan period as specified by the minimum price legislation.[61] The column of percentage changes in average real monthly prices gives an idea of the direction and magnitude of previous postharvest price changes at the producer level.[62] The final column of Table 7 gives an indication of the riskiness or variation in postharvest prices illustrated by Figure 4. Declines in real producer prices from the final month of harvest to the end of the arbitrary storage period occur with a frequency ranging from once in 12 years (beans – Ceará) to eight times in 11 years (seed cotton – Paraíba). The uncertainty of postharvest price changes appears to be one reason why many producers do not attempt to store more of their products, even with the minimum price guarantees. With producer prices in the Northeast at harvest time generally 20 to 30 percent above minimum price levels (except for rice), the occurrence of postharvest price declines has been and continues to be a real possibility.

The past movements of seasonal wholesale prices were investigated using the same techniques. Similar year-to-year variations were discovered, and several cases of a decline in postharvest wholesale prices were encountered (Table 28, Appendix 2). Since wholesale prices in the Northeast have usually been much higher than minimum prices (Table 26, Appendix 2), it is unlikely that the loan program has done much to reduce instability of wholesale prices. An attempt to test this hypothesis follows.

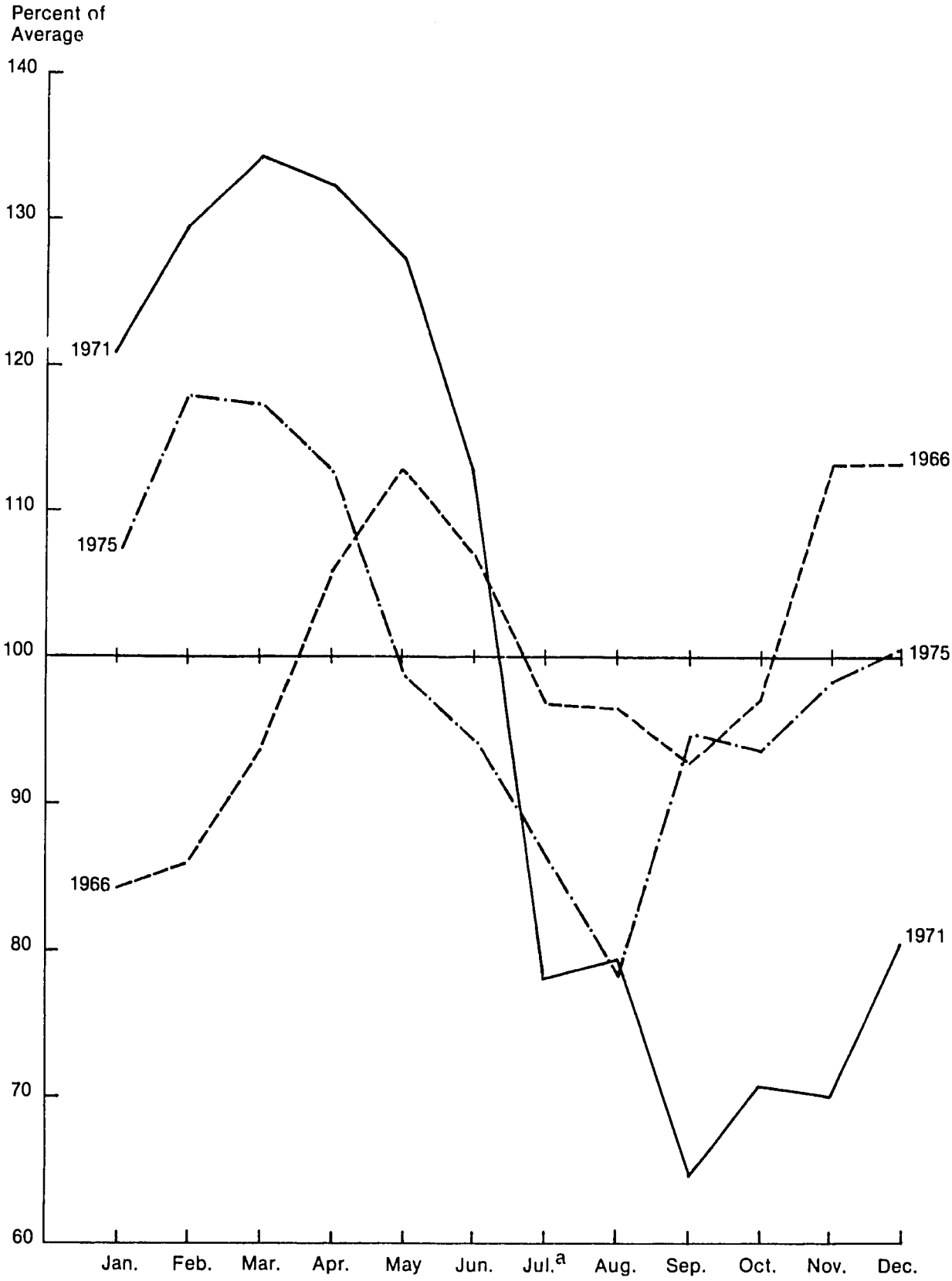
To study trends in seasonal prices, monthly and seasonal indices were estimated from the data series on real monthly producer and wholesale prices. Significant increases and decreases in seasonal highs and lows were determined on the basis of the seasonal indices.[63] The results had mixed implications for the minimum price pro-

[61] For rice and brown beans *(mulatinho)*, large loans can be obtained for a period one month longer than the maximum listed in Table 7, but periodic payments during the loan period are required.

[62] These data should not be interpreted as justifying storage when prices rise or avoiding storage when prices fall. The returns from storage involve the minimum price level, storage costs, losses during storage, inflationary gains to borrowers as well as changes in market prices. Only market price movements are reflected in Table 7.

[63] A Bureau of the Census computer routine based on the ratio-to-moving-average method was used to obtain the indices [U.S. Department of Commerce, Bureau of the Census , *The X-11 Variant of the Census Method II Seasonal Adjustment Program*, Technical Paper No. 15, 1967 revision (Washington, D.C.: U.S. Government Printing Office, 1967)]. For two data sets, wholesale bean *(mulatinho)* prices in Fortaleza and producer prices for rice in Bahia, the seasonal patterns were unstable; hence, these data were not used for further analyses. The monthly indices for the seasonal highs and lows were then regressed on time, and appropriate tests were applied to determine if significant trends existed. For example, if the seasonal index indicated May as the normal month of high prices, then the May index for each year was regressed on time ($I_{May} = a + bT$), and the sign and significance of the trend coefficient (b) evaluated. Convergence or reduction in seasonal conditions is indicated when the sign of the trend coefficient for the high month is negative, and for the low month, positive. Increasing seasonal price variation is represented by opposite signs (positive for the high month, negative for the low month). Indeterminate cases were analyzed by taking the difference between the highs and lows and regressing the difference on time.

Figure 4: Seasonal movement of real producer prices for corn, Ceará, Brazil, 1966, 1971, and 1975



[a]Final month of harvest.

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Table 7—Postharvest changes in real producer price, selected commodities and states, Northeast Brazil

Commodity and State	Final Month of Harvest	CFP Storage Period a/	Real Price Change b/	Proportion of Price Decreases c/
		(month)	(percent)	
Seed Cotton				
Ceará	October	2	+ 1.8	5/12
Rio Grande do Norte	December	2	− 0.9	7/11
Paraíba	December	2	−12.7	8/11
Rice				
Maranhão	June	6	+15.3	2/12
Ceará	May	6	− 3.7	8/12
Bahia	October	6	+ 6.2	3/11
Corn				
Maranhão	August	6	+34.3	1/11
Ceará	July	6	+11.4	3/11
Pernambuco	September	6	+16.3	3/11
Beans				
Ceará *(macaçar)*	July	3	+29.4	1/12
Pernambuco *(mulatinho)*	October	4	+ 9.3	3/10
Bahia	April	4	+ 2.3	7/12
Bahia	October	4	− 7.1	5/11

a/ Maximum period for EGF loans, average producers.

b/ Percentage change in average real monthly price from final month of harvest to end of the assumed storage period. For example, the average price of rice in Maranhão increased 15.3 percent from June to December (six months after harvest). Average monthly real prices based on 12 years of data in all but one case, Pernambuco beans [Brasil, Ministério da Agricultura, Comissão de Financiamento de Produçao. *Anuário Estatístico – 1977*]: (Brasilia, 1977); and Comissão de Financiamento da Produção, *Anuário Estatístico–1978* (Brasilia 1978)].

c/ Proportion of years in which the real price at the end of the assumed storage period was less than the real price in the last month of harvest.

gram. At the producer level, most of the results indicated increases in the spread between seasonal highs and lows (Table 8). The principal exception was for beans, a commodity with historically little participation in the program in the Northeast. The convergence of the highs and lows for rice in Ceará is likewise of minor importance because of insignificant participation within the state. The case of corn in Ceará is the sole example of convergence where participation in the program may have had a positive effect. Thus, at the producer level, instability is high and there is little evidence that the minimum price program has reduced seasonal price variations in Northeast Brazil. Although trend analysis of seasonal prices does not measure the structural relationships represented by the time series data, the implications of the results in this case are fairly clear. However, as in all analyses of this type, it is not possible to measure what the seasonal price variations would have been in the absence of the program.

At the wholesale level, the results proved more consistently that the spread between seasonal highs and lows was reduced (Table 29, Appendix 2). This occurred in four out of the five cases tested. The difficulty in interpreting these results is that several programs were implemented during the period that could have contributed to dampening the seasonal patterns. At least four marketing related programs were in effect: modification of the wholesale marketing system in the major Northeastern cities, major road construction and improvement, improvement of the market news system, and expansion of storage facilities. Consequently, the results do not provide unequivocal proof that the minimum price program reduced seasonal price variations at the wholesale level. A further difficulty arises because wholesale price series do not exist for cotton lint in Northeast locations; thus, seasonal prices of the major recipient of loans under the program could not be analyzed.

Changes in marketing margins also indicate changing efficiency in the marketing system. It is generally expected that the minimum price program and the structural improvements mentioned above would lead to a reduction in marketing margins. However, this expectation may not be realized if the demand for marketing services increased because new services were desired, habits changed, etc.

Producer-wholesale-marketing margins were examined for three commodities (rice, corn, and beans) in five markets. The real margin, calculated as the difference between real wholesale and producer prices at harvest time, was regressed on time (n = 12). In three of the five markets, no significant trend in the margin could be established (Table 9). For corn in Pernambuco and beans *(mulatinho)* in Ceará, there was a significant increase in the real producer-wholesale-margin between 1966 and 1977. In all cases, the variability of the margin, as measured by the coefficient of variation, was large. The general conclusion, however, is that in spite of the efforts to increase the efficiency of the marketing system, producer-wholesale-margins have not declined in the Northeast markets examined in this study.[64] This is contrary to what Smith found when studying mar-

[64] Trends in the margin as a percentage of the producer price were also estimated. Except for rice in the São Luís market, there were no significant trends in this variable (Table 30, Appendix 2). The trend coefficient for the São Luís equation was negative and significant, indicating that as a percentage of the producer price, the margin declined during the 1966 to 1977 period. This result, when combined with the results in Table 9, suggests that in the São Luís rice market a constant margin was added to an increasing producer price.

Table 8—Trends in indices of seasonal producer prices for selected commodities, Northeast Brazil, 1966 to 1977

Commodity and State	Seasonal High (H) Low (L) a/		Linear Trend Coefficient	Significance of Trend Coefficient b/		Correlation Coefficient c/
Seed Cotton						
Ceará	December	(H)	+0.97	Yes	D	0.99
	July	(L)	−0.04	No		0.11
Rio Grande de Norte	December	(H)	+1.17	Yes	D	0.98
	May	(L)	−0.29	Yes		0.80
Pernambuco	December	(H)	+2.01	Yes	D d/	0.97
	July	(L)	+0.25	Yes		0.67
Rice						
Maranhão	December	(H)	+1.05	Yes	D	0.99
	July	(L)	−0.51	Yes		0.73
Ceará	April	(H)	−0.50	Yes	C	0.86
	August	(L)	+0.48	Yes		0.95
Corn						
Maranhão	March	(H)	+0.44	Yes	D	0.69
	September	(L)	−1.63	Yes		0.96
Ceará	May	(H)	−0.91	Yes	C d/	0.99
	July	(L)	−0.40	Yes		0.93
Pernambuco	April	(H)	+0.85	Yes	D	0.84
	September	(L)	−0.58	Yes		0.80
Beans						
Ceará *(macaçar)*	November	(H)	+0.20	No	N	0.38
	July	(L)	−0.11	No		0.33
Pernambuco *(mulatinho)*	May	(H)	−0.63	Yes	C	0.66
	October	(L)	+0.76	Yes		0.95
Bahia	June	(H)	−0.23	Yes	C	0.95
	October	(L)	+0.96	Yes		0.94

a/ Based on a seasonal index derived from 12 years of monthly data (11 in the case of Pernambuco beans).

b/ Based on a 5 percent level, two-tailed t-test of the linear trend coefficient. D represents divergent or increasing seasonal price variation. C represents divergent or decreasing seasonal price variation. N represents no significant change in seasonal price spread.

c/ Sign omitted.

d/ Based on the trend in the difference between the seasonal high and low.

Table 9—Trends and variability in the real producer-wholesale marketing margin for selected commodities and markets, Northeast Brazil, 1966-77

Commodity and Market a/	Intercept Value b/	Trend Coefficient b/	Adjusted R^2	Coefficient of Variation c/
				(percent)
Rice				
São Luís	11.074	0.041	0.003	25.6
		(0.254)		
Recife	15.667	0.340	0.111	20.6
		(0.304)		
Corn				
Fortaleza	1.071	0.113	0.117	65.8
		(0.098)		
Recife	1.167	0.150*	0.393	40.2
		(0.059)		
Beans *(mulatinho)*				
Fortaleza	1.023	2.554*	0.489	74.7
		(0.825)		

a/ Value of the real margin based on the following prices:

Rice – São Luís wholesale price *(agulha)* and Maranhão producer price, May-June avg.
– Recife wholesale price *(agulha)*, July-September avg. and Maranhão producer price, May-June avg.
Corn – Fortaleza wholesale price and Ceará producer price, June-August avg.
– Recife wholesale price *(amarelo comun)* and Pernambuco producer price, August-October avg.
Beans – Fortaleza wholesale price *(Mulatinho)* and Ceara producer price *(mulatinho)*, June-August avg.

b/ Coefficients from a linear trend equation with the real margin a function of time ($RM_t = a + bT$). Figures in parentheses are the standard errors of the net regression coefficients. The asterisk (*) indicates that the coefficient is significantly different from zero at the 5 percent level (two-tailed t-test).

c/ Coefficient of variation of the real margin.

keting margins for an earlier period in the Center-South.[65] He concluded that: "Most of the bottlenecks have been eliminated in the Center-South of Brazil, largely through investment in roads and storage and private expansion of marketing facilities in response to high profits. This has been accompanied by a downward trend in marketing margins through wholesale in much of the region."[66] The opposite nature of the results for the Northeast, based on the cursory examination of five markets, suggests that more detailed analysis of marketing margins and the factors influencing them would be valuable.

Program's Effect on Output

The response of supply to prices, particularly guaranteed minimum prices, should be of primary importance when the program objective of expanding output is considered. The minimum price program, by fixing the prices of individual commodities below expected market prices, influences aggregate agricultural output only to the extent that price risks are reduced and new resources are attracted to the agricultural sector. No attempt was made to directly measure this phenomenon. The more likely effect of the program will be substitution among crops in response to changes in relative product prices. Most of the previous studies of Brazil's minimum price program have concentrated on the response of individual commodities to changes in minimum or market prices.

Although Oliveira's 1974 study was primarily theoretical, he included an empirical test of the hypothesis that minimum prices reduced risk and therefore increased individual crop output. Data for five commodities (peanuts, rice, cotton, corn, and beans) produced in the state of São Paulo were used to test the hypothesis. In general, the results were inconclusive and Oliveira left the empirical investigation of minimum prices and risk reduction open for further study.

Smith developed several models to study the influence of lagged market prices and preannounced minimum prices on the area planted and on output of rice, corn, peanuts, cotton, and beans.[67] Only in the case of peanuts did he find strong indications that preannounced minimum prices replaced market prices as the main determinant of changes in area planted or supply.[68] He was unable to obtain satisfactory response functions for cotton and corn, and concluded that preannounced minimum prices had little or no effect on the supply of rice and beans. Smith's study was based on data from the states of São Paulo and Rio Grande do Sul and the Center-South region as a whole. The Northeast region was not studied. However, Smith concluded that in the cases of rice, corn, and beans, the lack of response to minimum prices in São Paulo, Brazil's commercial agricultural state, must hold *a fortiori* for other areas.[69]

A study conducted by the Agricultural

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[65] Smith, "Brazilian Policy, 1950-67," pp. 222-224.

[66] Ibid., p. 223.

[67] Ibid.

[68] Ibid., p. 254.

[69] Ibid., p. 260.

Planning Commission of the state of Minas Gerais investigated the impact of minimum prices on the cultivated area of five crops grown in the state: cotton, rice, peanuts, beans, and corn.[70] Models similar to those used by Smith and Oliveira were applied to state-level data for 1963 to 1975. The results were similar to those obtained by Smith. Only in the case of peanuts did the coefficient of the minimum price variable (ratio of minimum price to the lagged market price) prove statistically significant and possess the expected sign. For the other commodities the study concluded that minimum prices had not influenced the aggregate planted areas. It suggested that minimum prices would have to be set higher than market prices if the government expected the program to significantly affect the area planted and consequently the level of output.

Duran studied the effect of minimum prices on the harvested area of rice, corn, and soybeans.[71] His study also concentrated on the Center-South region, but treated a more recent period than Smith, 1968 to 1976. Although his lagged minimum price model showed a significant response for all three commodities, he made no comparison with their response to lagged market prices or to a combination of lagged market prices and minimum prices (e.g., the ratio of market to minimum prices). Furthermore, some of the statistical results were only marginally acceptable (i.e., insignificant coefficients, wrong signs, or low R^2). Nevertheless, Duran presented the strongest evidence to date concerning the positive relationship between minimum prices and output response in Brazilian agriculture.

In the Northeast, research on area and output response has dealt almost exclusively with market prices, giving very little attention to the role of minimum prices. For this study, the results of both time series and cross section studies were reviewed. Without going into detail, the time series studies were overwhelming in their lack of consistent empirical evidence demonstrating farmer responses to market prices in Northeast Brazil. In one recent study, 84 Nerlove-type equations were fitted for 12 products in the Northeast.[72] Of 156 price coefficients obtained, only 6 were significantly different from zero, and 3 of these had negative signs. Pastore's earlier study yielded similar, mixed results.[73] Sampaio and Barbosa got results that followed the same pattern.[74] Poor data, inability to measure certain variables (e.g., weather), and the traditional behavior of the Northeast peasant were all offered as reasons for the failure to demonstrate the expected

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[70] Comissão Estadual de Planejamento Agrícola de Minas Gerais, "Preços Mínimos e a Oferta Agrícola em Minas Gerais," Belo Horizonte, Julho 1976.

[71] Duran, "Brazilian Policies in Agriculture."

[72] M. Osório de Lima Viana, "Efeitos do Mercado Sobre a Agricultura Regional," Banco do Nordeste do Brasil, ETENE, ca. 1977.

[73] Affonso Celso Pastore, *A Resposta da Produção Agrícola aos Preços no Brasil* (São Paulo: APEC, 1973).

[74] Yony de Sa Barretto Sampaio, "An Analysis of the Market for Dry Edible Beans in Northeast Brazil" (Ph.D. dissertation, University of California at Davis, 1974); Antonio Rodrigues Barbosa, "Relações Estruturais da Oferta de Produtos Alimentares na Agricultura do Rio Grande do Norte," monografia apresentado ao Departamento de Economia de Centro de Ciencias Socais Aplicadas da Universidade Federal do Rio Grande do Norte ao Concurso Professor Assistente, Natal, 1977.

price behavior. Interestingly, studies for the same commodities in the south of Brazil, using similar models, have more consistently confirmed the expected response to price changes.[75] Since most of the studies on the Northeast attempted to explain changes in area rather than in output or marketed surplus, important aspects of producer decisions in response to price changes were omitted. Another recent study contains estimates, derived indirectly, of the elasticity of marketed surplus for beans and corn in one Northeast state.[76] Rather high average values were obtained: 1.04 for corn and 0.43 for beans.

Cross section studies, primarily using programming techniques, have shown measurable responses to postulated changes in individual commodity prices. A World Bank study of the agricultural sector of the Northeast simulated the impact of changing the minimum price of corn.[77] Increasing the minimum price by 37 percent caused the output of corn to more than triple and increased the production of beans by 25 percent. In compensation, cattle production declined. Further use of the World Bank model might provide valuable insights into the potential effects of the minimum price program.

No previous time series studies of supply response for Northeastern commodities included minimum prices as explanatory variables. Preliminary and "unsuccessful" attempts were made during the course of this study to include minimum prices in a supply response model for rice. The inability to obtain reliable estimates of supply response restricts analyses that could be conducted on other aspects of the minimum price program, such as certain distributional implications, subsidy aspects, and cost effectiveness questions.

Aside from statistical problems, there are other reasons why it is difficult to measure area or output response to minimum prices in the Northeast. Before 1967, minimum prices for most commodities in the Northeast were generally announced during or after the planting season (Table 22, Appendix 1). Since 1967, they have usually been announced in December, one to two months before the first plantings. However, this still may not be early enough to influence producer decisions. Delays are bound to occur between the date that the prices are published in the official diary and the time they are known, even by the more well-informed farmers. Also, the labor intensive land clearing and preparation techniques used in the predominantly slash and burn agriculture of the Northeast suggest that cropping decisions may occur a month or two before the actual planting period. Much of the clearing and burning occurs in December, the normal end of the dry season. These considerations suggest that announcing minimum prices for the Northeast in November or earlier might result in more producers becoming aware of and using the

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[75] See Robert L. Thompson, "Agricultural Price Policy as a Factor in Economic Development," in *Proceedings of the Seminar on Agricultural Policy: A Limiting Factor in the Development Process*, March 17-21, 1975 (Washington, D.C.: Inter-American Development Bank, 1975), pp. 71-85.

[76] Carlos Alberto de Sousa Rosado, "Estruturas de Excedentes Comercializáveis de Feijão e Milho no Rio Grande do Norte" (M.S. thesis, Universidade Federal do Viçosa, 1977).

[77] Antonio Giles, "Análise Preliminar de Algumas Simulações do Modelo de Comportamento da Agricultura Nordeste," trabalho apresentado ao Seminário sobre a Economia Agrícola do Nordeste, Superintendencia do Desenvolvimento do Nordeste, Unidade Regional de Supervisão Nordeste, Recife, September 28-30, 1977.

prices in their planting decisions. The difficulty with releasing the minimum prices earlier is that the forecast period must be extended since the announced prices are supposed to represent guaranteed minimum prices at harvest time. For some of the longer season crops, such as cotton, the harvests in some Northeastern states may not be completed until November or December. Given the erratic behavior of market prices and inflation, forecasting prices for 12 to 15 months in advance of harvest is extremely difficult.

If the objective of the program is solely to stabilize income, then Mellor's argument that minimum prices should be set only after fairly good information on output is available might be valid.[78] Under this approach minimum prices would be high during years of small harvests and low during years of large harvests. However, when output responds to lagged prices, such a pricing policy would tend to reinforce cobweb-type price and output patterns and contribute to price instability. Also, with inelastic demand it would be difficult to control fluctuations in income unless the minimum price was actually a procurement price enforceable on all sales. Otherwise in years of short crops the market price would be considerably above the minimum required to stabilize income, and the resultant income would be greater than in years of large crops. Without price ceilings, only the fluctuations on the low end of the income distribution would be reduced, and this can be accomplished without abrupt year-to-year changes in the minimum price. Consequently, in Brazil, which relies to some extent on free markets, the policy of fixing minimum prices below but near long-run market prices appears valid, particularly if it results in reducing risk and consequently increasing aggregate supply.[79] However, there is no evidence that this has occurred in the Northeast. With producer prices, except for rice in one state, 20 to 30 percent above minimum prices and participation concentrated among a few large producers and wholesalers, the program does not appear to have been effective in stimulating output.

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[78] John W. Mellor, "Agricultural Price Policy in the Context of Economic Development," *American Journal of Agricultural Economics* 51 (December 1969): 1413-1420.

[79] The actual effects on output, market equilibrium, and social welfare will depend on the way in which farmers form their price and yield expectations. See P.B.R. Hazell and P.L. Scandizzo, "Farmers' Expectations, Risk Aversion, and Market Equilibrium Under Risk," *American Journal of Agricultural Economics* 59 (February 1977): 204-209 for a theoretical and empirical discussion of these issues.

6

FACTORS INFLUENCING PROGRAM PARTICIPATION

As indicated in Chapter 4, participation in the storage loan program has been concentrated among a few users. It was shown that the number of contracts involving producers was quite small relative to the potential. It is believed that the lack of widespread participation in the program is one reason why it has had difficulty in attaining its objectives. Some of the factors influencing program participation are investigated in this chapter. The economic incentives (positive and negative) for producers and wholesalers to utilize the storage loan program are treated in the first part of the chapter. This is followed by an attempt to measure empirically, by commodity, the factors that influence the aggregate (state or regional) demand for storage loans. Encouraging results were obtained for rice. Since the question of subsidized credit for agriculture is currently being debated in Brazil, this chapter contains estimates of the interest subsidy for cotton and rice storage loans in the Northeast and the impact on storage of an increase in the interest charge.

Storage Incentives

The past and potential uses and impacts of the loan program (EGF) depend in part on the economic incentives for storing the commodities receiving guaranteed minimum prices. Some general aspects of storage incentives under the program were studied, and the results of the storage of selected commodities by producers and wholesalers were estimated using historical data. In general, the private returns to storage appear high; however, the negative returns common in some markets and price risks may preclude participation by more risk-averse individuals.

Users of the minimum price storage program (EGF) receive a loan from the Bank of Brazil equal to the quantity of the product stored times the minimum price level for that geoeconomic zone (80 percent of the minimum price when the commodity is stored on the owner's property and is accepted without the option to sell to the government) after classification, certification, and approval of their application. The stored commodity is the only collateral required for the loan. The owner of the commodity must pay a storage receiving fee, storage costs, periodic charges for fumigation, and an interest charge of 18 percent per year on the value of the loan (15 percent prior to 1977). The commodity must be stored for at least one month. Except in the case of large loans for certain commodities, the storage fees and interest charges are not paid until the owner removes the commodity from storage. If ownership of the commodity passes to the government because market prices are low relative to the minimum price, then the original owner is not required to pay the interest and storage costs.

An analysis of the outcome of using the program (EGF) to store a commodity requires consideration of storage costs, losses

during storage, interest rate and inflation differentials, and minimum and expected market prices. The study of returns to storage was based on a partial budgeting approach that compared the gross and net returns from storage to the returns from selling the commodity at harvest time. Gross returns in month i were defined by the relationship:

$$GR_i = CMP_i + OR_i - FI_i - SC_i - IC_i \ ,$$

where

GR = gross return, e.g. Cr$/60 kg sack,
CMP = current market price,
OR = accumulated opportunity return on the value of the minimum price loan,
FI = accumulated forgone income on the positive difference between the market price at harvest time (CMP_1) and the minimum price (MP),
SC = accumulated storage costs including receiving fee, fumigation charges, and insurance, and
IC = accumulated interest charge on the minimum price loan.

Net returns (NR) from storage in month i were defined as the difference between gross returns in month i and the market price at harvest time (CMP_1) or the minimum price, whichever was greater. Thus, $NRi = GRi - CMP_1$ (or MP if $MP > CMP_1$). The net returns estimates indicate the added return or added cost for each month of storage. Storage is profitable only if the net return is positive. A negative net return indicates that the owner of the commodity would have been better off selling in the open market at harvest time or to the government at the minimum price, than storing the commodity. The analysis is "partial" because the costs of producing (acquiring) the commodity are omitted.[80]

An understanding of the interplay among the various factors that determine gross and net returns is important. The minimum price (MP), storage costs (SC), and the interest on the EGF loan (IC) are the only items known in advance.[81] The market price (CMP) is known at the time the decision to store is made, but its value during the storage period is uncertain. Foregone income (FI) is considered only when the market price at the time the commodity is put in storage is greater than the minimum price. Since the

[80] For producers, the omitted costs are the costs of production, the cost of processing on the farm, and transfer costs. For wholesalers, the acquisition costs include the purchase price plus processing and transfer costs. It is assumed that these costs are not affected by storage and consequently a partial budgeting approach can be used.

The major limitation of the approach used in this section is that it assumes that monthly demand is perfectly elastic at the current market price. Consequently, it is not possible to realistically estimate what would happen to net returns from storage if producers or wholesalers choose to store a larger or smaller proportion of the crop.

[81] The minimum prices referred to in this section are the "basic" state-level prices defined in Tables 5 and 24, Appendix 2. Storage costs were studied using data on actual storage charges for 1975, 1976, and 1977. It was found that the total costs of receiving, dusting, fumigating, insuring, and storing each commodity were a fairly constant proportion of the minimum price during the three year period. Consequently, storage costs (SC) were estimated as a fixed percentage of the "basic" minimum price for each commodity:

Rice	1 percent per month
Corn	1.5 percent per month
Beans *(mucaçar)*	1 percent per month
Beans *(mulatinho)*	0.5 percent per month
Cotton lint	0.1 percent per month.

minimum price for most commodities is fixed at the producer level, FI is expected to be greater when considering wholesalers than producers. The increase in FI during the storage period will depend on the opportunity rate of return on short-term investments. This is the same rate used to determine the opportunity return (OR) on the value of the loan. It can be estimated in an *ex post* sense as equal to the monetary correction (correção monetária) for time deposits plus the 6 percent fixed interest rate. With a nominal interest rate on EGF loans of 18 percent and a conservative estimate of OR at 40 percent for 1977, the interest subsidy, even for a short-term loan, can be substantial.

The 1975 rice season in the state of Maranhão is used in Table 10 to demonstrate the above concepts and method. In this example the producer market price was less than the minimum price at the end of the harvest season. Assuming that producers stored rice under the minimum price program, the results for the six months following the harvest are given. Assuming no physical losses and perfect knowledge of future prices and monetary correction, net return would have been highest in the fourth month (October). The rate of return, based on the Cr$65.00 initial value, was 4.31 percent per month. Net returns during the first two months (July and August) of the storage period were negative, indicating that producers would not have sold their rice on the open market.[82] During the last four months, producers were better off than if they sold their rice to the government at the minimum price (AGF mode). The opportunity return (OR) on the loan, under 1975 conditions, was greater than the combined storage and interest costs (SC + IC). Consequently, storage was essentially free for producers and the risk of further price declines was eliminated by the relatively high minimum price level.

To determine the longer run average returns to storage, harvest and post-harvest market prices were estimated on the basis of average ratios of market price to minimum price (Tables 5 and 26, Appendix 2) and the seasonal price indices discussed in the second part of Chapter 5.[83] The current market prices (CMP) in Table 11 were estimated using the procedure and represent long run seasonal prices that were evaluated under

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[82] Since the rules require that commodities remain in storage for at least one month, the option to sell to the government could not be exercised until August.

[83] Expected market prices at harvest time in year t, $\hat{P}_{ht}$, were derived from the equation $\hat{P}_{ht} = MP_t \times \bar{PR}$, where MP_t is the minimum price in year t, and $\bar{PR}$ is the average ratio of market to minimum prices, 1967-77. Expected monthly postharvest prices in year t, $\hat{P}h+1\ t, \ldots, \hat{P}h+6\ t$ were estimated by maintaining a constant relationship to the harvest period:

$$\frac{MP_t}{\bar{I}_h} = \frac{\hat{P}_{h+1\ t}}{I_{h+1}} = \ldots = \frac{\hat{P}_{h+6\ t}}{I_{h+6}}$$

where, MP_t is the minimum price in year t, $\bar{I}_h$ is the three month average of the market price index at harvest time, and $I_{h+1}, \ldots, I_{h+6}$ is the seasonal price index for six months after the harvest.

Table 10—Producer returns to storage under the minimum price program for rice, Maranhão, 1975

Item	Average June – July	July	August	September	October	November	December
				(Cr$/50 kg)			
Minimum price 1975 (MP)	65.00	...	...	...	...	...	...
Current market price (CMP)	61.00	61.50	63.50	68.92	76.33	75.67	75.00
Opportunity return (OR) a/	0.00	1.56	3.16	4.79	6.47	8.18	9.94
Forgone income (FI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Storage costs (SC) b/	0.00	0.65	1.30	1.95	2.60	3.25	3.90
Interest charges (IC) c/	0.00	0.81	1.62	2.44	3.25	4.06	4.88
Gross return (GR) d/	65.00	61.60	63.74	69.32	76.95	76.54	76.16
Net return (NR) e/	...	–3.40	–1.26	4.32	11.95	11.54	11.16
		(–5.23)	(–0.97)	(2.17)	(4.31)	(3.32)	(2.68)

a/ 2.40 percent of MP per month based on third and fourth quarter monetary correction for 1975 of 1.90 percent per month plus 0.50 percent monthly interest on time deposits (compounded).

b/ 1.0 percent of MP per month (accumulated).

c/ 1.25 percent of MP per month (accumulated).

d/ GR = CMP + OR – FI – SC – IC. Since the market price at harvest (avg. June-July) is less than the minimum price, the gross return of Cr$65.00 is based on direct sale to the government (AGF).

e/ Net return from storage compared to outcome of sale at harvest time. For example, NR in July is Cr$61.60 – Cr$65.00 = –Cr$3.40. Percentage rates of return per month, based on the Cr$65.00 initial value, are given in parentheses.

Table 11—Expected producer returns to storage under the minimum price program for rice, Maranhao, 1977

Item	Average May–June	July	August	September	October	November	December
				(Cr$/50 kg)			
Minimum price 1977 (MP)	100.00	...	...	...	...	...	...
Current market price (CMP) a/	97.00	92.85	93.70	99.31	104.85	107.53	110.64
Opportunity return (OR) b/	0.00	3.09	6.28	9.56	12.94	16.43	20.03
Forgone income (FI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Storage costs (SC) c/	0.00	1.00	2.00	3.00	4.00	5.00	6.00
Interest charges (IC) d/	0.00	1.50	3.00	4.50	6.00	7.50	9.00
Gross return (GR) e/	100.00	93.44	94.98	101.37	107.79	111.46	115.67
Net return (NR) f/	...	−6.56	−5.02	1.37	7.79	11.46	15.67
		(−6.56)	(−2.54)	(0.45)	(1.89)	(2.19)	(2.46)

a/ Average based on price ratio from Table 5; July-December estimated using seasonal index.

b/ 3.09 percent of MP per month based on third and fourth quarter monetary correction for 1977 of 2.59 percent plus 0.50 percent monthly interest on time deposits (compounded).

c/ 1.0 percent of MP per month (accumulated).

d/ 1.5 percent of MP per month (accumulated).

e/ GR = CMP + OR − FI − SC − IC. Since the market price at harvest (avg. May-July) is less than the minimum price, the gross return of Cr$100.00 is based on direct sale to the government (AGF).

f/ Net return from storage compared to outcome of sale at harvest time. For example, NR in July is Cr$93.44 − Cr$100.00 = −Cr$6.56. Percentage rates of return per month, based on the Cr$100.00 initial value, are given in parentheses.

1977 conditions.[84] The pattern that developed was similar to that observed for 1975 (Table 10). Net returns were negative in the first two months and positive thereafter. Highest returns occurred in the sixth month. These average conditions indicate fairly strong economic incentives for rice producers in Maranhão to use the minimum price loan program. Failure to use the program must be traced to specific circumstances. For example, producers who normally harvest their rice crop in June when the seasonal price index is 98.33 would have less incentive to store than producers who harvest in July when the index is 90.37. Other factors such as quality and volume of the crop, access to storage, proximity to an agency of the Bank of Brazil, and attitudes about indebtedness and risk will influence an individual's decision to store. Some of these factors (e.g., remoteness of the Bank of Brazil) may lead to high transaction costs that partially or completely offset the OR component.

The results of applying the same technique to represent the longer-run average conditions in the Recife wholesale rice market were revealing. These results indicate that, compared with open market sales during the July – September harvest period, returns to storage under the minimum price program in the subsequent six months were negative (Table 12). Two factors were responsible. First, the increase in the seasonal price index was modest, increasing from 96.81 at harvest time to 103.73 in February.[85] Second, the large average ratio of wholesale to minimum prices (3.59, see Table 26, Appendix 2) meant that the foregone income (FI) from not selling at harvest time was quite large. These results, indicating no incentives to store rice under average conditions, were substantiated by the data on EGF operations in Pernambuco, the state where Recife is located. In four of the ten years between 1968 and 1977 there were no EGF contracts for rice in Pernambuco. Moreover, at no time did the volume of rice stored under the program in Pernambuco exceed 1 percent of the storage in the Northeast. This occurred even though Recife is the largest urban area in the region. At the same time, rice storage in Maranhão, where the incentives were clearly positive, ranged from 73 to 94 percent of total Northeast operations.[86]

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[84] In this case, the 1977 minimum price for rice in the Northeast was Cr$100, and the 11-year average ratio of producer to minimum prices at harvest time for rice in Maranhão was 0.97 (Table 5). Thus, the "expected" 1977 harvest price was Cr$97 (Cr$100 x 0.97 = Cr$97). The producer price index for rice in Maranhão averaged 94.41 at harvest time (93.93, 98.93, and 90.37 respectively for May, June, and July). Postharvest "expected" prices for July through December were derived from the expression

$$\frac{97.00}{94.41} = \frac{\text{July}}{90.37} = \frac{\text{August}}{91.20} = \frac{\text{September, etc.,}}{96.66}$$

where the denominators are the respective monthly indices. The 1977 price is not a true expected price since the average price ratio in Table 5 includes the actual 1977 ratio. The same qualification holds for the postharvest prices derived from the seasonal indices.

[85] For the period under consideration the index was:

July	98.70	October	95.70	January	102.06
August	95.56	November	99.21	February	103.73
September	96.17	December	99.09	March	101.77

$\bar{X}_3 = 96.81$

[86] Brasil, Comissão de Financiamento da Produção, *Anuário Estatístico–1977 and 1978.*

Table 12—Expected wholesaler returns to storage under the minimum price program for rice, Recife, 1977

Item	Average July – September	October	November	December	January	February	March
				(Cr$/50 kg)			
Minimum price 1977 (MP)	100.00	...	...	...	...	...	...
Current market price (CMP) a/	359.00	354.88	367.90	367.45	378.47	384.66	377.39
Opportunity return (OR) b/	0.00	3.09	6.28	9.56	12.94	16.43	20.03
Forgone income (FI) c/	0.00	8.00	16.25	24.76	33.53	42.57	51.88
Storage costs (SC) d/	0.00	1.00	2.00	3.00	4.00	5.00	6.00
Interest charges (IC) e/	0.00	1.50	3.00	4.50	6.00	7.50	9.00
Gross return (GR) f/	359.00	347.47	352.93	344.75	347.88	346.02	330.54
Net return (NR) g/	...	−11.53	−6.07	−14.25	−11.12	−12.98	−28.46
		(−3.21)	(−0.85)	(−1.34)	(−0.78)	(−0.73)	(−1.37)

a/ Average based on price ratio from Table 26, Appendix 2; October-March estimated using seasonal index.

b/ 3.09 percent of MP per month based on third and fourth quarter monetary correction for 1977 of 2.59 percent plus 0.50 percent monthly interest on time deposits (compounded).

c/ 3.09 percent of average July-September CMP minus MP or Cr$259.00 (compounded).

d/ 1.0 percent of MP per month (accumulated).

e/ 1.5 percent of MP per month (accumulated).

f/ GR = CMP + OR − FI − SC − IC.

g/ Net return from storage compared to outcome of sale at harvest time. For example, NR in October is Cr$347.47 − Cr$359.00 = −Cr$11.53. Percentage rates of return per month, based on the Cr$359.00 initial value, are given in parentheses.

The same general procedure was applied to the data on corn and beans *(macaçar)* in the Ceará and Fortaleza markets (Tables 31 to 35, Appendix 2). The results indicate positive returns to storage, particularly in the case of beans where the "best" producer and wholesaler returns, based on values at harvest time, were 5 to 6 percent per month. The fact that virtually no beans were stored under the program, in spite of this apparent high return, suggests the need for further investigation of the factors limiting participation. Price risks do not appear to be a problem as real producer prices for *macaçar* during the postharvest period declined only once in Ceará from 1966 through 1977 (Table 7). Real wholesale prices for *macaçar* in the Fortaleza market during the July to October period rose in each of the nine years from 1969 through 1977 (Table 28, Appendix 2).

Further analyses of the returns from storage could be conducted. Alternative storage behavior can be postulated (e.g., basing price expectations on the previous three years' prices) and the outcomes compared with actual conditions. Producers who normally harvest their crop early can be compared with those who harvest it late. The information in this section suggests that more complete modeling efforts can be attempted. Nevertheless, the results already obtained indicate the major incentives and disincentives for using the program in various Northeast markets. In the case of rice particularly, participation in the program has been consistent with the incentives observed.

Demand for Minimum Price Loans (EGF)

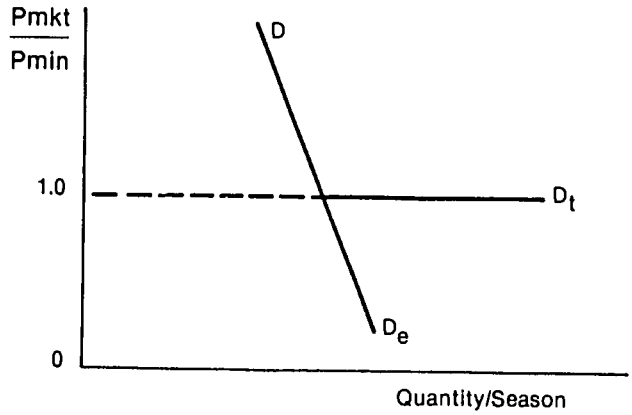
The preceding descriptive information and analyses suggest that the volume of EGF loans is sensitive to changes in market conditions, given the announced level of minimum prices. A more precise understanding of this relationship would be useful to program administrators and would provide structural coefficients for further research having to do with such items as minimum price levels and interest rates on EGF loans. Consequently, an attempt was made to specify and estimate the demand for minimum price loans.

The demand for EGF loans for a given commodity is depicted theoretically in Figure 5. When the loan program functions ideally (i.e., with no administrative delays, perfect access by users, no storage limitations, complete knowledge, etc.), the ratio of market to minimum prices will not fall below 1.0. Given a perfectly elastic supply of loan funds, as implied by the minimum price law, the theoretical ("ideal") demand function would be $D\ D_t$. For price ratios above 1.0, the function would be negatively sloped, reflecting different expectations of future prices, the increase in foregone income, and risk preferences. At a price ratio of 1.0, the theoretical demand is horizontal. Since the conditions for a particular commodity and region do not (and probably never will) meet the theoretical conditions, actual market prices do, on occasion, fall below the minimum price level. Thus, the empirical demand for EGF loans would appear as $D\ D_e$.[87]

Shifts in the demand for loans can result from changes in the availability and cost of storage, awareness of the program, inflation rates, knowledge about postharvest market prices, and final demand, including the determination of marketable surpluses. Not much specific information exists on these. However, a single-equation model that

[87] The absolute slope of the function may be smaller for price ratios less than 1.0 than for ratios greater than 1.0—a type of kinked demand.

Figure 5: Hypothetical demand for minimum price loans (EGF)



contained market and minimum prices, the quantity of production, and the inflation rate as independent variables was specified and tested.[88] Its general form was,

$$D_i = f\left(\frac{Pmkt_i}{Pmin_i}, I_t, Q_i\right),$$

where

D_i = the quantity of commodity i, in metric tons, stored with EGF loans,

$\frac{Pmkt_i}{Pmin_i}$ = the ratio of market to minimum prices at harvest time for commodity i.

I_t = inflation rate in period t. Two periods were specified: I_p based on the January – June rate to reflect past inflation and I_e based on July – December to reflect expected inflation, and

Q_i = metric tons of commodity i produced.

The price ratio variable was the same one developed in Chapter 4 (see Tables 5 and 26, Appendix 2). As indicated by the hypothetical demand curve in Figure 5, the sign this variable was expected to be negative. The impact of inflation on the returns to storage was demonstrated in the previous section. With higher rates of inflation and the associated monetary correction, the opportunity return on the value of the loan and the returns from storage increase. Hence, a positive sign was expected for the inflation variable. The use of past inflation (I_p) assumes that expectations are based on recent experience, in this case the inflation rates prior to and during the harvest period. The use of actual July – December inflation (I_e) to represent expected inflation during the storage period assumes perfect foresight

[88] Some of the variables may be determined simultaneously. Minimum prices are designed to influence planting decisions and hence output. However, as was shown in the section on supply response (Chapter 5) this relationship has not been verified empirically for the Northeast. Also, in recent years there has been some concern that subsidized agricultural credit, including the volume of minimum price loans, has contributed to the high rate of inflation. However, the impact of the level of loans on inflation is considered minimal for one commodity in one region. For these reasons, the single equation model is considered appropriate as a first approximation of the demand for loans.

on the part of storers.[89] Quantity of production (Q_i) was selected as a variable to reflect the pressure for short-term storage during the postharvest marketing season. The larger the crop, the greater the demand for storage.

The model was used to estimate the EGF demand relationships for cotton, corn, and rice. Linear equations were fitted with data for selected states and the Northeast as a whole. The lack of EGF data prior to 1968 limited the number of observations for each variable to 10 (1968 through 1977). In spite of the limited degrees of freedom, the model performed quite well for rice (Table 13). The signs of the variables were as expected and most of the net regression coefficients were different from zero at the 10 percent or better level of significance. The equations with expected inflation (I_e) performed better than those containing past inflation (I_p). In the equations for Maranhão (2) and the Northeast (4), an increase (decrease) of 1 percent in the July – December rate of inflation was associated with more than a 5,500 metric ton increase (decrease) in the quantity of rice stored under the program. Likewise, the responses to changes in production were similar in the two equations: 71 kilograms per metric ton change in Maranhão's production and 83 kilograms for the Northeast equation. The coefficients of the price ratios obtained from equations (2) and (4) were used to estimate the price elasticity of demand at the mean price ratio and EGF quantity level. For Maranhão, an elasticity coefficient of -0.72 was obtained, indicating that a 10 percent increase in the price ratio (PR_1) would be associated with a 7.2 percent decrease in the quantity of rice stored in Maranhão under the program. The actual price ratio ranged from 30 percent below to 36 percent above its mean during the ten-year period used to estimate the equation. The elasticity coefficient derived from the Northeast equation (4) was the same as that for Maranhão, -0.72.[90]

The demand model did not perform as well for cotton and corn. Of two equations used to estimate the demand for loans to store cotton lint in the Northeast, only one coefficient, January – June inflation (I_p), was significant (Table 35, Appendix 2). Neither the coefficient of the price ratio nor the production variables were significant. Eight equations based on the general model were estimated for corn (Table 36, Appendix 2). Only three contained variables with significant coefficients. Two of the three equations were for the state of Pernambuco, and the quantity of corn production was significant in both of these. (Except for the inflation variable, the two equations contained the same variables.) In the equation for Ceará, expected inflation had a significant effect on the quantity of corn stored.

It is not clear why the model performed better for rice than for cotton and corn. One possibility is that the market price data were poor or inappropriate. For example, the only wholesale price series available for Northeast cotton lint is on sales in São Paulo. This series shows long periods (several months) of constant prices, suggesting that prices were fixed or that no transactions were recorded and the previous month's

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[89] The separation of the I_p and I_e periods was based on average production and storage periods in the Northeast. More specific periods could be developed for each crop and location in the Northeast. For example, in Ceará the second and third quarters would better reflect I_p for cotton, and the fourth quarter and the first quarter of the following year would reflect I_e.

[90] Estimating the price elasticity for the Northeast from equation (3) yields a coefficient of -1.51. Both price ratio coefficients are significantly different from zero at the 5 percent level.

Table 13—Estimated demand equations for minimum price loans (EGF), rice in Maranhão and Northeast Brazil

Dependent Variable (n = 10)	Constant Term	PR_1	PR_2	I_p	I_e	Q_{ma}	Q_{ne}	Adjusted R^2	Adjusted Syx
1. D_{ma}	−21,095	−40,334		1,341.2		0.116**		0.722	18,744.4
		(34,438)		(1,298.5)		(0.053)			{7.252}
2. D_{ma}	−19,979	−37,152*			5,542.8*	0.071*		0.962	6,963.4
		(11,694)			(824.4)	(0.020)			{65.041}
3. D_{ne}	22,135		−24,680*	2,251.0*			0.085*	0.890	13,707.1
			(7,019)	(807.6)			(0.027)		{21.442}
4. D_{ne}	−43,663		−11,704*		5,606.1*		0.083*	0.968	7,362.2
			(4,133)		(867.9)		(0.014)		{79.259}

Notes: Figures in parentheses are the standard errors of the net regression coefficients.
Figures in brackets are the F-statistics for the regression equation.
D_{ma}, D_{ne} = EGF loans for rice in metric tons, Maranhão and Northeast Brazil, respectively.
PR_1 = May–July avg. producer price of rice in Maranhão ÷ minimum price for Maranhao.
PR_2 = July–September avg. wholesale price of rice *(agulha)* in Recife ÷ minimum price for Pernambuco.
I_p = January–June inflation rate based on FGV, col. 2.
I_e = July–December inflation rate based on FGV, col. 2.
Q_{ma}, Q_{ne} = metric tons of rice produced in Maranhão and Northeast Brazil, respectively.
* Coefficient significantly different from zero at the 5 percent level (two-tailed t-test).
** Coefficient significantly different from zero at the 10 percent level (two-tailed t-test).

price was repeated. A wholesale lint price quoted in the Northeast for actual sales would be more appropriate.

It is also possible that the price series for Northeast cotton did not adequately reflect the influence of international markets and that inclusion of a variable to represent trade opportunities might be warranted, given that some Northeast cotton normally enters the export markets.[91] A problem may also exist with the cotton production data in that a discontinuity appears to exist between the 1973 and 1974 estimates for Ceará and the Northeast, which coincides with a major change in the methods of crop estimation. The discontinuity is not obvious in the corn data. And finally, the statistical problems of fitting an equation with only 10 observations for each variable should not be overlooked.

The demand model illustrated in Figure 5 assumes a perfectly elastic supply of loan funds which, in fact, may be subject to a number of constraints. Loan rationing probably occurs within the Bank of Brazil since the most qualified loan applicants (usually established clients) normally receive preferential treatment, and some applicants are discouraged from applying for loans. Also, certain commodities may be preferred because of the experience of Bank personnel with their markets. At the regional and national levels, overall limits on loan funds may be set and arbitrarily changed as a part of the budgetary and administrative processes. All of these factors could influence the observed demand for loan funds and would not be reflected in the independent variables of the demand model. However, the success of the model in the case of rice supports the theoretical arguments that participants in the program do react to market conditions and the rate of inflation in making their storage decisions.

Subsidy Consideration

The government subsidy to users of the minimum price program from negative real interest rates has been mentioned at several points in this report. The general issue of subsidized interest rates has received a great deal of attention in Brazil, and recently there has been considerable pressure for raising nominal interest rates, particularly for agricultural loans, because of concern over their monetary and fiscal effects. Some estimates of the relative importance of the interest subsidy on EGF loans are developed in this section.

It is possible, using the EGF demand equations from Table 13 and other information, to estimate the effect of raising the rate of interest on loans. Increasing the interest rate lowers the effective minimum price. The estimated (hypothesized) change in the minimum price can then be introduced in the demand equation to yield a *ceteris paribus* estimate of its impact on the quantity of the commodity stored under the program.

Considering that the opportunity return used to calculate the returns from storage in 1977 was 3.09 percent per month (Chapter 6) a doubling of the 1.5 percent per month loan rate was hypothesized and evaluated. In order to calculate the impact on the minimum price, it was necessary to specify an average storage period. Four months was chosen because it is midway between the one month minimum and the six month

[91] A cursory examination of this possibility was conducted by calculating the correlation coefficient between the September – November average price of Northeast cotton and the corresponding Liverpool price (converted to cruzeiros) of U.S. cotton (1966 to 1977). The two price series were highly correlated ($r = 0.957$), indicating that the use of a world market price in the analysis would not significantly improve the results.

maximum for loans for rice storage.[92] The 1977 minimum price for rice in the Northeast was Cr$100 per 50 kilograms. Thus, the added interest charges for a four month period would be Cr$6.00 per 50 kilograms (1.5 percent times 100 times 4). This lowers the effective minimum price from Cr$100 to Cr$94, and has the further effect of increasing the price ratio variable in equations (2) and (4), Table 13 (PR_1 and PR_2) For the Northeast in 1977, PR_2 would increase from 2.831 to 3.012. Predicted Northeast demand for rice storage with the actual 1977 values of the independent variables was 108,327 metric tons.[93] Increasing the price ratio to 3.012 to reflect the impact of higher interest charges lowered the predicted storage by only 2,118 metric tons. This represents about a 2.0 percent reduction in EGF storage of rice in the Northeast. The same approach was applied for the state of Maranhão using equation (2) from Table 13. The estimated storage of rice declined by 1,598 metric tons or approximately 1.8 percent.

The interest subsidy of Cr$6 per 50 kilograms or Cr$120 per metric ton was used to estimate the aggregate value of the subsidy for rice in the Northeast. For 1977, the estimate was Cr$13.5 million (Cr$120 times 112,438 metric tons, the actual EGF storage of rice in 1977). The estimated subsidy represents about 5.8 percent of the 1977 value of EGF loans for rice in the Northeast. A similar calculation was made Cr$10.9 million, also 5.8 percent of actual EGF loans.

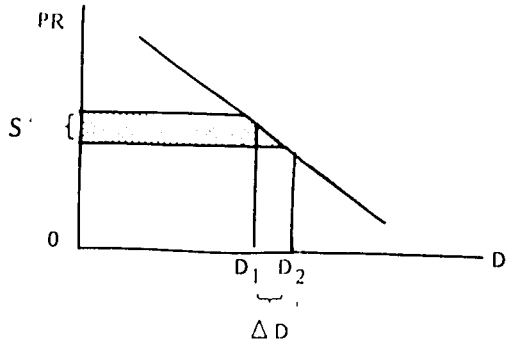
A somewhat different approach, using the concept of consumer surplus and the estimated EGF demand equations, yielded roughly similar estimates of the aggregate value of the subsidy for rice.[94] For the Northeast the estimate was Cr$12.9 million and for Maranhão it was Cr$11.5 million.[95]

The subsidy for cotton lint, the major user of the program, also was investigated. Again,

[92] Information on the average length of storage was not collected so an arbitrary period was specified. The impact of different storage periods can be investigated easily with the approach used in this section.

[93] Actual 1977 rice storage in the Northeast under the program was 112,438 metric tons.

[94] The change in quantity of rice stored (ΔD) as a result of the higher interest rate was estimated, as explained in the text, from equations (2) and (4) in Table 13. The total value of the subsidy (S) was calculated with the formula $S = (S' \times D_1) + 1/2\,(S' \times \Delta D)$, where S and ΔD are defined above and S' is the per unit value of the subsidy (Cr$120 per metric ton), and D_1 is the estimated quantity of rice stored without the subsidy. This is equivalent to measuring the change in consumer surplus (shaded area) depicted below:



[95] Northeast S = (Cr$120/metric ton x 106,209 metric tons) + ½ (Cr$120/metric ton x 2,118 metric tons).

Maranhão S = (Cr$120/metric ton x 94,711 metric tons) + ½ (Cr$120/metric ton x 1,598 metric tons).

a four month storage period and a doubling of the 1977 interest rate was assumed. On the basis of the Cr$297.00 per 15 kilograms minimum price, the interest subsidy was Cr$17.82 per 15 kilograms, or about Cr$858 million given the 1977 storage level for the Northeast (46,930 metric tons). This was 6.5 percent of the actual value of cotton lint loans in the Northeast.

The doubling of interest rates also can be considered in the context of the returns from storage estimates. Its effect can be seen, for example, in Table 11 where doubling IC would reduce the average producer return from rice storage and change the September return from positive to negative. Table 12 and Tables 31 to 34, Appendix 2 can be viewed in the same manner.

In general it appears that the direct interest subsidy is not large. Under partial equilibrium assumptions, raising the interest rate on storage loans would have only minor effects on program participation in the Northeast. However, general equilibrium considerations suggest that if the interest rate on EGF storage loans alone was increased, users of the program would shift to other sources of credit.

7

CONCLUSIONS

Overall, the results of the analyses have mixed implications for the performance of the program in Northeast Brazil. On the one hand, there is little evidence that the program has attained its objectives of expanding output and stabilizing prices and incomes. On the other hand, there is some evidence that users of the program reacted to market and program incentives in making their decisions about program participation. Part of the difficulty in reconciling these differences is that the program is more suitable for treating the symptoms of instability than its causes. Attempting to stabilize producer incomes by stabilizing prices can be only partially effective. In the Northeast, random variations in output contribute significantly to income variations. Although the growth of agricultural output in the Northeast has been generally satisfactory (3.6 percent per year for 1960 to 1975),[96] it is difficult to empirically attribute any of this growth to the minimum price program.

Given the mixed nature of the results, the pessimist might recommend that the program be abandoned. However, since the program objectives are aimed at some of the important economic problems of the Northeast and abandonment is unlikely, a more pragmatic approach is to consider possible improvements in the program. The government of Brazil might consider:

1. Allowing storage loans (EGF) to be administered by banks in addition to the Bank of Brazil, thereby increasing the possibility of participation in the program.
2. Raising the minimum price levels for the commodities supported in the Northeast, with the possible exception of rice. Basic food crops such as beans, corn, and manioc should be given special attention in this respect because of their substantial price risks, their importance in small-scale production and in diets, and the small participation in the program in the past.
3. Increasing the funds available for loans and purchases, and at the same time encouraging wider participation in the program. Encouraging producer cooperatives to use the program might increase small farmer participation. The high returns to storage in some areas of the Northeast could allow cooperatives to provide additional services and expand membership.
4. Raising the interest rate on storage loans in order to reduce the financial and social costs of the program. This would have to be considered as part of an overall reform of the interest policies on agricultural loans. The current policy of subsidized credit leads to nonprice rationing and other distortions.[97]

The effects of these four items interact. An increase of minimum prices should encourage greater program participation which

[96] Nobre, "Agricultura do Nordeste."

[97] See Dale W. Adams, Harlan Davis, and Lee Bettis, "Is Inexpensive Credit a Bargain for Small Farmers? The Recent Brazilian Experience," *Inter-American Economic Affairs* 26 (Summer 1972): 47-58; and Dale W. Adams, "Agricultural Credit in Latin America: A Critical Review of External Funding Policy," *American Journal of Agricultural Economics* 53 (May 1971): 163-172.

should increase the demand for loan funds. Acquisitions in years of low market prices also would increase. Raising the rate of interest will partially offset the increased demand for loans, but only by a little if general interest reform is achieved. Permitting additional banks to administer storage loans and encouraging use of the program by cooperatives will support the drive for expanded participation. However, since more than two-thirds of the rice, corn, and manioc produced in the Northeast is grown on small farms (less than 10 hectares), increasing producer participation in the program will not be easy without major agrarian reform.

5. The need for additional storage should also be considered. This can be particularly effective in expanding producer participation since storage facilities in some rural areas are poor in comparison to the facilities available in the larger cities where most of the storage currently occurs.

6. Consideration should be given to expanding the crop insurance program because it complements the minimum price program. At present, crop insurance is a relatively new pilot program. Since the minimum price program will at best only partially reduce variations in producers' income, the crop insurance program is particularly appropriate in the Northeast where climate plays such an important role in determining the incomes of individual producers.[98]

7. The research division of the Production Finance Commission (CFP) should be encouraged to conduct more research on the factors limiting participation in the program. The results of this study suggest that the reasons are commodity and location specific, and that micro-studies of producer behavior concerning consumption, storage, and sales are needed. The results of such studies could be extremely useful in recommending and implementing further changes in the program.

8. Since the objective of regulating domestic stocks was not investigated in this study, research is needed on this aspect of the program in order to obtain a comprehensive program evaluation. Investigation of the management of stocks should bring the impact of the program on nonagricultural consumers more explicitly into the evaluation, something that was not done in this study. The possibility of using regulatory stocks more aggressively to eliminate extreme price fluctuations (high consumer and low producer prices) needs to be studied.

The use by other countries of a minimum price program similar to Brazil's depends in part on the type of economic system they have and the nature of the problems confronting their economies. In a society where prices are fixed by the government, minimum prices are not needed. However, in a situation such as Brazil's, where market forces are allowed to operate within prescribed constraints, minimum prices can be useful in guiding production credit programs, storage loan programs, and government purchases for the purpose of regulating stocks. In these situations a minimum price program can be useful in promoting the development of the agricultural sector. However, as with all such programs, it is not a panacea for resolving the problems of agricultural stagnation.

[98] This recommendation is made recognizing the difficulties of administration and the potentially high costs of crop insurance schemes. See V.M. Dandekar, "Crop Insurance for Developing Countries," *Teaching and Research Forum* No. 10 (Singapore: The Agricultural Development Council, Inc., September 1977) for a general discussion of crop insurance and a proposal for an area approach linked to short-term agricultural credit.

APPENDIX 1

BASIC PROGRAM DATA

Table 14—Commodities covered by Brazil's minimum price program, 1977

A. Directly Supported

1. Cotton lint *(algodão em pluma)*
2. Seed cotton *(algodão em caroço)*
3. Peanuts in shells *(amendoim em casca)*
4. Rice in hulls *(arroz em casca)*
5. Oats *(aveia)*
6. Babaçu nuts
7. Cashew nuts in shell *(castanha de caju em casca)*
8. Brazil nuts in shell *(castanha do Brasil em casca)*
9. Brazil nuts, shelled *(castanha do Brasil, amêndoa)*
10. Rye *(centeio)*
11. Carnauba wax *(ceara de carnaúba)*
12. Barley *(cevada)*
13. Manioc flour *(farinha de mandioca)*
14. Manioc starch *(fécula de mandioca)*
15. Beans: black, white, colored, and string *(feijões: preto, branco, de cores, e de corda)*
16. Sesame *(gergelim)*
17. Sunflower *(girassol)*
18. Guaraná
19. Jute *(juta)*
20. Mallow *(malva)*
21. Castor beans *(mamona em baga)*
22. Corn *(milho)*
23. Mint oil *(óleo bruto de menta)*
24. Carnauba wax powder *(po cerífero de carnauba)*
25. Ramie hemp *(rami)*
26. Sisal, bulk and baled *(sisal, solto en enfardado)*
27. Soybeans *(soja em grão)*
28. Sorghum *(sorgo)*
29. Silk thread *(fio de seda)*
30. Rice seed *(semente de arroz)*
31. Barley seed *(semente de cevada)*
32. Bean seed *(semente de feijão)*
33. Jute seed *(semente de juta)*
34. Peanut seed *(semente de amendoim)*
35. Corn seed *(semente de milho)*
36. Soybean seed *(semente de soja)*

B. Indirectly Supported [a]

1. Processed rice *(arroz beneficiado, macerado, parbollizado)*
2. Peanut oil *(óleo de amendoim)*
3. Sunflower oil *(óleo de girassol)*
4. Castor bean *(óleo de mamona)*
5. Corn oil *(óleo de milho)*
6. Soybean oil *(óleo de soja)*

Source: Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Política de Garantia de Preços Mínimos*, Brasilia, April 1977.

a/ Accepted only in substitution for the original product during the EGF loan period. Loans also are available for jute sacks used to store some commodities.

Table 15—Regional distribution of minimum price loans (EGF), Brazil, 1968-1977

Year	North	Northeast	Center-West	Southeast	South	Total Brazil
			(real Cr$1,000) [a]			
1968	6,935.7	28,191.8	8,594.8	44,249.8	43,868.1	131,840.2
1969	3,960.6	24,775.5	12,190.0	35,269.0	59,055.1	135,250.2
1970	4,717.7	14,888.3	24,152.4	55,866.0	69,077.1	168,701.5
1971	3,290.3	18,524.0	10,346.0	48,963.1	110,921.7	192,045.1
1972	2,300.6	32,858.2	28,248.0	73,267.6	168,882.3	305,556.7
1973	4,178.0	29,270.0	39,013.3	57,081.7	108,156.8	237,699.8
1974	1,676.9	91,896.6	57,713.3	163,419.4	278,967.6	593,673.8
1975	12,376.7	198,850.9	83,944.7	227,563.6	732,143.4	1,254,879.3
1976	14,754.6	183,338.2	168,136.5	213,305.1	782,658.2	1,362,192.6
1977 [b]	16,695.8	170,937.6	89,064.3	248,508.5	894,082.4	1,419,288.6
% Δ 1968-69 to 1976-77	188.6	569.0	1,137.4	480.8	1,529.1	941.4

Table 15—Continued

Year	North	Northeast	Center-West	Southeast	South	Total Brazil
			(percent)			
1968	5.3	21.4	6.5	33.6	33.3	100.1 c/
1969	2.9	18.3	9.0	26.1	43.7	100.0
1970	2.8	8.8	14.3	33.1	40.9	99.9
1971	1.7	9.6	5.4	25.5	57.8	100.0
1972	0.8	10.8	9.2	24.0	55.3	100.1
1973	1.8	12.3	16.4	24.0	45.5	100.0
1974	0.3	15.5	9.7	27.5	47.0	100.0
1975	1.0	15.8	6.7	18.1	58.3	99.9
1976	1.1	13.5	12.3	15.7	57.5	100.1
1977 b/	1.2	12.0	6.3	17.5	63.0	100.0

Source: Table 17, Appendix 1.

a/ Current values deflated by the Fundação Getúlio Vargas' General Price Index, Column 2, 1965-67 = 100.

b/ Through December 1977.

c/ Percentage totals may not equal 100 due to rounding.

Table 16—Distribution of minimum price loans (EGF) by commodity and region, Brazil, 1968-1977 a/

Region and Commodity	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(percent)					
North										
Jute	99.6	96.6	96.9	98.4	98.3	99.8	100.0	28.8	77.4	82.0
Rice	0.3	3.4	2.8	1.6	1.7	0.2	0.0	39.8	22.5	17.3
Sum	99.9	100.0	99.7	100.0	100.0	100.0	100.0	68.6	99.9	99.3
Northeast										
Cotton lint	69.3	55.8	44.0	60.0	79.7	71.6	81.3	18.2	28.3	40.6
Rice	21.3	23.5	23.8	20.6	11.1	23.9	4.2	11.1	10.7	10.9
Carnauba wax	0.0	0.0	13.0	0.9	3.3	2.5	b/	5.3	4.6	4.9
Castor beans	0.0	2.2	0.3	2.2	0.0	0.0	8.4	4.4	1.8	1.2
Corn	1.1	0.7	2.1	15.1	5.3	1.6	5.5	2.8	1.0	2.7
Sisal	7.9	17.6	14.9	0.0	0.0	0.0	0.0	53.8	37.5	6.7
Sum	99.6	99.8	98.1	98.8	99.4	99.6	99.4	95.6	83.9	67.0
Center-West										
Cotton lint	1.1	3.1	3.5	20.9	14.2	14.5	8.6	6.2	1.4	5.9
Rice	92.4	95.1	87.9	69.9	76.7	80.5	43.8	54.0	70.4	43.0
Corn	4.5	0.9	7.3	5.3	3.8	3.7	41.8	32.0	22.6	41.5
Sum	98.0	99.1	98.7	96.1	94.7	98.7	94.2	92.2	94.4	90.4

Table 16—Continued

Region and Commodity	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(percent)					
Southeast										
Cotton lint	37.9	31.5	17.3	36.3	46.4	23.1	42.2	34.6	20.8	47.0
Peanuts	14.6	19.9	12.2	21.4	10.4	6.4	5.0	2.9	4.0	3.5
Rice	17.0	22.9	34.7	11.1	17.5	36.5	8.5	10.5	24.5	7.5
Corn	25.7	17.6	26.5	15.6	13.4	30.4	23.4	19.2	29.0	19.6
Soybeans	3.3	5.8	4.9	11.3	10.4	0.3	15.2	21.2	15.2	14.3
Sum	98.5	97.7	95.6	95.7	98.1	96.7	94.3	88.4	93.5	91.9
South										
Cotton lint	16.7	18.4	16.8	14.5	16.5	17.4	10.6	7.5	4.4	7.5
Rice	60.9	59.3	49.0	40.5	31.9	59.2	22.3	16.0	20.6	17.6
Corn	4.4	1.2	5.2	1.7	3.4	10.8	6.7	2.7	6.4	5.6
Soybeans	13.5	16.2	25.4	39.0	43.5	0.3	57.2	65.3	55.1	50.3
Sum	95.5	95.1	96.4	95.7	95.3	87.7	96.8	91.5	86.5	81.0

Source: Table 17, Appendix 1.

a/ Percent of total regional loan funds (EGF) allocated to each commodity. For example, in 1968, 99.6 percent of the funds loaned in the North were for jute.

b/ Less than 0.05.

Table 17—Minimum price storage loans (EGF) by region, commodity, and type of borrower, Brazil, 1968-1977

Region/Commodity Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
						(Cr$1,000)				
North										
Rice (rough)										
PC [a]	31.7	108.3	119.8	11.7	32.5	...	...	29,598	21,622	28,990.1
PH [a]	...	151.3	182.7	135.4	91.5	26.5	...	578	7,171	6,656.9
Sum	31.7	259.6	302.5	147.1	124.0	26.5	...	30,176	28,793	35,647.0
Jute/Mallow										
PC	...	...	...	...	...	252.4	...	...	1,248	18,684.9
PH	10,982.7	7,344.8	10,513.3	8,967.0	7,329.9	15,305.2	8,049.2	21,816	97,619	150,617.8
Sum	10,982.7	7,344.8	10,513.3	8,967.0	7,329.9	15,557.6	8,049.2	21,816	98,867	169,302.7
Other										
PC	13.4	...	2.3	...	...	...	...	6,093	115	1,192.8
PH	...	...	32.7	...	...	...	...	17,784	...	217.9
Sum	13.4	...	35.0	...	...	...	...	23,887	115	1,410.7

Table 17—Continued

Region/Commodity Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
Totals										
PC	45.1	108.3	122.1	11.7	32.5	252.4	...	35,691	22,985	48,867.8
PH	10,982.7	7,496.1	10,728.7	9,102.4	7,421.4	15,331.7	8,049.2	40,178	104,790	157,492.6
Sum	11,027.8	7,604.4	10,850.8	9,114.1	7,453.9	15,584.1	8,049.2	75,869	127,775	206,360.4
Northeast										
Cotton lint										
PC	911.4	842.0	663.4	1,379.4	3,951.3	7,690.1	23,475.1	13,485	48,822	120,216.5
PH	30,170.6	25,702.1	14,391.7	29,426.2	80,852.0	70,529.7	334,989.6	208,483	400,541	737,951.2
Sum	31,082.0	26,544.1	15,055.1	30,805.6	84,803.3	78,219.8	358,464.7	221,968	449,363	858,167.7
Rice (rough)										
PC	1,397.8	2,562.5	1,459.3	1,361.0	1,980.4	5,393.8	3,690.5	31,692	59,878	111,395.6
PH	8,166.9	8,627.5	6,701.9	9,228.6	9,887.1	20,733.8	14,739.3	103,895	109,728	119,084.1
Sum	9,564.7	11,190.0	8,161.2	10,589.6	11,867.5	26,127.6	18,429.8	135,587	169,606	230,479.7

Table 17—Continued

Region/Commodity Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
Carnauba wax										
PC	...	...	65.5	88.1	436.1	742.8	...	31,562	38,159	46,838.7
PH	...	...	4,374.7	351.6	3,086.8	2,009.9	159.8	33,490	34,447	56,128.2
Sum	...	...	4,440.2	439.7	3,522.9	2,752.7	159.8	65,052	72,606	102,966.9
Castor beans										
PC	...	1.9	22.1	...	...	...	13,366.2	5,911	28	...
PH	...	1,050.2	88.7	1,133.0	...	...	23,855.9	48,312	29,269	24,666.6
Sum	...	1,052.1	110.8	1,133.0	...	...	37,222.1	54,223	29,297	24,666.6
Corn										
PC	368.8	330.7	555.9	5,622.0	3,744.8	1,639.7	14,568.9	24,366	8,256	46,921.9
PH	119.0	23.2	152.8	2,134.7	1,855.2	102.0	9,908.3	9,891	7,970	11,147.4
Sum	487.8	353.9	708.7	7,756.7	5,600.0	1,741.7	24,477.2	34,257	16,226	58,069.3

Table 17—Continued

Region/Commodity Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
Sisal										
PC	1,772.4	6,656.5	5,022.2	...	...	...	...	340,386	307,168	112,934.7
PH	1,790.0	1,715.7	94.4	...	...	...	...	314,902	288,881	29,053.0
Sum	3,562.4	8,372.2	5,116.6	...	...	...	...	655,288	596,049	141,987.7
Others										
PC	128.1	56.7	650.6	587.0	657.3	335.2	2,350.3	10,458	72,935	391,338.1
PH	...	...	...	...	9.5	...	...	42,123	181,627	305,112.6
Sum	128.1	56.7	650.6	587.0	666.8	335.2	2,350.3	52,581	254,562	696,450.7
Totals										
PC	4,578.5	10,450.3	8,439.0	9,037.5	10,769.9	15,801.6	57,451.0	457,860	535,246	829,645.5
PH	40,246.5	37,118.7	25,804.2	42,274.1	95,690.6	93,375.4	383,652.9	761,096	1,052,463	1,283,143.1
Sum	44,825.0	47,569.0	34,243.2	51,311.6	106,460.5	109,177.0	441,103.9	1,218,956	1,587,709	2,112,788.6

Table 17—Continued

Region/Commodity/ Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
Center-West										
Cotton lint										
PC	...	385.8	600.0	2,392.0	3,523.9	...	1,507.7	21,795	5,909	15,934.3
PH	150.0	343.8	1,334.7	3,588.7	9,478.7	21,105.3	22,443.4	10,282	14,383	49,502.0
Sum	150.0	729.6	1,934.7	5,980.7	13,002.6	21,105.3	23,951.1	32,077	20,292	65,436.3
Rice (rough)										
PC	5,650.0	13,453.4	37,090.6	10,646.2	54,750.3	89,723.2	88,512.9	212,086	893,889	322,850.9
PH	6,980.1	8,808.2	11,743.8	9,400.3	15,436.4	27,467.1	32,826.3	65,752	131,759	151,043.1
Sum	12,630.1	22,261.6	48,834.4	20,046.5	70,186.7	117,190.3	121,339.2	277,838	1,025,648	473,894.0
Corn										
PC	621.8	201.7	4,029.2	1,531.7	3,482.2	5,410.1	115,922.6	164,129	315,196	450,177.2
PH	...	...	29.4	...	...	...	...	599	13,468	6,288.7
Sum	621.8	201.7	4,058.6	1,531.7	3,482.2	5,410.1	115,922.6	164,728	328,664	456,465.9

Table 17—Continued

Region/Commodity/ Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
Others										
PC	155.7	33.5	722.8	1,026.3	3,624.5	1,314.0	10,342.4	34,121	62,318	79,302.0
PH	108.2	178.4	...	73.1	1,227.6	500.0	5,468.6	5,817	19,140	25,736.9
Sum	263.9	211.9	722.8	1,099.4	4,852.1	1,814.0	15,811.0	39,938	81,458	105,038.9
Totals										
PC	6,427.5	14,074.4	42,442.6	15,596.2	65,380.9	96,447.3	216,285.6	432,131	1,277,312	868,264.4
PH	7,238.3	9,330.4	13,107.9	13,062.1	26,142.7	49,072.4	60,738.3	82,450	178.750	232,570.7
Sum	13,665.8	23,404.8	55,550.5	28,658.3	91,523.6	145,519.7	277,023.9	514,581	1,456,062	1,100,835.1
Southeast										
Cotton lint										
PC	13,988.3	3,199.5	6,025.1	16,709.8	38,924.0	19,064.2	102,825.4	140,114	82,059	330,856.8
PH	12,671.1	18,130.9	16,189.2	32,550.3	71,188.7	30,189.7	228,421.0	343,191	303,097	1,113,819.9
Sum	26,659.4	21,330.4	22,214.3	49,260.1	110,112.7	49,253.9	331,246.4	483,307	385,156	1,444,676.7

Table 17—Continued

Region/Commodity/ Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
Peanuts										
PC	197.9	202.3	399.0	910.2	3,026.4	148.8	806.7	1,878	6,535	2,635.4
PH	10,094.9	13,297.4	15,293.2	28,108.0	21,682.4	13,546.9	38,126.0	39,106	67,163	105,408.6
Sum	10,292.8	13,499.7	15,692.2	29,018.2	24,708.8	13,695.7	38,932.7	40,984	73,698	108,044.0
Rice (rough)										
PC	4,876.2	8,069.3	31,196.0	4,838.9	19,928.8	41,591.5	33,121.1	69,030	333,355	77,109.2
PH	7,109.1	7,449.7	13,371.8	10,162.1	21,599.3	36,086.3	33,665.7	77,876	119,452	153,969.1
Sum	11,985.3	15,519.0	44,567.8	15,001.0	41,528.1	77,677.8	66,786.8	146,906	452,807	231,078.3
Corn										
PC	16,423.3	8,996.4	31,951.2	18,882.0	28,262.7	42,419.8	170,829.2	244,096	397,940	530,078.2
PH	1,687.5	2,950.3	2,105.4	2,250.5	3,489.2	22,369.1	13,101.7	24,215	138,127	72,200.8
Sum	18,110.8	11,945.7	34,056.6	21,132.5	31,751.9	65,788.9	183,930.9	268,311	536,067	602,279.0
Soybeans										
PC	...	7.9	...	104.0	649.0	...	9,710.7	158,175	71,690	50,917.8
PH	2,850.5	3,914.3	6,248.8	15,283.3	24,156.4	660.9	109,746.0	138,160	209,106	289,264.9
Sum	2,850.5	3,922.2	6,248.8	15,387.3	24,805.4	660.9	119,456.7	296,335	280,796	440,182.7

Table 17—Continued

Region/Commodity/ Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
						(Cr$1,000)				
Soybeans										
PC	...	7.9	...	104.0	649.0	...	9,710.7	158,175	71,690	50,917.8
PH	2,850.5	3,914.3	6,248.8	15,283.3	24,156.4	660.9	109,746.0	138,160	209,106	289,264.9
Sum	2,850.5	3,922.2	6,248.8	15,387.3	24,805.4	660.9	119,456.7	296,335	280,796	440,182.7
Others										
PC	458.4	257.8	767.3	1,990.2	3,713.6	1,355.4	27,345.6	36,447	49,782	146,383.3
PH	...	1,241.7	4,944.7	3,838.5	766.5	5,482.0	16,714.1	122,675	68,916	98,466.5
Sum	458.4	1,499.5	5,712.0	5,828.7	4,480.1	6,837.4	44,059.7	159,122	118,698	245,304.8
Totals										
PC	35,944.1	20,732.2	70,338.6	43,435.1	94,504.5	104,579 7	344,638.7	649,740	941,361	1,138,435.7
PH	34,413.1	46,984.3	58,153.1	92,192.7	142,882.5	108,334.9	439,774.5	745,225	905,861	1,933,129.8
Sum	70,357.2	67,716.5	128,491.7	135,627.8	237,387.0	212,914.6	784,413.2	1,394,965	1,847,222	3,071,565.5

Table 17—Continued

Region/Commodity/ Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
South										
Cotton lint										
PC	5,529.2	8,928.2	10,341.4	14,096.0	22,854.0	17,590.6	46,291.0	72,627	37,818	170,785.1
PH	6,151.5	11,966.1	16,027.6	30,406.8	67,527.5	52,533.1	95,095.3	265,671	261,675	662,860.0
Sum	11,860.7	20,894.3	26,369.0	44,592.8	90,381.5	70,123.7	141,386.3	338,298	299,493	833,645.1
Rice (rough)										
PC	32,953.4	56,736.9	65,512.2	89,300.5	119,063.6	157,844.6	199,603.3	470,205	1,027,547	1,520,397.6
PH	9,537.0	10,518.5	12,330.5	35,135.9	55,673.0	81,057.6	98,670.5	246,583	366,006	426,009.6
Sum	42,490.4	67,255.4	77,842.7	124,436.4	174,736.6	238,902.2	298,273.8	716,788	1,393,553	1,946,407.2
Corn										
PC	2,330.1	1,062.8	7,404.1	3,032.0	9,569.6	21,961.5	47,669.1	67,936	248,460	477,728.7
PH	719.2	255.1	891.5	2,298.4	9,031.3	21,726.4	41,688.7	55,276	182,894	137,534.1
Sum	3,049.4	1,317.9	8,295.6	5,330.4	18,600.9	43,687.9	89,357.8	123,212	431,354	615,262.8

Table 17—Continued

Region/Commodity/ Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
Soybeans										
PC	2,146.0	7,862.5	19,872.1	73,447.0	137,252.0	908.5	374,695.7	2,342,528	2,575,186	3,848,700.8
PH	7,272.4	10,479.0	20,454.0	46,303.9	100,683.2	414.0	391,517.4	590,086	1,156,206	1,708,480.6
Sum	9,418.4	18,341.5	40,326.1	119,750.9	237,935.2	1,322.5	766,213.1	2,932,614	3,731,392	5,557,181.4
Other										
PC	2,102.6	1,248.3	2,027.5	7,183.8	18,672.7	30,789.5	18,974.4	252,031	774,748	1,752,312.5
PH	1,008.9	4,328.3	4,016.4	5,958.7	6,851.8	18,598.9	24,839.2	125,096	147,280	346,049.7
Sum	3,111.5	5,576.6	6,043.9	13,142.5	25,524.5	49,388.4	43,813.6	377,127	922,028	2,098,362.2
Totals										
PC	45,061.3	75,838.7	105,157.3	187,059.3	307,411.9	229,094.7	687,233.5	3,205,327	4,663,759	7,769,924.7
PH	24,689.0	37,547.0	53,720.0	120,193.7	239,766.8	174,330.0	651,811.1	1,282,712	2,114,061	3,280,934.0
Sum	69,750.3	113,385.7	158,877.3	307,253.0	547,178.7	403,424.7	1,339,044.6	4,488,039	6,777,820	11,050,858.7
Brazil										
Cotton lint	69,572.1	69,498.4	65,573.1	130,639.2	298,300.1	218,702.7	855,048.5	1,075,650	1,154,304	3,201,925.9
Peanuts	11,370.1	15,277.3	18,003.2	33,638.9	30,566.0	14,389.6	40,169.0	42,794	89,958	113,111.1

Table 17—Continued

Region/Commodity/ Borrower	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
					(Cr$1,000)					
Rice (rough)	76,702.2	116,485.6	179,708.6	170,220.6	298,442.9	459,924.4	504,829.6	1,307,295	3,070,407	2,917,506.2
Carnauba wax	...	...	4,440.2	439.7	3,522.9	2,752.7	159.8	65,052	72,606	102,967.0
Castor beans	...	4,976.3	7,023.6	6,389.2	1,419.2	3,908.4	71,478.4	95,925	70,137	70,341.6
Jute/Mallow	10,982.7	7,344.8	10,513.3	8,967.0	7,329.9	15,557.6	8,049.2	21,816	98,867	169,302.7
Corn	22,283.1	13,819.2	47,121.8	35,751.3	59,435.0	115,628.6	413,688.5	590,583	1,312,424	1,732,473.1
Sisal	3,562.4	8,372.2	5,116.6	...	...	...	...	655,288	596,049	141,987.7
Soybeans	12,268.9	22,263.7	46,827.3	135,181.2	265,709.8	2,483.4	891,968.1	3,263,887	4,050,032	6,059,161.2
Others	2,884.6	1,642.0	3,685.8	10,737.7	25,277.9	53,272.7	64,243.7	574,120	1,281,804	3,033,632.2
Sum PC	92,056.5	121,203.9	226,499.6	255,139.8	478,099.7	446,175.7	1,305,608.8	4,780,749	7,440,663	10,655,138.3
Sum PH	117,569.6	138,476.5	161,513.9	276,825.0	511,904.0	440,444.4	1,544,026.0	2,911,661	4,355,925	6,887,270.2
Total Brazil	209,626.1	259,680.4	388,013.5	531,964.8	990,003.7	886,620.1	2,849,634.8	7,692,410	11,796,588	17,542,408.5

Source: Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico—1977*, Brasilia, 1977; and Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico—1978*, Brasilia, 1978.

a/ PC = Producers and their cooperatives.

b/ PH = Private handlers and processors.

Table 18—Producer and cooperative participation in the minimum price loan program (EGF) by commodity and region, Brazil, 1968–1977 a/

Commodity and Year	North	Northeast	Center-West	Southeast	South	Total Brazil
Cotton lint						
1968	b/	2.9	0.0	52.5	47.3	29.4
1969	b/	3.2	52.9	15.0	42.7	19.2
1970	b/	4.4	31.0	27.1	39.2	26.9
1971	b/	4.5	40.0	33.9	31.6	26.5
1972	b/	4.7	27.1	35.3	25.3	23.2
1973	b/	9.8	0.0	38.7	25.1	20.3
1974	b/	6.5	6.3	31.0	32.7	20.4
1975	b/	6.1	67.9	29.0	21.5	23.1
1976	b/	10.9	29.1	21.3	12.6	15.1
1977	b/	14.0	24.4	22.9	20.5	19.9
Rice						
1968	100.0	14.6	44.7	40.7	77.6	58.5
1969	41.7	22.9	60.4	52.0	84.4	69.5
1970	39.6	17.9	76.0	70.0	84.2	75.3
1971	8.0	12.9	53.1	32.3	71.8	62.4
1972	26.2	16.7	78.0	48.0	68.1	65.6
1973	0.0	20.6	76.6	53.5	66.1	64.0
1974	b/	20.0	72.9	49.6	66.9	64.4
1975	98.1	23.4	76.3	47.0	65.6	62.2
1976	75.1	35.3	87.2	73.6	73.7	76.1
1977	81.3	48.3	68.1	33.4	78.1	70.6
Corn						
1968	100.0	75.6	100.0	90.7	76.4	88.7
1969	b/	93.4	100.0	75.3	80.6	76.6
1970	100.0	78.4	99.3	93.8	89.3	93.3
1971	b/	72.5	100.0	89.4	56.9	81.3
1972	b/	66.9	100.0	89.0	51.4	75.8
1973	b/	94.1	100.0	65.5	50.3	61.8
1974	b/	59.5	100.0	92.9	53.3	84.4
1975	100.0	71.1	99.6	91.0	55.1	84.8
1976	100.0	50.9	95.9	74.2	57.6	73.9
1977	45.0	80.8	98.6	88.0	77.6	86.9

Source: Table 17, Appendix 1.

a/ Percent of total loan funds (EGF) for each commodity and region that was received by producers and their cooperatives. The remainder was received by private processors and handlers.

b/ No loans made.

Table 19—Regional distribution of minimum price acquisitions, Brazil, 1969–1976

Year	North	Northeast	Center-West	Southeast	South	Total Brazil
			(Real Cr$1,000) a/			
1969	1,011	1,197	154	46	726	3,134
1970	63	3,568	41,341	5,667	26,117	76,746
1971	1	2,599	1,004	75	2,971	6,650
1972	0	742	63	0	6,340	7,145
1973	533	991	700	1,068	1,945	5,237
1974	653	761	17,769	1,710	4,576	25,469
1975	5,308	122,065	13,867	33,482	20,185	194,907
1976	11,812	80,569	98,552	13,342	10,506	214,781
			(percent)			
1969	32.2	38.2	4.9	1.5	23.2	100.0 c/
1970	0.1	4.6	53.9	7.4	34.0	100.0
1971	b/	39.1	15.1	1.1	44.7	100.0
1972	0.0	10.4	0.9	0.0	88.7	100.0
1973	10.2	18.9	13.4	20.4	37.1	100.0
1974	2.6	3.0	69.8	6.7	18.0	100.1
1975	2.7	62.6	7.1	17.2	10.4	100.0
1976	5.5	37.5	45.9	6.2	4.9	100.0

Source: Compiled from unpublished data provided by the Comissão de Financiamento da Produção of Brasil's Ministério da Agricultura.

a/ Current values deflated by the Fundação Getúlio Vargas' General Price Index, Column 2, 1965-67 = 100.

b/ Less than 0.05.

c/ Percentage totals may not equal 100 due to rounding.

Table 20—Minimum price acquisitions by region and commodity, Brazil, 1969—1976

	1969	1970	1971	1972	1973	1974	1975	1976
North								
Rice (rough)	333	144	1	...	1,985	3,104	2,829	93,234
Jute/Mallow	1,598	...	...	...	...	...	...	4,745
Corn	10	1	1	...	4	31	...	10
Brazil nut	...	...	...	...	...	...	29,711	1,324
Jute seed	...	...	...	...	...	...	...	2,980
Total	1,941	145	2	...	1,989	3,135	23,540	102,293
Northeast								
Cotton lint	123	5	...	...	668	...	25,407	25
Rice (rough)	1,637	92	1	...	2,491	1,388	3,415	20,161
Corn	345	26	287	1,977	367	...	103	372
Carnauba wax	...	...	1,895	387	78	52	55,720	66,583[a]
Sisal	190	8,084	5,011	...	...	1,867	662,121	610,264
Castor beans	...	...	...	...	...	...	1,477	...
Beans	...	...	2	34	2	...	...	...
Manioc flour	3	...	...	5	90	338	...	...
Peanuts	...	...	2	1	...	...	...	320
Sorghum	...	...	...	...	...	6	16	...
Total	2,298	8,207	7,198	2,404	3,696	3,651	748,259	697,725

Table 20—Continued

	1969	1970	1971	1972	1973	1974	1975	1976
Center-West								
Cotton lint	...	...	...	198	50	...	9,654	...
Rice (rough)	34	94,927	2,032	...	2,561	243	150	726,475
Corn	262	157	743	...	...	84,382	72,746	124,322
Soybeans	...	...	...	...	...	...	2,042	966
Beans	...	...	5	...	...	2	...	...
Peanuts	...	...	...	5	...	...	...	32
Sorghum	...	...	...	...	...	665	411	1,669
Total	296	95,084	2,780	203	2,611	85,292	85,003	853,464
Southeast								
Cotton lint	22	...	...	...	2,018	...	198,947	...
Rice (rough)	1	13,033	178	...	...	845	57	108,306
Corn	65	2	16	...	...	6,299	...	4,815
Soybeans	...	...	...	...	...	...	...	17
Beans	...	...	13	...	...	20	...	...
Manioc flour	...	...	...	...	1,965	1,042	...	...
Sorghum	...	....	...	...	...	...	...	829
Silk thread	...	...	...	...	...	...	5,350	...
Corn seed	...	...	...	...	...	...	891	1,574
Total	88	13,035	207	...	3,983	8,206	205,245	115,541

Table 30—Continued

	1969	1970	1971	1972	1973	1974	1975	1976
South								
Cotton lint	...	...	...	...	...	...	59,285	...
Rice (rough)	29	59,494	2,560	...	139	...	....	79,498
Corn	217	548	223	...	186	144	4	3,459
Soybeans	....	...	...	...	...	...	...	39
Beans	1,147	27	5,447	20,541	9	2,339	63,746	...
Manioc flour	...	...	...	...	6,881	19,451	...	...
Sorghum	...	...	...	...	38	30	3	5,316
Sunflower	1	...	...	...	...	...	...	...
Mint oil	...	...	...	...	...	...	...	1,818
Corn seed	...	...	...	...	...	...	699	856
Total	1,394	60,069	8,230	20,541	7,253	21,964	123,737	90,986

Source: Compiled from unpublished data provided by the Comissão de Financiamento da Produção of Brasil's Ministério da Agricultura.

Table 21—Minimum price acquisitions of five commodities, Brazil, 1961—1977

Year	Cotton lint	Rice	Corn	Beans	Soybeans
			(metric tons)		
1961	346	43,927	296	21,779	5
1962	0	6	0	0	0
1963	8,224	0	657,573	23,981	0
1964	2,373	1,738	61	64,000	0
1965	0	1,695,106	422,008	91,552	0
1966	0	2,436	305	0	0
1967	0	29	9,950	120,798	8
1968	0	156	65,711	84,002	0
1969	122	9,175	7,593	3,590	0
1970	4	517,800	5,280	65	0
1971	0	14,122	8,618	8,554	0
1972	97	0	8,352	26,877	0
1973	1,034	12,162	2,083	16	0
1974	0	6,548	164,275	1,829	0
1975	58,806	3,115	97,545	38,470	1,810
1976	0	649,302	146,919	0	885
1977	611	1,169,974	1,504,858	7,897	0

Sources: For 1961—66, Gordon W. Smith, "Brazilian Agricultural Policy, 1950-1967," in *The Economy of Brazil*, ed. Howard S. Ellis (Berkeley: University of California Press, 1969), p. 244; for 1966-68, João do Carmo Oliveira, "Observações Sobre a Política de Preços Mínimos no Brasil," Monografias No. 5, Universidade de São Paulo, Instituto de Pesquisas Econômicas, São Paulo, 1974, Appendix Table 1; the figures for 1969-77 were compiled from unpublished data provided by the Comissão de Financiamento da Produção of Brasil's Ministério da Agricultura.

Table 22—Dates of selected decrees fixing minimum prices for Northeast Brazil, 1963–1978

Decree No.	Date a/	Harvest b/	Commodities c/
52,152	July 1, 1963	1963	Cotton
52,445	September 3, 1963 d/	1963	Rice, corn, beans (black)
53,646	March 4, 1964	1964	Beans *(macaçar)*
54,010	July 10, 1964	1964	Cotton
52,294	September 21, 1964	1964 & 1965	Rice, corn, beans (except *macaçar*)
55,783	February 22, 1965	1965	Beans *(macaçar)*
55,809	March 8, 1965	1965	Cotton
57,598	January 10, 1966	1966	Cotton, rice, beans, corn
59,815	December 21, 1966	1967	Cotton, rice, beans, corn
61,966	December 27, 1967	1968	Cotton, rice, beans, corn
63,809	December 16, 1968	1969	Cotton, rice, beans, corn
65,746	November 26, 1969	1970	Cotton, rice, beans, corn
67,920	December 22, 1970	1971	Cotton, rice, beans, corn
69,657	December 3, 1971	1972	Cotton, rice, beans, corn
71,624	December 29, 1972	1973	Rice, corn, beans
71,752	January 1, 1973	1973	Cotton
73,299	December 14, 1973	1974	Cotton, rice, corn, beans
75,157	December 30, 1974	1975	Cotton, rice, corn, beans
76,938	December 31, 1975	1976	Cotton, rice, corn, beans
78,912	December 12, 1976	1977	Cotton, rice, corn, beans
80,388	September 29, 1977	1978	Rice—Maranhão, Piauí
81,302	February 3, 1978	1978	Cotton, rice, corn, beans—rest of Northeast

a/ Date, unless otherwise noted, decree published in *Diário Oficial.*

b/ Calendar year during which most of the harvest in the Northeast occurs (see footnote at the beginning of Chapter IV).

c/ Minimum prices for other commodities were often included in the decrees; only those commodities considered in this study are listed.

d/ Date decree signed; date published not known.

APPENDIX 2

ADDITIONAL AND SUPPORTING RESULTS

Table 23—Trends in real minimum prices for selected commodities and states, Northeast Brazil, 1967—1977 a/

Commodity and State	Percent 1967/68—1976/77	Linear Trend Coefficient b/	Correlation Coefficient
Cotton lint — Ceará	92.3	1.3714	0.90
		(0.2206)	
Seed cotton — Ceará	63.3	0.3378	0.86
		(0.0672)	
Rice (rough) — Maranhão	37.1	0.3357	0.73
		(0.1033)	
Beans *(macaçar)* — Ceará	18.5	0.2445	0.64
		(0.0984)	
Beans *(mulatinho)* — Ceará	69.4	0.9157	0.96
		(0.0858)	
Corn — Ceará	34.8	0.2299	0.83
		(0.0513)	

a/ Current minimum prices for a given season were deflated by the annual consumer price index (Fundação Getúlio Vargas, Index No. 2, 1965-67 = 100) for that year.

b/ Slope coefficient from a linear equation of real price as a function of time, n = 11. Figures in parentheses are the standard errors of the trend coefficients. All coefficients are significantly different from zero at the 5 percent level (two-tailed test).

Table 24—Ratios of minimum prices for selected commodities and states, Northeast and Center-South Brazil, 1968—1978 a/

Year	Cotton Lint Ceará ÷ São Paulo	Cotton Seed Ceará ÷ São Paulo	Rice Maranhão ÷ Rio Grande do Sul	Beans *(mulatinho)* Ceará ÷ Paraná	Corn Ceará ÷ Paraná
1968	1.04	1.02	1.10	1.07	1.35
1969	1.04	1.07	1.00	0.99	1.20
1970	1.17	1.03	0.92	1.04	1.21
1971	1.09	1.10	0.95	1.17	1.32
1972	1.00	1.00	0.88	1.09	1.28
1973	1.05	0.96	0.92	1.01	1.23
1974	1.18	1.05	0.89	0.97	1.12
1975	1.26	1.11	1.14	1.11	1.19
1976	1.27	1.16	1.06	1.12	1.14
1977	1.28	1.15	1.00	1.06	1.14
1978	1.20	1.13	1.02	1.05	1.13
Mean	1.14	1.07	0.99	1.06	1.21
Percent Change 1968/69 – 1977/78	19.2	9.1	–3.8	2.4	–11.0

Source: Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico–1977* (Brasilia, 1977); and Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico–1978* (Brasilia, 1978).

a/ Minimum prices are the average "basic" price for each state and represent these qualities:

Cotton,	Ceará,	Type 3, 34/36 mm, 1968-71 Type 3, 32/34 mm, 1972-78
	São Paulo,	Type 5, regular, 28/30 mm, 1968-71 Type 5, regular, 30/32 mm, 1972-78
Rice,	Maranhão,	Type 1 & 2, short grain, 1968-71 Type 2, medium grain, 1972-78
	Rio Grande do Sul,	Type 1 & 2, medium grain, 1968-71 Type 2, long grain, 1972-78
Beans,	Ceará,	Type 3, colored, 1968-78
	Paraná,	Type 3, white and colored, 1968-78
Corn,	Ceará,	Type 3, 1968-76 Type 2, 1977-78
	Paraná,	Type 3, 1968-78

Table 25—Trends and variability in prices received by producers, selected commodities and states, Northeast and Center-South Brazil, 1967—1977

Commodity and State a/	Intercept Value b/	Trend Coefficient b/	Adjusted R^2	Standard Deviation of Percentage Deviations from Trend c/
Cotton Seed				
Ceará	1.312	0.298	0.923	33.28
	(0.195)	(0.029)		
São Paulo	1.264	0.288	0.973	15.95
	(0.108)	(0.016)		
Rice				
Maranhão	1.664	0.246	0.946	18.94
	(0.133)	(0.020)		
Rio Grande do Sul	1.948	0.237	0.956	17.19
	(0.113)	(0.017)		
Corn				
Ceará	1.769	0.236	0.940	20.64
	(0.135)	(0.020)		
Paraná	1.212	0.260	0.980	12.73
	(0.085)	(0.013)		
Beans				
Ceará	2.256	0.299	0.868	51.92
(macaçar)	(0.264)	(0.039)		
Ceará	2.373	0.293	0.871	48.62
(mulatinho)	(0.254)	(0.037)		
Paraná	2.230	0.302	0.953	22.28
(mulatinho)	(0.151)	(0.022)		

a/ For definitions of price series, see Table 5.

b/ Coefficients from the natural log trend equation, $LnP_t = a + bT$, (n = 11). Figures in parentheses are the standard errors of the net regression coefficients. All coefficients are significantly different from zero at the 5 percent or better level of significance (two-tailed t-test).

c/ Percentage deviations from trend are defined as:

$$d_t = \frac{P_t - \hat{P}_t}{\hat{P}_t} \times 100$$

where $\hat{P}_t$ is the trend value.

Table 26—Ratios of wholesale prices to minimum prices for selected commodities and states, Northeast and Center-South Brazil, 1967—1977 [a]

	Cotton Lint	Rice			Beans				Corn		
	São Paulo	São Luís	Recife	Porto Alegre	(Macaçar) Fortaleza	(Mulatinho) Fortaleza	(Mulatinho) Recife	(Mulatinho) São Paulo	Fortaleza	Recife	São Paulo
1967	1.37	3.12	4.16	2.50	...	1.79	1.37	...	1.69	1.83	...
1968	1.39	2.47	3.65	2.84	...	2.03	1.92	2.04	1.29	1.47	1.53
1969	1.29	2.04 [b]	3.46	2.09	2.11	3.29	4.23	1.77	1.66	1.85	1.66
1970	1.57	2.84	3.25	2.00	4.69	2.92	3.66	1.83	2.18	2.41	1.44
1971	1.56	2.81 [b]	3.97	2.44	1.94	1.97	1.75	1.96	1.66	1.71	1.63
1972	1.26	2.94	4.40	2.55	2.48	1.74	1.73	1.38	1.41	1.48	1.38
1973	1.60	1.98	3.00	2.18	2.60	4.11	3.74	2.97	1.49	2.22	1.76
1974	1.37	3.93	4.71	3.06	2.65	2.19	1.73	1.32	1.70	1.44	1.26
1975	1.07	2.39	3.33	3.08	2.48	2.60	1.96	1.23	1.47	1.55	1.50
1976	2.25	2.12	2.71	2.15	5.82	4.75	5.77 [c]	2.33	1.87	2.18	1.44
1977	1.17	1.77	2.83	1.86	1.87	2.47	1.74	2.12	1.44	1.57	1.22

Table 26—Continued

	Cotton Lint	Rice			Beans				Corn		
					(Macaçar)	(Mulatinho)	(Mulatinho)	(Mulatinho)			
	São Paulo	São Luís	Recife	Porto Alegre	Fortaleza	Fortaleza	Recife	São Paulo	Fortaleza	Recife	São Paulo
Mean	1.45	2.58	3.59	2.43	2.96	2.71	2.69	1.90	1.62	1.79	1.48
Standard Deviation	0.31	0.63	0.65	0.42	1.36	0.98	1.43	0.52	0.25	0.34	0.17

Source: Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico—1977* (Brasilia, 1977); and Brasil, Ministério da Agricultura, Comissão de Financiamento da Produção, *Anuário Estatístico—1978* (Brasilia, 1978).

a/ Minimum price qualities listed in Tables 5 and 24. Wholesale prices based on average of three monthly prices at harvest time:

Cotton Lint — São Paulo, Type 5. May—July.

Rice
- São Luís, *aguiha*, May—July.
- Recife, *aguiha*, July—September.
- Porto Alegre, medium grain: 1967—71; long grain: 1972—77, April—June.

Beans
- Fortaleza, June—August.
- Recife, September—November
- São Paulo, January—March.

Corn
- Fortaleza, June—August.
- Recife, *amarelo comun*, August—October.
- São Paulo, *amareião*, May—July.

b/ September—November wholesale price.

c/ September wholesale price.

Table 27—Trends and variability in wholesale prices, selected commodities and markets, Northeast and Center-South Brazil, 1967—1977

Commodity and State a/	Intercept Value b/	Trend Coefficient b/	Adjusted R^2	Standard Deviation of Percentage Deviations from Trend c/
Cotton Lint				
São Paulo	2.518 (0.135)	0.280 (0.020)	0.957	21.48
Rice				
São Luís *(agulha)*	2.705 (0.131)	0.234 (0.019)	0.942	19.36
Recife *(agulha)*	3.046 (0.113)	0.233 (0.017)	0.956	16.89
Porto Alegre	2.614 (0.120)	0.246 (0.018)	0.955	18.89
rn				
Fortaleza	1.891 (0.119)	0.253 (0.018)	0.958	17.49
Recife *(amarelo comun)*	2.013 (0.123)	0.249 (0.018)	0.959	18.49
São Paulo *(amarelão)*	1.640 (0.071)	0.251 (0.010)	0.985	10.07
Beans				
Fortaleza *(macaçar)*	2.491 (0.398)	0.292 (0.053)	0.811	49.34
Fortaleza *(mulatinho)*	2.892 (0.191)	0.320 (0.028)	0.935	28.86
Recife *(mulatinho)*	2.946 (0.290)	0.302 (0.043)	0.847	51.81
São Paulo *(mulatinho)*	2.657 (0.186)	0.290 (0.027)	0.925	27.08

a/ For definitions of price series, see Table 26, Appendix 2.

b/ Coefficients from the natural log trend equation, $LnP_t = a + bT$, (n = 11 except for Fortaleza beans, *macaçar*, n = 9). Figures in parentheses are the standard errors of the net regression coefficients. All coefficients are significantly different from zero at the 5 percent or better level of significance (two-tailed t-test).

c/ Percentage deviations from trend are defined as:

$$d_t = \frac{P_t - \hat{P}_t}{\hat{P}_t} \times 100$$

where $\hat{P}_t$ is the trend value.

Table 28—Postharvest changes in real wholesale prices, selected commodities and markets, Northeast Brazil

Commodity and Market	Final Month of Harvest	CFP Storage Period a/	Real Price Change b/	Proportion of Price Decreases c/
		(months)	(percent)	
Rice *(agulha)*				
São Paulo	June	6	+ 4.7	5/9
Fortaleza	May	6	− 1.2	6/12
Recife	October	6	+ 5.3	5/11
Corn				
São Luís *(amarelo)*	August	6	+17.1	2/7
Fortaleza	July	6	+ 5.4	4/11
Recife *(amarelo comun)*	September	6	+ 9.5	4/11
Beans				
Fortaleza *(macaçar)*	July	3	+35.3	0/9
Fortaleza *(mulatinho)*	July	4	+ 5.4	6/12
Recife *(mulatinho)*	October	4	+ 0.5	4/10
Salvador *(mulatinho)*	April	4	− 8.1	6/9
Salvador *(mulatinho)*	October	4	−10.8	3/8

a/ Maximum period for EGF loans, average producers.

b/ Percentage change in average real monthly price from final month of harvest to end of the assumed storage period. For example, the average wholesale price of rice in São Luís increased 4.7 percent from June to December.

c/ Proportion of years in which the real price at the end of the assumed storage period was less than the real price in the last month of harvest.

Table 29—Trends in the indices of seasonal wholesale prices for selected commodities, Northeast Brazil, 1966–1977

Commodity and City	Seasonal High (H) Low (L) a/		Linear Trend Coefficient	Significance of Trend Coefficient b/		Correlation Coefficient c/
Rice						
Recife *(agulha)*	May	(H)	−0.30	Yes	C	0.65
	August	(L)	+0.44	Yes		0.98
Corn						
Fortaleza	April	(H)	−0.35	Yes	C	0.82
	September	(L)	+0.10	No		0.29
Recife *(amarelo comno)*	April	(H)	−0.80	Yes	C	0.94
	August	(L)	+0.08	No		0.17
Beans						
Fortaleza *(macaçar)*	March	(H)	−1.57	Yes	C	0.92
	July	(L)	+0.44	Yes		0.97
Salvador *(mulatinho)*	May	(H)	+0.91	Yes	D d/	0.98
	October	(L)	+0.76	Yes		0.99

a/ Based on a seasonal index derived from 12 years of monthly data (9 in the case of beans).

b/ Based on a 5 percent level, two-tailed t-test of the linear trend coefficient. D represents increasing seasonal price variation. C represents decreasing seasonal price spread.

c/ Sign omitted.

d/ Based on the trend in the difference between seasonal high and low.

Table 30—Trends in the producer-wholesale marketing margin relative to producer prices, selected commodities and markets, Northeast Brazil, 1966–1977

Commodity and Market a/	Intercept Value b/	Trend Coefficient b/	Adjusted R^2
Rice			
São Luís	200.02*	−4.603*	0.372
	(13.914)	(1.891)	
Recife	290.45*	−2.808	0.037
	(33.299)	(4.525)	
Corn			
Fortaleza	18.983	1.190	0.065
	(10.514)	(1.429)	
Recife	18.468*	1.729	0.191
	(8.268)	(1.123)	
Beans *(mulatinho)*			
Fortaleza	52.384	7.040	0.144
	(39.985)	(5.433)	

a/ Fo. definitions of price series used to calculated the margin, see Table 9.

b/ Coefficients from a linear trend equation with the margin as percent of the producer price a function of time $\left(\frac{M_t}{P_t} \times 100 = a + bT \right)$.

Figures in parentheses are the standard errors of the net regression coefficients. The asterisk (*) indicates that the coefficient is significantly different from zero at the 5 percent level (two-tailed t-test).

Table 31—Expected producer returns to storage under the minimum price program for corn, Ceará, Brazil, 1977

Item	Average June — August	August	September	October	November	December	January
				(Cr$/60 kg)			
Minimum price 1977 (MP)	72.00	...	...	...	...	...	...
Current market price (CMP) a/	95.04	95.22	95.04	97.74	103.71	107.00	107.97
Opportunity return (OR) b/	0.00	2.22	4.52	6.88	9.32	11.83	14.42
Forgone income (FI) c/	0.00	0.71	1.45	2.20	2.98	3.79	4.62
Storage costs (SC) d/	0.00	1.08	2.16	3.24	4.32	5.40	6.48
Interest charges (IC) e/	0.00	1.08	2.16	3.24	4.32	5.40	6.48
Gross return (GR) f/	95.04	94.57	93.79	95.94	101.41	104.24	104.81
Net return (NR) g/	...	−0.47	−1.25	0.90	6.37	9.20	9.77
		(−0.49)	(−0.66)	(0.31)	(1.64)	(1.87)	(1.64)

a/ Average based on price ratio from Table 5; August—January estimated using seasonal index.

b/ 3.09 percent of MP per month based on third and fourth quarter monetary correction for 1977 of 2.59 percent per month plus 0.50 percent monthly interest on time deposits (compounded).

c/ 3.09 percent of average June—August CMP minus MP or Cr$23.04 (compounded).

d/ 1.5 percent of MP per month (accumulated).

e/ 1.5 percent of MP per month (accumulated).

f/ GR = CMP + OR − FI − SC − IC.

g/ Net return from storage compared to outcome of sale at harvest time. For example, NR in August is Cr$94.57 − Cr$95.04 = −Cr$0.47. Percentage rates of return per month, based on the Cr$95.04 initial value, are given in parentheses.

Table 32—Expected wholesaler returns to storage under the minimum price program for corn, Fortaleza, Brazil, 1977

Item	Average June – August	August	September	October	November	December	January
				(Cr$/60 kg)			
Minimum price 1977 (MP)	72.00	...	...	...	...	...	...
Current market price (CMP) a/	116.64	116.34	112.14	117.44	122.80	132.61	128.03
Opportunity return (OR) b/	0.00	2.22	4.52	6.88	9.32	11.83	14.42
Forgone income (FI) c/	0.00	1.38	2.80	4.27	5.78	7.34	8.94
Storage costs (SC) d/	0.00	1.08	2.16	3.24	4.32	5.40	6.48
Interest charges (IC) e/	0.00	1.08	2.16	3.24	4.32	5.40	6.48
Gross return (GR) f/	116.64	115.02	109.54	113.57	117.70	126.30	120.55
Net return (NR) g/	...	−1.62	−7.1	−3.07	1.06	9.66	3.91
		(−1.39)	(−3.09)	(−0.89)	(0.23)	(1.60)	(0.55)

a/ Average based on price ratio from Table 26, Appendix 2; August–January estimated using seasonal index.

b/ 3.09 percent of MP per month based on third and fourth quarter monetary correction for 1977 of 2.59 percent per month plus 0.50 percent monthly interest on time deposits (compounded).

c/ 3.09 percent of average June–August CMP minus MP or Cr$44.64 (compounded).

d/ 1.5 percent of MP per month (accumulated).

e/ 1.5 percent of MP per month (accumulated).

f/ GR = CMP + OR − FI − SC − IC.

g/ Net return from storage compared to outcome of sale at harvest time. For example, NR in August is Cr$115.02 − Cr$116.64 = −Cr$1.62. Percentage rates of return per month, based on the Cr$116.64 initial value, are given in parentheses.

Table 33—Expected producer returns to storage under the minimum price program for beans (macaçar), Ceará, Brazil, 1977

Item	Average June – August	August	September	October
		(Cr$/60 kg)		
Minimum price 1977 (MP)	130.20	...	...	...
Current market price (CMP) a/	299.46	309.43	339.45	366.58
Opportunity return (OR) b/	0.00	4.02	8.17	12.45
Forgone income (FI) c/	0.00	5.23	10.62	16.18
Storage costs (SC) d/	0.00	1.30	2.60	3.90
Interest charges (IC) e/	0.00	1.95	3.90	5.85
Gross return (GR) f/	299.46	304.97	330.50	353.10
Net return (NR) g/	...	5.51	31.04	53.64
		(1.84)	(5.05)	(5.65)

a/ Average based on price ratio from Table 5; August – October estimated using seasonal index.

b/ 3.09 percent of MP per month based on third and fourth quarter monetary correction for 1977 of 2.59 percent per month plus 0.50 percent monthly interest on time deposits (compounded).

c/ 3.09 percent of average June–August CMP minus MP or Cr$169.26 (compounded).

d/ 1.0 percent of MP per month (accumulated).

e/ 1.5 percent of MP per month (accumulated).

f/ GR = CMP + OR – FI – SC – IC.

g/ Net return from storage compared to outcome of sale at harvest time. For example, NR in August is Cr$304.97 – Cr$299.46 = Cr$5.51. Percentage rates of return per month, based on the Cr$299.46 initial value, are given in parentheses.

Table 34—Expected wholesaler returns to storage under the minimum price program for beans (macaçar), Fortaleza, Brazil, 1977

Item	Average June – August	August	September	October
		(Cr$/60 kg)		
Minimum price 1977 (MP)	130.20	...	...	...
Current market price (CMP) a/	350.24	374.37	403.34	433.30
Opportunity return (OR) b/	0.00	4.02	8.17	12.45
Forgone income (FI) c/	0.00	6.80	13.81	21.03
Storage costs (SC) d/	0.00	1.30	2.60	3.90
Interest charges (IC) e/	0.00	1.95	3.90	5.85
Gross return (GR) f/	350.24	368.34	391.20	415.07
Net return (NR) g/	...	18.10	40.96	64.83
		(5.17)	(5.69)	(5.82)

a/ Average based on price ratio from Table 26, Appendix 2; August–October estimated using seasonal index.

b/ 3.09 percent of MP per month based on third and fourth quarter monetary correction for 1977 of 2.59 percent per month plus 0.50 percent monthly interest on time deposits (compounded).

c/ 3.09 percent of average June–August CMP minum MP or Cr$220.04 (compounded).

d/ 1.0 percent of MP per month (accumulated).

e/ 1.5 percent of MP per month (accumulated).

f/ GR = CMP + OR – FI – SC – IC.

g/ Net return from storage compared to outcome of sale at harvest time. For example, NR in August is Cr$368.34 – Cr$350.24 = Cr$18.10. Percentage rates of return per month, based on the Cr$350.24 initial value, are given in parentheses.

Table 35—Estimated demand equations for minimum price loans (EGF) for cotton lint in Northeast Brazil a/

Dependent Variable (n = 10)	Constant Term	PR	I_p	I_e	Q_{ne}	Adjusted R_2	Adjusted Syx
D_{ne}	399	−4,507.7	2,452.9 *		0.0112	0.758	8,573.3
		(4,289.8)	(567.2)		(0.0202)		{8.620}
D_{ne}	11,485	−8,617.0		2,993.0	0.0094	0.254	15,047.7
		(7,283.7)		(2,106.3)	(0.0436)		{1.447}

Figures in parentheses are the standard errors of the net regression coefficients.

Figures in brackets are the F-statistics for the regression equation.

D_{ne} = EGF loans for cotton lint in metric tons, Northeast Brazil.

PR = September–November average lint price for Northeast cotton in São Paulo (Tipo 3 & 4, 32/34 mm) ÷ minimum price for Ceará.

I_p = January–June inflation rate based on FGV, col. 2.

I_e = July–December inflation rate based on FGV, col. 2.

Q_{ne} = metric tons of seed cotton produced in Northeast Brazil.

* Coefficient significantly different from zero at the 5 percent level (two-tailed t-test).

a/ Based on time series data for 10 years, 1968 to 1977.

Table 36—Estimated demand equations for minimum price loans (EGF) for corn in Ceará, Pernambuco, and Northeast Brazil a/

Dependent Variable (n = 10)	Constant Term	PR_1	PR_2	PR_3	I_p	I_e	Q_{ce}	Q_{pe}	Q_{ne}	Adjusted R^2	Adjusted Syx
D_{ce}	− 8,690	− 4,289			1,903**		0.0204			0.454	7,909
		(9,674)			(852)		(0.0304)				{2.711}
D_{ce}	2,697	− 6,473			866		0.0126			0.288	9,031
		(10,991)			(569)		(0.0342)				{1.613}
D_{pe}	−21,022		6,099			−448		0.0808		0.491	5,434
			(9,699)			(556)		(0.0431)			{3.047}
D_{pe}	−16,011		2,054		126			0.0634		0.448	5,658
			(9,763)		(346)			(0.0464)			{2.656}
D_{pe}	−24,430			6,132		−334		0.0801**		0.502	5,372
				(8,319)		(509)		(0.0372)			{3.164}
D_{pe}	−27,267			5,727	141			0.0766**		0.483	5,474
				(8,468)	(320)			(0.0386)			{2.974}
D_{ne}	58,171		−31,584			2,441			−0.0008	0.387	17,211
			(24,221)			(1,755)			(0.0310)		{2.193}

Table 36—Continued

Dependent Variable (n = 10)	Constant Term	PR_1	PR_2	PR_3	I_p	I_e	Q_{ce}	Q_{pe}	Q_{ne}	Adjusted R^2	Adjusted Syx
D_{ne}	21,768		−17,957		1,830				0.0073	0.466	16.054
			(25,205)		(1,036)				(0.0301)		{2.819}

Figures in parentheses are the standard errors of the net regression coefficients.

Figures in brackets are the F-statistics for the regression equation.

D_{ce}, D_{pe}, D_{ne} = EGF loans for corn in metric tons, Ceará, Pernambuco, and Northeast Brazil, respectively.

PR_1 = June–August average producer price of corn in Ceará ÷ minimum price for Ceará.

PR_2 = August–October average producer price of corn in Pernambuco ÷ minimum price for Pernambuco.

PR_3 = August–October average wholesale price of corn in Recife ÷ minimum price for Recife.

I_p = January–June inflation rate based on FGV, col. 2.

I_e = July–December inflation rate based on FGV, col. 2.

Q_{ce}, Q_{pe}, Q_{ne} = metric tons of corn produced in Ceará, Pernambuco, and Northeast Brazil, respectively.

** Coefficient significantly different from zero at the 10 percent level (two-tailed t-test).

a/ Based on time series data for 10 years, 1968 to 1977.

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