RESEARCH REPORT

THE BRAZILIAN WHEAT POLICY: ITS COSTS, BENEFITS, AND EFFECTS ON FOOD CONSUMPTION

Geraldo M. Calegar
G. Edward Schuh

May 1988

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

The **International Food Policy Research Institute** was established in 1975 to identify and analyze alternative national and international strategies and policies for meeting food needs in the world, with particular emphasis on low-income countries and on the poorer groups in those countries. While the research effort is geared to the precise objective of contributing to the reduction of hunger and malnutrition, the factors involved are many and wide-ranging, requiring analysis of underlying processes and extending beyond a narrowly defined food sector. The Institute's research program reflects worldwide interaction with policymakers, administrators, and others concerned with increasing food production and with improving the equity of its distribution. Research results are published and distributed to officials and others concerned with national and international food and agricultural policy.

The Institute receives support as a constituent of the Consultative Group on International Agricultural Research from a number of donors including the United States, the World Bank, Japan, Canada, the United Kingdom, the Netherlands, Australia, the Ford Foundation, Italy, Norway, the Federal Republic of Germany, India, the Philippines, Switzerland, Belgium, and the People's Republic of China. In addition, a number of other governments and institutions contribute funding to special research projects.

THE BRAZILIAN WHEAT POLICY: ITS COSTS, BENEFITS, AND EFFECTS ON FOOD CONSUMPTION

Geraldo M. Calegar
G. Edward Schuh

Research Report 66
International Food Policy Research Institute
May 1988

Library of Congress Cataloging in Publication Data

Calegar, Geraldo M.
The Brazilian wheat policy.

(Research report ; 66)
Bibliography: p. 61.
1. Wheat trade—Government policy—Brazil. 2. Wheat—Prices—Government policy—Brazil. I. Schuh, G. Edward (George Edward), 1930- II. Title. III. Series: Research report (International Food Policy Research Institute) ; 66.

HD9049.W5B79 1988 338.1'8 88-673
ISBN 0-89629-068-9

CONTENTS

TABLES

ILLUSTRATIONS

FOREWORD

International Food Policy Research Institute (IFPRI) has a long record of research on various aspects of food subsidies in developing countries, including effects on consumption, production, and foreign trade. In addition to a number of research reports on countries including Brazil, India, Egypt, Bangladesh, Sri Lanka, and the Philippines, a series of working papers on food subsidies is in progress. This extensive body of work examines the social costs and benefits of subsidies from the viewpoint of nutrition, income levels and distribution, and equity between rich and poor and rural and urban, as well as fiscal costs. This large effort has been prompted by the critical importance of food prices to the real incomes of the poor, the large public costs of food subsidy programs, and the potential effects of these policies on food production.

This report on Brazil's wheat subsidies is particularly interesting because the government has intervened extensively in both production and consumption with often conflicting results. In doing so, it has inadvertently created severe strains on the economy that have had far-reaching results. By making available the results of studies such as this, IFPRI provides policymakers with information to choose wisely among the options for increasing agricultural production and feeding the poor, while avoiding the pitfalls that in the long run have high costs not only to efficiency but to equity as well.

John W. Mellor

Washington, D.C.
May 1988

ACKNOWLEDGMENTS

The authors wish to thank Per Pinstrup-Andersen for his support and encouragement throughout the preparation of this report.

Many thanks are also extended to Peter Knight, Mauro Lopes, Inês Lopes, and Roque G. A. Tomasini, who introduced us to the wheat production and consumption issues in Brazil and helped us to gather basic data, without which this study could not have been done.

Helpful comments and suggestions were also provided by Sue Horton, Alberto Valdés, Antônio Salazar P. Brandão, and anonymous referees.

In addition, we also wish to thank the Agricultural Research Center for the Semi-Arid Region of Northeast Brazil, Aldomar Coelho Lima and Antônio Alvino de Souza for their computational assistance, and Ricardo Alves Dantas, who typed the final version.

1

SUMMARY

Large government interventions in Brazil's wheat sector in recent years have raised questions about possible negative effects on resource allocation, expenditure on foreign exchange, and the drain on the public budget. This study is an attempt to identify and measure the main effects of these interventions on welfare, income distribution, and trade.

The two components of Brazilian wheat policy—production and consumption policies—are kept relatively separate. Both components derive from national goals of self-sufficiency in wheat supply, control of inflation, provision of low-cost food for the urban population, and improvement in the distribution of income. To implement its policies, the central government has become the only seller and buyer of both imported and domestically produced wheat. Moreover, the government has maintained rigid control over prices at the producer, wholesale, and retail levels.

This study attempts to estimate the aggregate effects of Brazilian wheat policy on domestic production, consumption, and imports, as well as its subsidy, social, and foreign exchange benefits and costs. It also estimates the effects of the wheat consumption policy on income distribution of a selected area in Brazil, comparing the effects with those of a similar policy for rice.

The basic analytical tools used are standard partial equilibrium and comparative static analyses, whenever necessary making use of the concepts of economic surplus. The first part of the analysis is made at the national level. The effects of production and consumption subsidies on the quantities produced, consumed, and imported, with and without interventions, are estimated, as are the welfare effects for producers, consumers, and for society as a whole during the period 1966-82.

In the second part of the analysis, which is based on disaggregated data, the effects of the consumption policy on the relative and absolute gains for consumers by expenditure group in the metropolitan area of Belo Horizonte and rural areas of the states of Minas Gerais and Espírito Santo are estimated for the year 1974/75.

During the period considered in this study, 1966-82, the Brazilian government made a sustained effort to achieve self-sufficiency in wheat through a production policy that consisted of a guaranteed producer price keyed to the cost of producing wheat. This producer price was generally above border prices evaluated at official exchange rates and below border prices evaluated at the shadow exchange rate. Compared with historical levels, wheat production would have been higher if the free market had prevailed at the shadow exchange rate in 4 years and lower in 13 others. The reason for this disparity is that the cruzeiro (Cr$) was persistently overvalued during this period. Hence, the producer subsidy in most cases only offset the tax resulting from a distorted exchange rate.

The wheat consumption policy, like the production policy, had two main components: an implicit subsidy to consumers resulting from the overvalued currency, and, mainly after 1972, an explicit general price subsidy. Throughout the period, aggregated wheat consumption increased mainly as a consequence of the explicit subsidy, and with the exception of seven years (1966-72), the increase in consumption was greater than the increase in wheat production, when evaluated at the official exchange rate. As a whole, the explicit production subsidy was able to reduce net imports only during the seven years referred to above. The gains in production were small, especially after discounting for the increase in seed demand for the following year in order to increase the area planted.

The wheat production policy for the whole period (1966-82) represented an estimated net subsidy of Cr$11.6 billion (in real 1977 cruzeiros), evaluated at the official exchange rate, and an estimated net tax of Cr$15.3 billion evaluated at the shadow exchange rate. This subsidy was due in part to the rise in the price of wheat in the world market in the mid- and late 1970s, at which time the domestic price set by the government fell short of the border price. In addition, the overvaluation of the cruzeiro represented a tax on producers.

The estimated social costs of the production policy for the whole period were Cr$2.1 billion and Cr$2.9 billion, evaluated at official and shadow exchange rates, respectively (again in real 1977 cruzeiros). The effects on foreign exchange induced by the production policy for the whole period were estimated to be a saving of about Cr$5.0 billion and an expenditure of Cr$16.4 billion. This latter expenditure in foreign exchange was contrary to the stated objective of the explicit production policy. Because of these failures, the wheat policy did not meet its stated objectives satisfactorily.

The total cost of the wheat consumption subsidy for the whole period was about Cr$84 billion at the official rate and Cr$150 billion at the shadow rate. Of this total, estimates show that consumers captured a maximum of 86 percent. However, because of spillover effects (approximately one-third of the total subsidy was captured by those outside of the target group), manipulations by the millers (another one-third) and social costs amounting to about 15 percent of the total cost of the subsidy, only 19 percent of the total subsidy during the period was captured by low-income consumers, the true target group. Thus, the cost-effectiveness of the wheat consumption subsidy is poor. This conclusion is reinforced by the results obtained from alternative consumption policy analysis, in which a general price subsidy for bread was ranked in third place and cost 4.5 to 7.4 times more than a food stamp program.

For foreign exchange expenditure, the wheat consumption subsidy program cost Cr$30 billion at the official exchange rate and Cr$54 billion at the shadow exchange rate. The expenditure was not in accord with one of the objectives of the wheat production policy, that of achieving a saving in foreign exchange. The combined effect of the production and consumption policies is the sum of the individual effects of each policy.

Even though the gains in consumer welfare are slightly biased toward high-expenditure groups, the disaggregative analysis shows that the wheat consumption subsidy contributed to the income redistribution objective by distributing the benefits of the subsidy equitably. When the same subsidy costs for wheat are shifted to rice in a simulated general price subsidy, the distribution of the gains is slightly biased toward the low-expenditure groups. However, two main points should be considered: first, even if a cut in the wheat consumption subsidy (or the simulated rice subsidy) harms the low- and medium-expenditure groups more, the decline in real expenditure is slight (less than 2 percent). Second, the nutritional effect in kilocalories consumed was small—less than 1.5 percent of the total per capita energy intake.

Finally, based on the cases studied in the alternative policy analysis, the wheat consumption subsidy is not an effective policy for redistributing income, nor for dealing with malnutrition problems. The alternative consumption policy analysis shows that if food consumption is to be subsidized, the subsidy should be through a target-oriented program, such as food stamps.

2

BRAZILIAN WHEAT POLICY

Both the production and consumption components of Brazilian wheat policy derive from a number of frequently articulated national goals: self-sufficiency in wheat supply, control of inflation, provision of cheap food for the urban population, and improvement in the distribution of income. To implement its policies, the central government has maintained both a monopolistic and a monopsonistic role in the wheat market, thus making it the only seller and buyer of both imported and domestically produced wheat. Moreover, the government has maintained rigid control over prices at the producer, wholesale, and retail levels.

This study has three main objectives: first, to estimate the total effect of Brazilian wheat policy on the levels of domestic production, consumption, and imports; second, to estimate aggregated subsidy, social, and foreign exchange costs, as well as the social benefits of the policy; and third, to estimate the income distribution effects of the wheat consumption policy for a selected area in Brazil, comparing them with those of a similar policy for rice.

The first part of this chapter deals with production policy, emphasizing the reasons for the chosen policy of self-sufficiency. The second part deals with consumption policy and speculates on the reasons for its particular form. At the end of each part, some questions are raised that should be of interest to policymakers.

Wheat Production Policy

The production side of Brazilian wheat policy has a fairly long history. Wheat was introduced in Brazil in the first quarter of the sixteenth century by the first European settlers. Prior to the mid-1930s, however, there is no indication that the wheat crop ever developed sufficiently to satisfy domestic demand. Because of the absence of a guaranteed market for domestically produced wheat, farmers in the southern states of Brazil (Rio Grande do Sul and Santa Catarina) had little incentive to increase wheat production beyond the amount required to satisfy their own needs. Thus there was little surplus to be marketed. In the mid-1930s the government established a chain of experimental stations to develop production technologies suitable to Brazilian conditions. However, cultivated area and production remained relatively small until 1967 (Table 1), reflecting the high cost of production, poor soils, serious disease problems, difficult climatic conditions, and inadequate scientific and technical support.

Starting in about 1967, cultivated area and production began to increase at a fairly rapid rate, reaching record highs in area in 1979 and in production in 1976 (Table 1). As a whole, however, production has been relatively unstable, primarily because of climatic conditions and diseases, which have made wheat production a somewhat risky activity. Since wheat is an off-season (winter) crop in Brazil, it seldom conflicts with the main in-season (summer) crop, soybeans. The machinery, labor, and some chemical inputs applied to wheat are complementary with soybean production. On the negative side, however, the chronologies of the two crops do not fit perfectly. Soybean production can be reduced about 6 percent, on average, by the delay in planting caused by waiting for the wheat harvest. In the northern part of the states of Paraná, São Paulo, and Mato Grosso, the overlap period is in the fall, when the soybean harvest delays wheat planting.

Because of the risks associated with the production of wheat and the penalty to soybean yields when double-cropped with wheat, there is a large annual variation in

Table 1—Cultivated area, production, and average yields of wheat, 1962-82

Year	Area	Production	Yield
	(hectares)	(metric tons)	(kilograms/hectare)
1962	258,221	255,404	986
1963	302,122	97,811	324
1964	300,542	213,691	711
1965	354,680	221,576	625
1966	385,028	298,523	775
1967	561,987	364,870	649
1968	845,693	693,508	820
1969	1,299,518	1,146,319	882
1970	1,861,204	1,734,972	932
1971	2,008,215	2,038,632	1,015
1972	2,340,431	693,399	296
1973	1,604,305	1,934,439	1,206
1974	2,212,643	2,848,040	1,287
1975	3,110,830	1,582,587	509
1976	3,520,709	3,037,864	863
1977	3,020,831	2,012,842	666
1978	2,794,365	2,700,707	966
1979	4,104,144	2,881,186	702
1980	3,318,501	2,702,130	814
1981	2,063,747	2,223,032	1,077
1982	2,960,010	1,802,337	609

Sources: Banco do Brasil, "Trigo Nacional," Departamento de Comercialização do Trigo Nacional, Pôrto Alegre, RS, December 1979 (mimeographed); and Banco do Brasil, "Preços de Trigo para os Produtores e Volume de Produção," Departamento de Comercialização do Trigo Nacional, Pôrto Alegre, RS, 1983 (mimeographed).

area planted to wheat as individual farmers adjust their planting to changing conditions. In recent years the area planted in soybeans has increased more rapidly than the area planted in wheat, as some farmers have opted to plant soybeans alone rather than risk a potential failure in the wheat crop. After 1972, the area in soybeans increased faster than that in wheat, and in 1980, 8.6 million hectares were planted to soybeans, whereas only 3.3 million hectares were planted to wheat.

The few alternatives to wheat in the winter season include pasture, oats, flax, and rapeseed. Pasture requires an associated livestock enterprise and is not a viable alternative for all soybean producers. Oats and flax have limited markets. Rapeseed is a new crop being tested at the experimental station level. If viable, it would have a market similar to soybeans with possible application as a substitute for diesel oil.

Guaranteed producer prices have been used to stimulate domestic production of wheat ever since 1938. In recent years the producer price has been set by the National Supply Council (CONAB) and made public by the National Supply Superintendency (SUNAB) through reports of deliberations known as *portarias*. Domestic production is purchased by the Bank of Brazil according to rules designed to avoid frauds, such as those that have occurred in the past. These frauds gave rise to such concepts as "paper wheat" and "wheat nationalization."

Both kinds of fraud had their roots in a dual price system. Because of the production subsidy built into the guaranteed producer price, the price of domestically produced wheat was above the world free market price, while the price of imported wheat was below the free market price because of the implicit consumption subsidy that resulted from a more favorable exchange rate for wheat imports. The "paper wheat" fraud was of two types. The first consisted of an agreement between miller and producer for a pseudo purchase of national wheat, which gave the miller the right to acquire a corresponding quota of the cheaper imported wheat. The second type appeared after Government Decree Number 40,316 of November 8, 1956, which determined that the price of domestically produced wheat consisted of two parts, one paid by the miller at the moment of purchase from the producer, and the other paid by the Bank of Brazil when the producer presented the receipt of sale. With this system it became only a matter of acquiring a receipt of sale for quantities greater than were actually sold, or even nonexistent sales, in order to profit.

The "wheat nationalization" fraud consisted of taking the low-priced wheat imported by the miller through the quota system and following it back to the farmer from where it returned "nationalized" as being produced domestically at a cost of al-

most twice that of the imported wheat. Thus, in order to profit through either of these frauds one had only to know how to manipulate the bureaucratic mechanisms.

In order to put an end to these frauds, on November 9, 1962, the government approved a resolution that named the Bank of Brazil as the only direct buyer of domestically produced wheat.[1] As a consequence of the earlier fraud schemes, data on domestic wheat collected prior to 1962, the date of the government resolution, are not considered reliable. Since 1962 these frauds have occurred less frequently.

Self-sufficiency in wheat production has been a policy goal pursued by the government for a long time, primarily through a producer price policy that guarantees prices above world market prices. In addition, however, considerable resources have been provided for the development of marketing facilities. These facilities include cooperatives for supplying inputs, the Bank of Brazil for purchasing the output, and the Brazilian Storage Company (CIBRAZEM) for storing and distributing the production to mills throughout the country.

The main arguments used to justify the goal of self-sufficiency can be grouped in three basic categories—economic, political, and romantic.[2] The economic category includes three arguments. The first, based on foreign exchange considerations, argues that wheat imports consume valuable foreign exchange that should be reserved for importing goods more essential to Brazil's growth.[3] A second argument is that many resources have already been invested in machinery, marketing structures, and other kinds of human and physical capital, and that these investments, as well as the people who depend on them, should not be abandoned because the resources involved are not perfectly mobile. The third argument is that foreign countries, including some of Brazil's major suppliers, subsidize wheat production, and therefore Brazilian producers must be subsidized if they are to compete with foreign exports.

In an attempt to evaluate these arguments, Knight noted that "the main economic argument is that wheat production should not be rapidly reduced, because this policy would involve a waste of resources already committed to wheat or wheat-soybean production, as well as considerable social costs. No valid economic arguments exist, however, for increasing wheat production further until research and extension have drastically altered the efficiency with which resources can be employed in this activity."[4]

Since it is not possible to justify the self-sufficiency policy followed by the government in terms of short-run economic efficiency, one might go further and think in terms of long-run efficiency along the lines of an "infant industry" argument. On these grounds, increasing production over time would be expected either to drive production costs down or give rise to some positive externalities.

Data on the evolution of production costs for wheat over time, however, indicate that they have almost always been equal to the price guaranteed by the government for the respective year.[5] Moreover, with few exceptions, the guaranteed price, calculated at the official exchange rate, from 1967 through 1982 was almost always above world prices. The exceptions were 1973-74 and 1980, when world prices were above domestic producer prices because of a large increase in world wheat prices (Table 2). The infant

---

[1] For details see Ricardo Pereira Soares, *Avaliação Econômica da Política Tritícola de 1967 a 1977*, vol. 20. (Brasília: Comissão de Financiamento da Produção, Coleção Análise e Pesquisa, 1980); and Peter Knight, *Brazilian Agricultural Technology and Trade—A Study of Five Commodities* (New York: Praeger, 1971), p. 223.

[2] These arguments were set forth in Knight, *Brazilian Agricultural Technology.*

[3] This has been the basis of much of Brazil's more general import-substituting posture.

[4] Knight, *Brazilian Agricultural Technology.*

[5] Fereração das Cooperativas Brasileiras de Trigo e Soja LTDA, "Custo de Produção: Trigo Revisão Safra, 1983, Soja-Estimativa, 1983-84," Pôrto Allegre, Rio Grande do Sul, 1983; and World Bank, *Brazil: A Review of Agricultural Policies* (Washington, D.C.: World Bank, 1982).

Table 2---Estimated real prices at the producer, miller, and border levels for wheat, 1965-82

Year	Producer Price	Index	Miller Price	Index	Border Price	Index
	(1977 Cr$/ metric ton)	(1965 100)	(1977 Cr$/ metric ton)	(1965 100)	(1977 Cr$/ metric ton)	(1965 100)
1965	3,577	100	2,707	100	3,888	100
1966	3,246	91	2,222	82	3,941	101
1967	3,170	89	2,096	77	3,998	103
1968	3,141	88	2,116	78	3,523	91
1969	3,107	87	2,006	74	3,371	85
1970	2,955	83	2,161	80	2,950	76
1971	2,955	77	2,036	75	2,728	70
1972	2,587	72	1,950	72	2,828	73
1973	2,736	76	1,897	70	4,042	104
1974	3,838	107	1,838	68	5,806	149
1975	3,389	95	1,480	55	4,180	108
1976	3,012	84	1,093	40	3,742	96
1977	3,398	95	1,202	44	2,496	64
1978	3,251	91	1,032	38	2,807	72
1979	2,498	70	732	27	3,103	80
1980	2,424	68	516	19	3,594	92
1981	2,929	82	1,105	41	3,338	86
1982	3,123	87	1,364	50	2,979	77

Source: Calculated by the authors.

Notes: The producer price is the farmgate price adjusted to the mill level. The miller price is the price set by the government, including the consumer subsidy. The border price is the c.i.f. price plus the port-to-mill expenses, using the shadow exchange rate to convert the c.i.f. prices to the domestic currency.

industry argument, therefore, does not appear to be relevant.

To evaluate the foreign exchange savings argument, one can take as a criterion the domestic resource cost of a U.S.$1.00 saving in wheat imports. Previous studies have found that coefficient to be 2.20 for 1967, 2.47 for 1968, 2.00 for 1971, and 1.35 for 1976/77.[6] This means that it cost at least U.S.$1.35 in domestic resources to save U.S.$1.00 in wheat imports, and in some years it cost significantly more.

These data suggest that the production subsidy has not only driven a wedge between domestic and world price, but it may also be worsening the foreign exchange situation. That would be the case if resources were being attracted to the production of wheat at the expense of some other exports that would be socially profitable in terms of generating foreign exchange.

The political arguments favoring domestic wheat production are based on the supposed value of economic autarky. One such argument is that in case of a world war the country might be strongly penalized by its high wheat consumption and the need to depend heavily on imports. A second argument is that countries that supply a large part of these imports might impose economic pressures on Brazil. A third is that there is always the possibility of a large rise in wheat prices in the world market, such as occurred in the mid-1970s, and that paying these prices might create political difficulties at home.

Regarding these political reasons for subsidizing domestic wheat production,

[6] Coefficients for 1967 and 1968 are from Knight, *Brazilian Agricultural Technology;* those for 1971 are from José Roberto Mendonça de Barros, "Exportações de Produtos Primários Não Tradicionais," Série IPE Monografias 4, Universidade de São Paulo, 1974, p. 67; and those for 1976/77 are from Pereira Soares, Avaliação Econômica da Política Triticola.

Knight noted that "it should be remembered, however, in weighing these essentially noneconomic arguments, that wheat is not indispensable, and that the production of many low-cost substitutes could be rapidly increased in the event of a future emergency."[7]

The romantic reasons for pursuing the domestic production of wheat are the least important of the three broad sets of arguments set forth above and will not be considered here.[8]

Few studies have attempted to evaluate the real and monetary effects of the wheat production policy over time.[9] But because of current high rates of inflation, the government has recently been forced to cut expenditures in order to balance the budget. As a consequence, questions have been raised about all kinds of subsidies. In the case of wheat subsidies, policymakers would benefit from answers to the following questions: What has been the total treasury cost of the programs? What have been the gains in producers' welfare? What have been the social costs of the subsidies? What have been the savings or losses in foreign exchange? And, what has been the real increase in production due to the subsidies? This study will attempt to provide answers to these questions.

Wheat Consumption Policy

The consumption side of Brazilian wheat policy has a more recent history, even though wheat, in the form of French bread, macaroni, and wheat flour, has been a staple in the consumer's food basket ever since colonial days. Only since 1972, however, when an explicit systematic general consumption subsidy was instituted, has the per capita consumption of wheat shown a clear tendency to increase (Table 3). This subsidy has been a major factor in impeding the attainment of self-sufficiency in wheat production, especially after 1972, because it contributed strongly to keeping the ratio of domestic production to consumption low (Table 4). As a result, imports have supplied an average of approximately 70 percent of domestic consumption in the last 17 years.

Wheat is the major food item imported in Brazil. Both consumption and imports have had a clear tendency to increase over time, with a peak reached for both values in 1980. The value of wheat imports as a share of total value of imports headed downward prior to 1971, but since then it has fluctuated around 3 to 4 percent, in large part because of the consumption subsidy.

According to Luis Eduardo Carvalho, the main reason for providing an explicit consumption subsidy in the period after 1972 was to reduce domestic price inflation, and specifically to escape the effects of the increases in the world price of wheat in the mid 1970s.[10] Concern was also expressed about maintaining the nutritional status of low-income groups. The subsidy was instituted in the expectation that the world price of wheat would soon return to the low levels that prevailed before the increase. But real wheat prices (1967 = 100) did not return to the old levels of U.S.$60-U.S.$70 per metric ton that prevailed in the late 1960s and early 1970s.[11] Instead, the price of wheat rose to U.S.$148 in 1974, went to U.S.$61 in 1977 and to U.S.$71 in 1978, and rose again to U.S.$90 in 1980 and to U.S.$81 in 1981.

The effects of consumption subsidies on inflation are not as straightforward as proponents of such subsidies seem to believe. In a narrow sense, such subsidies can lower

---

[7] Knight, *Brazilian Agricultural Technology*.

[8] Ibid.

[9] See Claudio Roberto Contador, "Trigo Nacional: O Custo Social da Auto-Suficiência," *Estudos Econômicos* 4 (No. 3, 1974): 53-85; Pereira Soares, *Avaliação Econômica da Política Tritícola;* and Knight, *Brazilian Agricultural Technology.*

[10] Luis Eduardo Carvalho, "O Caráter Social da Política de Subsídio ao Trigo," *Alimentação e Nutrição* (March 1981): 32-42.

[11] All tons referred to in this report are metric tons.

Table 3—Annual per capita consumption of wheat, rice, and beans, 1966-81

Year	Wheat	Rice	Beans
		(kilograms)	
1966	29.2	43.6	23.4
1967	27.9	45.8	27.2
1968	32.3	45.9	24.6
1969	32.0	41.8	21.7
1970	32.6	47.8	21.5
1971	33.6	42.9	25.7
1972	34.5	48.9	24.9
1973	37.9	43.2	20.2
1974	40.0	40.7	19.4
1975	42.3	42.3	19.4
1976	46.9	52.1	15.0
1977	47.5	48.5	19.4
1978	49.9	40.0	17.4
1979	52.5	45.2	...
1980	57.1	47.0	...
1981	50.0	50.4	...

Sources: Data on wheat consumption are from Brazil, National Supply Superintendency, Departamento do Trigo, "Evolução do Preço do Trigo em Grão para Produtores e Moinhos e Consumo Aparente de Farinha de Trigo," SUNAB, Rio de Janeiro, 1983 (mimeographed); data on population are from Banco Central, *Brasil: Programa Econômico: Ajustamento Interno e Externo*, October 1982; and data on rice and beans are from Fundação Instituto Brasileiro de Geografia e Estatística, *Anuário Estatístico do Brasil* (Rio de Janeiro: FIBGE, various years).

the cost of living of particular groups in society. Moreover, wheat products are heavily weighted in the calculation of the general price index. As computed by the Getúlio Vargas Foundation, the General Price Index (IGP-DI) is a weighted average of wholesale prices (0.6), the consumer price index in Rio de Janeiro City (0.3), and the civil construction cost index in Rio de Janeiro (0.1). (The latter was replaced in 1985 by a National Civil Construction Cost Index with the same weight of 0.1.)[12] The wheat and wheat products included in the Wholesale Price Index (IPA-DI) are as follows:

	Weights
Wheat	1.2229
Wheat flour	0.4347
Total	1.6576

Those in the Consumer Price Index in Rio de Janeiro (IPC-RJ) are

	Weights
Wheat flour	0.0756
French bread	3.1819
Subtotal	3.2575
Sandwich loaf	0.2111
Noodles *(masas)*	1.5988
Cakes	0.1571
Cookies	0.3155
Subtotal	2.2825
Total	5.5400

Thus, the total weight for wheat and wheat flour in the IPA-DI corresponds to 0.994690 in the IGP-DI. If the wheat flour and French bread from the IPC-RJ (3.2575 · 0.3 = 0.9773) are added to that, the wheat and wheat products in the IGP-DI will correspond to at least 1.9719 percent of total weight. The other items in the IPC-RJ listed above, including wheat products and others such as maize products, correspond to a weight of 0.684 percent in total IGP-DI. Thus, wheat products correspond to at least 1.9719 percent and, at most, 2.6567 percent of the total weight of the IGP-DI.[13] Hence, on the surface, such subsidies would appear to contribute to reducing measured inflation. However, their government costs contribute to the budget deficit and, consequently, are a general cause of inflation, as has been shown in Egypt[14] and Pakistan.[15]

[12] Getúlio Vargas Foundation, "General Price Index."

[13] José L. Carvalho, personal communication, Rio de Janeiro, May 13, 1986.

[14] Grant M. Scobie, *Food Subsidies in Egypt: Their Impact on Foreign Exchange and Trade*, Research Report 40 (Washington, D.C.: International Food Policy Research Institute, 1983).

[15] F. D. McCarthy and Lance Taylor, "Macro Food Policy Planning: A General Equilibrium Model for Pakistan," *Review of Economics and Statistics* 62 (February 1980): 107-121.

Table 4—Consumption and imports of wheat grain and selected ratios, 1966-82

Year	Consumption A	Imports B	Relative Shares (B/A)·100	(C/A)·100	(D/E)·100
	(1,000 metric tons)				
1966	2,448	2,391	98	8	10.5
1967	2,404	2,446	102	10	10.8
1968	2,884	2,621	91	10	7.6
1969	2,908	2,356	81	20	6.6
1970	3,034	1,969	65	32	4.1
1971	3,209	1,711	53	47	3.3
1972	3,378	1,797	53	56	5.1
1973	3,798	2,946	76	12	4.6
1974	4,116	2,399	58	40	3.3
1975	4,437	2,082	47	56	3.9
1976	5,064	3,426	68	25	3.4
1977	5,252	2,608	50	51	2.5
1978	5,656	4,334	77	27	3.8
1979	6,097	3,651	60	38	3.4
1980	6,802	4,755	70	38	3.7
1981	6,098	4,360	72	38	3.2
1982	6,101	4,144	68	30	3.1

Sources: For consumption data: Brazil, National Supply Superintendency, Departamento do Trigo, "Evolução do Preço do Trigo em Grão para Produtores e Moinhos e Consumo Aparente de Farinha de Trigo," SUNAB, Rio de Janeiro, 1983 (mimeographed); for import data, Fundação Instituto Brasileiro de Geografia e Estatística, *Anuário Estatístico do Brasil* (Rio de Janeiro: FIBGE, various years); Banco do Brasil, "Trigo Nacional," Departamento de Comercialização do Trigo Nacional, Pôrto Alegre, RS, 1979; and Fundação Getúlio Vargas, *Conjuntura Econômica*, various issues.

Notes: A = consumption,
B = imports,
C = (production, [illegible] seeds),
D = f.o.b. value of wheat imports, and
E = f.o.b. value of all Brazilian imports.

Telma Ferreira e Silva[16] estimated that, as of November 1980, a reduction of the consumption subsidy by 25, 50, and 100 percent would have increased the general price index by 0.57, 1.14, and 2.27 percent, respectively, other things being equal.[17] If one recognizes that during 1980 the inflation rate in Brazil was 110 percent, then it would appear to make little difference, except in a distributional sense, to have an inflation rate 2.27 percent higher by cutting the entire wheat consumption subsidy. Since the effect on the measured rate of inflation of eliminating the subsidy would not be great, and it would have only a one-time effect, then the question remains, "Why doesn't the government eliminate it?" The answer to this question leads to the other major reason for maintaining the consumption subsidy—that the subsidy is supposedly relevant to lowering the price of wheat products to benefit low-income groups who are heavily dependent on those products.

Few studies have been made of this issue.[18] Those that have been made, however, have suggested that the subsidy has

[16] Telma Ferreira e Silva, "Política Triticola—Efeitos de uma Redução no Subsídio" (M.S. thesis, Universidade Federal de Viçosa, 1981).

[17] Discussion of inflation in Brazil usually focuses on the cost of living *(custo de vida)*.

[18] See Ferreira e Silva, "Política Triticola"; L. E. Carvalho, "Caráter Social de Política de Subsídio ao Trigo"; and Cheryl Williamson Gray, *Food Consumption Parameters for Brazil and Their Application to Food Policy*, Research Report 32 (Washington, D.C.: International Food Policy Research Institute, 1982).

benefited medium- and high-income groups more than low-income groups.

At least two issues of interest arise relevant to the consumption subsidy for wheat. First, this subsidy has in fact benefited mostly medium- and high-income groups in society because those groups (all those above 2X in Table 5) consume more of the three major wheat products than the low-income groups (X-2X in Table 5). Moreover, on a regional basis, the poorer northeast, north, and center-west regions have benefited less from the subsidy than the more developed south and southeast regions (Table 6). This is because the former regions have lower per capita consumption rates than do the latter, even though per capita consumption has increased substantially in the poorer regions since 1972.

Despite the bias of the subsidy in favor of medium- and high income groups, it is important to note that low income families spend a larger share of their budget on wheat products (5-6 percent) than do medium- and high income families (about 1 percent). Thus, in a relative sense a price increase for these products would have a larger relative effect on low income families, in a situation in which about 72 percent of the economically active population receives only 25 percent of all income.[19]

A second issue is that the consumption subsidy has distorted the relative prices between wheat products and rice, beans, maize flour, and cassava flour, making wheat products relatively cheaper (Table 7) and stimulating their consumption (Table 5). As a consequence of the subsidy, the producers of rice, beans, maize, and cassava, who are usually poor small farmers, have suffered discrimination.

To the authors' knowledge, there have been no previous studies of these two important issues that have attempted to estimate

Table 5---Per capita consumption of wheat by level of expenditure, 1974/75

City	Wheat Product	Average	X	1X	2X	2X	4X	4X	8X	8X	12X	12X	20X	20X	28X	More than 28X
								(grams/person/day)								
Rio de Janeiro	Bread	80	45	67	83		91		91		81		77		73	
	Macaroni	19	22	21	19		19		16		12		12		16	
	Flour	4	1	2	3		6		7		8		13		10	
São Paulo	Bread	73	32	60	74		78		83		81		72		62	
	Macaroni	18	13	14	17		19		24		19		19		18	
	Flour	6	2	3	4		6		9		13		12		16	
Pôrto Alegre	Bread	102	67	90	102		111		104		111		93		101	
	Macaroni	15	11	13	16		15		15		10		10		18	
	Flour	28	38	35	34		23		18		13		19		13	
Distrito Federal	Bread	73	28	52	70		81		87		91		89		84	
	Macaroni	13	4	9	13		15		15		15		10		13	
	Flour	4	0	1	2		4		6		9		7		13	
Belem	Bread	101	69	86	104		121		110		116		109		116	
	Macaroni	11	3	7	12		16		16		14		13		16	
	Flour	2	0	1	1		3		4		3		6		5	

Source: Luis Eduardo Carvalho, "O Caráter Social de Política de Subsídio ao Trigo," *Alimentação e Nutrição* (March 1981): 32-42.

Note: X = a minimum monthly salary per family plus 0.22 of that salary.

[19] L. E. Carvalho, "Caráter Social de Política de Subsídio ao Trigo."

Table 6—Total and per capita consumption of wheat by region, 1972 and 1981

Region	Total Consumption		Percent Change	Per Capita Consumption		Percent Change
	1972	1981		1972	1981	
	(metric tons/year)			(kilograms/year)		
Northeast	654,273 (19.0)	1,302,833 (20.7)	99	22.0	37.5	70
Southeast	1,992,703 (57.7)	3,368,399 (53.5)	69	49.4	71.9	46
South	667,594 (19.4)	1,312,557 (20.8)	97	40.0	69.1	73
North	80,727 (2.3)	183,508 (2.9)	127	22.1	30.8	39
Center-West	54,703 (1.6)	132,703 (2.1)	143	10.6	17.6	66
Total	3,450,000 (100.0)	6,300,000 (100.0)	83	35.0	55.3	58

Source: Luis Eduardo Carvalho, "O Caráter Social da Política de Subsídio ao Trigo," *Alimentação e Nutrição* (March 1981): 32-42.
Note: Numbers in parentheses represent the share of the total.

Table 7—Retail price of wheat flour relative to prices of rice, beans, cassava flour, and maize flour, 1966-82

Year	Pwf/Pr	Pwf/Pb	Pwf/Pcf	Pwf/Pmf
1966	0.88	0.83	2.00	...
1967	0.69	1.20	1.69	1.85
1968	1.00	1.26	1.93	2.20
1969	1.04	0.73	2.06	2.05
1970	1.17	0.85	1.85	1.85
1971	0.99	0.87	1.45	1.83
1972	0.82	0.88	1.35	1.65
1973	0.90	0.42	1.49	1.59
1974	0.73	0.63	1.40	1.42
1975	0.52	0.53	0.94	0.98[a]
1976	0.50	0.20	0.50	0.83[a]
1977	0.66	0.26	0.65	1.06[a]
1978	0.46	0.38	0.75	0.85[a]
1979	0.35	0.22	0.60	0.75[a]
1980	0.28	0.13	0.43	0.62[a]
1981	0.49[a]	0.21[a]	0.53	0.92[a]
1982	0.36[a]	0.36[a]	0.73[a]	1.40[a]

Source: Fundação Instituto Brasileiro de Geografia e Estatística, *Anuário Estatístico do Brasil* (Rio de Janeiro: FIBGE, various years).
Notes: P is price; wf, wheat flour; r, rice; b, beans; cf, cassava flour; and mf, maize flour.
[a] Average for city of Sao Paulo.
[b] Average for city of Fortaleza.

the treasury, social, and foreign exchange costs or the consumer benefits of the consumption subsidy for wheat, or their relative incidence among income groups. Only one study has attempted to evaluate the alternative products to which the wheat subsidy could be changed in order to diminish the spillover effects.[20] That study did not address the issues listed above.

The government has been urged to phase out these subsidies, especially in light of the drain on the budget. However, given economic, social, and political considerations, it has been difficult to do this. In 1980, the government initiated a plan to remove the consumption subsidy gradually, but at the time of this writing it is still high. Moreover, with current high rates of unemployment, and with the economy in disarray, policymakers could benefit from information on both the real and monetary effects of the subsidies, and on possible lower-cost alternatives to wheat consumption subsidy that would help low-income groups.

[20] Williamson Gray, *Food Consumption Parameters for Brazil.*

3

ANALYSIS OF THE AGGREGATE EFFECTS OF WHEAT POLICY ON PRODUCERS AND CONSUMERS

This chapter deals with the basic model used to develop the aggregative analysis of the wheat consumption and production policies and the discussions of the main results.

A Model for the Aggregative Analysis

Price policy for the Brazilian wheat sector is implemented by means of a multiple price system. The price for producers is set by the government, generally at levels above world market prices or the price at which wheat can be imported. The difference between these two prices constitutes the producer subsidy.

The consumer price is the price at which the government sells the wheat to millers. This price has, in general, been below the world price. The difference between these prices is the consumption subsidy.

Figure 1 presents this multiple price system graphically. SS, DD, and WW are the domestic supply, domestic demand, and world (export) supply of wheat to Brazil, respectively. The world (export) supply to Brazil is assumed to be perfectly elastic, which means that Brazil is assumed to be a price taker in the world market. This is a plausible assumption because Brazil is a relatively small buyer in the world market, taking an average of only 3.6 percent of total world exports.[21]

Standard partial equilibrium and comparative static analysis, which makes use of the concepts of economic surplus is used as the basic analytical tool in this study. Since the literature on this approach to policy analysis is rather large, the justifications for and limitations of the approach will not be addressed here.[22]

The following measures for evaluating the production policy can be derived from Figure 1:

TCP	treasury cost of the production policy subsidy (area a + b),	(1)
CPW	change in producers' welfare (area a),	(2)
SCP	social costs in production (area b),	(3)
FEP	foreign exchange effect on production (area e + i), and	(4)
COP	change in quantity produced (Q_p q_p),	(5)

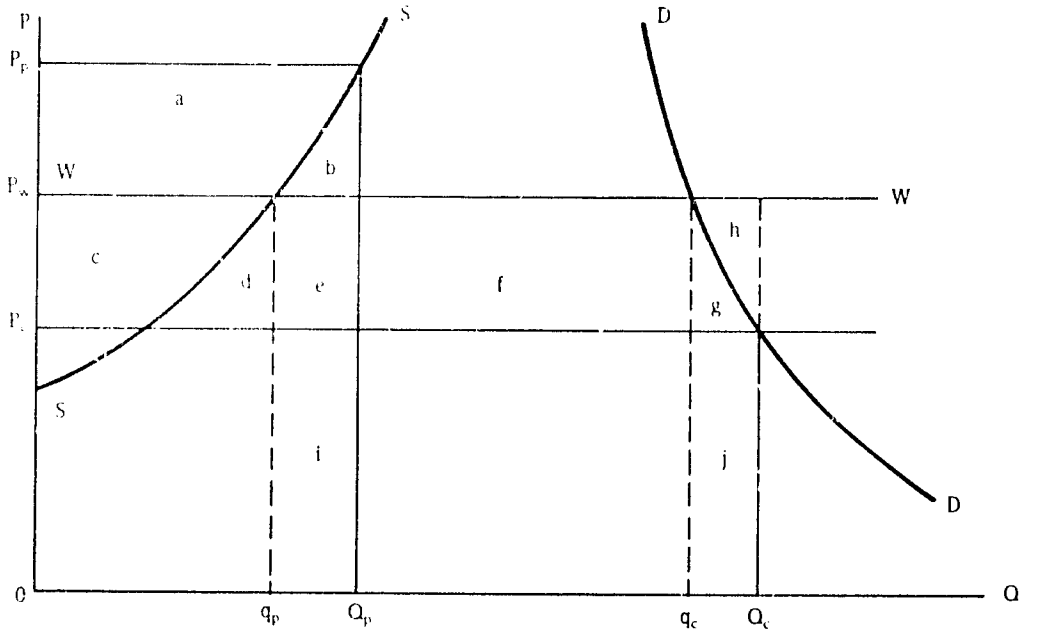
where

Q_p = quantity produced at the subsidized price, and

[21] D. Portela de Lima Fernandes, "Aspectos Econômicos e Estatísticos do Trigo no Brasil." *Informe Agropecuário* 9 (January 1983): 1-8.

[22] Background information can be found in J. M. Curry, J. A. Murphy, and A. Schmitz, "The Concept of Economic Surplus and Its Use in Economic Analysis," *Economic Journal* 81 (December 1971): 741-799; and R. E. Just, D. L. Hueth, and A. Schmitz, *Applied Welfare Economics and Public Policy* (Englewood Cliffs, N.J.: Prentice-Hall, 1982). An application along the lines sought here can be found in Randolph Barker and Yujiro Hayami, "Price Support Versus Input Subsidy for Food Self-Sufficiency in Developing Countries," *American Journal of Agricultural Economics* 63 (February 1981): 8-21.

Figure 1—Multiple price system for wheat



q_p = quantity produced at the world price.

Assuming a constant elasticity supply curve such as $q = aP^{\varepsilon}$, equations (1-5) can be re-written as

$$TCP = (P_p - P_w)Q_c, \quad (6)$$

$$CPW = \int_{P_w}^{P_c} aP^{\varepsilon}\,dP - [Q_p/(1+\varepsilon)][P_p - (P_w/P_p)^{\varepsilon}P_w], \quad (7)$$

$$SCP = TCP - CPW, \quad (8)$$

$$FEP = P_w Q_p[1 - (P_w/P_p)^{\varepsilon}], \text{ and} \quad (9)$$

$$CQP = Q_c[1 - (P_w/P_c)^{\varepsilon}], \quad (10)$$

where

$P_p = [(P_f + m_1) \cdot 100]/GPI,$

$P_w = [(P_{cif} \cdot ER + m_b) \cdot 100]/GPI,$

and

P_p = producer price adjusted to the wholesale level,

P_f = the farmgate price,

P_w = the border price adjusted to the wholesale level,

P_{cif} = the c.i.f. price,

ER = the equilibrium exchange rate,

GPI = the general price index,

m_1 = the farm-to-mill expenses,

m_b = the port-to-mill expenses,

ε = the domestic supply elasticity, and

a = the supply shifter.

To evaluate the consumption policy, one can derive the following measures from Figure 1:

TCC = treasury cost of the consumption policy subsidy [area (c + d + e + f + g + h)], (11)

CCW = change in consumers' welfare [area (c + d + e + f + g)], (12)

SCC = social cost of consumption policy (area h), (13)

FEC = foreign exchange effect on the consumption side [area (h + g + j)], (14)

and

CQC = change in quantity consumed ($Q_c - q_c$), (15)

where

Q_c = quantity consumed at the subsidized price, and

q_c = quantity consumed at the world price.

Assuming a constant elasticity demand curve, such as $q = bP^{-\eta}$, one can rewrite equations (11-15) as

$$TCC = (P_w - P_f)Q_c, \quad (16)$$

$$CCW = \int_{P_w}^{P_c} bP^{-\eta}dP - [Q_c/(1-\eta)][(P_c/P_w)^{\eta}P_w - P_c], \quad (17)$$

$$SCC = TCC - CCW, \quad (18)$$

$$FEC = P_w Q_c[1 - (P_c/P_w)^{\eta}], \text{ and} \quad (19)$$

$$CQC = Q_c[1 - (P_c/P_w)^{\eta}], \quad (20)$$

where P_c is the consumer price; η, the domestic demand elasticity; and b, the demand shifters.

Finally, the net effects of both the wheat production policy and the wheat consumption policy can be summarized as

$$TTC = TCP + TCC, \quad (21)$$

$$CSW = CPW + CCW, \quad (22)$$

$$TSC = SCP + SCC, \quad (23)$$

$$NEF = FEP + FEC, \text{ and} \quad (24)$$

$$CI_t = CQC_t - [CQP_{t-1} - (SP_t - SW_t)],^{23} \quad (25)$$

where

TTC = the total treasury cost,

CSW = the change in social welfare,

TSC = total social cost,

NEF = net effect on foreign exchange,

CI_t = change in imports of wheat in year t,

SP_t = quantity of seeds used in year t at the subsidized producer price,

SW_t = quantity of seeds used in year t if the world price had prevailed, and

CQP_{t-1} = change in quantity produced in year t−1.

The determination of the three main prices to be used in the analysis just described (P_f, P_c, and P_w) involves two main mechanisms: government intervention (P_f and P_c) and free market forces (P_w). In the first semester of each year, before the planting season, the government, through the National Supply Superintendency (SUNAB), makes public the wheat producer price for the year. The political and economic forces involved in the determination of the producer price include the two big cooperatives of wheat and soybean producers in the states of Rio Grande do Sul (FECOTRIGO) and Paraná (OCEPAR), and the government institutions—the Commission for Production Financing (CFP), the Ministry of Agriculture, and the Ministry of Planning—through their bureaucratic and political forces. Basically, these institutions start the bargaining process with estimates of the cost of production for wheat during the year, and from that, they consider other aspects such as self-sufficiency goals.

The determination of miller prices (P_c) during the year is primarily a result of the

[23] The expression $[CQP_{t-1} - (SP_t - SW_t)]$ represents the net change in production in year t−1 available for human consumption in year t after adjustment for seeds used in year t.

willingness of the government to have a cheap food policy, for reasons that are not clear, at least on the surface. Some argue that because wheat products are an important component of the consumer price index, then any time the government wants a lower inflation rate for a specific month, it only has to leave the wheat price unaltered. However, this argument should be embraced with caution.

Other than the exchange rate policy followed during the period, there is little government interference in the determination of the import price (P_w); it is determined in the world market. As a rule, the exchange rate policy has been to maintain an overvalued currency in order to subsidize imports, especially capital goods, for the industrialization of the country. This exchange rate policy also works as an implicit import subsidy for wheat, however, thus keeping P_w artificially low domestically.

The nominal rate of protection for producers (NPP) and the nominal rate of protection for consumers (NPC) are used as measures of price distortion that result from government intervention. They are calculated as percentages of the world or border prices, as follows:

$$NPP \quad [(P_p - P_w)/P_w] \cdot 100, \text{ and} \qquad (26)$$

$$NPC \quad [(P_c - P_w)/P_w] \cdot 100. \qquad (27)$$

The border prices are calculated using the shadow or official exchange rate for each year and "correcting" for 1977 cruzeiros (CrS) at the wholesale level, taking into account the respective marketing margins. Producer prices are also measured at the wholesale level in 1977 cruzeiros by taking into account the respective marketing margins.

As Bale and Lutz point out, the use of wholesale prices can be justified in a practical sense because wheat grain is transformed into various products between the wholesale and retail levels.[24] As a consequence, a single retail price does not exist for wheat grain.

Given the unavailability of data on stocks, the levels of stocks will be assumed to remain constant and unchanged.

All the data needed for application of the model are reported in Appendix 1, Tables 16 to 18.

Behavior of Real Prices and Estimated Nominal Rates of Protection

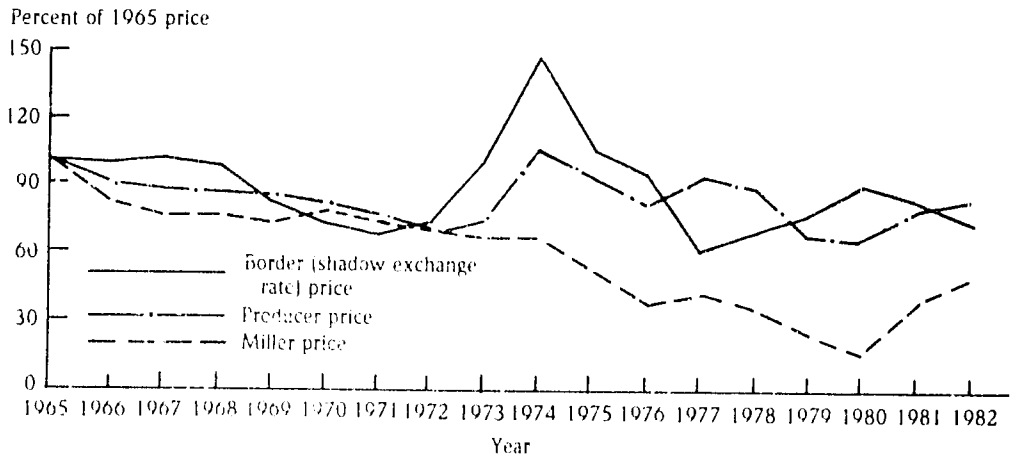
Estimates of the real prices of wheat at the producer, miller, and border prices are presented in Table 2. Producer prices are farmgate prices adjusted to the mill level; miller prices are the prices set by the government, and include the consumer subsidy; and border prices are the c.i.f. prices evaluated with the shadow foreign exchange rate (SFR) and adjusted to the miller level, exclusive of the consumer subsidy.

Prices at the miller level declined almost steadily until 1980 (Figure 2), when the lowest price for the period was observed: CrS516, which was only 19 percent of the highest price of CrS2,707, in 1965, which was arbitrarily taken as a base of comparison (see Table 2). To understand this trend, it is useful to divide the series into two distinct periods: the first covering the period up to 1972, and the second covering 1973-82. Prior to 1972, the tendency of miller prices to decline in real terms was mainly caused by the downward trend in world prices, represented here by border prices. From 1973 through 1980, the downward trend in miller prices was largely a consequence of the explicit general wheat price consumption subsidy. In 1982, however, a government plan to phase out gradually the wheat consumption subsidy was introduced.

During the same two periods, producer prices experienced rather different trends. From a peak in 1965, the real price at the

[24] M. D. Bale and E. Lutz, "Price Distortions in Agriculture and Their Effects: An International Comparison," *American Journal of Agricultural Economics* 63 (February 1981): 8-22.

Figure 2—Behavior of real prices of wheat, 1965-82



producer level declined through 1972 (Figure 2). The observed decline was primarily a result of year-to-year variations in the level of the producer subsidy set by the government. From 1972 through 1982, the pattern of producer prices varied. From 1972 until 1974, they showed a recovery in real terms over 1972. This recovery could be associated with high world prices from 1973 to 1976. The government seems to have followed world prices in setting its guaranteed prices to producers until 1976. From 1976 through 1982, the producer price had a slight tendency to decline. There were two cycles, one beginning in 1976 and the other in 1980.

Finally, border prices tended to decline from 1967 until 1971, following the behavior that had prevailed since the late 1940s.[25] After 1971, border prices experienced a cyclical pattern with two peaks (Figure 2), one in 1974 and another in 1980. Both of these peaks were caused in part by crop failures in the Soviet Union, but also by monetary phenomena in international commodity markets.

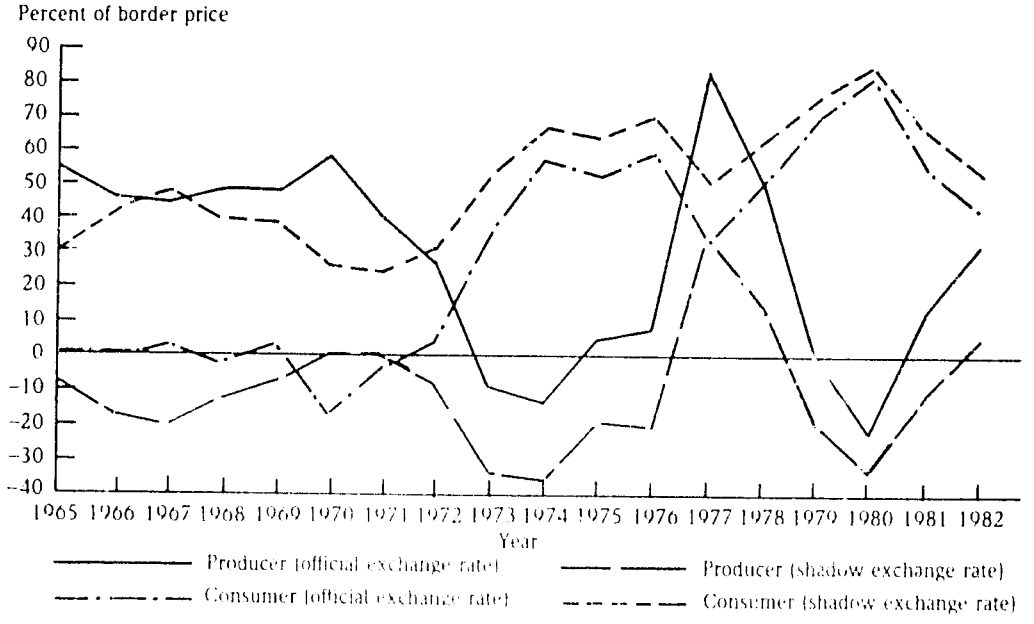
The production and consumption subsidies, calculated as a percentage of the border price evaluated at both the official and the shadow exchange rates, are shown in Appendix 1, Table 19 and represented in Figure 3. At the official exchange rate (OER), the production subsidy was positive in 15 years of the period and negative in 3 years. In the years in which the production subsidy was negative, the producers were in fact taxed. This occurred because the border price happened to be far above the guaranteed price set by the government for the domestic producers. The guaranteed price generally has been set at the end of the first semester of each year.

Under the OER, the government pursued a consistent policy of import substitution on the production side until 1982, except for the years 1973, 1974, and 1980, for which the guaranteed producer prices fell short of the border prices.

At least two facts help explain this behavior: first, the instability in the world wheat market, reflected in the rises and declines in border prices after 1972; and, second, the overvaluation of the cruzeiro with respect to the U.S. dollar. As can be seen in Figure 3, when the production subsidy is calculated using the OER, producers were taxed in only three years, 1973, 1974, and 1980, and in two of those years border prices were at their peak. However, when the

[25] M. V. Martin and R. F. Brokken, "The Scarcity Syndrome: A Comment," *American Journal of Agricultural Economics* 65 (February 1983): 158-159.

Figure 3—Subsidy levels for wheat, 1965-82



overvaluation of the cruzeiro is taken into account, producers are perceived to receive a lower subsidy. This is because the overvalued currency served as an implicit (export) tax for producers, since it caused domestic prices to be lower than they would have been without the overvaluation.

On the consumption side, the subsidy was mainly an implicit subsidy until 1972, due primarily to the overvaluation of the cruzeiro (Appendix 1, Table 19 and Figure 3). An overvalued currency is an implicit (import) subsidy for consumers because it causes domestic prices to be lower than they would have been without the overvaluation.

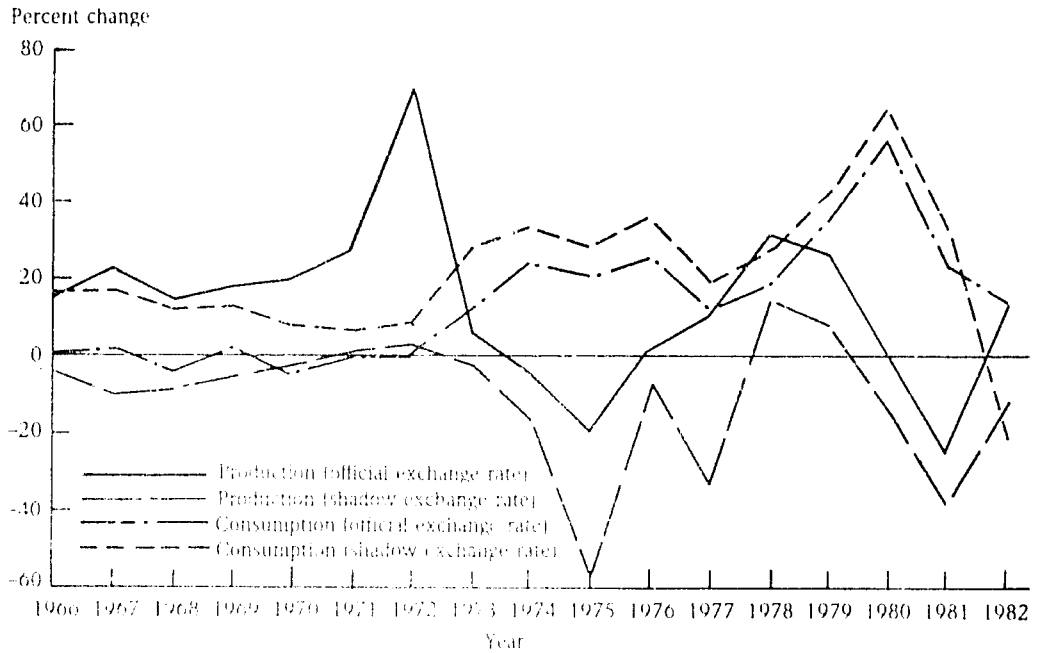
Because of an upturn in the world prices of wheat in 1971 and the end of purchases on concessionary terms from the United States under P.L. 480, the government subsidized wheat consumption explicitly every year from 1972 through 1982. It should be noted that at the OER, it appears that consumers were explicitly taxed during three years of the 1965-71 period. This apparent tax stems from the policy vis-à-vis concessional food purchases, in which wheat was purchased under the concessionary terms of P. L. 480, below world prices and with long-term financing. It was sold in the domestic market at higher prices in order to obtain revenue to finance the wheat subsidy for producers. Of course, this apparent tax disappears when the distortion in the exchange rate is excluded.

Production, Consumption, and Import Effects

Results of the model are presented first under the OER and then under the SER.

Estimates of the effects of the production subsidy or tax on the levels of production under the OER are presented in Appendix 1, Table 20, and represented in Figure 4. As can be seen, the changes in production are positive or negative and vary according to the magnitudes of the producer and border prices and the output level for the respective year. The change in production as a percentage of the level of production that would have resulted if border prices had prevailed was never greater than 31.2 percent, except for the year 1972, when it was 71.1 percent. In three years production was in fact reduced, 1973, 1974, and 1980.

Figure 4—Production and consumption effects of the wheat subsidy, 1966-82



The changes in consumption as a consequence of the consumption subsidy were positive and varied according to the level of consumer and border prices and the consumption level of the respective year. The largest relative change in consumption was in 1980 when the consumption subsidy was at its highest level, 85.6 percent (Table 2, last column) and total consumption was at its highest level, 6.8 million metric tons (Appendix 1, Table 17). In 1980 the total consumption of wheat grain was 56.3 percent higher than it would have been if there had been no consumption subsidy at all (Appendix 1, Table 20, column 7). In evaluating the trade effects of the policies, it is of interest to determine the separate effects of the production policies. These are identified as the change in production and the partial change in import levels shown in Table 20, second and fourth columns, respectively.

The total effect on imports (taking into account both producer and consumer policies) was negative and small during 1966-72, indicating that the wheat production policy had a relatively small effect on self-sufficiency in wheat production. This was so because of the large increase in wheat imports that resulted from the wheat consumption subsidy, especially after 1972.

This is a good example of conflicting policy objectives. On the one hand, the production policy was designed to substitute for wheat imports, while, on the other hand, the consumption policy, although not necessarily designed to stimulate wheat consumption, in fact did so, and this in turn required more imports. Thus, the effect of the wheat production policy, as an import substitution policy, was partially or totally overridden by the consumption policy and the distortion in the exchange rate.

To isolate the effects that overvaluation of the cruzeiro had on the results of Table 20 in Appendix 1, the figures in that table are recalculated using the SER. The results are presented in Appendix 1, Table 21. The production policy has a smaller effect when the distortion in the exchange rate is taken into account. This is because domestic production at world prices would have been larger and the observed production would continue to be the same. On the other hand, the consumption policy has a larger effect

on consumption when the distortion in the exchange rate is taken into account. Finally, the total change in imports is larger than when the overvaluation of the currency is not taken into account, mainly as a result of the wheat consumption subsidy. Thus the overvaluation of the cruzeiro works as a deterrent to the import substitution policy.

The effects of production and consumption policies, with and without distortions in the exchange rate, are estimated in Appendix 1, Tables 22-25.

Cost, Benefits, and Exchange Rate Effects

The cost, benefits, and exchange rate effects of the Brazilian wheat policy can be viewed, considering not only the explicit but also the implicit subsidy or tax placed on domestic producers and consumers of wheat products through the price of wheat set periodically by the government and through the existing exchange rate policy.

A summary of the measurements of the effects for the period of 1966-82 is represented in Table 8. One can see that at the outset, producers and consumers were both explicitly subsidized. However, when the effect of the overvaluation of the currency (the SER)during the period was included, it is clear that producers were taxed and consumers were highly subsidized in a net sense. This was so because an overvalued currency works as an export tax for producers and as an import subsidy for consumers.

The gains in welfare for producers, consumers, and both groups combined ranged from 81-86 percent of the total subsidy value. Under the SER, only producers experienced a loss in welfare. The social cost of the Brazilian wheat policy ranged from 14-19 percent of the total subsidy value, which shows how large the costs of such government interventions can be. The foreign exchange effects of the Brazilian wheat policy were negative in all cases except for the production policy analyzed under the OER.

If it is assumed that one of the major objectives of the wheat production policy is to promote import substitution of wheat, then it can be argued that such a government intervention did not work accordingly in a free market situation. Finally, each dollar of foreign exchange saved or spent due to the wheat production policy has a social cost ranging from 0.17 to 0.43, which means that in order to substitute US$1.00 of wheat imports the government had to spend from US$1.17 to US$1.43 (Table 8

Table 8—Isolated and combined total monetary effects of the Brazilian wheat policy, 1966-82

Exchange Rate	Total Subsidy (Tax) Cost	Change in Welfare as Percent of Total Cost	Social Cost as Percent of Total Cost	Foreign Exchange Effect	Social Cost/ Foreign Exchange
	(U.S. $ million)			(U.S. $ million)	
Production policy					
Shadow	-803.4	-119	19	-865.6	-0.17
Official	820.1	82	18	351.0	0.43
Consumption policy					
Shadow	7,890.2	85	15	-2,847.2	-0.41
Official	5,937.6	86	14	-2,103.0	-0.39
Combined production and consumption policies					
Shadow	7,086.8	81	19	-3,712.8	-0.36
Official	6,757.7	86	14	-1,752.0	-0.54

Source: Calculated by the authors using the total results of Appendix 1, Tables 23-25, and the shadow and official exchange rates for 1977 taken from Appendix 1, Table 18. The minus sign indicates a loss in foreign exchange.

first two lines). (Note that the interpretation of social cost does not depend on whether the sign is negative or positive.) As a whole, each additional US$1.00 of wheat imports had a cost ranging from US$1.36 to US$1.54 (Table 8, fifth and sixth lines of the last column). All these results indicate that the Brazilian wheat policy has been a sizable burden for society as a whole, and in the case of wheat production policy, it cannot be justified as an import substitution policy, because in a free market situation wheat imports tend to increase due to implicit taxation of producers as a result of an overvalued exchange rate.

Figures 5-8 show the behavior of costs, benefits, and foreign exchange effects of both wheat consumption and wheat produc-

Figure 5—Effects of the wheat consumption policy under the official exchange rate, 1966-82

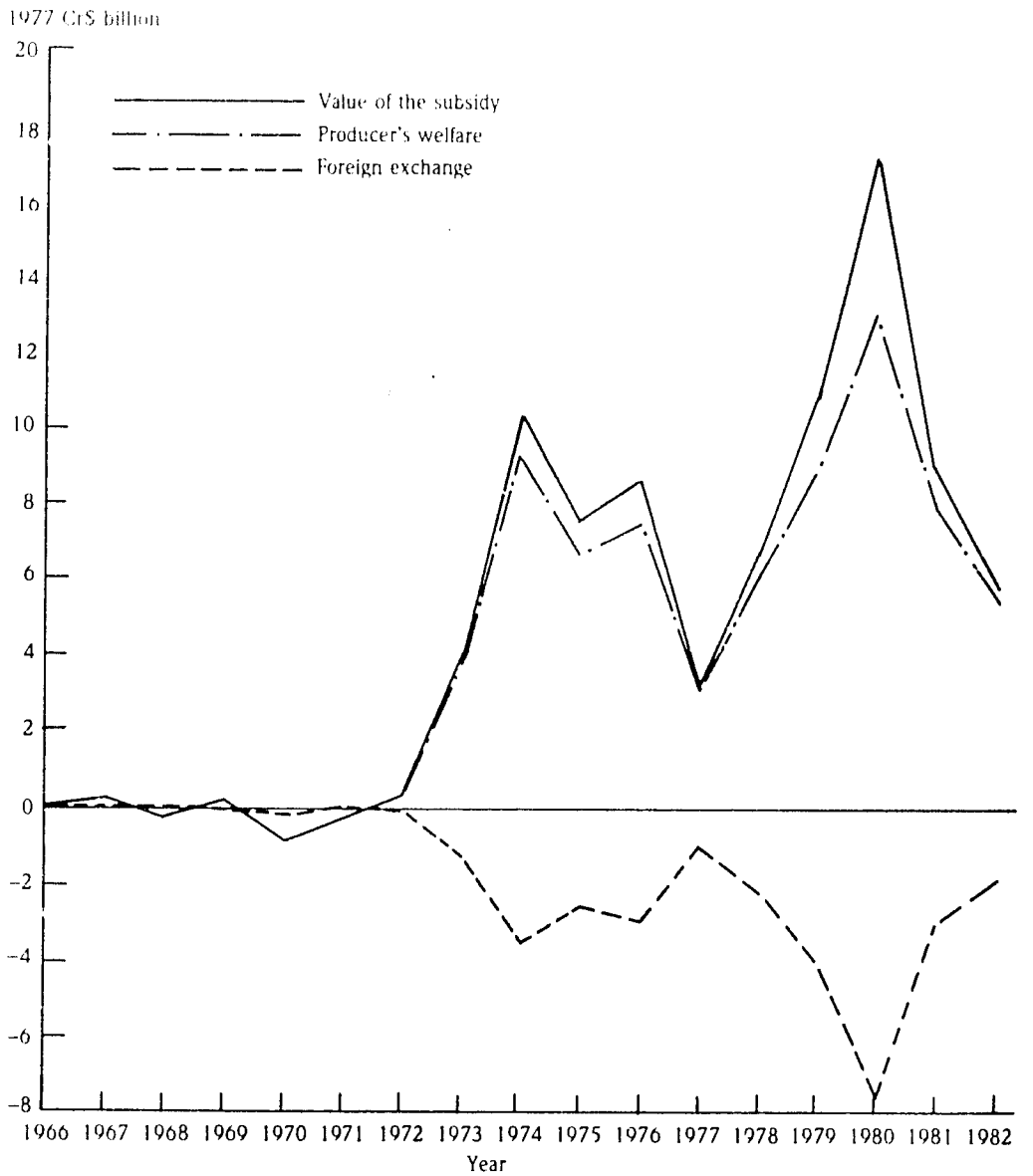


Figure 6—Effects of the wheat consumption policy under the shadow exchange rate, 1966-82

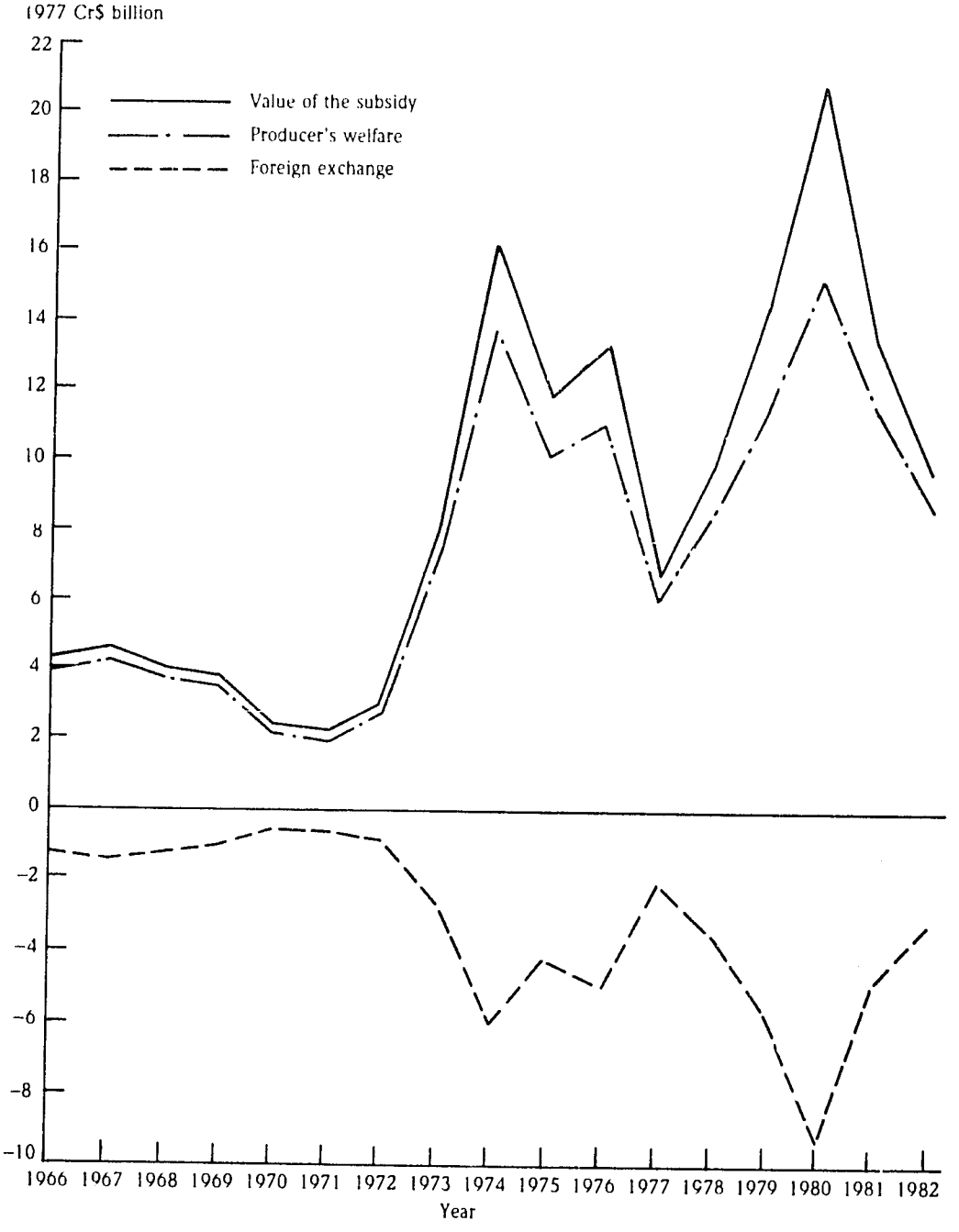


Figure 7—Effects of the wheat production policy under the official exchange rate, 1966-82

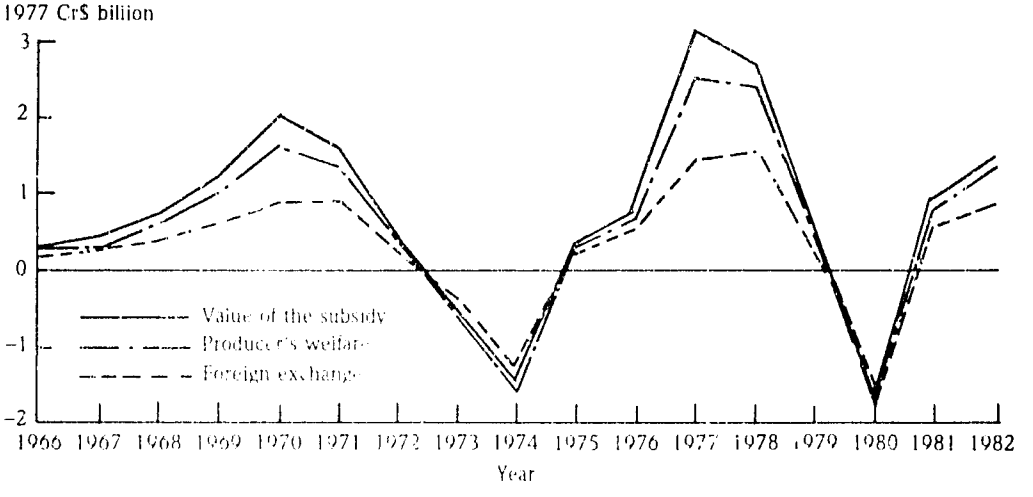
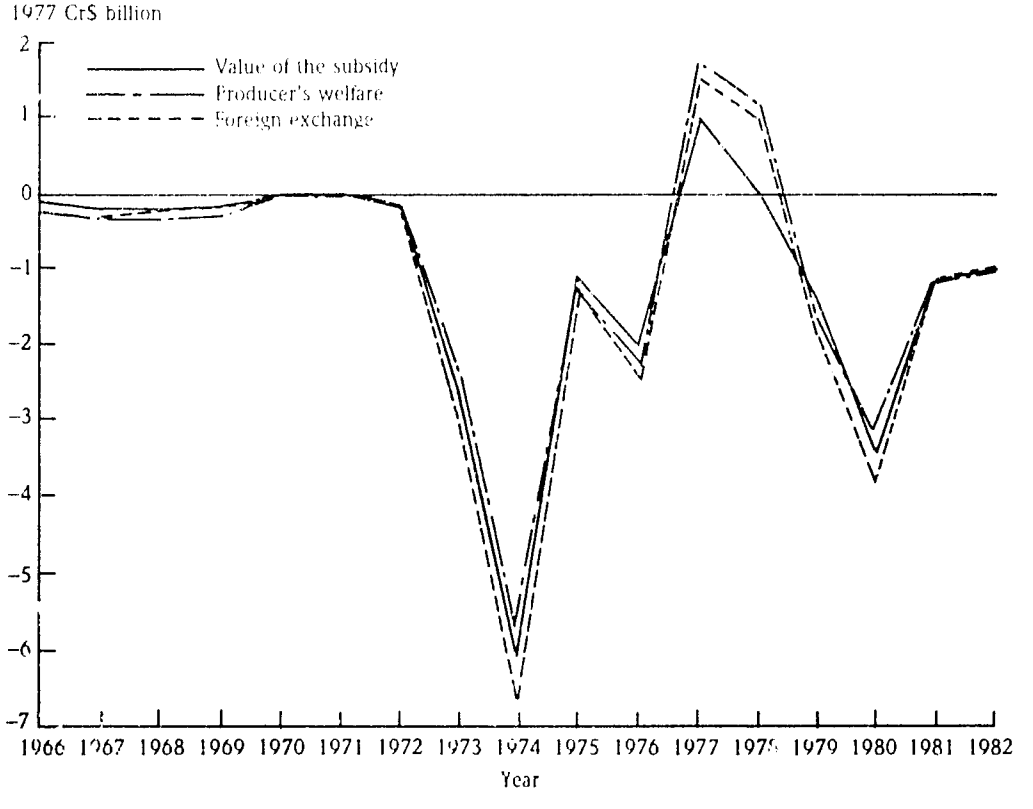


Figure 8--Effects of the wheat production policy under the shadow exchange rate, 1966-82



tion policy for the period 1966-82, under official and shadow exchange rates, respectively. The wheat consumption policy had two distinct subperiods—the first from 1966 to 1972 and the second from 1972 to 1982 (Figures 5 and 6). In the first subperiod, the effects of that policy on the value of the subsidy, producers' welfare, and foreign exchange were small under the OER (Figure 5) and of considerable size under the SER (Figure 6). In the second subperiod, under both OER and SER, the sizes of the policy measures referred to were considerably larger, mainly as a result of the explicit wheat consumption subsidy in effect since 1973. Both the wheat consumption subsidy and the expenditures in foreign exchange reached their maximums in 1980. This is because domestic production was not large enough to meet the domestic demand under the subsidized price.

The wheat production policy had different subperiods of subsidization and taxation of producers during the period of the analysis under both the OER and the SER (see Figures 7 and 8). Under the OER, producers were subsidized until 1972 and again from 1975 to 1979 and from 1981 to 1982. They were taxed during 1973, 1974, and 1980. Under the SER, producers were taxed during most of the period, the exceptions being 1970-71 and 1977-78.

4

DISTRIBUTION OF BENEFITS BY FARM SIZE AND INCOME

Brazilian wheat policy has two basic income distribution effects. The first is at an aggregate level, in which case the issue is the distribution of the implicit and explicit taxes and subsidies between producers and consumers. That issue was considered in the previous section. The second effect is at a disaggregate level, in which case the issue is the distribution of benefits among producers and consumers by size of farm and by level of income.

In this chapter, this second effect is examined. The distributive effects on consumers are emphasized because the consumption policy seems to involve a larger redistribution of income than does the production policy, for two basic reasons. First, total subsidy costs of the wheat consumption policy are larger than those of the production policy, and, second, the whole population of the country consumes wheat products, but, as a rule, wheat is only grown on medium and large farms in the southern part of Brazil. An additional reason for concentrating on the consumption policy is that more consumption data are available for such an analysis, including data on expenditure and consumption of wheat products by expenditure group. Parallel data on the distribution of wheat production by farm size are not available.[26]

A Model for Disaggregative Analysis

The model used to carry out the disaggregative analysis (which applies only to the consumption policy) is similar to that used for the aggregative analysis. The main difference is that the aggregate result here is made up of the sum of the consumers' surplus of all expenditure groups for each wheat product.

The case for one wheat product j and two expenditure strata ($i = 1,2$) is shown in Figure 9. The first two parts of the figure represent alternative expenditure situations and the third part depicts the aggregate market. D_{j1} and D_{j2} represent the respective disaggregate and aggregate demand curves for the particular wheat product, with the aggregate curve of D_j being the horizontal sum of the disaggregate curve of Figure 9. P_0^j and P_1^j, q_0^{ji} and q_1^{ji}, and Q_0^j and Q_1^j are the prices and quantities, with and without price subsidy, respectively, for the wheat product j. Then, using procedures similar to those for the aggregative analysis, policy measures can be derived by using the areas a_j, b_j, c_j, and f_j.

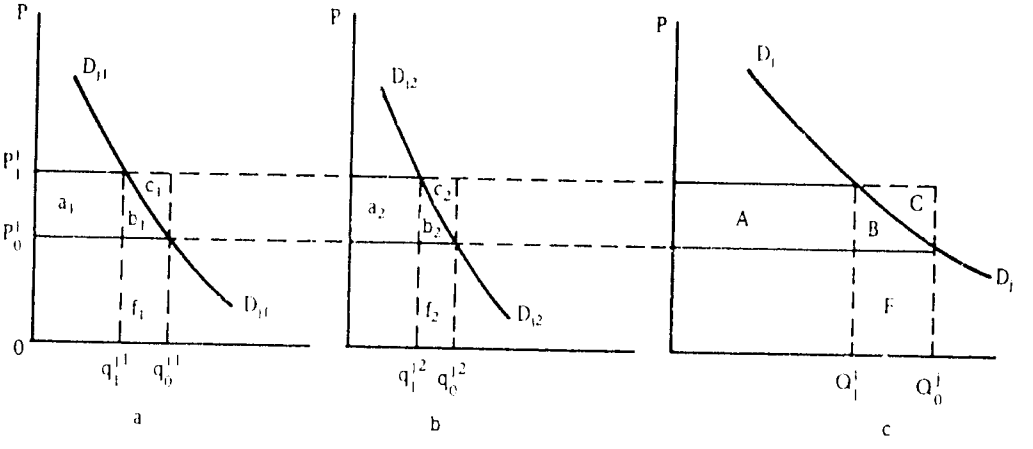
Assuming a constant elasticity demand curve of the form $q_{ji} = a_{ji} P^{-\eta_{ji}}$ for each wheat product j and each expenditure stratum i, and generalizing for n expenditure strata and m wheat products, one can derive the following formulas to conduct the disaggregative analysis for a specific year:

$$TCC = \sum_{j=1}^{m} \sum_{i=1}^{n} TCC_{ji}$$

$$= \sum_{j=1}^{m} \sum_{i=1}^{n} (P_1^j - P_0^j) q_0^{ji}, \qquad (28)$$

[26] In a study of the effect of the distortion in the exchange rate by size of farm for Brazil as a whole, Mauro Lopes found that taxation by overvaluation of the cruzeiro had a regressive effect on income distribution. Large producers can escape the export tax by reorganizing their resources, but this option is not available to the small producers (Mauro R. Lopes, "The Mobilization of Resources from Agriculture: A Policy Analysis of Brazil" [Ph.D. dissertation, Purdue University, 1977]).

Figure 9—Hypothetical market for a specific wheat product under two income strata situations and for the aggregated market



Notes: a and b represent alternative income strata; c represents the aggregated demand.

$$CCW = \sum_{j=1}^{m} \sum_{i=1}^{n} CCW_{ji}$$

$$= \sum_{j=1}^{m} \sum_{i=1}^{n} \int_{P_0^j}^{P_1^j} a_{ji} P^{-\eta_{ji}} dp$$

$$= \sum_{j=1}^{m} \sum_{i=1}^{n} [q_0^j/(1-\eta_{ji})]$$

$$[(P_0^j/P_1^j)^{\eta_{ji}} P_1^j - P_0^j], \quad (29)$$

$$SCC = TCC - CCW$$

$$= \sum_{j=1}^{m} \sum_{i=1}^{n} SCC_{ji}, \text{ and} \quad (30)$$

$$CQC = \sum_{j=1}^{m} \sum_{i=1}^{n} CQC_{ji}$$

$$= \sum_{j=1}^{m} \sum_{i=1}^{n} q^{ji}[1 - (P_0^j/P_1^j)^{\eta_{ji}}], \quad (31)$$

where

TCC = the total treasury cost on the consumption side for a specific wheat product,

CCW = the change in consumers' welfare,

SCC = the social cost of the subsidy,

CQC = the change in quantity consumed, and

η_{ji} = the constant demand elasticity for wheat product j in each expenditure strata i, where j = 1,2,...m i = 1,2,...n.

P_0^j and P_1^j are the prices of the specific wheat product j with and without the consumption subsidy, respectively, and a_{ji} is the demand shifter for each product j in each expenditure stratum i.

To estimate P_0^j and P_1^j the following formulas can be used:

$$P_0^{wf} = P_{wg} \cdot Q_{wg} + 0_c^{wf}, \quad (32)$$

$$P_1^{wf} = [P_{wg}/(1 - CS_{wg})]Q_{wg} + 0_c^{wf}, \quad (33)$$

$$P_0^j = P_0^{wf} Q_{wf}^j + 0_c^j, \text{ and} \quad (34)$$

$$P_1^j = P_1^{wf} Q_{wf}^j + 0_c^j, \quad (35)$$

where

P_k^{wf} = the price of wheat flour with the consumption subsidy, k = 0, and without the consumption subsidy, k = 1;

P_{wg} = the price of wheat grain for the millers;

Q_{wg} = the quantity of wheat grain required to produce 1 kilogram of wheat flour;

0_c^{wf} = other costs involved in the production of wheat flour;

CS_{wg} = the percent value of the average consumption subsidy calculated for a respective year from the aggregative analysis;

P_j^1 = the price of wheat product j with the wheat consumption subsidy, k = 0, and without the consumption subsidy, k = 1;

Q_{wf}^j = the quantity of wheat flour required to produce 1 kilogram of the j^{th} wheat product; and

0_c^j = other costs involved in the production of the j^{th} wheat product.

P_0^{wf}, $P_{w,r}$, $Q_{w,r}$, $CS_{w,r}$, P_{j0}, and Q_{wf}^j are known from secondary sources; 0^{wf} and P_0^{wf} can be calculated from equations (32) and (33); and 0_c^j and P_0^j can be determined by substituting them in equations (34) and (35).

After calculating the change in consumers' welfare by expenditure strata, one can go further and derive the respective Lorenz curve for the distribution of the gain in consumers' welfare and compare that distribution with the Lorenz curve resulting from the expenditure distribution of the families in the respective expenditure groups.[27] The relative bias of the wheat consumption subsidy with respect to low- or high-income consumers can then be evaluated.

General Considerations

As a basis for the discussion of the disaggregate effects of the consumption policy on consumers from different expenditure groups, the data set collected by Fundação Instituto Brasileiro de Geografia e Estatística (FIBGE), from now on referred to as the FIBGE survey, and some direct price elasticities estimated by Garcia are examined.[28] Two main considerations are emphasized. The first is the effect of the consumption subsidy on consumers' expenditures on wheat products, and the second is its effect on calorie consumption. In both cases, a specific region of Brazil is considered—Region 4 of the FIBGE survey, which encompasses the states of Minas Gerais and Espírito Santo. Within this region, data on the metropolitan area of Belo Horizonte represent the urban area of Minas Gerais and data on the states of Minas Gerais and Espírito Santo represent the rural area.

For each region of the FIBGE survey total expenditures and consumption of wheat products are almost invariably correlated positively with the total expenditures of the family by expenditure group. This positive correlation indicates that the higher the expenditure group, the greater the absolute benefits captured by the consumers in those groups. The discrepancies in per capita expenditure on wheat products (Table 9), per capita wheat consumption (Table 10), and the estimated per capita wheat consumption subsidy (Table 11) are mainly due to the price differential resulting from differences in composition or quality of the wheat products consumed by each group of consumers in each expenditure group. On the other hand, in the urban area of Belo Horizonte, the budget share of wheat products is inversely correlated with total expenditure by expenditure group. This suggests that, in relative terms, the lower expenditure groups could gain more from the consumption subsidy than the higher expenditure groups.

Thus, for the urban area any decline in the consumption subsidy could lead to a decline in real income because there are few close substitutes for wheat products. An increase in the price of those products means that, on a limited budget, there will

[27] For details on the Lorenz curve theory, see Nanak C. Kakwani, *Income Inequality and Poverty—Methods of Estimation and Policy Applications* (New York: Oxford University Press for the World Bank, 1980), p. 377.

[28] Fundação Instituto Brasileiro de Geografia e Estatística, *Anuário Estatístico do Brasil* (Rio de Janeiro: FIBGE, various years); João Carlos Garcia, "Avaliação dos Impactos do Aumento na Oferta de Alimentos e Renda sobre a Nutrição Humana e suas Implicações para o Estabelecimento de Prioridades de Pesquisas Agrícolas no Brasil" (Ph.D. dissertation, Universidade Federal de Viçosa, 1978).

Table 9—Annual expenditures and budget shares per capita, metropolitan area of Belo Horizonte and rural areas of Minas Gerais and Espirito Santo, 1974/75

Household Expenditure Group	Average Annual Per Capita Expenditure	Wheat Products[a]		Rice		Beans		Cassava Flour		Maize	
		Per Capita Expenditure	Budget Share	Per Capita Expenditure	Budget Share	Per Capita Expenditure	Budget Share	Per Capita Expenditure	Budget Share	Per Capita Expenditure	Budget Share
	(Cr $)	(Cr $)	(percent)	(Cr $)	(percent)	(Cr $)	(percent)	(Cr $)	(percent)	(Cr $)	(percent)
Metropolitan area											
Less than 4,500	1,004	56	3.5	70	4.4	44	2.7	15	0.9	13	0.8
4,500–8,999	1,749	57	3.3	105	6.0	51	2.9	13	0.7	14	0.8
9,000–11,299	2,549	86	3.4	154	6.0	60	2.4	19	0.7	14	0.5
11,300–15,799	2,692	87	3.2	144	5.3	53	2.0	9	0.3	12	0.4
15,800–22,599	3,793	111	2.9	164	4.3	63	1.7	15	0.4	12	0.3
22,600–31,599	4,453	122	2.7	143	3.2	54	1.2	10	0.2	10	0.2
31,600–45,199	5,919	143	2.4	132	2.2	50	0.8	9	0.2	10	0.2
45,200–67,799	10,869	182	1.7	154	1.4	60	0.5	12	0.1	9	0.1
More than 67,999	27,494	229	0.8	131	0.5	51	0.2	25	0.1	16	0.1
Mean	6,755	123	1.8	140	2.1	54	0.8	13	0.2	12	0.2
Rural area											
Less than 2,300	530	9	1.6	39	7.3	46	8.6	21	3.9	14	2.6
2,300–3,399	955	19	2.0	77	8.1	70	7.3	28	2.9	39	4.1
3,400–4,499	991	21	2.1	93	9.4	65	6.5	20	2.3	36	3.7
4,500–6,799	1,123	28	2.5	112	10.0	69	6.1	22	2.0	38	3.4
6,800–8,999	1,574	39	2.5	159	10.1	88	5.6	23	1.5	48	3.0
9,000–15,799	1,690	42	2.5	163	9.7	79	4.7	14	0.8	48	2.8
15,800–22,599	2,670	60	2.3	190	7.1	91	3.4	19	0.7	54	2.0
22,600–31,599	3,778	67	1.8	221	5.8	84	2.2	17	0.4	55	0.6
More than 31,599	7,863	104	1.3	265	3.4	98	1.2	20	0..	43	0.6
Mean	2,268	48	2.1	172	7.6	87	3.9	21	0.9	50	2.2

Source: Fundação Instituto Brasileiro de Geografia e Estatística, *Estudo Nacional da Despesa Familiar: Despesas das Familias, Dados Preliminares*, 6 vols. (Rio de Janeiro: FIBGE, 1978 and 1979).

[a] Wheat products include wheat bread, macaroni, and wheat flour.

Table 10—Per capita energy consumption per day, by expenditure group, metropolitan area of Belo Horizonte and rural areas of Minas Gerais and Espírito Santo, 1974/75

Household Expenditure Group	Total Kilocalories per Day	Wheat Products[a]		Rice		Beans		Cassava Flour		Maize	
		Kilocalories per Day	Percent of Total	Kilocalories per Day	Percent of Total	Kilocalories per Day	Percent of Total	Kilocalories per Day	Percent of Total	Kilocalories per Day	Percent of Total
(Cr $)											
Metropolitan area											
Less than 4,500	1,457	189	13.0	274	18.8	152	10.4	28	1.9	122	8.4
4,500–8,999	1,824	196	10.7	435	23.8	187	10.3	21	1.2	94	5.2
9,000–11,299	1,852	236	12.7	465	25.0	169	9.1	22	1.2	68	3.7
11,300–15,799	1,903	247	13.0	470	24.7	161	8.5	12	0.6	66	3.5
15,800–22,599	1,933	257	13.3	475	24.6	161	8.3	16	0.8	57	2.9
22,600–31,599	2,027	297	14.7	453	22.3	154	7.6	12	0.6	52	2.6
31,600–45,199	2,138	339	15.9	412	19.3	136	6.4	14	0.7	41	1.9
45,200–67,799	2,170	338	15.6	386	17.8	129	5.9	11	0.5	32	1.5
More than 67,799	2,323	356	15.3	321	13.8	102	4.4	17	0.7	30	1.3
Mean	2,040	289	14.2	423	20.7	146	7.2	15	0.7	52	2.5
Rural area											
Less than 2,300	1,478	33	2.2	186	12.6	297	20.1	245	16.6	150	10.1
2,300–3,399	1,865	57	3.1	272	14.6	296	15.9	213	11.4	250	13.4
3,400–4,499	1,972	75	3.8	337	17.1	284	14.4	179	9.1	291	14.8
4,500–6,799	2,098	88	4.2	410	19.5	311	14.8	176	8.4	270	12.9
6,800–8,999	2,212	104	4.7	465	21.0	301	13.6	149	6.7	271	12.3
9,000–15,799	2,420	123	5.1	551	22.8	302	12.5	117	4.8	294	12.1
15,800–22,599	2,611	161	6.2	557	21.3	321	12.3	134	5.1	232	8.9
22,600–31,599	2,715	169	6.2	660	24.3	286	10.5	111	4.1	234	8.6
More than 31,599	2,784	191	6.9	663	23.8	273	9.8	98	3.5	146	5.2
Mean	2,354	122	5.2	506	21.5	300	12.7	140	5.9	256	10.9

Source: Fundação Instituto Brasileiro de Geografia e Estatística, "Special Runs of ENDEF: Consumption in Calories by Global Income Classes, Annex-A: Number of Days Researched; Annex-B: Average Number of Comensal Days," FIBGE, Rio de Janeiro (mimeographed).

[a] Wheat products include wheat bread, macaroni, and wheat flour.

Table 11—Estimated per capita distribution of yearly costs and benefits of the wheat consumption policy, metropolitan area of Belo Horizonte

Household Expenditure Group	Annual per Capita Expenditure (PCE)	Annual per Capita Subsidy (PCS)	Change in Consumer Welfare (CCW)	Percent of PCS	Social Cost	Percent of PCS	$\frac{CCW}{PCE} \cdot 100$
(1974 Cr $)		(1974 Cr $)			(1974 Cr $)		(percent)
Less than 4,500	1,604	33.8	32.8	97	1.0	3	2.04
4,500 - 8,999	1,749	33.7	32.0	95	1.7	5	1.83
9,000 - 11,299	2,549	40.1	38.0	95	2.1	5	1.49
11,300 - 15,799	2,692	41.2	39.1	95	2.1	5	1.45
15,800 - 22,599	3,793	42.6	40.7	97	1.9	3	1.07
22,600 - 31,599	4,453	48.2	46.6	99	1.6	1	1.05
31,600 - 45,199	5,919	54.1	53.7	99	0.4	1	0.91
45,200 - 67,799	10,869	53.3	52.8	99	0.5	1	0.49
More than 67,799	27,402	55.4	54.6	99	0.8	1	0.20

Source: Calculated by the author, based on data provided by Fundação Instituto Brasileiro de Geografia e Estatística.
Note: Wheat products include wheat bread, macaroni, and wheat flour used directly by consumers.

be less money to allocate to other products. Moreover, the medium- and low-income groups will lose more, relative to their total expenditures, than the high-income groups.

In the rural areas, both the amount consumed and the expenditures on wheat products increase as the expenditure groups ascend. However, the budget shares present a stable maximum for the middle groups (the same figure applies for more than one stratum), while declining as total expenditure increases. These data support the hypothesis that in rural areas, the consumption subsidy has benefited the higher expenditure groups in absolute terms and the medium expenditure groups in relative terms.

A comparison of energy consumption as a percentage of total kilocalories consumed per day in the metropolitan area with that in the rural areas (Table 10) shows clearly that the wheat consumption policy has discriminated against rural consumers because wheat products play a smaller part in their diets. Moreover, in both rural and urban areas, the higher the expenditure group, the higher the consumption of wheat products in absolute terms.

Taking the observations for the urban and rural areas together, one can conclude that much of the budgetary cost of the wheat consumption subsidy was captured by those who were not targeted—those in the high- and medium-expenditure groups. Thus the cost effectiveness of this general price subsidy was probably quite low.[29]

For purposes of comparison, data on budget share and calorie consumption for rice, beans, cassava flour, and maize are also included in Tables 9 and 10. In the Belo Horizonte metropolitan area, rice had the largest budget share among the five products. This implies that a general price consumption subsidy on rice (at the same subsidy level as wheat) would do a better job of redistributing income, provided the price elasticities of demand by income groups for both products behaved similarly.

For the metropolitan area, all other products in Tables 9 and 10 are better suited to be target-oriented than wheat products (in terms of a general price subsidy to benefit low-income people). That is, both budget shares and per capita calorie consumption in general tend to decline as expenditure increases. However, the decline is less rapid for wheat products than it is for other products.

[29] The cost incurred by the government per unit of change in nutrient consumption by the target group was high, that is, the effectiveness of the money spent in that program was low. Some figures are presented in Appendix 3.

Estimates of the price elasticities of demand for wheat products and for rice are presented in Table 12. The absolute sizes of the elasticities for bread and macaroni tend to increase as income increases and to decline at higher expenditure levels. Atypically, the price elasticity of demand for wheat flour increases continuously in absolute terms as income increases. For rice, the price elasticity declines continuously as family income increases.

Distributional Effects

The effects of the 1974/75 consumption subsidy on the distribution of expenditure of the population of the Belo Horizonte metropolitan area are quantified using the data presented in Appendix 1, Tables 26 and 27, and Table 11, and the formulas developed earlier in this chapter (equations 28-35). These calculations provide a rough idea of the distributional effects of the consumption policy when the distortion in the exchange rate is taken into account (Table 11).

The amount of subsidy per capita estimated by expenditure group increases with the increase in expenditure level because the quantity of wheat products consumed increases as income rises. Consumer welfare as a percentage of the per capita subsidy increases for all groups except the second and the eighth. This is primarily a result of the size and behavior of the different price elasticities of demand for wheat bread, macaroni, and wheat flour (Table 12). The results presented in Table 11 were obtained from the summation of these individual results.[30]

The social cost is greater for the low- and medium-expenditure consumers than for the upper expenditure groups primarily because of the size of the price elasticity of demand.

The last column of Table 11 shows the relative effects of the consumption subsidy on the consumers' real expenditures. The first four expenditure groups have a greater relative gain than the remaining groups. These results suggest that a cut in the consumption subsidy would hurt the low and medium expenditure groups relatively more than the higher ones.

In an attempt to evaluate the effects of transferring the consumption subsidy from wheat to rice, the same policy measures were estimated for rice as for wheat in Table 13, with its value of the subsidy expected to be the same. (For details on the methodology and data set used to derive the results in Table 13, see Appendix 2.) Three main advantages appear to favor a rice subsidy over wheat. First, the change in consumers' welfare is larger for the expenditure groups up to the sixth with the exception of the first (lowest) group. Second, the social costs are low due to the lower price elasticity of demand. And finally, the increase in the real expenditure power, represented by the percentage of increase in expenditure due to the subsidy, is larger for the simulated rice subsidy, which can be seen by comparing the last columns of Tables 11 and 13. All of these results are mainly due to the higher per capita consumption of rice in all expenditure groups, especially the lowest, and to the small and decreasing size of the price elasticities of demand for rice as income increases (see the last column of Table 13).

Table 14, which is derived from Tables 11 and 13, and Appendix 1, Table 28, presents the cumulative distribution of consumers' total expenditures and change in welfare for both wheat and rice. Those cumulative distributions are used for drawing the concentration curves in Figure 10.[31] With the exception of the first two expenditure strata, the distribution of the change in consumers' welfare when the consumption subsidy is on rice is slightly biased toward the two lowest expenditure groups. This is because the cumulative percentage of the change in consumers' welfare for rice is almost always greater than that for wheat, and it is also greater than the cumulative percentage of the population.

Figure 10 shows five basic curves. Curve A is the change in the consumers' welfare

[30] The individual results are not presented but can be obtained from the authors.

[31] These curves have interpretations analogous to the Lorenz curve for income distribution.

Table 12—Estimates of direct price elasticities of demand for wheat products and rice, by income group, Juiz de Fora, Minas Gerais, 1973

Household Income Group	Demand Elasticities			
	Wheat Bread	Macaroni	Wheat Flour	Rice
(Cr $)				
Less than 4,591	-0.199	-0.119	-0.284	-0.153
4,591-7,143	-0.427	-0.144	-0.472	-0.150
7,144-10,053	-0.486	-0.127	-0.512	-0.126
10,054-13,158	-0.484	-0.107	-0.528	-0.105
13,159-18,645	-0.407	-0.082	-0.553	-0.078
18,646-32,978	-0.220	-0.058	-0.566	-0.058
32,979-44,991	0.000	-0.041	-0.559	-0.040
44,992-74,876	0.000	-0.028	-0.575	-0.026
74,877-166,835	0.000	-0.014	-0.589	-0.014

Source: João Carlos Garcia, "Avaliação dos Impactos do Aumento na Oferta de Alimentos e Renda sobre a Nutrição Humana e suas Implicações para o Estabelecimento de Prioridades de Pesquisas Agrícolas no Brasil" (Ph.D. dissertation, Universidade Federal de Viçosa, 1978).

distribution when the subsidy is on rice. Curve B is the perfect equality curve. Curve C is the same as curve A, but the subsidy is on wheat. Curve D is the expenditure distribution curve. And finally, curve E is the line of perfect inequality.

Some important deductions can be drawn from Figure 10. First, because curve A is above curve B, except for the first two expenditure groups, the distribution of benefits of a rice consumption subsidy is biased toward low-expenditure people. The reverse is true for curve C. However, since curve C is above curve D, the wheat consumption subsidy—though biased toward high-expenditure groups—has some power to redistribute expenditure and income because it increases the purchasing power.

The main problem with both the subsidies on wheat and rice is their low cost-effectiveness, as the result of a large spillover of benefits to nontargeted groups. This will be shown in Appendix 3.

A final question is, "Which consumption subsidy would be better from a nutritional standpoint?" Both wheat and rice products are rich calorie sources; therefore, the per capita daily gain in calories due to the sub-

Table 13—Estimated per capita distribution of yearly costs and benefits of the general price subsidy on rice in metropolitan area of Belo Horizonte

Household Expenditure Group	Annual per Capita Expenditure (PCE)	Annual per Capita Subsidy (PCS)	Change in Consumer Welfare (CCW)	Social Cost	Percent of PCS	$\frac{CCW}{PCE} \cdot 100$
(1974 Cr$)		(1974 Cr$)		(1974 Cr$)		(percent)
Less than 4,500	1,604	29.5	28.8	0.7	2.3	1.80
4,500-8,999	1,749	47.5	46.3	1.2	2.5	2.65
9,000-11,299	2,549	50.8	49.5	1.3	2.6	1.94
11,300-15,799	2,692	51.4	50.1	1.3	2.5	1.86
15,800-22,599	3,793	51.9	50.6	1.3	2.5	1.33
22,600-31,599	4,453	49.5	48.2	1.3	2.6	1.08
31,600-45,199	5,919	45.0	43.9	1.1	2.4	0.007
45,200-67,799	10,869	42.2	42.1	1.1	2.6	0.004
More than 67,799	27,494	35.1	34.2	0.9	2.6	0.001

Source: Calculated by the authors.

Table 14—Cumulative share of consumers' expenditure and change in consumers' welfare per expenditure group, Belo Horizonte, 1974

Household Expenditure Group	Cumulative Share of Consumer Welfare[a]	Cumulative Share of Total Expenditure[a]	Cumulative Share of CCW with Wheat Subsidy[b]	Cumulative Share of CCW with Rice Subsidy[b]
(Cr $)		(percent)		
Less than 4,500	1.2	0.3	0.9	0.8
4,500–8,999	11.3	2.9	8.3	11.0
9,000–11,299	18.4	5.6	14.4	18.6
11,300–15,799	33.6	11.6	27.9	35.1
15,800–22,599	51.3	21.5	44.3	54.6
22,600–31,599	67.8	32.4	61.8	71.9
31,600–45,199	81.0	43.9	78.0	84.6
45,200–67,799	89.5	57.6	87.0	92.2
More than 67,799	100.0	100.0	100.0	100.0

Source: Calculated by the authors.
Note: CCW is the change in consumer welfare
[a] Obtained from Columns 3 and 4 of Appendix 1, Table 28.
[b] Obtained from cumulative multiplication of the changes in consumer welfare from Table 11 by the number of consumers in Appendix 1, Table 28.
[c] Obtained from cumulative multiplication of the changes in consumer welfare from Table 13 by the number of consumers in Appendix 1, Table 28.

sidy for each product is evaluated (Table 15). In both cases, the increase in calorie consumption was relatively small—less than 1.5 percent of per capita calorie consumption—because of the relatively low values of the price elasticities of demand for both products. In effect, the subsidies were working more as an income transfer than as an instrument to stimulate food consumption directly.

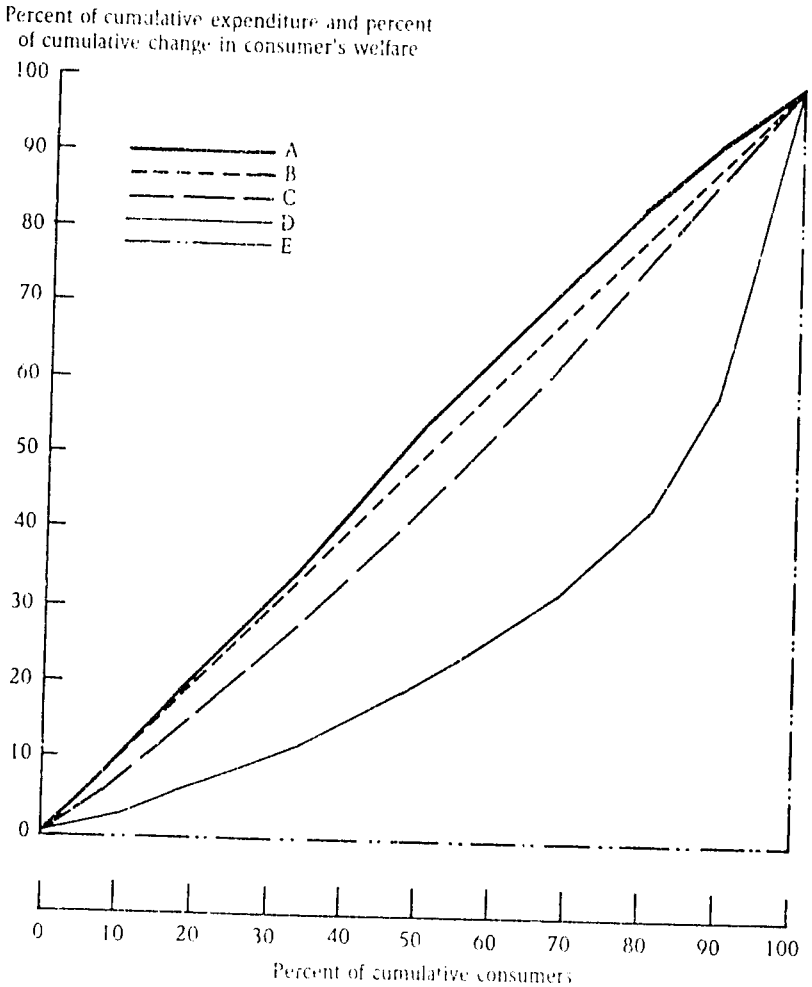
The spillover effect of these subsidies on either wheat or rice is large because the

Table 15—Estimated daily increase in energy consumption due to a general price consumption subsidy on wheat and rice, Belo Horizonte, 1974

Household Expenditure Group	Calories Consumed[a]	Daily per Capita Increase in Calorie Consumption		
		Wheat Subsidy[b]	Rice Subsidy[b]	Percent of Increase from Wheat to Rice
(Cr $)				
Less than 4,500	1,447	10	16	60
4,500–8,999	1,812	12	25	108
9,000–11,299	1,832	20	27	85
11,300–15,799	1,877	26	27	4
15,800–22,599	1,909	24	27	13
22,600–31,599	2,008	19	26	37
31,600–45,199	2,132	6	23	283
45,200–67,799	2,164	6	22	267
More than 67,799	2,314	9	18	122

Sources: Calculated by the authors. Per capita calorie consumption is from Fundação Instituto Brasileiro de Geografia e Estatística, "Special Runs of ENDEF: Consumption in Calories by Global Income Classes," FIBGE, Rio de Janeiro, 1974 (mimeographed).
[a] This column is the actual per capita calorie consumption less the increase in calorie consumption due to the wheat consumption subsidy in effect in 1974.
[b] These columns were obtained from the model used in this chapter

Figure 10—Consumers' welfare distribution



Notes: A = change in distribution of consumer welfare with rice subsidy; B = perfect equality; C = the change in distribution of consumer welfare with wheat subsidy; D = expenditure distribution; and I E = inequality.

nontarget group—consumers above the third expenditure stratum—consumes a larger amount of the wheat or rice consumed. If the primary goals of subsidizing food consumption are to improve income distribution and the nutritional status of the poor, then rice is slightly better than wheat because the increase in calorie consumption for the rice subsidy is greater than that for the wheat subsidy. In the case of wheat, a general price subsidy is even more costly because the present wheat consumption policy directs the subsidy to the wheat grain that millers buy from the government. Pereira Soares reports that during the period 1967-77 millers appropriated approximately one-third of the value of the subsidy through manipulations in the production of special wheat flour and in the marketing of bran, which was not under strong government control.[32]

In the case of rice, even if there were

[32] Pereira Soares, *Avaliação Econômica da Política Triticola.*

better distributional characteristics (see Figure 10), a general price subsidy would be difficult to administer because of a lack of organizational structure.[33] If the government's real goals are a more equitable distribution of income and improvement in the nutritional status of the poor, which kind of program should the government undertake?

Some simple estimations of the costs of alternative consumption policies are presented in Appendix 3. However, this topic deserves a more careful analysis in future research.

[33] L. E. Carvalho, "Caráter Social de Política de Subsídio ao Trigo."

5

CONCLUSIONS

During the period 1966-82, the Brazilian government's sustained effort to achieve self-sufficiency in wheat production through a production policy that consisted of a guaranteed producer price keyed to the cost of producing wheat led to a producer price that was generally above border prices evaluated at official exchange rates and below border prices evaluated at shadow exchange rates. This policy, in terms of increased wheat production, showed positive results in 4 years and negative results in 13 others, compared with the levels of production if the free market had prevailed at the shadow exchange rate. Largely because the cruzeiro was persistently overvalued during this period, the producer subsidy in most cases only offset the tax from a distorted exchange rate.

Throughout the period, aggregate wheat consumption increased mainly as a consequence of the explicit general price subsidy, and, with the exception of seven years (1966-72), this increase was greater than the increases in wheat production when valued at the official exchange rate. As a whole, the explicit production subsidy was able to reduce net imports only during the seven years referred to above. The gains in production were small, especially after discounting for the increase in seed demand for the following year as a result of increases in area planted.

The wheat production policy for the whole period represented an estimated net subsidy of Cr$11.6 billion and an estimated net tax of Cr$15.3 billion in 1977 real cruzeiros, evaluated at official and shadow exchange rates respectively. This was due in part to the rise in the price of wheat in the world market in the mid- and late 1970s, at which time the domestic price set by the government fell short of the border price. In addition, the overvaluation of the cruzeiro represented a tax on producers.

The estimated social costs of the production policy for the whole period were Cr$2.1 billion at the official rate and Cr$2.9 billion at the shadow rate. The effects on foreign exchange induced by the production policy were estimated to be a savings of about Cr$5.0 billion at the official rate and an expenditure of Cr$16.4 billion at the shadow rate. This result was contrary to the stated objectives of the explicit production policy.

The total costs of the wheat consumption subsidies for the whole period were about Cr$84.0 billion and Cr$149.9 billion evaluated at official and shadow exchange rates respectively. Of this total, consumers captured a maximum of 86 percent. However, approximately one-third of the total subsidy was captured by the nontarget group, one-third was lost through the manipulations of the millers,[34] and social costs amounted to about 15 percent of the total cost. Thus, only about 19 percent of the total subsidy was captured by the true target group, the low-income consumers. Clearly, the wheat consumption subsidy is a poor program from the viewpoint of cost-effectiveness. This conclusion is reinforced by the results obtained through the alternative consumption policy analysis in Appendix 3, in which a general price subsidy for bread was ranked in third place and had a cost 4.5 to 7.4 times greater than that of a food stamp program.

In foreign exchange expenditure, the wheat consumption subsidy program cost Cr$29.7 billion in real 1977 cruzeiros evaluated at the official exchange rate and Cr$54.1 billion at the shadow. This level of expenditure was not in accord with the objective of achieving a saving in foreign exchange. The effects of the production and

[34] Pereira Soares, *Avaliação Econômica da Política Tritícola.*

consumption policies together are the sum of individual effects of each policy.

Based on the disaggregative analysis, one can conclude that, even though the gains in consumer welfare are slightly biased toward high-expenditure groups, the wheat consumption subsidy contributed to the income redistribution objective by distributing the benefits of the subsidy more equitably. When the subsidy costs for wheat were shifted to rice in a simulated general price subsidy, the distribution of the gains became slightly biased toward the low-expenditure groups. However, two main points should be made: first, even if a cut in the wheat consumption subsidy (or the simulated rice subsidy) harms the low- and medium-expenditure groups more, the drop in real expenditure is small (less than 2 percent). Second, the effect on nutrition was slight—less than 1.5 percent of the total per capita energy intake.

Finally, based on cases studied in the alternative consumption policy analysis (Appendix 3), one can conclude that the wheat consumption subsidy is not a good policy for redistributing income, nor is it a good instrument for dealing with malnutrition. The alternative consumption policy analysis shows that if food consumption is to be subsidized, the subsidy should be through a target-oriented program, such as food stamps.

Many of the parameters used in this analysis came from secondary sources. In some cases they were estimated for a period of time other than that of the study and under somewhat different conditions. The results could be improved with updated estimates of parameters for aggregate supply and demand, disaggregate demand by income groups, shadow prices of foreign exchange, and individual intake of wheat products by income groups.

Once estimates of the parameters of the aggregate demand and supply curves and of the disaggregated demand curves are obtained, it will be possible to develop a new set of formulas to calculate the policy measures derived in this study, thus relaxing the assumption of constant demand and supply parameters. Relaxing that assumption would bring more realism to the analysis.

The production policy analysis could also be extended to account for the net effect of all policies that affect wheat production in each year. Such an analysis could be performed by making use of the theory of effective protection.

In addition, it would be interesting to expand the analysis of the alternative consumption policies to consider the products that are the best candidates for subsidizing in each typical macroregion of Brazil, considering the tastes and preferences of the target groups. Moreover, estimates and comparisons of the administrative costs of target-oriented programs and country-wide programs would be of interest.

Finally, a plan could be developed to phase out both subsidies—production and consumption—in order to minimize the negative effects on wheat growers and low-income consumers.

APPENDIX 1:

SUPPLEMENTARY TABLES

Data Set for the Aggregative Analysis

Table 16—Current wheat prices, 1965-82

Year	Producer Price	Miller Price	Import Price (c.i.f.)
		(Cr$/ metric ton)	
1965	210	157	138
1966	265	180	158
1967	317	218	197
1968	383	273	235
1969	450	311	281
1970	490	402	300
1971	547	456	385
1972	600	511	466
1973	750	573	784
1974	1,400	713	1,478
1975	1,670	734	1,380
1976	2,130	766	1,702
1977	3,170	1,202	1,574
1978	4,150	1,432	2,506
1979	5,400	1,563	4,644
1980	11,840	2,206	11,654
1981	28,500	9,918	20,550
1982	58,823	23,921	36,051

Sources: Banco do Brasil, "Trigo Nacional," Departamento de Comercialização do Trigo Nacional, Pôrto Alegre, RS, December 1979; Banco do Brasil, "Preços de Trigo para os Produtores e Volume de Produção," Departamento de Comercialização, do Trigo Nacional, Pôrto Alegre, RS. 1984 (mimeographed), Brazil, National Supply Superintendency. Departamento do Trigo, "Evolução do Preço do Trigo em Grão para Produtores e Moinhos e Consumo Aparente de Farinha de Trigo," SUNAB, Rio de Janeiro, 1983 (mimeographed); and Fundação Instituto Brasileiro de Geografia e Estatística, *Anuário Estatístico do Brasil* (Rio de Janeiro: FIBGE, various years).

Note: The c.i.f. price was obtained by dividing the total c.i.f. value of wheat grain imports by the quantity imported.

Table 17—Total production, seed consumption, consumption by millers, and imports of wheat, 1965-82

Year	Production	Seeds	Consumption	Imports
		(metric tons)		
1965	221,576	17,602	. .	2,380,659
1966	298,523	29,076	2,488,062	2,394,408
1967	364,870	47,661	2,404,039	2,446,017
1968	693,598	71,911	2,884,158	2,621,013
1969	1,146,319	117,155	2,907,855	2,355,599
1970	1,734,972	166,159	3,033,611	1,969,300
1971	2,038,632	224,831	3,209,356	1,710,521
1972	693,399	152,467	3,377,669	1,796,877
1973	1,934,439	219,351	3,797,636	2,945,548
1974	2,848,046	279,257	4,116,482	2,399,175
1975	1,582,567	344,575	4,437,274	2,082,376
1976	3,637,864	328,237	5,064,250	3,425,999
1977	2,012,842	382,699	5,252,116	2,608,068
1978	2,700,707	483,403	5,656,178	4,334,432
1979	2,381,186	402,889	6,096,512	3,650,741
1980	2,702,130	315,177	6,802,036	4,755,116
1981	2,223,632	388,272	6,097,950	4,360,034
1982	1,892,347	405,365	6,101,072	4,144,000

Sources: Banco do Brasil, "Trigo Nacional," Departamento de Comercialização do Trigo Nacional, Pôrto Alegre, RS, December 1979, Banco do Brasil, "Preços de Trigo para os Produtores e Volume de Produção," Departamento de Comercialização do Trigo Nacional, Pôrto Alegre, RS 1984 (mimeographed); Brazil, National Supply Superintendency, Departamento do Trigo, "Evolução do Preço do Trigo em Grão para Produtores e Moinhos e Consumo Aparente de Farinha de Trigo," SUNAB, Rio de Janeiro, 1983 (mimeographed); and Fundação Instituto Brasileiro de Geografia e Estatística, *Anuário Estatístico do Brasil* (Rio de Janeiro: FIBGE, various years).

Table 18—Miscellaneous data for the aggregative analysis of Brazilian wheat policy, 1965-82

Year	General Price Index, Annual Average	General Price Index, November 1977	Nominal Exchange Rate	Shadow Price Exchange Rate	Port to Mill Expenses as Percent of c.i.f. Prices[a]	Farm to Mill Expenses as Percent of Farmgate Prices[b]
	(1977	100)	(Cr$/U.S. $)			
1965	5.8	6.4	1.90	2.70	0.15	0.09
1966	8.1	8.9	2.22	3.90	0.15	0.09
1967	10.4	11.1	2.67	4.90	0.15	0.11
1968	12.9	13.9	3.38	5.70	0.15	0.14
1969	15.5	16.8	4.08	6.50	0.15	0.16
1970	18.6	19.9	4.59	7.30	0.15	0.20
1971	22.4	23.8	5.29	7.30	0.15	0.20
1972	26.2	27.6	5.93	8.20	0.15	0.19
1973	30.2	31.8	6.13	8.30	0.15	0.16
1974	38.8	42.3	6.79	9.00	0.15	0.16
1975	49.6	54.7	8.19	10.70	0.15	0.11
1976	70.1	79.9	10.67	14.30	0.15	0.13
1977	100.0	111.0	14.14	19.00	0.18	0.19
1978	138.7	157.3	18.07	24.00	0.16	0.20
1979	213.5	263.7	26.85	33.60	0.14	0.22
1980	427.5	561.8	52.71	61.50	0.13	0.15
1981	897.3	1,118.8	93.12	120.10	0.13	0.15
1982	1,753.7	2,185.2	179.51	228.20	0.14	0.16

(continued)

Table 18—Continued

Notes and Sources: The price elasticity of [illegible] for wheat grain for the whole period was −0.25 and that for supply was 0.75 (A. Rojko et al., *Alternative Futures for World Food in 1985*, Foreign Agricultural Economics Report No. 14 [Washington, D.C.: U.S. Department of Agriculture, 1978]). The general price index is from Fundação Getúlio Vargas, *Conjuctura Econômica*, various issues. The nominal exchange rate is from the International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, 1983). The shadow price of the exchange rate was calculated by the authors for each year, based on the shadow price of foreign exchange estimated by the World Bank at Cr$61.50 per U.S.$1.00 for the year 1980 (World Bank, *Brazil: Industrial Policies and Manufactured Exports* (Washington, D.C.: World Bank, 1981), Annex 21. The authors' estimate was made on the basis of the purchasing power parity method (data set and methodology are available from Geraldo Calegar upon request).

[a] Because data on port to mill expenses are not available for the years 1965-75, a simple average from 1976-82 is used here. Data for the latter years are found in Commission for Production Financing, "Preços e Custos Domésticos Internacionais Distorções, Um Estudos Preliminar," August 1983 (mimeographed).

[b] Farm to mill expenses are calculated from Banco do Brasil, "Farm to Mill Expenses," Departamento de Comercialização do Trigo Nacional (Porto Alegre, RS, 1983) (mimeographed).

Table 19—Estimated production and consumption subsidies, evaluated at official and shadow prices of foreign exchange, 1965-82

Year	Production Subsidy[a]		Consumption Subsidy[b]	
	Official Exchange Rate	Shadow Exchange Rate	Official Exchange Rate	Shadow Exchange Rate
	(percent)			
1965	55.0	3.9	1.1	30.4
1966	45.8	17.6	0.9	43.6
1967	45.8	−20.7	3.8	47.6
1968	49.7	−11.1	1.0	40.1
1969	49.4	6.5	3.8	39.6
1970	59.3	0.2	−10.5	26.7
1971	40.0	1.1	−3.0	25.4
1972	26.4	−8.5	4.6	31.1
1973	−8.2	−32.3	36.4	53.1
1974	−12.4	−33.9	58.0	68.4
1975	5.8	−18.9	53.8	64.6
1976	8.2	−19.5	60.9	70.8
1977	83.5	36.2	35.3	51.8
1978	51.1	15.8	50.8	63.2
1979	0.5	−19.5	70.5	76.4
1980	−21.7	32.6	83.2	85.6
1981	13.6	−12.3	57.3	66.9
1982	32.7	4.8	41.8	54.2

Source: Calculated by the authors.

[a] Nominal rate of protection for producers.

[b] Nominal rate of protection for consumers.

Table 20—Estimated effects of wheat production and consumption policies on quantities produced, consumed, and imported, based on the official exchange rate, 1966-82

Year	Change in Production in Year t−1[a]	Percent[b]	Partial Change in Imports in Year t[c]	Percent[b]	Consumption in Year t	Percent[b]	Total Change in Imports in Year t[d]	Percent[b]
	(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)	
1966	40.3	15.5	33.3	-1.4	5.9	0.2	-27.4	-1.1
1967	72.3	22.9	60.6	-2.4	23.1	1.0	-37.6	-1.5
1968	89.5	15.1	-70.6	-2.6	-7.2	-0.3	77.8	-2.9
1969	181.7	18.4	-151.4	-6.1	27.9	1.0	-123.5	-5.0
1970	296.4	20.4	-247.5	-10.6	-118.1	-3.8	-365.6	-15.7
1971	511.5	28.5	-461.8	-21.0	-23.9	-0.7	-485.7	-22.1
1972	450.7	71.1	-426.1	-19.5	40.1	1.2	-386.0	-17.7
1973	112.0	5.6	-126.8	-4.8	407.0	12.0	280.2	10.5
1974	130.8	4.4	101.7	6.8	803.4	24.3	905.1	60.6
1975	296.4	19.1	310.9	31.3	777.9	21.3	1,088.8	109.6
1976	66.3	2.3	-48.7	-2.0	1,058.7	26.4	1,009.8	41.8
1977	167.9	10.5	-28.4	-1.4	541.4	11.5	513.0	24.5
1978	733.3	31.2	617.8	-15.3	918.1	19.4	300.3	7.4
1979	757.6	26.4	755.5	-27.0	1,602.8	35.7	847.3	30.2
1980	15.8	0.1	-77.9	-3.3	2,450.5	56.3	2,372.6	99.6
1981	532.1	-25.6	566.5	21.6	1,168.6	23.7	1,735.2	66.1
1982	197.2	12.2	119.1	-3.4	772.1	14.5	653.0	18.7

Source: Calculated by the authors.

[a] The production of year t − 1 is consumed in year t.

[b] The percentages represent the degree of difference in production, consumption, and imports that would have been observed if world prices had prevailed.

[c] The partial change in imports in year t is the result of the production subsidy in year t − 1 alone. It is given by $\{-COP_{t-1} / [QP_{t-1} (SP_{t-1} - SW_{t-1})]\}$, where COP is the change in quantity produced, QP is the quantity produced at the subsidized price, SP is the quantity of seeds used at the subsidized producer price, and SW is the quantity of seeds used if the world price had prevailed.

[d] The total change in imports includes the effects of both producer and consumer subsidies.

Table 21—Estimated effects of wheat production and consumption policies on quantities produced, consumed, and imported based on the shadow exchange rate, 1966-82

Year	Change in Production in Year t−1[a]	Percent[b]	Partial Change in Imports in Year t[c]	Percent[b]	Consumption in Year t	Percent[b]	Total Change in Imports in Year t[d]	Percent[b]
	(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)		(1,000 metric tons)	
1966	14.3	4.1	9.8	0.5	332.0	15.4	341.8	16.7
1967	46.7	10.8	37.7	1.8	358.4	17.5	396.1	19.3
1968	69.3	9.1	62.7	2.8	346.9	13.7	409.6	18.5
1969	63.9	−5.3	57.9	3.0	344.4	13.4	402.3	20.6
1970	−58.8	−3.4	59.0	3.5	227.1	8.1	286.1	17.0
1971	2.2	0.1	−0.4	−0.03	226.3	7.6	225.9	15.2
1972	16.9	2.3	−27.4	−1.8	299.9	9.7	272.5	17.9
1973	48.0	1.9	−26.6	−1.2	654.4	20.8	627.8	27.1
1974	−657.9	−16.9	556.3	68.3	1,029.8	33.3	1,585.1	194.7
1975	1,036.3	55.9	977.6	1,082.6	1,014.5	29.6	1,992.1	2,206.1
1976	269.7	7.5	211.7	11.3	1,431.3	36.0	1,552.0	82.8
1977	537.0	33.6	616.1	55.6	876.8	20.0	1,492.9	133.9
1978	415.9	16.3	−365.5	10.6	1,251.8	28.4	886.3	25.7
1979	281.7	8.3	−352.9	16.4	1,847.8	43.5	1,494.9	69.3
1980	−509.0	−14.0	400.7	23.0	2,615.1	62.5	3,015.8	173.4
1981	928.7	37.9	888.7	44.5	1,472.4	31.8	2,361.1	118.1
1982	228.9	13.2	242.9	8.6	1,082.4	21.6	1,325.3	47.0

Source: Calculated by the authors.

[a] The production of year t − 1 is consumed in year t.

[b] The percentages represent the degree of difference in production, consumption, and imports that would have been observed if world prices had prevailed.

[c] The partial change in imports in year t is the result of the production subsidy in year t − 1 alone. It is given by $-(QP_{t-1} - [QP_{t-1}(SP_t - SW_0)]_t)$, where QP is the change in quantity produced, QP is the quantity produced at the subsidized price, SP is the quantity of seeds used at the subsidized producer price, and SW is the quantity of seeds used if the world price had prevailed.

[d] The total change in imports includes the effects of both producer and consumer subsidies.

Table 22—Estimated effects of the production policy, based on the official exchange rate, 1966-82

Year	Total Subsidy (Tax) Cost (TC)		Change in Producers' Welfare		Social Cost (SC)		Effect on Foreign Exchange (EF)		Ratio of SC to EF
	Cr$ Million	Percent	Cr$ Million	Percent of TC	Cr$ Million	Percent of TC	Cr$ Million	Percent[a]	
1966	299.4	100	263.7	88.1	35.7	11.9	162.1	2.9	0.22
1967	362.0	100	318.2	87.9	43.8	12.1	195.0	3.5	0.22
1968	725.5	100	632.1	87.1	93.4	12.9	380.6	6.5	0.25
1969	1,171.5	100	1,022.6	87.3	148.9	12.7	618.0	11.2	0.24
1970	1,908.5	100	1,632.6	85.5	275.9	14.5	948.6	20.6	0.29
1971	1,592.2	100	1,418.7	89.1	173.5	10.9	890.6	20.8	0.19
1972	375.8	100	345.7	92.0	30.1	8.0	229.2	5.9	0.13
1973	481.7	100	498.0	103.4	16.3	3.4	389.8	4.8	0.04
1974	-1,546.8	100	-1,627.6	105.2	81.1	5.2	-1,301.8	-14.1	0.06
1975	299.1	100	292.8	97.9	6.3	2.1	213.3	3.1	0.03
1976	668.3	100	649.9	97.2	18.4	2.8	469.0	4.7	0.04
1977	3,101.8	100	2,550.8	82.2	551.0	17.8	1,362.0	21.9	0.40
1978	2,679.1	100	2,363.9	88.2	315.2	11.8	1,457.7	13.6	0.22
1979	51.9	100	51.7	99.6	0.2	0.4	38.7	0.4	0.01
1980	-1,772.6	100	-1,948.7	109.9	176.1	9.9	-1,637.7	-12.6	0.11
1981	758.3	100	724.8	95.6	33.5	4.4	210.2	4.3	0.07
1982	1,404.0	100	1,269.7	90.4	134.3	9.6	813.0	7.8	0.16
Total	11,596.6	100	9,462.9	81.6	2,133.7	18.4	4,963.7	3.7	0.43

Source: Calculated by the authors.
Note: Cr$ million are in real 1977 cruzeiros.
[a] Percent = EF ÷ 100/(total cost of wheat imports + EF).

Table 23—Estimated effects of the production policy, based on the shadow exchange rate, 1966-82

Year	Total Subsidy (Tax) Cost (TC)		Change in Producers' Welfare		Social Cost (SC)		Effect on Foreign Exchange (EF)		Ratio of SC to EF
	Cr$ Million	Percent	Cr$ Million	Percent of TC	Cr$ Million	Percent of TC	Cr$ Million	Percent[a]	
1966	207.5	100	223.9	107.9	-16.4	-7.9	184.3	2.0	0.09
1967	-302.1	100	331.1	109.6	-29.0	9.6	-277.3	2.9	0.10
1968	-271.9	100	284.8	104.6	12.9	4.6	-226.0	2.5	0.06
1969	245.2	100	251.6	102.6	-6.3	-2.6	-195.0	2.6	0.03
1970	8.7	100	8.7	100.0	0.0	0.0	6.5	0.1	0.00
1971	61.2	100	60.9	99.5	0.3	0.5	45.4	1.0	0.00
1972	-167.1	100	172.9	103.5	-5.8	3.5	135.5	2.7	0.04
1973	-2,526.4	100	2,962.8	117.3	-436.4	17.3	2,658.6	-28.8	0.16
1974	-5,604.9	100	-6,642.7	118.5	1,037.8	18.5	6,019.8	-76.1	0.17
1975	-1,251.8	100	1,359.4	108.6	107.6	8.6	-1,127.1	-14.9	0.10
1976	-2,217.6	100	2,415.4	108.9	197.8	8.9	-2,009.3	18.6	0.10
1977	1,815.0	100	1,630.5	89.8	185.1	10.2	1,037.8	13.8	0.18
1978	1,199.1	100	1,137.0	94.8	62.1	5.2	790.6	6.1	0.08
1979	-1,743.1	100	-1,898.5	108.9	155.4	8.9	-1,579.2	16.2	0.10
1980	3,161.5	100	3,713.6	117.5	-552.1	17.5	-3,337.3	24.3	0.17
1981	-909.5	100	956.6	105.2	47.1	5.2	764.5	5.5	0.06
1982	259.5	100	255.0	98.3	4.5	1.7	186.8	1.5	0.02
Total	-15,264.6	100	18,120.9	118.7	2,856.3	18.7	-16,446.8	-10.5	0.17

Source: Calculated by the authors.
Note: Cr$ million are in real 1977 cruzeiros.
[a] Percent = EF ÷ 100/(total cost of wheat imports + EF).

Table 24—Estimated effects of the consumption policy, based on the official exchange rate, 1966-82

Year	Total Subsidy (Tax) Cost (TC)		Change in Consumers' Welfare		Social Cost (SC)		Effect on Foreign Exchange (EF)		Ratio of SC to EF
	Cr$ Million	Percent	Cr$ Million	Percent of TC	Cr$ Million	Percent of TC	Cr$ Million	Percent[a]	
1966	52.2	100	52.3	99.8	0.1	0.2	13.1	0.23	0.01
1967	177.1	100	176.2	99.5	0.9	0.5	500.0	0.95	0.02
1968	60.6	100	60.7	100.2	0.1	0.2	15.1	0.27	0.01
1969	229.7	100	228.6	99.5	1.1	0.5	58.3	1.20	0.02
1970	-928.3	100	-945.8	101.9	17.5	1.9	219.0	5.66	0.08
1971	-189.4	100	190.0	100.3	0.6	0.3	46.8	1.37	0.01
1972	320.9	100	319.0	99.4	1.9	0.6	81.7	2.27	0.02
1973	4,131.8	100	3,889.6	94.1	242.2	5.9	1,214.6	16.03	0.20
1974	10,468.2	100	9,264.1	88.5	1,204.1	11.5	3,520.1	50.35	0.34
1975	7,632.1	100	6,856.7	89.8	775.4	10.2	2,489.6	59.65	0.31
1976	8,604.2	100	7,532.0	87.5	1,072.2	12.5	2,955.1	44.70	0.36
1977	3,440.1	100	3,246.9	94.4	193.2	5.6	1,005.0	26.18	0.19
1978	6,946.1	100	6,233.3	89.7	716.8	10.3	2,272.7	30.23	0.32
1979	10,056.7	100	8,968.7	83.4	1,748.0	16.6	3,975.2	78.27	0.44
1980	17,440.4	100	13,191.4	75.6	4,249.0	24.4	7,546.9	106.31	0.56
1981	9,043.4	100	8,025.0	88.7	1,018.4	11.3	3,024.5	36.62	0.34
1982	5,979.1	100	5,558.1	93.0	420.0	7.0	1,816.5	22.91	0.23
Total	83,957.7	100	72,295.2	86.1	11,661.5	13.9	29,736.4	30.68	0.39

Source: Calculated by the authors.
Note: Cr$ million are in real 1977 cruzeiros.
[a] Percent EF = 100 × (total cost of wheat imports ÷ EF).

Table 25—Estimated effects of the consumption policy, based on the shadow exchange rate, 1966-82

Year	Total Subsidy (Tax) Cost (TC)		Change in Consumers' Welfare		Social Cost (SC)		Effect on Foreign Exchange (EF)		Ratio of SC to EF
	Cr$ Million	Percent	Cr$ Million	Percent of TC	Cr$ Million	Percent of TC	Cr$ Million	Percent[a] of TC	
1966	4,272.6	100	3,952.7	92.5	319.3	7.5	1,308.7	16.1	0.24
1967	4,572.5	100	4,186.1	91.6	386.4	8.4	1,432.9	17.2	0.27
1968	4,086.9	100	3,814.9	93.3	272.0	6.7	1,225.7	15.3	0.22
1969	3,823.8	100	3,573.8	93.5	250.0	6.5	1,143.5	17.1	0.22
1970	2,393.5	100	2,298.1	96.0	95.4	4.0	669.9	13.0	0.14
1971	2,220.9	100	2,137.8	96.3	83.1	3.7	617.5	15.3	0.13
1972	2,965.6	100	2,823.8	95.2	141.8	4.8	847.7	20.0	0.17
1973	8,145.9	100	7,334.6	90.0	811.3	10.0	2,645.0	28.6	0.31
1974	16,334.2	100	13,815.2	84.6	2,519.0	5.4	5,972.8	75.1	0.42
1975	11,980.6	100	10,320.5	86.1	1,660.1	13.9	4,240.3	95.0	0.39
1976	13,415.2	100	11,195.0	83.5	2,220.2	16.5	5,018.9	64.3	0.44
1977	6,796.7	100	6,143.3	90.4	653.4	9.6	2,188.7	50.6	0.30
1978	10,039.7	100	8,701.1	86.7	1,338.6	13.3	3,513.9	40.6	0.38
1979	14,454.8	100	11,628.4	80.5	2,826.4	19.5	5,733.5	102.5	0.49
1980	20,963.7	100	15,384.5	73.5	5,552.2	26.5	9,398.3	122.2	0.59
1981	13,616.7	100	11,602.0	85.2	2,014.7	14.8	4,915.2	51.0	0.41
1982	9,853.2	100	8,838.5	89.7	1,014.7	10.3	3,224.4	35.4	0.31
Total	149,913.9	100	127,755.3	85.2	22,158.6	14.8	54,096.9	45.4	0.41

Source: Calculated by the authors.
Note: Cr$ million are in real 1977 cruzeiros.
[a] Percent EF = 100/(total cost of wheat imports ÷ EF).

Data Set for the Disaggregative Analysis

Table 26—Annual per capita expenditures on wheat products and rice, by expenditure group, metropolitan area of Belo Horizonte and rural areas of Minas Gerais and Espirito Santo, 1974/75

Expenditure Group	Wheat Bread and Crackers	Macaroni	Wheat Flour	Rice
		(Cr $)		
Metropolitan area				
Less than 4,500	30	25	2	70
4,500–8,999	37	20	1	105
9,000–11,299	57	28	2	154
11,300–15,799	62	23	2	144
15,800–22,599	82	27	2	164
22,600–31,599	137	33	5	143
31,600–45,199	170	30	5	132
45,200–67,799	150	28	5	154
More than 67,799	189	30	10	131
Rural areas				
Less than 2,300	2	6	0	39
2,300–3,399	6	12	1	77
3,400–4,499	6	11	2	93
4,500–6,799	9	16	2	112
6,800–8,999	15	20	3	159
9,000–15,799	18	18	7	163
15,800–22,599	25	25	10	190
22,600–31,599	35	22	12	221
More than 31,599	61	29	14	265

Source: Fundação Instituto Brasileiro de Geografia e Estatística, *Estudo Nacional da Despesa Familiar: Despesas das Famílias, Dados Preliminares*, 6 vols. (Rio de Janeiro: FIBGE, 1978 and 1979).

Note: Wheat products include bread and crackers, macaroni, and wheat flour.

Table 27—Energy consumption from wheat products and rice per consumer per day, metropolitan area of Belo Horizonte and rural areas of Minas Gerais and Espírito Santo, 1974/75

Expenditure Group	Wheat Bread and Crackers	Macaroni	Wheat Flour	Rice
		(kilocalories/consumer/day)		
Metropolitan area				
Less than 4,500	73	109	7	274
4,500–8,999	107	83	6	435
9,000–11,299	132	94	10	465
11,300–15,799	152	84	11	470
15,800–22,599	166	79	12	475
22,600–31,599	199	79	19	453
31,600–45,199	252	69	18	412
45,200–67,799	265	53	20	386
More than 67,799	274	48	34	321
Rural areas				
Less than 2,300	4	28	1	186
2,300–3,399	13	42	2	272
3,400–4,499	13	52	10	337
4,500–6,799	17	60	14	410
6,800–8,999	25	65	14	465
9,000–15,799	32	61	30	551
15,800–22,599	37	79	45	557
22,600–31,599	58	69	42	650
More than 31,599	71	70	50	663

Source: Fundação Instituto Brasileiro de Geografia e Estatística, "Special Runs of ENDEF: Consumption in Calories by Global Income Classes," FIBGE, Rio de Janeiro, n.d. (mimeographed).
Note: Wheat products include bread and crackers, macaroni, and wheat flour.

Table 28—Data for derivation of expenditures and changes in consumer welfare curves, Belo Horizonte, 1974/75

Household Expenditure Group	Per Capita Expenditure	Number of Consumers	Total Expenditure
(Cr$)	(Cr$)	(1,000)	(Cr$1,000)
Less than 4,500	1,604	22	37,102
4,500–8,999	1,749	184	321,816
9,000–11,299	2,549	128	326,272
11,300–15,999	2,692	275	740,300
16,000–22,599	3,793	320	1,213,760
22,600–31,599	4,453	300	1,335,900
31,600–45,199	5,919	240	1,420,560
45,200–67,799	10,869	155	1,684,695
More than 67,799	27,494	190	5,223,860
Total	. . .	1,814	12,304,265

Source: Fundação Instituto Brasileiro de Geografia e Estatística, *Estudo Nacional da Despesa Familiar: Despesas das Famílias, Dados Preliminares*, 6 vols. (Rio de Janeiro: FIBGE, 1978).
Note: Total expenditure is the per capita expenditure times the number of consumers.

APPENDIX 2: A SIMPLE MODEL FOR ANALYZING THE EFFECTS OF SHIFTING THE SUBSIDY FROM WHEAT TO RICE

When the market for rice in Belo Horizonte is viewed as an undistorted market (that is, without government intervention), it can be depicted in equilibrium at price P_0 and quantity Q_0, according to Figure 11. DD is the demand for rice and SS is the supply of rice. It is assumed that SS is infinitely elastic because the Belo Horizonte market is a relatively small fraction of the Brazilian market. To determine the effect on the price of rice of transferring the consumption subsidy from wheat to rice, in order to use the methodology in Chapter 4 to evaluate the distributional effects of that transfer, the following equations related to Figure 11 must be solved:

$$(P_0 - P_1)Q_1 = TCS, \qquad (36)$$

$$Q_0 = aP_0^{\eta}, \text{ and} \qquad (37)$$

$$Q_1 = aP_1^{\eta}, \qquad (38)$$

where

P_0 and Q_0 = the equilibrium free market price and quantity;

P_1 and Q_1 = the postsubsidy equilibrium price and quantity;

TCS = the total cost of the subsidy of wheat transferred to rice, that is, area P_0ABP_1 in Figure 11;

a = the demand shifter; and

η = the price elasticity of demand for rice in Belo Horizonte.

As can be seen, the demand function is assumed to be of constant elasticity.

In the system above, the values for P_0, Q_0, and TCS have been estimated from secondary sources, as shown in the table below.

	Estimate
P_0	Cr$3.25/kg
Q_0	377 kg/year
η	−0.13
TCS	Cr$402.00/year
P_1	Cr$2.23/kg

Here P_0 is an average price per kilogram paid by consumers in the metropolitan area of Belo Horizonte in August 1974, calculated by dividing the annual per capita expenditures on rice[35] by the annual per capita consumption of rice,[36] after converting to kilograms, considering that 1 kilogram = 3,570 calories.[37]

Q_0 is the average quantity used (41.9 kilograms per year) multiplied by nine, which is an average of the nine expenditure strata. η is an average from estimates made by Paniago and Mandell for Brazil.[38] TCS, the total cost of the subsidy, is obtained from Table 12. It is a summation of all nine figures of the third column. Finally, P_1 is obtained from the solution of equation (39) below.

After substituting the known variables above into the system defined earlier and solving for P_1, the following equation is obtained:

$$377 \cdot (3.25)^{1.13} \cdot (P_1)^{-0.13} - 377 \cdot (3.25)^{1.13} \cdot (P_1)^{0.87} - 402 = 0. \qquad (39)$$

---

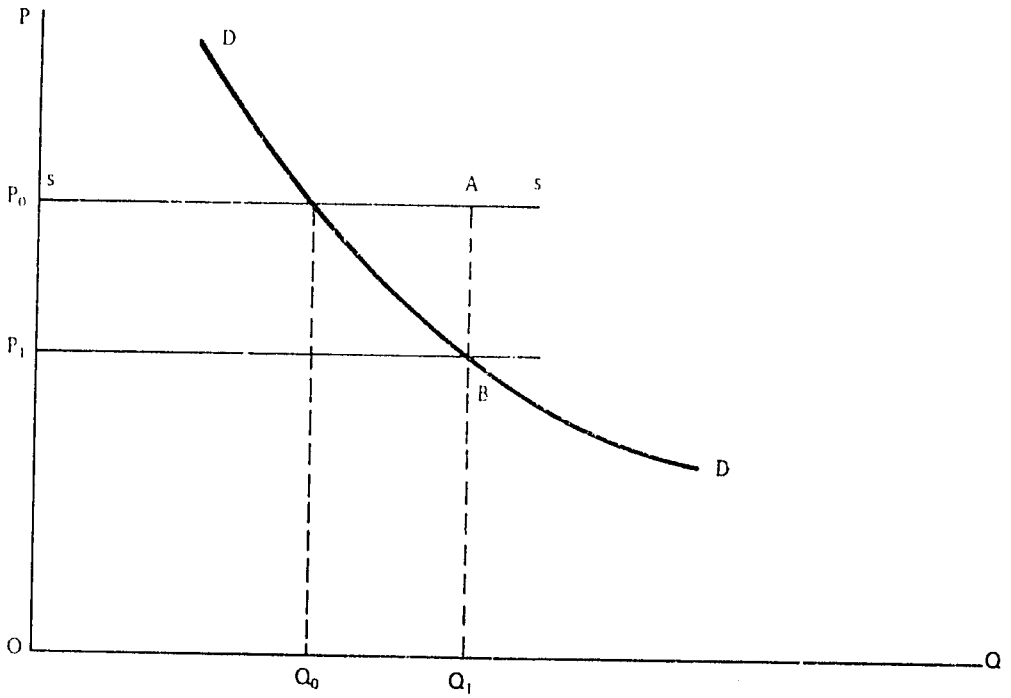
[35] Fundação Instituto Brasileiro de Geografia e Estatística, *Estudo Nacional da Despesa Familiar: Despesas das Famílias, Dados Preliminares*, 6 vols. (Rio de Janeiro: FIBGE, 1978) Region 4, p. 65, first column.

[36] Fundação Instituto Brasileiro de Geografia e Estatística, "Special Runs of ENDEF: Consumption in Calories by Global Income Classes," Rio de Janeiro, n.d., Region 4, p. 29 (mimeographed).

[37] Fundação Instituto Brasileiro de Geografia e Estatística, *Estudo Nacional da Despesa Familiar: Tabelas de Composição de Alimentos*, 2nd edition (Rio de Janeiro: FIBGE, 1981), p. 22.

[38] Euler Paniago, "An Evaluation of Agricultural Price Policies for Selected Food Products: Brazil," (Ph.D. dissertation, Purdue University, 1969); and A. I. Mandell, "A Expansão da Moderna Rizicultura: Crescimento de Oferta numa Economia Dinâmica," *Revista Brasileira de Economia* 26 (July/September 1972): 169-236.

Figure 11—Retail market for rice in Belo Horizonte



APPENDIX 3: ALTERNATIVE CONSUMPTION POLICIES: A MODEL AND SOME RESULTS

Among the many questions to be answered before any policy option is chosen, questions of fiscal cost and cost-effectiveness are perhaps the most important if one considers that public resources are scarce and therefore must be allocated as efficiently as possible. In this appendix, a simple model suggested by Reutlinger and Selowsky is presented to estimate the fiscal cost and cost-effectiveness of three basic policy options for improving the nutritional status of target groups in any society.[39]

Two large typologies of policies are identified for study: country-wide and target group-oriented programs. In the first case, all segments of society benefit in the process of benefiting the target or deficient group; in the second case, only the target group receives the benefits. In other words, there is no spillover effect. The country-wide policy to be considered is a general price subsidy, whereas the target-oriented programs include a food stamp program and a price subsidy.

The Model

Under the assumption that the policy objective is to increase the consumption of a specific food in the target group by a fraction λ of the initial consumption of that food item by the target group, let α represent the share of consumption of that food by the target group (in the present case a low-income group).

If there are only two consumer groups, the target or low-income group (p), and the remaining, or richer group (r), with respective price elasticities of demand for the food item, η_p and η_r, one can define η_t as

$$\eta_p + (1 - \alpha)\eta_r,$$

where η_t is the total demand price elasticity for the commodity, expressed as the weighted average of the demand elasticities of both groups in absolute values.

First, an expression is derived to compute the fiscal cost (FC) of a general price subsidy, taking into account the policy objective defined above and the parameters of supply and demand for the target group or the whole population whenever necessary. Departing from the definitions of supply and demand elasticities and considering the market equilibrium after the general price subsidy has been instituted, two equations are obtained of the form:

$$\eta_p = (dq/dp^d)(P_o/q_o) + dp^d = \lambda/\eta_p, \text{ and} \quad (40)$$

$$\eta_t dp^d = \varepsilon_t dp^s + dp^s = (\eta_t/\varepsilon_t)\, dp^d, \quad (41)$$

where

q_o = the quantity of the commodity consumed by the target group, or αQ_o, where Q_o is the total consumption of the aggregated consumers;

dp^d, dp^s = percent of changes in the demand and supply prices, respectively;

ε_t = elasticity of total supply for the commodity; and

λ = dq/qo.

Substituting equation (40) into equation (41) gives

$$dp^s = (\eta_t/\eta_p)(\lambda/\varepsilon_t)P_o. \quad (42)$$

With FC as the fiscal cost of the general price subsidy under consideration, the equation can be written:

---

[39] Shlomo Reutlinger and Marcelo Selowski, *Malnutrition and Poverty: Magnitude and Policy Options* (Baltimore: Johns Hopkins University Press for the World Bank, 1976).

$$FC_G = (dp^d + dp^s)$$
$$[Q_o + \eta_t dp^d(Q_o/P_o)], \qquad (43)$$

which, after substituting equations (41) and (42) into (43), becomes

$$FC_G = P_o Q_o(\lambda/\eta_p)[1 + (\eta_t/\varepsilon_t)]$$
$$[1 + \lambda(\eta_t/\eta_p)]. \qquad (44)$$

If $\varepsilon_t \to \infty$, the product could have an infinitely elastic supply curve (which could be the case if it is an imported product for which the country is a small buyer in the world market), then equation (44) becomes

$$FC_G = P_o Q_o(\lambda/\eta_p)[1 + \lambda(\eta_t/\varepsilon_p)]. \qquad (45)$$

In order to obtain the unitary cost of the general price consumption subsidy, UC_G (the cost incurred by the government for each additional unit of the consumption good by the target group), it is only necessary to divide equations (44) and (45) by dq (the total increase in consumption of the good by the target group with respect to the initial consumption level of the target group) as follows:

$$UC_G = (FC_G/\lambda\alpha Q_o). \qquad (46)$$

In order to derive expressions for the fiscal cost and the unitary cost of target-oriented programs using the same set of parameters as above, one must depart from Figure 12. Figure 12 represents the market for a food product that is relevant for the low-income target group, where D_p represents the demand by the group as a function of initial income Y, and S_p represents the excess supply faced by the target group. Therefore, $S_p = S_t - D_r$, where S_t and D_r are the total supply and demand of the non-target (upper-income) group.

Initial consumption and price are q_o and P_o, respectively.

The objective of the policy as set forth earlier is to induce an increase in consumption of the food product by the target group by $\lambda = \Delta q/q_o$. First, some basic expressions are derived that will be used later in computing the fiscal and unitary costs of the alternative policy options for the target group.

The increase in price needed to induce an increment in supply equal to Δq is equal to Δ_1. Denoting ε_p as the elasticity of supply faced by the target group, the following expression may be defined:

$$\varepsilon_p = [(\Delta_q/q_o)/(\Delta_1/P_o)]$$
$$+ (\Delta_1/P_o) = (\lambda/\varepsilon_p). \qquad (47)$$

If the decline in price required to induce the target group to increase consumption by λ is equal to Δ_2, then the following expression may be defined (in absolute value):

$$\eta_p = [(\Delta_q/q_o)/(\Delta_1/P_o)]$$
$$+ (\Delta_2/P_o) \quad (\lambda/\eta_p). \qquad (48)$$

Now the respective formulas for calculating the fiscal cost and unitary costs of a price subsidy and a food stamp program are derived.

First, if the possibility of subsidizing just the consumption of the target group is considered, then the fiscal cost of that subsidy will be

$$FC_s = (q_o + \Delta_q)(\Delta_1 + \Delta_2). \qquad (49)$$

Substituting from equations (47) and (48) and recalling that $q_o = \alpha Q_o$ and $q = \lambda\alpha Q_o$, one obtains:

$$FC_s = P_o Q_o \alpha\lambda(1 + \lambda)(1/\varepsilon_p + 1/\eta_p), \qquad (50)$$

and if $\varepsilon_p \to \infty$, then

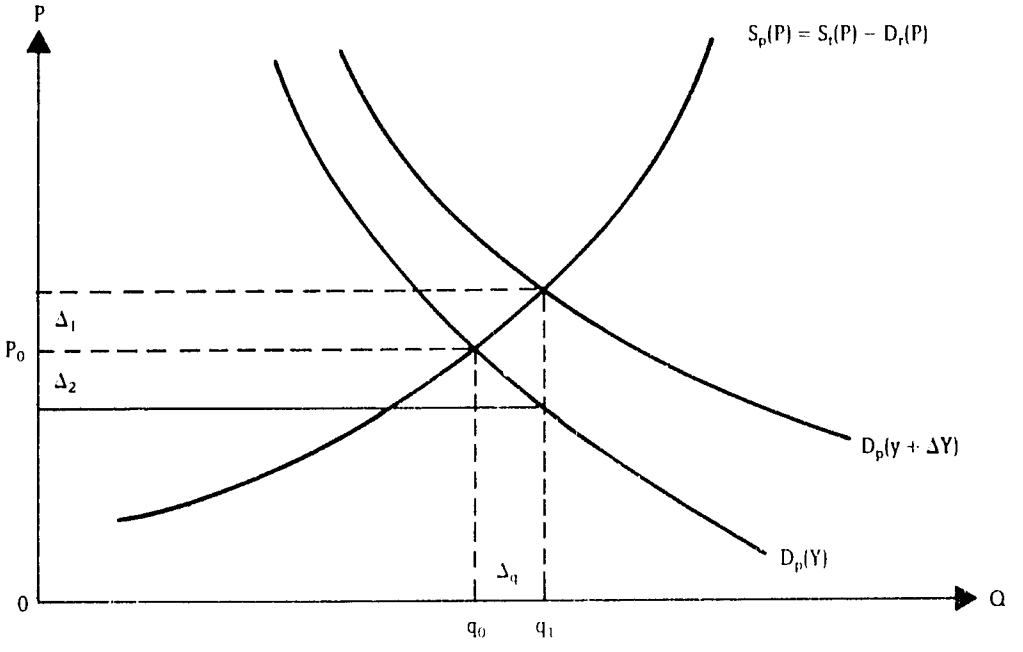
$$FC_s = P_o Q_o(\alpha\lambda/\eta_p)(1 + \lambda), \qquad (51)$$

and the unitary cost UC_s will be

$$UC_s = FC_s/\alpha\lambda Q_o. \qquad (52)$$

Next, the cost of a food stamp program is considered. The question now is, "What is the value of the income transfer or the fiscal cost FC_{FS} required to induce an increase in physical consumption of a specific product i by the target gorup in Δ_q?" Note that the value of the transfer must be able

Figure 12—Hypothetical market for a relevant product for a target group



to finance the increment Δ_q—valued at the new supply price of the product—as well as to finance the increased cost of the old consumption q_0. The transfer or fiscal cost of the program becomes

$$FC_{FS} = \Delta_1(q_0 + \Delta_q) + P_0\Delta_q, \text{ and}$$

$$FC_{FS} = P_0Q_0\alpha\lambda\{[(1 + \lambda)/\varepsilon_p] + 1\}. \quad (53)$$

If $\varepsilon_p \to \infty$, then

$$FC_{FS} = P_0Q_0\alpha\lambda. \quad (54)$$

The unitary cost of the additional consumption due to the program is given by

$$UC_{FS} = FC_{FS}/\alpha\lambda Q_0. \quad (55)$$

Cost-Effectiveness of Alternative Policies

Once the disaggregative model has been applied to a comparison of the relative costs of a food stamp and a price subsidy program for a target group with a general price subsidy for food in Brazil as a whole, the cost-effectiveness of these programs can be considered. Although a search of the literature did not yield an ideal set of parameters for estimating the cost-effectiveness of the programs, those parameters that were available were used with the sensitivity analysis shown in Table 29 in order to account for possible variations. The programs, ranked in order of cost-effectiveness, were food stamp program, target-oriented price subsidy, and general price subsidy.

The difference between the cost-effectiveness of the target-oriented price subsidy and the food stamp program, for the alternative values of ε and η_p, ranged from 11 percent ($\varepsilon = 0.14$ and $\eta_p = 1.0$) to 62 percent ($\varepsilon = 0.14$ and $\eta_p = 0.7$). This means that the target-oriented price subsidy is less cost-effective than the food stamp program, but the difference was not large in comparison with the ineffectiveness of the general price subsidy (last line of Table 29). To make one dollar of food available for the target group, the cost ranged from 5.62 percent ($\varepsilon = 0.8$ and $\eta_p = 1.0$) to 27.16 percent ($\varepsilon = 0.14$ and $\eta_p = 0.7$). This means that the differences in cost-effectiveness be-

Table 29—Cost-effectiveness of target-group-oriented programs and a general food price subsidy program with different demand and supply elasticities, as a ratio of the price per unit, 1984

Program	Formula	Wheat Bread[a]		Rice[a]		Edible Beans[a]	
		−1.0	−0.7	−1.0	−0.7	−1.0	−0.7
Target group							
Food stamp	$1 - [(1 - \lambda)/\varepsilon_p]$	1.25	1.25	1.56	1.56	1.80	1.80
Price subsidy	$(1 - \lambda)[1/\varepsilon_p + 1/\eta_p]$	1.45	1.96	1.76	2.27	2.00	2.91
General							
Price subsidy	$1/\alpha\eta_p(1 - \eta_t/\varepsilon)$ $(1 - \lambda\eta_t/\eta_p)$	5.62	9.30	9.54	16.73	15.02	27.16

Source: Calculated by the authors.

Notes: The value of ε was obtained according to the method described in A. C. Pastore, "A Oferta de Produtos Agrícolas no Brasil," *Estudos Econômicos* 7 (No. 1, 1975): 29-64. The values of $\lambda = 0.20$, $\alpha = 0.30$, and $\eta_t = 0.2$ were assumed by the authors. In order to get η_t and η_{tp}, the following formulas were used: $\eta_t = \eta_p + (1-\lambda)\eta_t$ and $\varepsilon_i = \varepsilon/\lambda + (1-\alpha) \cdot \eta_i/\alpha$.

[a] For wheat bread, the value of $\varepsilon = 0.8$ ($\varepsilon_i = 4.8$); for rice, it is $\varepsilon = 0.27$ ($\varepsilon_i = 2.15$); and for edible beans, it is $\varepsilon = 0.14$ ($\varepsilon_i = 1.50$), and for each product respectively $\eta_t = -1.0$ and -0.7.

tween the general price subsidy and the food stamp program ranged from 3.5 to 14 times.

This is a significant difference. If it were possible to shift from the present general price subsidy for wheat in Brazil to a food stamp program, it would certainly lead to a large gain in cost-effectiveness. With the same amount of financial resources, the per capita benefits for the target group (here assumed to be $\alpha = 30$ percent of the population) would be considerably larger. A shift from the general price subsidy for wheat to a food stamp program would strongly contribute to reducing the budget deficit without lowering the nutritional status of low-income people.

It is clear that this simple exercise should be improved, and more sophisticated methodologies should be used, taking into account not only the direct but also the cross-effects, to evaluate more carefully the real and monetary effects of different programs to improve the nutritional status of the low-income population in Brazil.

BIBLIOGRAPHY

Banco do Brasil. "Farm to Mill Expenses." Departamento de Comercialização do Trigo Nacional. Pôrto Alegre, Rio Grande do Sul, 1984 (mimeographed).

———. "Precos de Trigo para os Produtores e Volume de Produção." Departamento de Comercialização do Trigo Nacional. Pôrto Alegre, Rio Grande do Sul, 1983 (mimeographed).

———. "Trigo Nacional." Departamento de Comercialização do Trigo Nacional. Pôrto Alegre, Rio Grande do Sul, December 1979 (mimeographed).

Banco Central. *Brasil Programa Econômico—Ajustamento Interno e Externo.* Brasilia: Banco Central, October 1982.

Bale, Malcolm D., and Lutz, Ernst. "Price Distortions in Agriculture and Their Effects: An International Comparison." *American Journal of Agricultural Economics* 63 (February 1981): 8-22.

Barker, Randolph, and Hayami, Yujiro. "Price Support Versus Input Subsidy for Food Self-Sufficiency in Developing Countries." *American Journal of Agricultural Economics* 58 (February 1981): 617-628.

Brazil, Commission for Production Financing. "Precos e Custos Domésticos e Internacionais: Distorções, Um Estudo Preliminar." August 1983 (mimeographed).

Brazil, National Supply Superintendency, Departamento do Trigo. "Evolução do Preço do Trigo em Grão para Produtores e Moinhos e Consumo Aparente de Farinha de Trigo." Rio de Janeiro, 1983 (mimeographed).

Calegar, Geraldo M. "Brazilian Wheat Policy and Its Income Distribution and Trade Effects: A Case Study." Ph.D. dissertation, University of Minnesota, 1984.

Carvalho, Luis Eduardo. "O Caráter Social de Política de Subsídio ao Trigo." *Alimentação e Nutrição* (March 1981): 32-42.

Contador, Claudio Roberto. "Trigo Nacional: O Custo Social da Auto-Suficiência." *Estudos Econômicos* 4 (No. 3, 1974): 53-83.

Currie, J. M.; Murphy, J. A.; and Schmitz, A. "The Concept of Economic Surplus and Its Use in Economic Analysis." *Economic Journal* 81 (December 1971): 741-799.

Federação das Cooperativas Brasileiras de Trigo e Soja, LTDA. "Custo de Produção: Trigo Revisão Safra 1983, Soja-Estimativa 1983-84." Pôrto Alegre, Rio Grande Do Sul, n.d.

Ferreira e Silva, Telma. "Politica Triticola—Efeitos de uma Redução no Subsídio." M.S. thesis: Universidade Federal de Viçosa, 1981.

Fundação Getúlio Vargas. *Conjunctura Econômica* 33 (November 1977).

———. *Conjunctura Econômica* 39 (April 1985).

Fundação Instituto Brasileiro de Geografia e Estatística. *Anuário Estatístico do Brasil.* Rio de Janeiro: FIBGE, various years.

———. *Estudo Nacional da Despesa Familiar: Despesas das Famílias, Dados Preliminares.* 6 vols. Rio de Janeiro: FIBGE, 1978 and 1979.

_____. *Estudo Nacional de Despesa Familiar: Tabelas de Composição de Alimentos.* 2nd edition. Rio de Janeiro: FIBGE, 1981.

_____. "Special Runs of ENDEF: Consumption in Calories by Global Income Classes; Annex A: Number of Days Researched; Annex B: Average Number of Comensal Days." FIBGE, Rio de Janeiro, n.d. (mimeographed).

Garcia, João Carlos. "Avaliação dos Impactos do Aumento na Oferta de Alimentos e Renda sobre a Nutrição Humana e suas Implicações para o Estabelecimento de Prioridades de Pesquisas Agrícolas no Brasil." Ph.D. dissertation, Universidade Federal de Viçosa, 1978.

Hall, L. L. "Evaluating the Effects of P. L. 480: Wheat Imports in Brazil's Grain Sector." *American Journal of Agricultural Economics* 62 (February 1980): 19-28.

Harberger, A. C. "Three Basic Postulates for Applied Welfare Economics: An Interpretative Essay." *Journal of Economic Literature* 9 (September, 1971): 785-797.

International Monetary Fund. *International Financial Statistics.* Washington, D.C.: IMF, 1983.

Just, R. E.; Hueth, D. L.; and Schmitz, A. *Applied Welfare Economics and Public Policy.* Englewood Cliffs, N.J.: Prentice-Hall, 1982.

Kakwani, N. C. *Income Inequality and Poverty: Methods of Estimation and Policy Applications.* New York: Oxford University Press, 1980.

Knight, Peter. *Brazilian Agricultural Technology and Trade: A Study of Five Commodities.* New York: Praeger, 1971.

Lopes, Mauro R. "The Mobilization of Resources from Agriculture: A Policy Analysis of Brazil." Ph.D. dissertation, Purdue University, 1977.

Mandell, P. I. "A Expansão da Moderna Rizicultura: Crescimento de Oferta Numa Econômia Dinâmica." *Revista Brasileira de Economia* 26 (July/September 1972): 169-232.

Martin, M. V., and Brokken, R. F. "The Scarcity Syndrome: A Comment." *American Journal of Agricultural Economics* 63 (February 1983): 158-159.

McCarthy, F. D., and Taylor, Lance. "Macro Food Policy Planning: A General Equilibrium Model for Pakistan." *The Review of Economics and Statistics* 62 (February 1980): 107-121.

Mendonça de Barros, José Roberto. *Exportações de Produtos Primários Não Tradicionais.* Série IPE-Monografias-4. São Paulo: Universidade de São Paulo, 1974.

Paniago, Euter. "An Evaluation of Agricultural Price Policies for Selected Food Products: Brazil." Ph.D. dissertation, Purdue University, 1969.

Pastore, A. C. "A Oferta de Produtos Agrícolas no Brasil." *Estudos Econômicos* 12 (No. 1, 1975): 29-64.

Pereira Soares, Ricardo. *Avaliação Econômica da Política Triticola de 1967 a 1977,* vol. 20. Brasília: Comissão de Financiamento da Produção, Coleção Análise e Pesquisa, 1980.

Portela de Lima Fernandes, D. "Aspectos Econômicos e Estatísticos do Trigo no Brasil." *Informe Agropecuário* 9 (January 1983): 1-8.

Reutlinger, Shlomo, and Selowski, Marcelo. *Malnutrition and Poverty: Magnitude and Policy Options.* Baltimore: The Johns Hopkins University Press for the World Bank, 1976.

Rojko, A.; Rieger, D.; O'Brien, A.; Coffing, A.; and Bailey, L. *Alternative Futures for World Food in 1985.* Foreign Agricultural Economics Report No. 14. Washington, D.C.: U.S. Department of Agriculture, 1978.

Scobie, Grant M. *Food Subsidies in Egypt: Their Impact on Foreign Exchange and Trade.* Research Report 40. Washington, D.C.: International Food Policy Research Institute, 1983.

Williamson Gray, Cheryl. *Food Consumption Parameters for Brazil and Their Application to Food Policy.* Research Report 32. Washington, D.C.: International Food Policy Research Institute, 1982.

World Bank. *Brazil: A Review of Agricultural Policies.* Washington, D.C.: World Bank, 1982.

_____. *Brazil: Industrial Policies and Manufactured Exports.* Washington, D.C.: World Bank, 1981, Annex 2.

RECENT IFPRI RESEARCH REPORTS (continued)

47 *EVOLVING FOOD GAPS IN THE MIDDLE EAST/NORTH AFRICA: PROSPECTS AND POLICY IMPLICATIONS,* December 1984, by Nabil Khaldi

46 *THE EFFECTS ON INCOME DISTRIBUTION AND NUTRITION OF ALTERNATIVE RICE PRICE POLICIES IN THAILAND,* November 1984, by Prasarn Trairatvorakul

45 *THE EFFECTS OF THE EGYPTIAN FOOD RATION AND SUBSIDY SYSTEM ON INCOME DISTRIBUTION AND CONSUMPTION,* July 1984, by Harold Alderman and Joachim von Braun

44 *CONSTRAINTS ON KENYA'S FOOD AND BEVERAGE EXPORTS,* April 1984, by Michael Schluter

43 *CLOSING THE CEREALS GAP WITH TRADE AND FOOD AID,* January 1984, by Barbara Huddleston

42 *THE EFFECTS OF FOOD PRICE AND SUBSIDY POLICIES ON EGYPTIAN AGRICULTURE,* November 1983, by Joachim von Braun and Hartwig de Haen

41 *RURAL GROWTH LINKAGES: HOUSEHOLD EXPENDITURE PATTERNS IN MALAYSIA AND NIGERIA,* September 1983, by Peter B. R. Hazell and Ailsa Röell

40 *FOOD SUBSIDIES IN EGYPT: THEIR IMPACT ON FOREIGN EXCHANGE AND TRADE,* August 1983, by Grant M. Scobie

39 *THE WORLD RICE MARKET: STRUCTURE, CONDUCT, AND PERFORMANCE,* June 1983, by Ammar Siamwalla and Stephen Haykin

38 *POLICY MODELING OF A DUAL GRAIN MARKET: THE CASE OF WHEAT IN INDIA,* May 1983, by Raj Krishna and Ajay Chhibber

37 *SERVICE PROVISION AND RURAL DEVELOPMENT IN INDIA: A STUDY OF MIRYALGUDA TALUKA,* February 1983, by Sudhir Wanmali

36 *AGRICULTURE AND ECONOMIC GROWTH IN AN OPEN ECONOMY: THE CASE OF ARGENTINA,* December 1982, by Domingo Cavallo and Yair Mundlak

35 *POLICY OPTIONS FOR THE GRAIN ECONOMY OF THE EUROPEAN COMMUNITY: IMPLICATIONS FOR DEVELOPING COUNTRIES,* November 1982, by Ulrich Koester

34 *EGYPT'S FOOD SUBSIDY AND RATIONING SYSTEM: A DESCRIPTION,* October 1982, by Harold Alderman, Joachim von Braun, and Sakr Ahmed Sakr

33 *AGRICULTURAL GROWTH AND INDUSTRIAL PERFORMANCE IN INDIA,* October 1982, by C. Rangarajan

32 *FOOD CONSUMPTION PARAMETERS FOR BRAZIL AND THEIR APPLICATION TO FOOD POLICY,* September 1982, by Cheryl Williamson Gray

31 *SUSTAINING RAPID GROWTH IN INDIA'S FERTILIZER CONSUMPTION: A PERSPECTIVE BASED ON COMPOSITION OF USE,* August 1982, by Gunvant M. Desai

30 *INSTABILITY IN INDIAN FOODGRAIN PRODUCTION,* May 1982, by Peter B. R. Hazell

29 *GOVERNMENT POLICY AND FOOD IMPORTS: THE CASE OF WHEAT IN EGYPT,* December 1981, by Grant M. Scobie

28 *GROWTH AND EQUITY: POLICIES AND IMPLEMENTATION IN INDIAN AGRICULTURE,* November 1981, by I. S. Sarma

27 *AGRICULTURAL PRICE POLICIES UNDER COMPLEX SOCIOECONOMIC AND NATURAL CONSTRAINTS: THE CASE OF BANGLADESH,* October 1981, by Raisuddin Ahmed

26 *FOOD SECURITY IN THE SAHEL: VARIABLE IMPORT LEVY, GRAIN RESERVES, AND FOREIGN EXCHANGE ASSISTANCE,* September 1981, by John McIntire

Geraldo M. Calegar is an economist with Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA). G. Edward Schuh is dean of the Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, Minneapolis.

RECENT IFPRI RESEARCH REPORTS

(continued on inside back cover)

International Food Policy Research Institute
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036 USA