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**Quantitative Analysis of Less Developed Country
Economic Growth and Agricultural Trade**

Technical Report

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1. Introduction

The United States has an extensive assistance program for less developed countries (LDCs), although it is the lowest among the developed market economies in percent of allocated GNP. About 15 percent of U.S. development assistance is related directly or indirectly to agriculture, well below the contributions to GNP of agricultural sectors in most developing economies. The impact of agricultural development assistance on U.S. agricultural export markets is a concern of the U.S. government and agricultural producers, especially in periods of excess supplies of agricultural commodities. Specifically, U.S. policy makers and producers ask whether development assistance emphasizing agriculture in LDCs is consistent with policies to promote or enhance exports of U.S. agricultural commodities and increase income to the domestic agricultural sector.

The relationship between U.S. development assistance to LDCs and LDC trade in agricultural products depends upon two general linkages: the link between development assistance and LDC income growth, and the link between LDC income growth and increased food consumption in the form of increased agricultural commodity imports. Agricultural development contributes to agricultural sector income growth, leading to increased food demand. In addition, increased agricultural production saves foreign exchange for capital imports and/or provides wage goods for the nonagricultural sector, thereby encouraging development and increased food demand in that sector. And, agricultural development provides food to meet increased demand.

Analysis of these linkages provides a basis for evaluating the impacts of development assistance to LDCs on international agricultural

trade. Existing analyses of these linkages fall into three categories: (1) descriptive studies of historical trends among groups of LDCs, (2) single-equation statistical estimates of correlations between trade, production, and income growth based on cross-section and/or time series data, and (3) broader scope models of LDC trade, income and/or agricultural production growth. In general, these analyses indicate that development assistance, even that which enhances LDC food production, leads to LDC agricultural import growth. Studies from all three categories have concluded that LDCs represent the agricultural market with the most future growth potential. These same studies have emphasized economic growth (income growth) as the driving and sustaining force behind increased LDC agricultural imports.

What is lacking in existing studies is a comprehensive analysis of world agricultural trade under different income growth scenarios. This research plan is for a quantitative analysis of the link between LDC income growth and trade using CARD/FAPRI models of world soybean and grain markets. Existing models incorporate macroeconomic and domestic agricultural policy variables and technology-related trends in agricultural production.

By altering the rate of LDC income growth or the macroeconomic environment in the model, the nature of the income-trade link can be evaluated. This will indicate the importance for U.S. agriculture of encouraging LDC income growth (agricultural or otherwise) through development assistance programs, macroeconomic policies, and policies for structural reform.

The objectives of the CARD analysis are: (1) to identify and define the major linkages between development assistance and U.S. agricultural

exports, in particular the link between LDC income growth and international agricultural trade; and (2) to project world and regional agricultural trade for alternative LDC income growth scenarios and different macroeconomic environments (i.e. alternative assumptions about debt, inflation, exchange rates, etc.).

With regard to the first objective, secondary objectives are:

(a) survey and critically review existing research on the topic; (b) summarize the results of prior research for comparison with CARD/FAPRI estimates; (c) develop hypotheses on effects of income growth on trade for quantitative assessment. The first objective provides the frame of reference for the present research.

With regard to the second objective, secondary objectives are:

(a) enhance the regional detail of the models by adding countries with significantly large levels of agricultural trade or production in the relevant commodities; (b) establish a baseline forecast of world, and regional and country specific trade equilibria; (c) test the sensitivity of the model solution to alternative LDC income growth rates and pessimistic and optimistic world economic scenarios; (d) compare the results from (c) against a baseline solution; and (e) compare CARD/FAPRI model results against the results of previous research reviewed under general objective one.

2. Model Description

The CARD/FAPRI agricultural trade model is a nonspatial equilibrium econometric model. It has components for each of the major crop commodities. These include feed grains (corn, sorghum, barley and oats), wheat, and the soybean complex. Each commodity submodel in the crops

system is made up of country and regional units. Table 2.1 shows the regional breakdown of the commodity models used in this project. While each individual commodity model may be run independently, they can also be integrated into a larger system with other commodity components via price linkages permitting cross-commodity and cross country interactions to take place. These linkages between countries and commodities are designed to reflect the simultaneity of the price determination process in the agricultural sector.

The econometric models for the commodity components in each regional unit include behavioral relationships for the most important supply and demand components. Domestic prices that are market determined in each region are explicitly linked to a world price via price linkage equations which include exchange rates and transfer service costs. Figure 2.1 is a general representation of the structural specification for one commodity in a regional unit of a commodity trade model. The model rests on an extensive set of predetermined or exogenous variables that reflect the U.S. domestic economy, the world economy, climatic conditions and other determinants of prices in agricultural commodity markets such as U.S. and foreign agricultural and trade policies.

Each of the commodity submodels is designed as a dynamic nonspatial equilibrium model where the major emphasis is on net quantities traded by country or region and not on the origin and destination of the traded commodity. Equilibrium prices, quantities and net trade are determined by equating excess demands and supplies across countries and regions. The basic elements of a nonspatial equilibrium supply and demand model are illustrated in Figure 2.2.

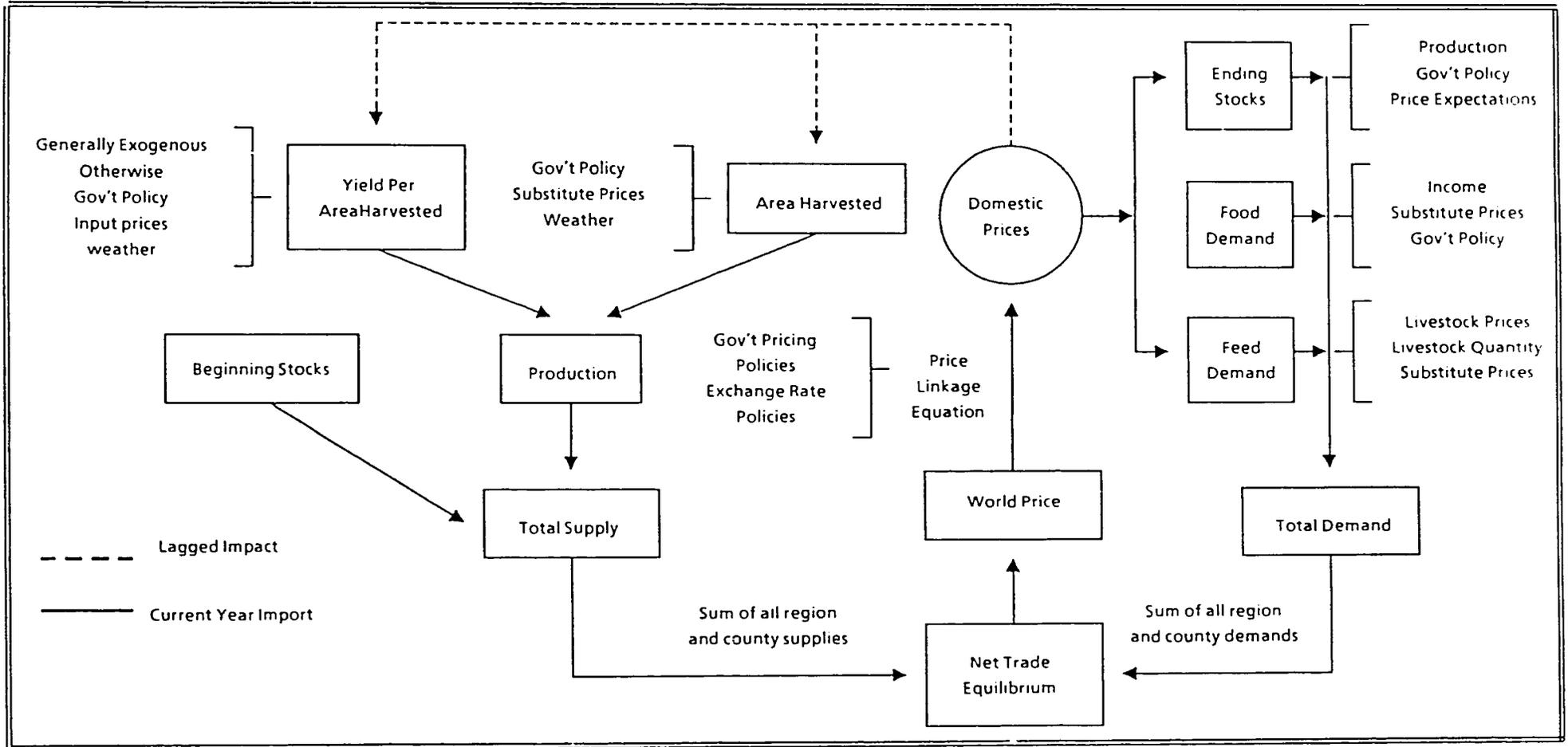
Table 2.1. Regional composition of the CARD/FAPRI trade models.

Wheat Model		Feed Grains Model a/ Importers		Sorghum Model	
Exporters	Importers	Exporters	Importers	Exporters	Importers
Developing Countries		Developing Countries		Developing Countries	
Argentina	High Income East Asia India China Brazil Mexico Algeria Tunisia Morocco Egypt Other L. America Other LDC Asia Other LDC Africa & Middle East	Argentina Thailand China	High Income East Asia Brazil Mexico Egypt Saudi Arabia Other L. America Other LDC Asia Other LDC Africa & Middle East	Argentina	Mexico Nigeria India Rest of the World
Other Countries		Other Countries		Other Countries	
United States Canada Australia EC-12	Japan USSR Eastern Europe Other Western Europe Other Importers	United States Canada Australia EC-12 South Africa	Japan USSR Eastern Europe Other Importers	United States Australia South Africa	Japan
Soybean Model		Soymeal Model		Soyoil Model	
Exporters	Importers	Exporters	Importers	Exporters	Importers
Developing Countries		Developing Countries		Developing Countries	
Argentina Brazil China	Taiwan South Korea Mexico Rest of the World	Argentina Brazil China	Taiwan South Korea Mexico Rest of the World	Argentina Brazil South Korea	China Taiwan Mexico Rest of the World
Other Countries		Other Countries		Other Countries	
United States	Japan EC-12 USSR Eastern Europe	United States	Japan EC-12 USSR Eastern Europe	United States EC-12	Japan USSR Eastern Europe

a/ Corn, barley and oats.

Soybean Complex

Figure 2.1 General Structure Specification of a Commodity Model for a Regional Unit in the CARD/FAPRI Agricultural Trade Models



Supply

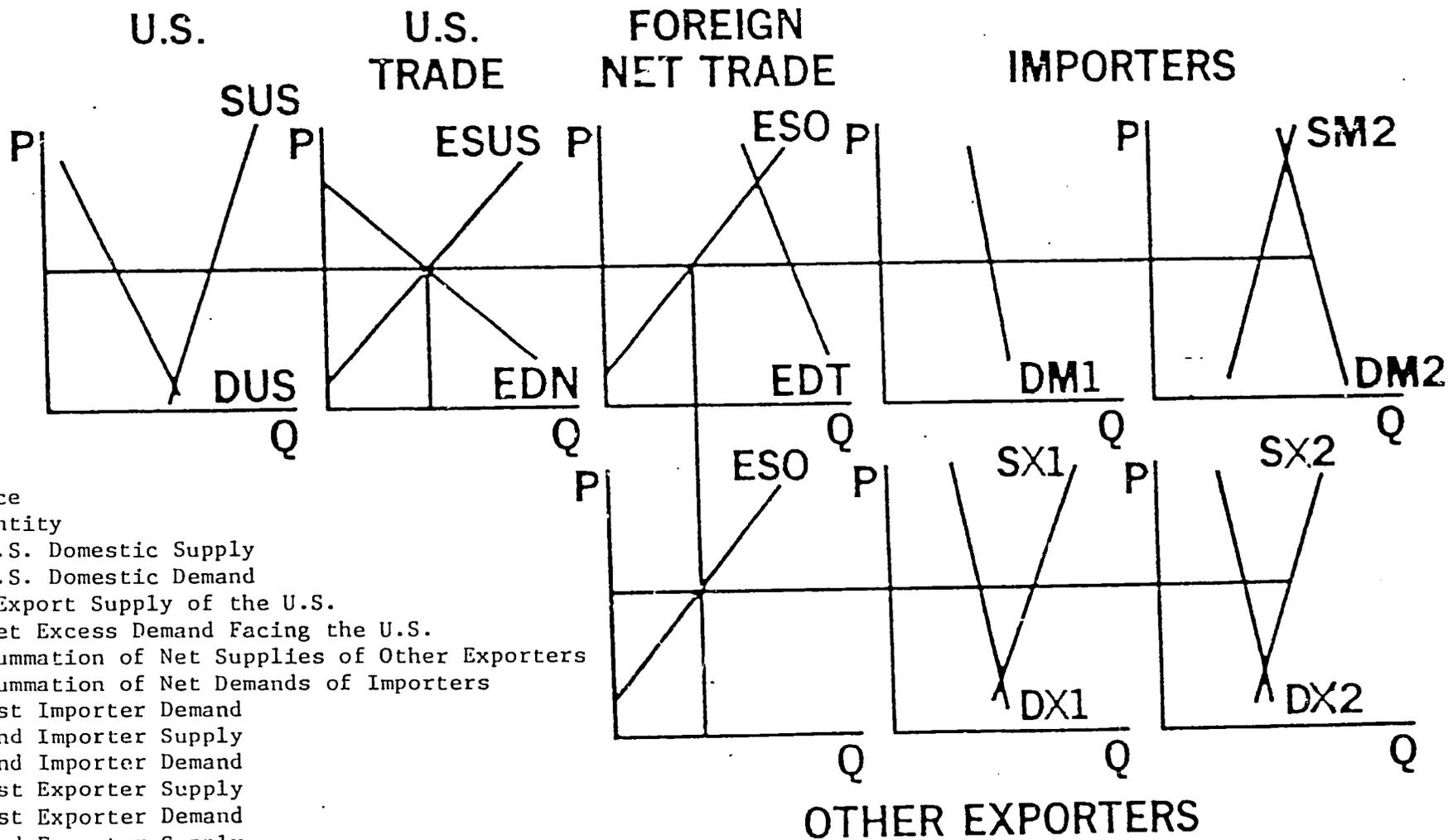
- Acreage Harvested (1000 ha)
- Yield (MT/ha)
- Net Imports (1000 MT)
 - International Markets

Demand (1000 MT)

- Feed Use
- Food and Other Use
- Stocks

Price Equilibrium (\$/MT)

- Government Policy
- Economic Conditions
- Weather Conditions



P = Price
 Q = Quantity
 SUS = U.S. Domestic Supply
 DUS = U.S. Domestic Demand
 ESUS = Export Supply of the U.S.
 EDW = Net Excess Demand Facing the U.S.
 ESO = Summation of Net Supplies of Other Exporters
 EDT = Summation of Net Demands of Importers
 DM1 = 1st Importer Demand
 SM2 = 2nd Importer Supply
 DM2 = 2nd Importer Demand
 SX1 = 1st Exporter Supply
 DX1 = 1st Exporter Demand
 SX2 = 2nd Exporter Supply
 DX2 = 2nd Exporter Demand

Figure 2.2 Determination of equilibrium prices and quantities in the CARD/FAPRI agricultural trade models

The summation of net demands of importers (EDT) less the net supplies of other (non-U.S.) exporters (ESO) is the net demand facing the U.S. model (EDN). The market equilibrium price clears the net demands facing the United States (EDN) and the net export supplies from the United States (ESUS). Agricultural and trade policies in each of the regional components of the model will affect the slopes of that region's supply and demand curves. These policies will be reflected in the slope of the net import demand curve (EDN) facing the U.S. market.

There are a number of key structural parameters in the model. While a review of all the parameters and model specification is not within the scope of this report, a more detailed model description and the main behavioral elasticities are provided in a separate report. A comprehensive documentation of these trade models including estimation and validation statistics may be found in Bahrenian, Devadoss and Meyers (1986), CARD (1988), Devadoss, Helmar and Meyers (1986), and Meyers, W.H., M.D. Helmar and S. Devadoss (1986).

Table 2.2 presents income elasticities of demand from various studies surveyed in the literature review and those of the LDC regional units in the CARD/FAPRI commodity models. The latter elasticities are point elasticities for 1987 and will differ from those at the mean depending on the relative growth rates of income and domestic use of the commodity.

The quantity variable used in the feed grains demand equation is total domestic use, including food and feed demand, industrial use, seed and waste. Therefore the estimated elasticities are not strictly comparable to those estimated for food demand and feed demand separately. Given that the CARD/FAPRI elasticities are a combination of food and feed demand elasticities, it is expected that they be somewhat lower than those

Table 2.2. Estimated income elasticities of demand for aggregated food and feed grains and specific commodities from various sources. a/

Source (Date of Study) Category (Number of Countries)	Time Period of Estimation	Cereals	Food Grains	Feed Grains	Wheat	Corn	Sorghum	Barley	Oats
Christiansen (1987)									
Non-oil Exporting Developing Countries (67)	(1977)		NS	0.76	NS	0.73	1.60	2.30	6.17
Non-oil Exporting Developing Countries (66)	(1980)		NS	0.75	NS	0.60	1.53	1.59	7.43
de Janvry, Sudolet (1987)									
<\$600 per capita GDP (37)	(1970-80)	0.26			1.01	0.27			
>\$600 per capita GDP (23)	(1970-80)	0.35			0.36	1.34			
All Countries (60)	(1970-80)	0.33			0.80	0.93			
Yotopolous (1985)									
Less Developed (90)	(1966-80)	0.20	0.14	0.74					
<\$370 per cap income (40)	(1966-80)	0.17	0.23	0.75					
>\$370 per cap income (50)	(1966-80)	0.25	0.18	0.63					
Developed (34)	(1966-80)	0.35	-0.06	0.53					
Sarma (1986)									
Brazil	(1980)	0.15							
Egypt	(1980)	0.04							
India	(1980)	0.25							
Mexico	(1980)	-0.10							
Philippines	(1980)	0.22							

Table 2.2. Estimated income elasticities of demand for aggregated food and feed grains and specific commodities from various sources. (continued)

Source (Date of Study) Category (Number of Countries)	Time Period of Estimation	Feed Grains	Wheat	Corn	Sorghum	Barley	Soybean Complex		
							Soybeans	Soymeal	Soyoil
FAPRI Trade Model	(1987)								
Argentina				0.14				3.00	1.11
Brazil		0.56	0.66					0.31	1.15
Mexico		0.19	0.77		0.39			1.42	1.43
Other Latin America		0.45	0.71						
Thailand				1.03					
China		0.01	0.14				0.18	0.39	
High Income East Asia		1.07	0.75						
Taiwan							0.46	0.83	0.43
South Korea							0.27	0.60	0.74
India			0.78						
Other Asia		0.17	0.74						
Egypt			0.81	0.53					
Saudi Arabia						0.20			
Algeria			0.45						
Tunisia			0.82						
Morocco			0.84						
Other Africa and Middle East		0.22	0.39						
ROW (sorghum)					0.28				
ROW (soybeans)								0.79	0.80

Notes:

Christiansen 1987 - Countries include all non-oil exporting countries with per capita GDP less than \$10,000 (also excludes European countries). Afghanistan is excluded in 1980.

Consumption is defined as apparent utilization (production plus imports minus exports).

Apparent utilization is regressed on per capita GDP across all countries as defined for the years 1977 and 1980.

De Janvry and Sautolet 1986 - All elasticities listed are significant at the 5% level except for corn for the <\$600 per capita income group. Per capita GDP are in terms of 1965 U.S.

dollars. The relationship between consumption and income is based on a loglinear regression for the period 1970 - 80.

Yotopolous 1985 - Per capita GDP levels are in terms of 1970 U.S. dollars. Elasticities are calculated from dividing annual growth rate in per capita demand by per capita GDP growth rate.

Total cereals elasticities of demand include residual uses such as industrial, seed and waste.

FAPRI - The quantity variable used to estimate income elasticities of feed demand includes food and feed demand as well as residual uses such as seed, industrial uses and waste. The elasticities are estimated at 1987 levels of incomes and quantities.

that estimate only feed demand, and somewhat higher than those that estimate only food demand. Also, it is expected that for countries where the main source of demand for feed grains is animal feeds, the demand elasticities should be in about the same range as those of studies that look only at feed demand such as Yotopolous 1985 and Christiansen 1987. CARD/FAPRI income demand elasticities for feed grains in Brazil and High Income East Asia (Singapore, South Korea, Taiwan and Hong Kong), and corn in Thailand are between .56 and 1.07, in about the same range as those of Yotopolous 1985 and Christiansen 1987. In regions where feed grains are a staple food source such as Mexico, Other Latin America and much of Africa, income elasticities of demand range from .45 to .19, in about the same range as those for food grains estimated by Yotopolous 1985.

Wheat income elasticities are comparable to those estimated by de Janvry and Sandoz for all countries. The wheat income elasticities of those North African countries that are individually modeled are significantly higher than those for the Other Africa and Middle East region suggesting that different demand characteristics for wheat make it necessary to model Sub-saharan Africa separately from North Africa and the Middle East. In general wheat income elasticities are higher than feed grain income elasticities, with the exception of High Income East Asia where rapidly growing incomes are leading to a rapidly expanding demand for meat and consequently a high derived demand for feed grains.

3. Description of the Baseline

The purpose of the baseline forecast is to evaluate the implications of current and projected agricultural policies of the United States and other countries in the context of a likely world macroeconomic and financial environment. The baseline projections incorporate domestic and

world financial forecasts from the WEFA Group (Bala Cynwyd, Pennsylvania) and domestic and trade policy assumptions for major participants in world markets for feed grains, soybeans, and wheat. The system used to develop the FAPRI projections is solved simultaneously for world and U.S. market outcomes and includes provisions for feedback between the crops and U.S. livestock sectors. An in depth description of the FAPRI baseline used for this project may be found in FAPRI's "Ten-Year International Agricultural Outlook", March 1988.

3.1. Macroeconomic Environment

In the baseline the projected rate of real gross domestic product (GDP) growth is substantially improved over the low or negative real GDP growth rates of the early 1980s. However, it remains sluggish relative to the high levels reached in the 1970s. Thus, in the baseline, demand and trade recover from the levels of the early 1980s but do not approach the high levels of the 1970s.

The pattern of economic growth in developing economies is diverse with some struggling under heavy external debt and others, like the Asian newly industrialized countries (NICs) experiencing sustained growth.

The purchasing power of the U.S. dollar relative to many developed country currencies is projected to continue declining at a low rate to 1989 and to recover marginally thereafter.

The major factors influencing the outlook for the agricultural markets are:

- World growth in 1988 is lower than in 1987 by about 0.5 percent and is then expected to recover slowly to around 3.0 percent. The continuing weakness in oil markets and in world commodity markets are key elements in a modest economic growth projection.

- Limited progress is made in reducing structural deficits in the United States.
- Because the dollar continues to slide, dollar block countries are expected to capture a larger than expected share of a slowly growing world trade market.
- Protectionism remains a threat to world trade, but is assumed to be held under control.

3.2. U.S. Policy Environment

It is assumed that current programs (FSA85 and the 1987 budget compromise) will continue and will be operated with the objective of reducing stocks, remaining competitive in world markets, and reducing government program costs. This implies reductions in support prices and continued use of programs to control production and encourage the utilization of commodities currently in excess supply. Key program provisions for the years of the projection and the commodities under study in this report are shown in Table 3.1.

3.3. Commodity Markets

The FSA85 policies and implementation strategies resulted in marked declines in commodity market prices during the first year of the program. Throughout the projection period crop prices increase in nominal terms but are stable in real terms.

The heavy use of PIK certificates, which are primarily redeemed in the corn market, has distorted normal price ratios between corn and other commodities. The price of corn has fallen relative to the prices of soybeans and other grains since the implementation of the FSA85. The major impact of this has been for the soybean market where the bean-corn

Table 3.1. Key Program Provisions

		Target	Loan	Acreage	Paid	Diversion
		Price	Rate	Reduction	Diversion	Diversion
		(\$/bu.)	(\$/bu.)	Program	(% of	Payment
				(% of Base)	Base)	(\$/bu.)
Wheat	87/88	\$4.38	\$2.28	27.5%	0.0%	---
	88/89	\$4.23	\$2.21	27.5%	0.0%	---
	89/90	\$4.10	\$2.06	15.0%	0.0%	---
	90/91	\$4.00	\$2.10	10.0%	0.0%	---
	91/92	\$3.92	\$2.10	10.0%	0.0%	---
Corn	87/88	\$3.03	\$1.82	20.0%	15.0%	\$2.00
	88/89	\$2.93	\$1.77	20.0%	10.0%	\$1.75
	89/90	\$2.84	\$1.65	20.0%	10.0%	\$1.75
	90/91	\$2.75	\$1.56	20.0%	0.0%	---
	91/92	\$2.70	\$1.49	10.0%	0.0%	---
Barley	87/88	\$2.60	\$1.49	20.0%	15.0%	\$1.60
	88/89	\$2.51	\$1.44	20.0%	10.0%	\$1.40
	89/90	\$2.43	\$1.35	20.0%	10.0%	\$1.40
	90/91	\$2.35	\$1.45	20.0%	0.0%	---
	91/92	\$2.30	\$1.48	10.0%	0.0%	---
Sorghum	87/88	\$2.88	\$1.74	20.0%	15.0%	\$1.90
	88/89	\$2.78	\$1.68	20.0%	10.0%	\$1.55
	89/90	\$2.69	\$1.56	20.0%	10.0%	\$1.55
	90/91	\$2.60	\$1.48	20.0%	0.0%	---
	91/92	\$2.55	\$1.41	10.0%	0.0%	---
Oats	87/88	\$1.60	\$0.94	20.0%	15.0%	\$0.80
	88/89	\$1.55	\$0.90	5.0%	0.0%	---
	89/90	\$1.49	\$0.85	5.0%	0.0%	---
	90/91	\$1.44	\$1.05	5.0%	0.0%	---
	91/92	\$1.41	\$1.14	5.0%	0.0%	---
Soybeans	87/88	---	\$4.77	---	---	---
	88/89	---	\$4.53	---	---	---
	89/90	---	\$4.50	---	---	---
	90/91	---	\$4.50	---	---	---
	91/92	---	\$4.50	---	---	---

ratio has moved from less than 2.5 to 1 to more than 3.2 to 1. This change in relative prices has been a stimulus to foreign producers to shift from corn to soybeans, thus creating more competition for U.S. soybean and soybean exports. This price distortion is expected to be corrected as the use of PIK certificates is gradually reduced over the projection period.

3.4. Trade

The combination of more competitive domestic crop prices, more favorable exchange rates, increased rates of real GDP growth around the world and aggressive export subsidy programs causes a noticeable turnaround in the volume and value of U.S. agricultural exports. The most significant change is in the current year, with an expected growth of 44 percent in wheat exports and 14 percent in corn exports at the same time that market prices are rising. However, much of this growth is due to the export subsidy programs and may not be sustained. Continued strong foreign competition and the assumed phase out of the export enhancement program lead to projected U.S. trade shares that are fairly stable after the gains of 1987/88.

3.5. Key Assumptions and Qualifications

Certain assumptions about the agricultural policy, economic and technical environment in which world agriculture will function had to be made for the baseline projections. The assumptions that could most affect the projections and about which there is greatest risk are:

- Sustained economic growth over the projection period. A recession in the United States and abroad is likely to occur resulting in a slump in demand for agricultural products below that projected.

This would generate associated policy and adjustment problems.

- Emphasis on reducing costs and the role of government in agriculture. Depending on such variables as the results of the U.S. presidential election in November, developments in the GATT negotiations and budgetary pressures the government may choose to pursue policies which result in higher government costs and a more aggressive posture in world markets.
- Steady rates of technological change. In the projections demand and technological change move together resulting in long term trends of real prices that are relatively flat. Breakthroughs in biotechnology or other areas that increase crop yields, dairy production and livestock weight gain would place downward pressure on commodity markets.

4. Income Impact Procedures

To evaluate the impact on wheat, feed grains and soybean trade of a one percentage point increase in the economic growth rates of developing countries, the LDC regional units of the CARD/FAPRI commodity models were grouped into four different regions. These are Latin America, LDC Africa and Middle East, LDC Asia and all LDCs. Table 4.1 shows the baseline real GDP and real GDP growth rate for the individual LDCs and LDC regions for 1984/85 to 1991/92 compared to the real GDP and real GDP growth rate assumptions after the one percentage point increase. The increase was imposed each year for five years starting in 1987/88.

The following scenarios were evaluated relative to the baseline:

1. Scenario 1: The real GDP growth rate for all LDCs in the commodity models, whether modeled as individual countries or as a region, were raised by one percentage point above baseline

Table 4.1. AID/OICD PROJECT: INCOME SHOCK

Effect of a one percentage point increase in the GDP growth rate on baseline income. a/

		CROP YEAR								Change in income in the 5th year of the shock (1991)	
		1984	1985	1986	1987	1988	1989	1990	1991	(%)	(absolute)
India, GDP Billion 1980 Rupees	Base	1,595	1,687	1,770	1,816	1,890	1,976	2,054	2,139		
	Base % change		5.77%	4.92%	2.60%	4.07%	4.55%	3.95%	4.14%		
	Impact	1,595	1,687	1,770	1,832	1,924	2,028	2,127	2,235	4.49%	96
	Impact % change		5.77%	4.92%	3.50%	5.02%	5.41%	4.88%	5.08%		
China Nat. Income Billion Yuan	Base	558	625	678	730	779	832	888	946		
	Base % change		12.01%	8.48%	7.67%	6.71%	6.80%	6.73%	6.53%		
	Impact	558	625	678	737	794	856	921	991	4.76%	45
	Impact % change		12.01%	8.48%	8.70%	7.73%	7.81%	7.59%	7.60%		
Argentina, GDP '000 1980 Australas	Base	25,529	26,525	26,948	27,622	28,561	29,389	30,565	31,726		
	Base % change		3.90%	1.59%	2.50%	3.40%	2.90%	4.00%	3.80%		
	Impact	25,529	26,525	26,948	27,891	29,119	30,254	31,767	33,291	4.93%	1,565
	Impact % change		3.90%	1.59%	3.50%	4.40%	3.90%	5.00%	4.80%		
Brazil, GDP Billion 1980 Cruzados	Base	13,750	14,877	15,213	15,072	15,927	16,133	17,747	18,498		
	Base % change		8.20%	2.26%	-0.93%	5.67%	1.29%	10.00%	4.23%		
	Impact	13,750	14,877	15,213	15,224	16,240	16,612	18,441	19,405	4.90%	0.907
	Impact % change		8.20%	2.26%	0.07%	6.67%	2.29%	11.00%	5.23%		
Mexico, GDP Billion 1980 Pesos	Base	4,598	4,556	4,548	4,644	4,695	4,813	4,993	5,212		
	Base % change		-0.91%	-0.18%	2.11%	1.10%	2.51%	3.74%	4.39%		
	Impact	4,598	4,556	4,548	4,689	4,788	4,956	5,191	5,471	4.97%	259
	Impact % change		-0.91%	-0.18%	3.10%	2.11%	3.51%	4.74%	5.39%		
Egypt, GDP 10 million 1980 Pounds	Base	205	208	216	224	233	241	251	261		
	Base % change		1.46%	3.85%	3.70%	4.02%	3.43%	4.15%	3.98%		
	Impact	205	208	216	225	237	247	259	272	4.21%	11
	Impact % change		1.46%	3.85%	4.17%	5.33%	4.22%	4.86%	5.02%		

a/ Some percentages may not be accurate due to rounding.

Table 4.1. AID/OICD PROJECT: INCOME SHOCK
 Effect of a one percentage point increase in the GDP growth rate on baseline income. (continued) a/

		CROP YEAR								Change in income in the 5th year of the shock (1991)	
		1984	1985	1986	1987	1988	1989	1990	1991	(%)	(absolute)
Algeria, GDP Billion 1980 Dinars	Base	159	159	154	151	149	150	152	156		
	Base % change		0.00%	-3.14%	-1.95%	-1.32%	0.67%	1.33%	2.63%		
	Impact	159	159	154	153	152	154	158	163	4.49%	7
	Impact % change		0.00%	-3.14%	-0.65%	-0.65%	1.32%	2.60%	3.16%		
Tunisia, GDP Million 1980 Dinars	Base	4,233	4,278	4,362	4,516	4,648	4,831	5,024	5,238		
	Base % change		1.06%	1.96%	3.53%	2.92%	3.94%	4.00%	4.26%		
	Impact	4,233	4,278	4,362	4,557	4,732	4,963	5,208	5,478	4.58%	240
	Impact % change		1.06%	1.96%	4.47%	3.84%	4.88%	4.94%	5.18%		
Morocco, GDP Billion 1980 Dirhams	Base	79.2	82.7	85.9	87.6	90.8	93.6	96.6	100.2		
	Base % change		4.42%	3.87%	1.98%	3.65%	3.08%	3.21%	3.73%		
	Impact	79.2	82.7	85.9	88.4	92.5	96.1	100.1	104.9	4.69%	4.7
	Impact % change		4.42%	3.87%	2.91%	4.64%	3.89%	4.16%	4.80%		
Other Africa & M. East, GDP (Wheat) Billion 1980 U.S. Dollars	Base	759	752	754	764	790	816	851	885		
	Base % change		-0.92%	0.27%	1.33%	3.40%	3.29%	4.29%	4.00%		
	Impact	759	752	754	772	805	841	884	929	4.97%	44
	Impact % change		-0.92%	0.27%	2.39%	4.27%	4.47%	5.11%	5.09%		
Other L. America GDP Billion 1980 U.S. Dollars	Base	163	170	186	185	187	187	192	198		
	Base % change		4.29%	9.41%	-0.54%	-2.16%	3.31%	2.67%	3.13%		
	Impact	163	170	186	187	184	193	200	207	4.55%	9
	Impact % change		4.29%	9.41%	0.54%	-1.60%	4.89%	3.63%	3.50%		
Other Asia, GDP (Wheat) Billion 1980 U.S. Dollars	Base	226	229	240	254	265	276	286	300		
	Base % change		1.33%	4.80%	5.83%	4.33%	4.15%	3.62%	4.90%		
	Impact	226	229	240	257	270	284	298	315	5.00%	15
	Impact % change		1.33%	4.80%	7.08%	5.06%	5.19%	4.93%	5.70%		

a/ Some percentages may not be accurate due to rounding.

Table 4.1. AID/OICD PROJECT: INCOME SHOCK
 Effect of a one percentage point increase in the GDP growth rate on baseline income. (continued) a/

		CROP YEAR								Change in income in the 5th year of the shock (1991)	
		1984	1985	1986	1987	1988	1989	1990	1991	(%)	(absolute)
High Income	Base	194	206	229	250	266	281	296	315		
East Asia, GDP	Base % change		6.19%	11.17%	9.17%	6.40%	5.64%	5.34%	6.42%		
Billion 1980											
U.S. Dollars	Impact	194	206	229	253	271	289	307	330	4.76%	15
	Impact % change		6.19%	11.17%	10.48%	7.11%	6.64%	6.23%	7.49%		
Thailand, GDP	Base	885	918	978	1,047	1,095	1,140	1,184	1,252		
Billion 1980	Base % change		3.73%	6.54%	7.06%	4.58%	4.11%	3.86%	5.74%		
Baht											
	Impact	885	918	978	1,056	1,115	1,172	1,228	1,310	4.63%	58
	Impact % change		3.73%	6.54%	7.98%	5.59%	5.11%	4.78%	6.68%		
Other Africa & M. East, GDP	Base	651	651	658	665	688	709	737	769		
(Feed Grains)	Base % change		0.00%	1.08%	1.06%	3.46%	3.05%	3.95%	4.34%		
Billion 1980											
U.S. Dollars	Impact	651	651	658	671	701	730	766	807	4.94%	38
	Impact % change		0.00%	1.08%	1.98%	4.47%	4.14%	4.93%	5.35%		
Other Asia, GDP	Base	390	408	424	438	457	475	494	516		
(Feed Grains)	Base % change		4.62%	3.92%	3.30%	4.34%	3.94%	4.00%	4.45%		
Billion 1980											
U.S. Dollars	Impact	390	408	424	443	466	489	514	541	4.84%	25
	Impact % change		4.62%	3.92%	4.48%	5.19%	4.94%	5.11%	5.25%		
S. Arabia, GDP	Base	366,095	322,399	309,199	301,300	306,500	318,941	339,180	353,922		
Million 1980	Base % change		-11.94%	-4.09%	-2.55%	1.73%	4.06%	6.35%	4.35%		
Riyals											
	Impact	366,095	322,399	309,199	304,104	312,369	328,150	352,079	370,599	4.71%	16,677
	Impact % change		-11.94%	-4.09%	-1.65%	2.72%	5.05%	7.29%	5.26%		
Taiwan, GDP	Base	1,910	2,050	2,277	2,488	2,656	2,787	2,930	3,122		
Million 1980	Base % change		7.33%	11.07%	9.27%	6.75%	4.93%	5.13%	6.55%		
NT\$											
	Impact	1,910	2,050	2,277	2,511	2,705	2,866	3,042	3,271	4.77%	149
	Impact % change		7.33%	11.07%	10.28%	7.73%	5.95%	6.14%	7.53%		

a/ Some percentages may not be accurate due to rounding.

Table 4.1. AID/OICD PROJECT: INCOME SHOCK
 Effect of a one percentage point increase in the GDP growth rate on baseline income. (continued) a/

		CROP YEAR								Change in income in the 5th year of the shock (1991)	
		1984	1985	1986	1987	1988	1989	1990	1991	(%)	(absolute)
South Korea, GDP Billion 1980 Won	Base	12,827	13,917	15,594	17,130	18,321	19,438	20,585	22,057		
	Base % change		8.50%	12.05%	9.85%	6.95%	6.10%	5.90%	7.15%		
	Impact	12,827	13,917	15,594	17,286	18,661	19,985	21,364	23,105	4.75%	1048
	Impact % change		8.50%	12.05%	10.85%	7.95%	7.10%	6.90%	8.15%		
ROW, GDP (Soybeans) Billion 1980 U.S. Dollars	Base	2,678	2,746	2,866	2,932	3,011	3,096	3,183	3,294		
	Base % change		2.54%	4.37%	2.30%	2.69%	2.82%	2.81%	3.49%		
	Impact	2,678	2,746	2,866	2,961	3,070	3,187	3,308	3,457	4.95%	163
	Impact % change		2.54%	4.37%	3.31%	3.68%	3.81%	3.80%	4.50%		
ROW, GDP (Sorghum) Billion 1980 U.S. Dollars	Base	8,045	8,198	8,383	8,615	8,854	9,104	9,353	9,593		
	Base % change		1.90%	2.26%	2.77%	2.77%	2.82%	2.74%	2.57%		
	Impact	8,045	8,198	8,383	8,699	9,027	9,372	9,722	10,069	4.96%	476
	Impact % change		1.90%	2.26%	3.77%	3.77%	3.82%	3.73%	3.57%		

a/ Some percentages may not be accurate due to rounding.

levels for five years starting in 1987/88 and ending in 1991/92.

This scenario is also referred to as the "All LDC" scenario.

2. **Scenario 2:** The real GDP growth rates for specific Latin American countries and those aggregated into the Other Latin America region were raised by one percentage point above baseline growth rates for five years starting in 1987/88. This scenario is also referred to as the "Latin America" scenario.
3. **Scenario 3:** The real GDP growth rates for specific African and Middle Eastern countries and those aggregated into the Other Africa and Middle East region were raised by one percentage point above baseline growth rates for five years starting in 1987/88. This scenario is also called the "Africa and Middle East" scenario or simply the "Africa" scenario.
4. **Scenario 4:** In scenario 4 the real GDP growth rates for specific Asian countries and those aggregated into the Other Asia region were raised by one percentage point above baseline growth rates for five years starting in 1987/88. This scenario is also called the "Asia" scenario.

All the commodity models were solved simultaneously for each of the scenarios to arrive at consistent market clearing price and quantity equilibria for each of the commodities. Although in scenarios 2, 3 and 4 not all LDC incomes will have increased relative to the baseline, those LDCs whose incomes have remained unchanged will still be affected by the income change in other LDCs as they will be facing different prices than those in the baseline. The impact of increasing economic growth rates, as described above, can then be evaluated by taking the equilibrium prices and quantities for each scenario and comparing them to the baseline. The

appendix tables contain a summarized version of the results for the major regions, Latin America, LDC Asia and LDC Africa and the Middle East. These include the equilibrium prices as well as world and U.S. net trade in wheat, feed grains and soybeans.

5. Income Impact Results

5.1. World Net Trade and Prices

The impact of the different income shocks scenarios on wheat, corn and soybean prices and world net trade in 1991/92 are summarized in Figures 5.1 and 5.2 and Tables 5.1 and 5.2. The impact of income changes on market clearing prices, world and U.S. net trade and trade share differ markedly between scenarios.

In all scenarios, the commodity price that is most affected by the income shock is the wheat price. The higher impact of the income change on wheat prices is due to the combination of several factors. Two primary factors are that LDC wheat net imports account for a larger share of world wheat net imports (64.1 percent in 1986/87, Table A.2) than LDC feed grains net imports do of world feed grains imports (excluding sorghum, 36.4 percent in 1986/87, Table A.2) and that the world wheat market is more price inelastic compared with that of feed grains and soybeans. Therefore even equal percentage increases in world demand of wheat, feed grains, and soybeans will have a larger impact on wheat prices than on the other prices. Corn price increases relative to the baseline are generally higher than soybean price effects except in the Asia scenario.

Not surprisingly, the All LDC scenario has the largest impact on all prices since in this scenario the incomes of all LDCs have been raised and it is therefore the scenario in which the largest increases in demand occur. The volume of world net trade in wheat rises the most--3.186

Figure 5.1. COMMODITY PRICES

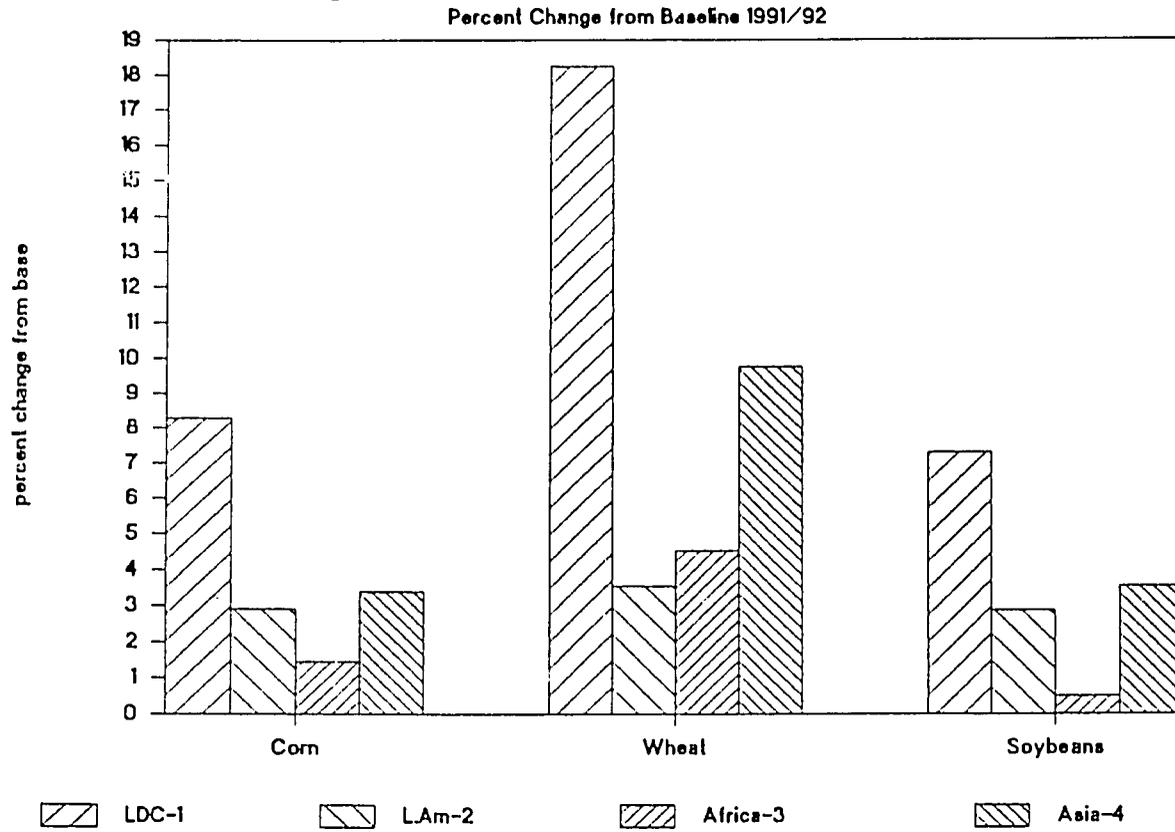


Figure 5.2. WORLD NET COMMODITY TRADE

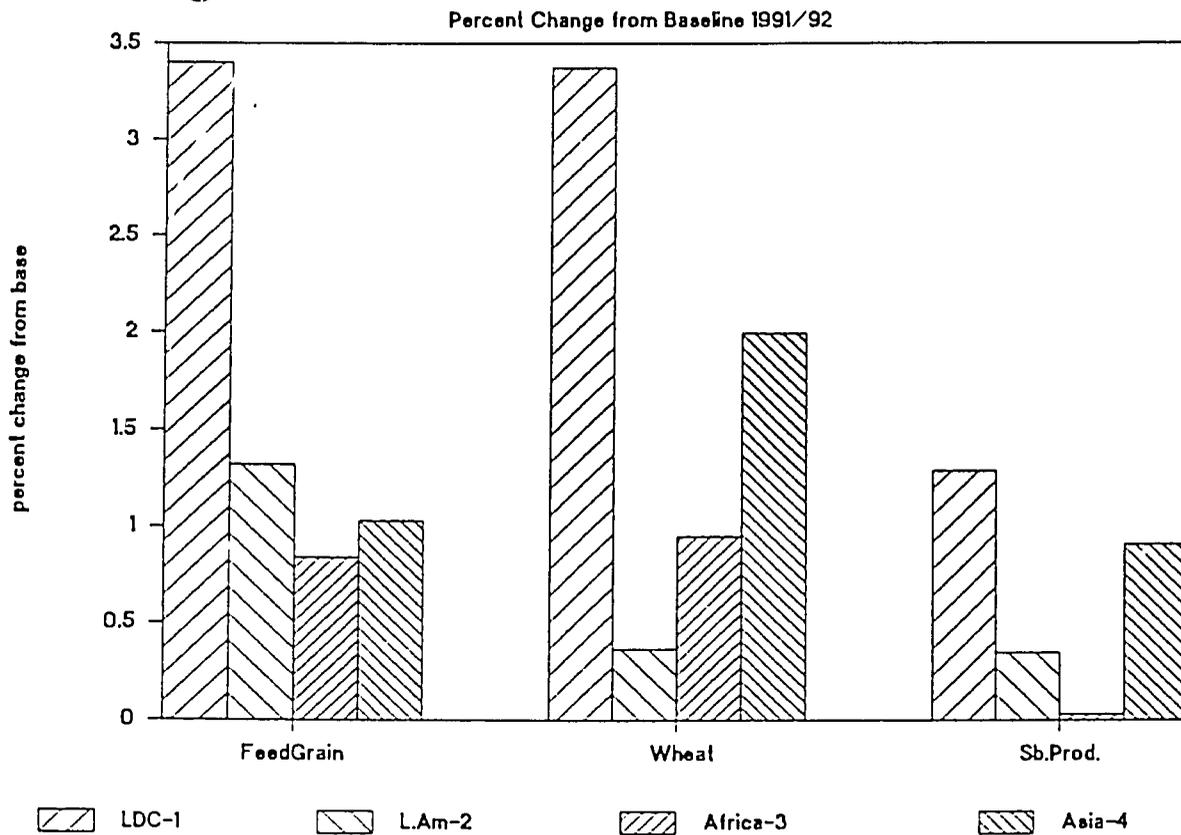


Table 5.1. Comparison of crop prices in the baseline and scenarios 1, 2, 3, and 4. a/

Scenario	Crop	86/87	87/88	88/89	89/90	90/91	91/92	Change from	
								baseline in 1991/92	
Corn					\$/tn			(\$/tn)	
	Baseline	59.05	67.32	74.80	77.16	78.74	80.70		
	Scen. 1	59.05	68.89	76.77	79.92	83.46	87.40	8.29%	6.69
	Scen. 2	59.05	67.71	75.59	78.34	80.31	83.07	2.93%	2.36
	Scen. 3	59.05	67.71	75.19	77.55	79.52	81.89	1.46%	1.18
	Scen. 4	59.05	68.11	75.59	78.34	81.10	83.46	3.41%	2.76
Wheat									
	Baseline	88.92	94.06	104.72	109.50	111.33	112.80		
	Scen. 1	88.92	99.58	114.27	121.25	127.50	133.38	18.24%	20.58
	Scen. 2	88.92	94.80	106.19	111.70	114.27	116.84	3.58%	4.04
	Scen. 3	88.92	95.17	106.92	112.44	115.38	117.95	4.56%	5.14
	Scen. 4	88.92	97.37	110.23	116.11	120.15	123.83	9.77%	11.02
Soybeans									
	Baseline	176.37	206.87	229.28	194.01	187.76	215.32		
	Scen. 1	176.37	212.38	236.26	201.72	200.62	231.12	7.34%	15.80
	Scen. 2	176.37	209.07	232.22	197.68	193.64	221.57	2.90%	6.25
	Scen. 3	176.37	206.87	230.02	194.38	188.13	216.42	0.51%	1.10
	Scen. 4	176.37	210.18	232.96	198.05	194.38	223.04	3.58%	7.72

a/ Scenario 1: 1 percentage point increase in the GDP growth rates of all LDCs.

Scenario 2: 1 percentage point increase in the GDP growth rates of all LDC Latin America.

Scenario 3: 1 percentage point increase in the GDP growth rates of all LDC Africa and Middle East.

Scenario 4: 1 percentage point increase in the GDP growth rates of all LDC Asia.

million metric tons (mmt). In relative terms, however, feed grains trade (including sorghum) rises marginally more, 3.40 percent compared to wheat's 3.37 percent rise over the baseline. World net trade in soybeans and soybean products is the least affected of all the commodities in scenario 1, rising by 1.29 percent or 708 thousand mt relative to the baseline.

Among the regional scenarios, the Asia scenario has the largest impact on all prices. LDC Asia is the largest consumer of wheat, feed grains and soybeans and products out of the three regions, and the second largest importer of wheat and feed grains. In addition, the model income elasticities of demand in LDC Asia for these three commodities are relatively large. World net trade in wheat rises by 2 percent or 1.884 mmt in the Asia scenario relative to the baseline in 1991/92 while the increases in the Latin America and Africa scenarios are 0.37 percent and 0.95 percent respectively. Given the substitutability between wheat and corn in demand, the high wheat prices of the Asia scenario exert enough of a pull on corn prices to make the corn price changes in the Asia scenario larger than those resulting from the Latin America scenario. This occurs even though the increases in world net feed grain trade in the Asia scenario (1.03 percent or 882 thousand mt) are secondary to those in the Latin America scenario (1.32 percent or 1.124 mmt).

The Africa scenario has very little impact on corn and soybean prices. Even though the Africa and Middle East region is a larger importer of feed grains than Latin America, the Latin America scenario has a larger impact on corn price due to the larger income elasticities of demand for feed grains estimated in the Latin American models. The increase in world net feed grain trade (including sorghum) resulting from

the Africa scenario is 0.84 percent or 717 thousand mt while the increase from the Latin America scenario is 1.124 mmt. World net trade in soybeans and soybean products is largely unaffected in the Africa scenario in 1991/92 and rises only 0.35 percent or 19 thousand mt relative to the baseline in the Latin America scenario.

Since the structural supply and demand equations include cross price effects, changes in relative prices one period lagged determine production adjustments while current changes in relative prices determine demand adjustments. However, price transmission elasticities specific to each country or region must also be considered in determining the impact of relative price changes in a given regional unit. Of particular concern are the movements in the wheat/corn and soybean/corn price ratios due to the substitutability of these commodities in production and demand in the developing, centrally planned and developed countries or regions included in the commodity models. In specific countries movements in other price ratios are of interest, especially on the production side: barley/wheat in Canada, sorghum/barley in Argentina and Australia and soybean/wheat in Brazil.

Soybean/wheat, sorghum/wheat and barley/wheat price ratios show the largest decreases in scenarios 1 and 4. Wheat/corn price ratios show the largest increases in these same two scenarios. The magnitude of the change is largest in scenario 1. The soybean/corn price ratio remains above baseline levels throughout the projection period in both scenarios, except in 1991/92 in scenario 1 when it falls below the baseline.

In the Latin America scenario in 1990/91 and 1991/92 the wheat/corn price ratio rises the least of all the scenarios. The soybean/corn price ratio is above baseline levels from 1987/88 to 1990/91 and then declines

marginally below baseline levels in 1991/92. The soybean/wheat price ratio remains near baseline levels throughout the projection period until 1991/92 when it falls below.

In the Africa scenario the soybean/corn price ratio remains at or below baseline levels for the projection period. In 1991/92 the changes in soybean/wheat and wheat/corn price ratios are in the same direction but of a larger magnitude compared with those in the Latin America scenario.

In 1991/92 the soybean crushing margin increases relative to the baseline in the LDC, Latin America, and Asia scenarios by 9.09 percent, 5.45 percent and 3.64 percent, respectively, and is unchanged in the Africa scenario. This increase in crushing margin leads to larger crush demand in soybean exporting countries such as Brazil and Argentina, and to larger soybean import demand by importers with crushing capacity such as the EC-12, Japan and High Income East Asia.

5.2. United States Net Trade and Trade Share

The effect of the income shocks on U.S. trade and trade share in wheat, feed grains including sorghum, and soybeans and soybean products are shown in Figure 5.3 and Table 5.3. Under all scenarios and for all commodities the volume of net trade by the United States increases. The increases in U.S. net export volume relative to the baseline follow much the same pattern as the changes in world net trade with the exception of feed grains. Again, as expected the largest increases in U.S. net trade in all commodities occurs in the LDC scenario. Increasing incomes in LDC Asia, the Asia scenario, results in larger increases in net exports of wheat and soybeans and soybean products from the United States than those resulting from the Latin America and Africa scenarios. The largest

Figure 5.3. U.S. NET COMMODITY TRADE

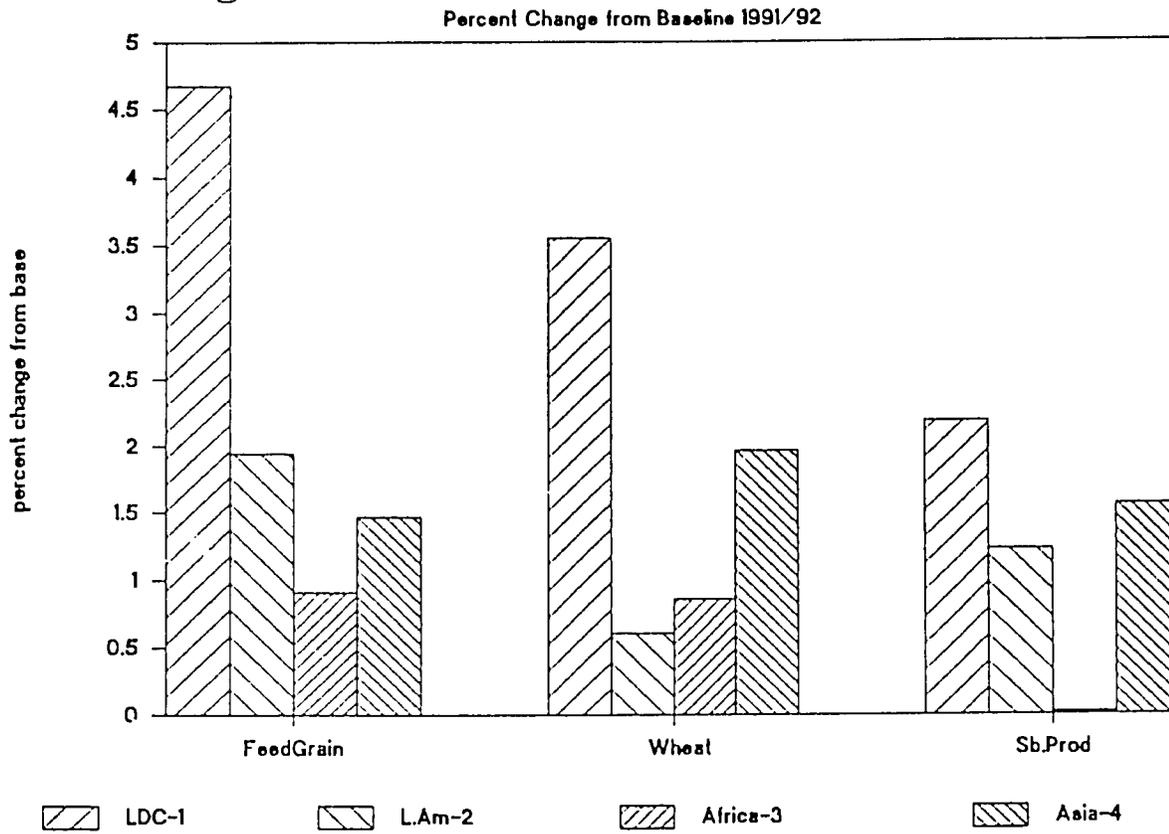


Table 5.3. Comparison of U.S. net trade in the baseline and scenarios 1, 2, 3, and 4. a/

Commodity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from		
								baseline in 1991/92		
							(1000 mt)	('000 mt)		
Feed Grains b/										
	Baseline	45,603	50,984	51,672	50,656	52,430	55,337			
	Scen. 1	45,602	51,374	52,554	52,072	54,416	57,922	4.67%	2585	
	Scen. 2	45,602	51,168	52,072	51,271	53,273	56,413	1.94%	1076	
	Scen. 3	45,602	51,090	51,863	50,947	52,818	55,342	0.91%	505	
	Scen. 4	45,602	51,084	51,920	51,074	53,043	56,148	1.47%	811	
Wheat										
	Baseline	26,540	39,045	39,330	38,162	39,037	40,175			
	Scen. 1	26,540	39,568	40,169	39,274	40,297	41,597	3.54%	1422	
	Scen. 2	26,540	39,118	39,453	38,330	39,248	40,422	0.61%	247	
	Scen. 3	26,540	39,156	39,525	38,433	39,342	40,520	0.86%	345	
	Scen. 4	26,540	39,358	39,825	38,818	39,749	40,961	1.96%	786	
Soybeans and soybean products										
	Baseline	27,740	28,515	27,103	27,270	28,124	29,020			
	Scen. 1	27,740	28,664	27,422	27,759	28,776	29,836	2.81%	816	
	Scen. 2	27,740	28,573	27,233	27,471	28,397	29,376	1.23%	356	
	Scen. 3	27,740	28,520	27,108	27,278	28,135	29,027	0.02%	7	
	Scen. 4	27,740	28,602	27,286	27,550	28,489	29,474	1.56%	454	
Percent Trade Share										
Feed Grains										
	Baseline	65.1%	69.6%	67.8%	65.2%	64.5%	64.9%			
	Scen. 1	65.1%	69.7%	68.2%	65.7%	65.4%	65.7%	1.23%		
	Scen. 2	65.1%	69.6%	68.0%	65.4%	65.1%	65.3%	0.62%		
	Scen. 3	65.1%	69.6%	67.9%	65.2%	64.8%	64.9%	0.07%		
	Scen. 4	65.1%	69.6%	68.0%	65.3%	65.0%	65.2%	0.43%		
Wheat										
	Baseline	32.5%	44.0%	43.8%	42.5%	42.4%	42.6%			
	Scen. 1	32.5%	44.2%	44.1%	42.8%	42.6%	42.6%	0.16%		
	Scen. 2	32.5%	44.0%	43.9%	42.5%	42.5%	42.7%	0.24%		
	Scen. 3	32.5%	44.0%	43.9%	42.5%	42.5%	42.5%	-0.09%		
	Scen. 4	32.5%	44.1%	44.0%	42.7%	42.5%	42.5%	-0.04%		
Soybean and products										
	Baseline	56.3%	56.4%	53.1%	51.9%	52.2%	52.7%			
	Scen. 1	56.3%	56.6%	53.5%	52.4%	52.9%	53.5%	1.51%		
	Scen. 2	56.3%	56.5%	53.3%	52.2%	52.6%	53.2%	0.88%		
	Scen. 3	56.3%	56.4%	53.1%	51.9%	52.2%	52.7%	-0.01%		
	Scen. 4	56.3%	56.5%	53.3%	52.2%	52.5%	53.0%	0.65%		

- a/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.
 Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.
 Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.
 Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

increase in U.S. net feed grains exports result from increasing Latin American incomes.

Historically, the United States in its role as residual supplier in world markets, has gained trade share in times of expanding markets. As shown in Table 5.3., in general, this is borne out by the results of the income shocks. In the case of wheat, the United States gains market share in the LDC and Latin America scenarios, but loses a marginal amount in the Africa and Asia scenarios. This may be explained by the movement in price ratios and the response of U.S. competitors to these price ratios. In 1990/91 the wheat/corn and soybean/wheat price ratios favor wheat. Given lagged price responses in production, the 1990/91 price ratios influenced supply in 1991/92. Canada would increase wheat area harvested at the expense of barley, Australia will be increasing wheat area harvested at the expense of sorghum, Argentina production is very responsive to the changes in price ratios so wheat area harvested increases significantly at the expense of sorghum and to some extent soybeans and corn.

Since the 1991/92 wheat/corn price ratios also favor wheat, given the substitutability of wheat and corn in demand, wheat demand would be reduced relative to feed grains demand. The situation in 1991/92 is one of large wheat supplies among the competitors. This pattern is repeated in all four scenarios relative to the baseline but is less strong in the Latin America scenario, where the wheat/corn price ratio barely raises above baseline levels. In the All LDC scenario, the large increases in wheat demand resulting from increased incomes allow the United States to increase market share, as not all competitors can increase exports at the same rate that world trade is increasing. In the Africa and Asia scenarios, however, the increase in world trade is smaller relative to the

baseline and the United States loses market share marginally to its competitors.

In 1991/92 the United States increases exports of soybeans and soybean product in all scenarios, and gains share of the soybean and soybean product market in all but the Africa scenario. In the Africa scenario the soybean and soybean product market remains virtually unchanged from baseline levels and the U.S. share of this market falls marginally. Being the residual supplier of both soybeans and soybean products, and having excess capacity in bean production and crush, the United States would increase its trade share of expanding markets, especially when crushing capacity is more fully utilized in Argentina and Brazil and is not growing as fast as world demand.

In the ALL LDC scenario world demand for soybeans and soybean products expand as a result of the rise in incomes in all LDC's. Given the income increases in Brazil and Argentina, domestic use in these two countries increases, often by more than production increases, consequently reducing their exports and market share. While Argentina's soybean share remains essentially unchanged, Brazil loses share. They both lose soy meal and soy oil share. Taking advantage of the available excess capacity, the United States picks up market share in beans and products. In the Latin America scenario, only Latin America increases demand for soybeans and soybean products. Again, Brazil and Argentina increase domestic use and lose market share to the United States in meal and oil. Argentina's share of the bean market is unchanged while Brazil loses share. In the Africa and Asia scenarios, while Brazil and Argentina increase exports, world demand outpaces the growth in their crushing capacity. In these scenarios Argentina and Brazil both lose market share in meal to the United States.

In the soyoil market the United States and Brazil pick up share at the expense of Argentina, the EC-12 and South Korea.

5.3. Regional Results

5.3.1. Latin America: Wheat Sector

The effects of the income impacts on Latin America are shown in Figures 5.4, 5.5 and 5.6; and Table 5.4. Of the three regions, Latin America is the smallest producer, consumer, and importer of wheat. In 1991/92 given the high wheat/corn and wheat/soybean price ratios in all four scenarios relative to the baseline, wheat production increases by 2.26 percent, 0.25 percent, 0.66 percent and 1.35 percent in scenarios 1, 2, 3, and 4, respectively. The increases in Latin American income in scenarios 1 and 2 lead to increases in domestic use that are larger than the increases in production. This results in increases in wheat imports for the region of 9.95 percent in scenario 1 and 15.32 percent in scenario 2. While the increase in income is the same in both of these scenarios, the increases in domestic production demand and imports differ because price ratios differ between scenarios.

In scenarios 3 and 4 Latin America faces higher prices but its income remains unchanged relative to the baseline. While high prices lead to higher wheat production relative to the baseline, they do not lead to lower wheat demand because in some of the Latin American countries domestic use is influenced by production. However, production increases still lead to declining Latin American net wheat imports in scenarios 3 and 4.

Figure 5.4. LATIN AMERICA WHEAT

Level Change from Baseline 1991/92

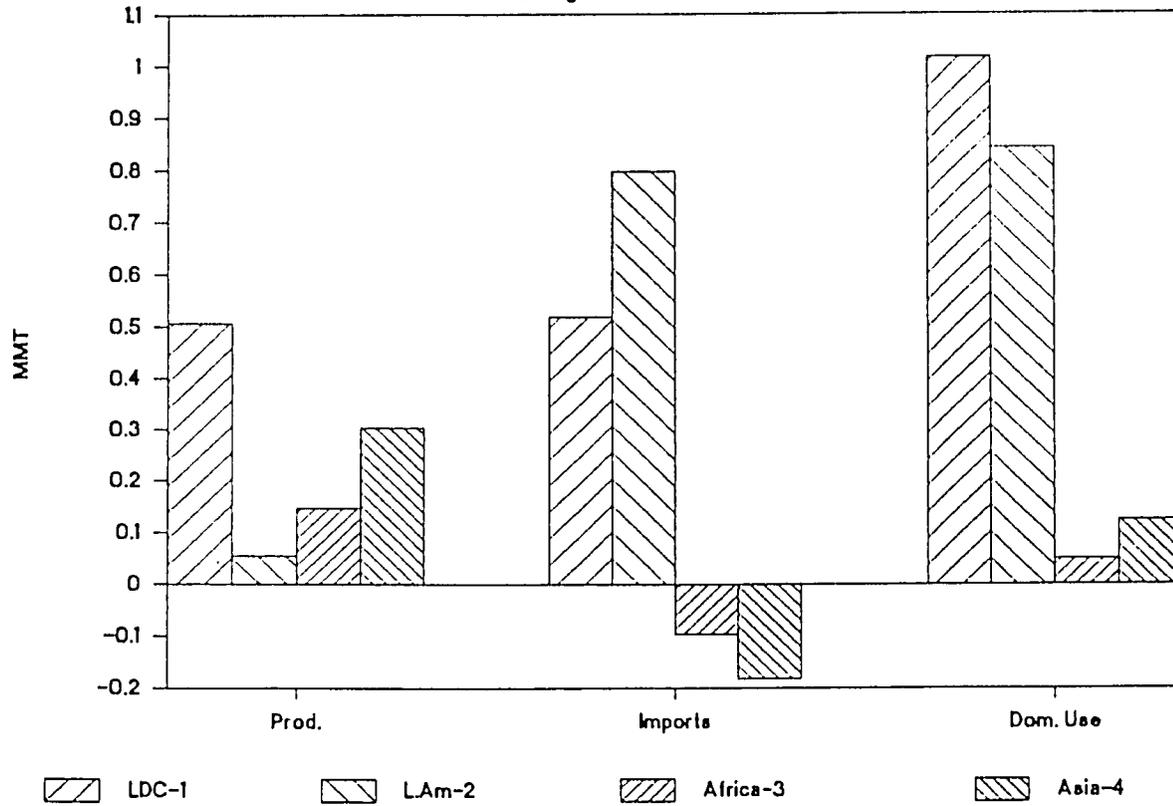


Figure 5.5. LATIN AMERICA FEED GRAINS

Level Change from Baseline 1991/92

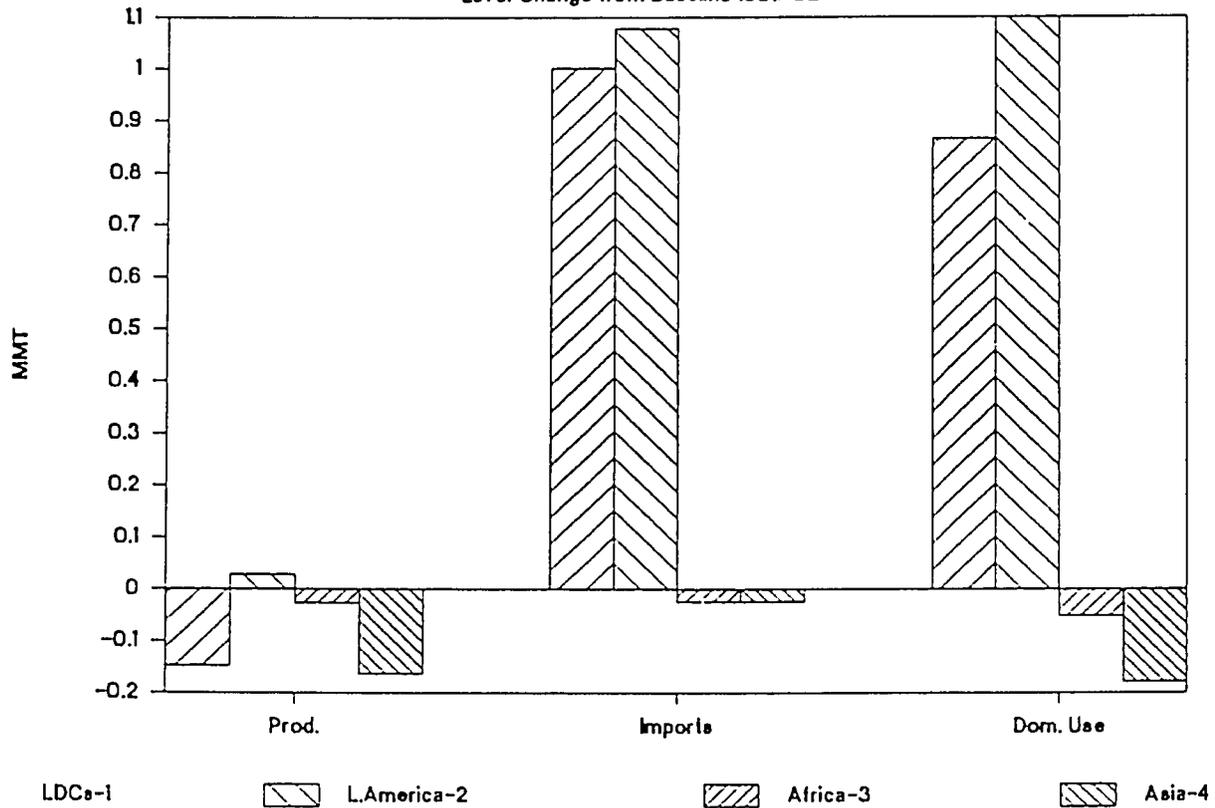


Figure 5.6. LATIN AMERICA WHEAT

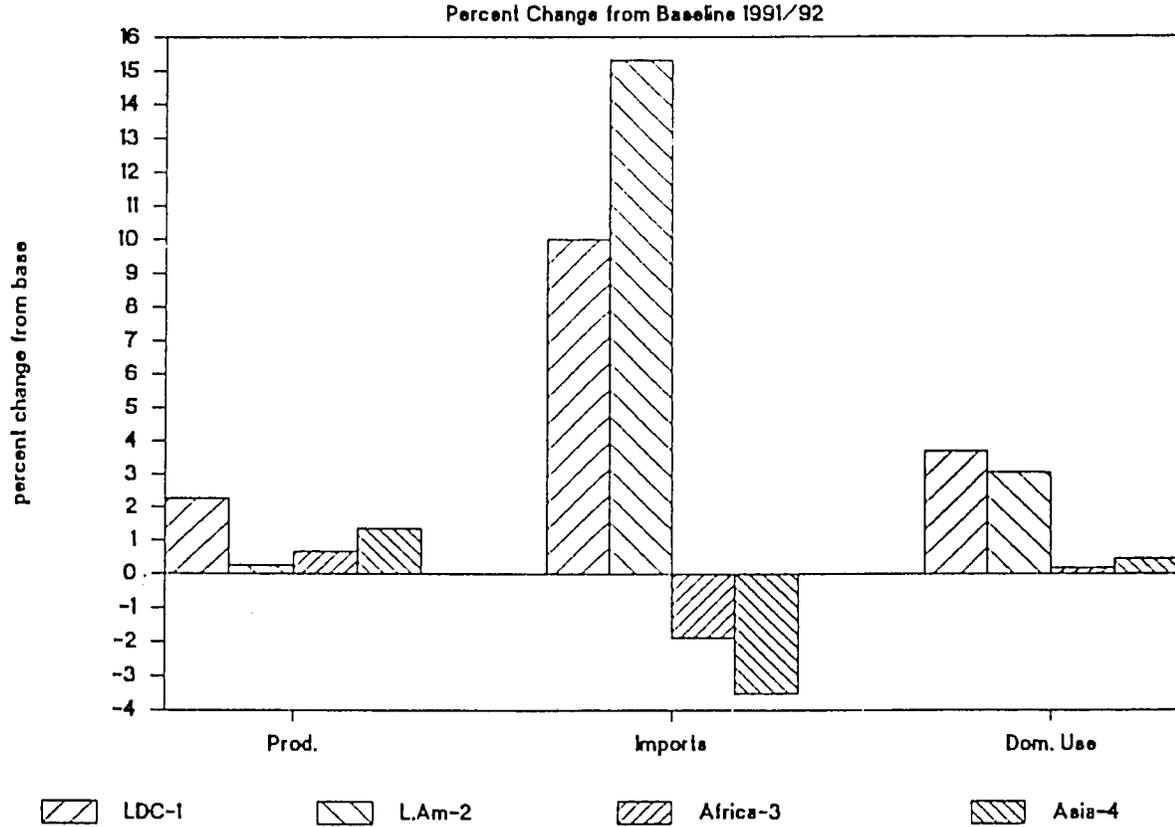


Figure 5.7. LATIN AMERICA FEED GRAINS

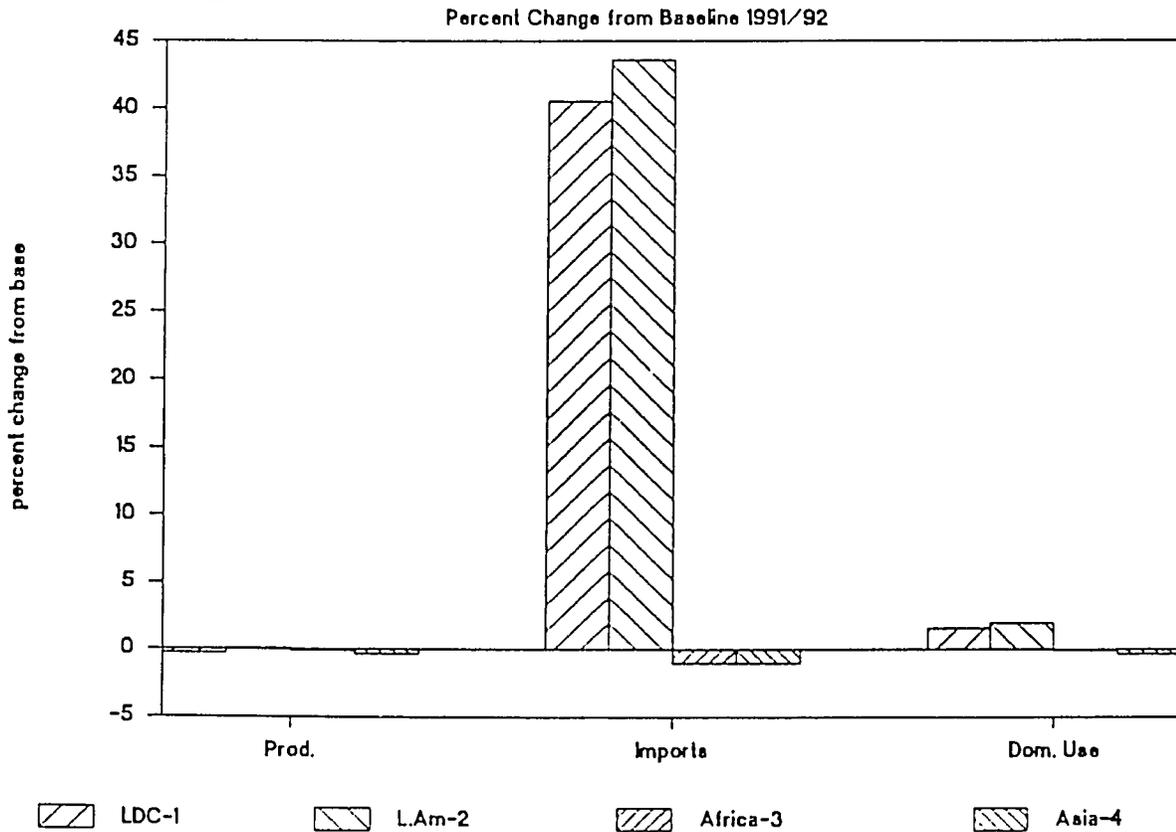


Table 5.4. LATIN AMERICA: WHEAT
Comparison of Baseline and Scenarios 1, 2, 3, and 4 a/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	

Production (1000 mt)								('000 mt)	
	Baseline	20,820	21,749	21,382	21,349	21,788	22,375		
	Scen. 1	20,820	21,749	21,486	21,581	22,157	22,881	2.26%	506
	Scen. 2	20,820	21,749	21,387	21,367	21,822	22,430	0.25%	55
	Scen. 3	20,820	21,749	21,406	21,407	21,893	22,522	0.66%	147
	Scen. 4	20,820	21,749	21,447	21,495	22,014	22,678	1.35%	303
Net Imports (1000 mt)									
	Baseline	4,427	3,935	3,851	4,720	5,222	5,197		
	Scen. 1	4,427	4,066	4,069	5,029	5,629	5,714	9.95%	517
	Scen. 2	4,427	4,083	4,145	5,171	5,839	5,993	15.32%	796
	Scen. 3	4,427	3,931	3,829	4,677	5,150	5,100	-1.87%	-97
	Scen. 4	4,427	3,922	3,801	4,630	5,085	5,015	-3.50%	-182
Domestic Use (1000 mt)									
	Baseline	25,098	25,425	25,128	25,934	26,856	27,521		
	Scen. 1	25,098	25,550	25,446	26,469	27,625	28,537	3.69%	1016
	Scen. 2	25,098	25,567	25,420	26,394	27,498	28,362	3.06%	841
	Scen. 3	25,098	25,422	25,132	25,950	26,891	27,570	0.18%	49
	Scen. 4	25,098	25,413	25,145	25,990	26,946	27,645	0.45%	124

- a/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.
 Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.
 Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.
 Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

5.3.2. Latin America: Feed Grains Sector

The impacts of the different scenario income changes on the Latin America feed grains sector are shown in Table 5.5 and Figures 5.5 and 5.7. There are no substantial production effects for feed grains in any of the scenarios. Thus when domestic use increases in scenarios 1 and 2, imports increase to make up the difference. In scenarios 3 and 4 the higher prices faced by Latin America reduce domestic use by more than production falls (due to substitution of wheat for feed grains in supply) leading to a small decrease in imports.

5.3.3. LDC Asia: Wheat Sector

Following the pattern of price movements in 1990/91, wheat production in LDC Asia increases in all four scenarios; the highest production increase is in the LDC scenario, followed by the Asia scenario (Table 5.6. and Figures 5.8 and 5.10). Domestic use rises in those scenarios where LDC Asia incomes are increased and falls in scenarios 2 and 3 when price increases are not offset by higher incomes. In scenarios 1 and 4 domestic use increases are larger than production increases leading to increased import demand. In scenarios 2 and 3 the combination of increased wheat production and reduced demand lead to small reductions in imports.

5.3.4. LDC Asia: Feed Grains Sector

The impact of the different LDC income increases on the LDC Asia feed grains sector is shown in Table 5.7. and Figures 5.9. and 5.11. Domestic use increases in scenarios 1 and 4 by 1.227 mmt and 1.221 mmt, respectively. While domestic use in scenario 4 should have risen more than in scenario 1 since prices are higher in the latter scenario, this does not occur because domestic use is tied to production in parts of LDC

Table 5.5. LATIN AMERICA: FEED GRAINS a/
Comparison of baseline and scenarios 1, 2, 3, and 4. b/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	
Production (1000 mt)								('000 mt)	
	Baseline	49,719	48,303	49,483	50,722	52,201	53,373		
	Scen. 1	49,718	48,302	49,459	50,616	52,063	53,224	-0.28%	-149
	Scen. 2	49,719	48,303	49,491	50,723	52,208	53,401	0.05%	28
	Scen. 3	49,719	48,303	49,491	50,710	52,176	53,345	-0.05%	-28
	Scen. 4	49,718	48,302	49,448	50,620	52,057	53,210	-0.31%	-163
Imports (1000 mt)									
	Baseline	1,433	2,480	3,349	1,920	2,129	2,473		
	Scen. 1	1,433	2,628	2,675	2,480	2,916	3,476	40.56%	1003
	Scen. 2	1,433	2,658	2,714	2,500	2,958	3,550	43.55%	1077
	Scen. 3	1,433	2,468	2,327	1,904	2,110	2,448	-1.01%	-25
	Scen. 4	1,433	2,657	2,328	1,927	2,126	2,448	-1.01%	-25
Domestic Use (1000 mt)									
	Baseline	51,153	51,088	51,677	52,626	54,226	55,719		
	Scen. 1	51,153	51,245	51,985	53,097	54,893	56,585	1.55%	866
	Scen. 2	51,153	51,266	52,049	53,206	55,063	56,819	1.97%	1100
	Scen. 3	51,153	51,080	51,666	52,603	54,188	55,668	-0.09%	-51
	Scen. 4	51,153	51,070	51,628	52,544	54,092	55,540	-0.32%	-179

a/ Excludes sorghum.

b/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.

Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.

Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.

Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

Table 5.6. LDC ASIA: WHEAT

Comparison of baseline and scenarios 1, 2, 3, and 4. a/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	

Production (1000 mt)								('000 mt)	
	Baseline	155,056	151,231	157,115	163,461	169,767	175,954		
	Scen. 1	155,053	151,231	157,162	163,835	170,407	176,997	0.59%	1043
	Scen. 2	155,053	151,231	157,122	163,495	169,842	176,075	0.07%	121
	Scen. 3	155,053	109,831	157,125	163,511	169,876	176,126	0.10%	172
	Scen. 4	155,053	109,831	157,143	163,654	179,216	176,695	0.42%	741
Domestic Use (1000 mt)									
	Baseline	175,965	176,070	181,036	188,262	195,280	202,579		
	Scen. 1	175,965	176,584	181,975	189,782	197,471	205,494	1.44%	2915
	Scen. 2	175,965	176,052	180,976	188,172	195,163	202,429	-0.07%	-150
	Scen. 3	175,965	176,042	180,948	188,132	195,120	202,387	-0.09%	-192
	Scen. 4	175,965	176,640	182,130	190,006	197,752	205,845	1.61%	3266
Imports (1000 mt)									
	Baseline	21,315	24,361	23,866	25,072	26,029	27,303		
	Scen. 1	21,315	24,866	24,755	26,342	27,650	29,278	7.23%	1975
	Scen. 2	21,315	24,341	23,798	24,952	25,844	27,043	-0.95%	-260
	Scen. 3	21,315	24,330	23,766	24,898	25,771	26,955	-1.27%	-348
	Scen. 4	21,315	24,926	24,931	26,646	28,104	29,904	9.53%	2601

a/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.

Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.

Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.

Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

Figure 5.8. LDC ASIA WHEAT

Level Change from Baseline 1991/92

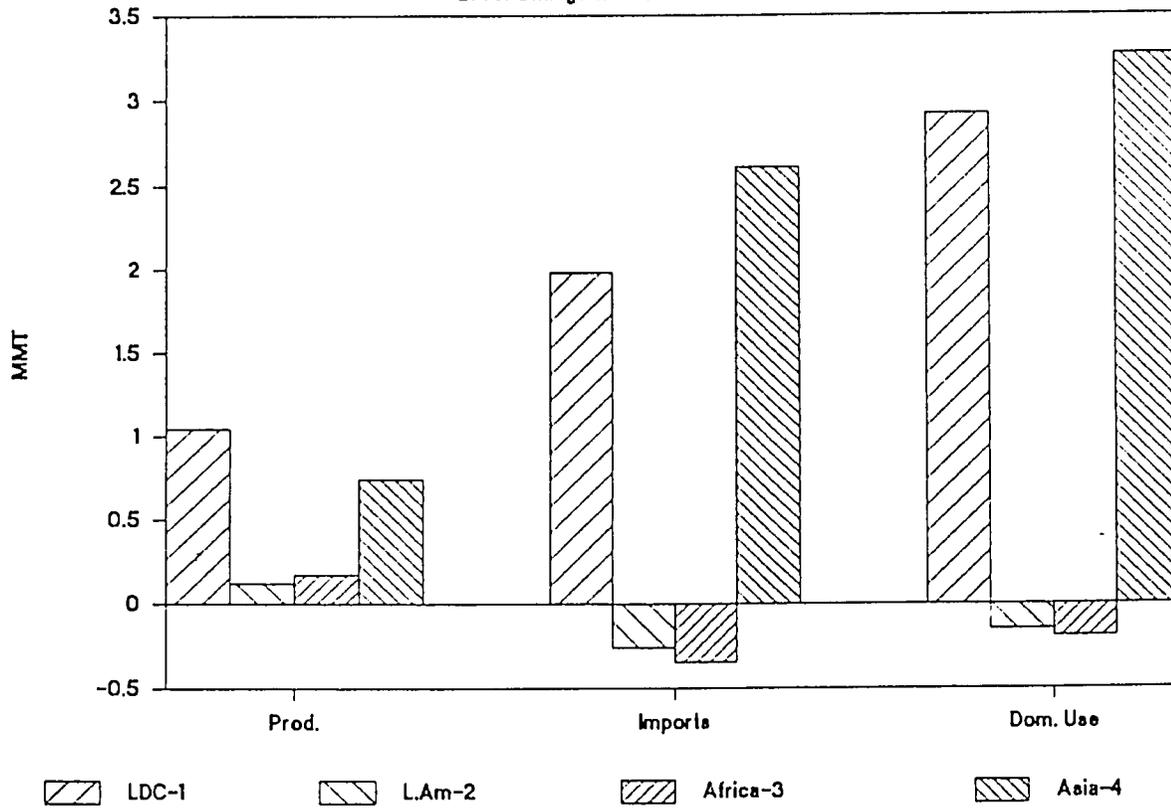


Figure 5.9. LDC ASIA FEED GRAINS

Level Change from Baseline 1991/92

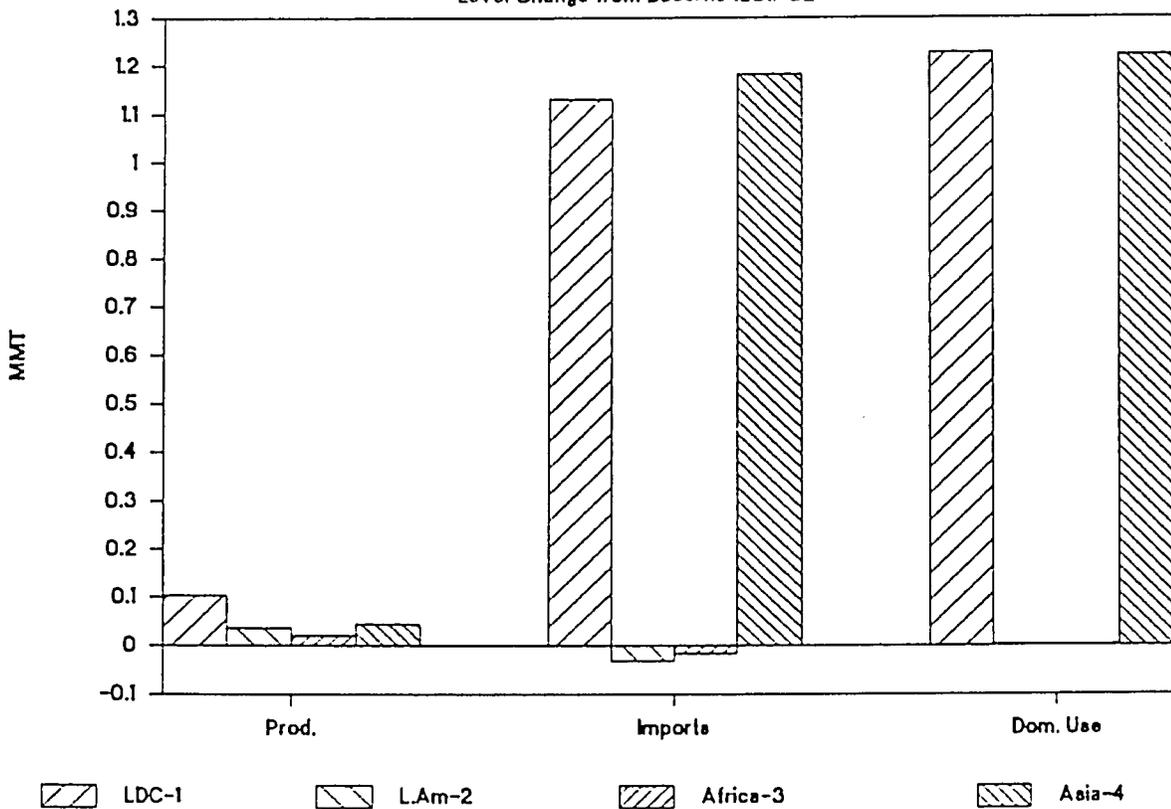


Figure 5.10. LDC ASIA WHEAT

Percent Change from Baseline 1991/92

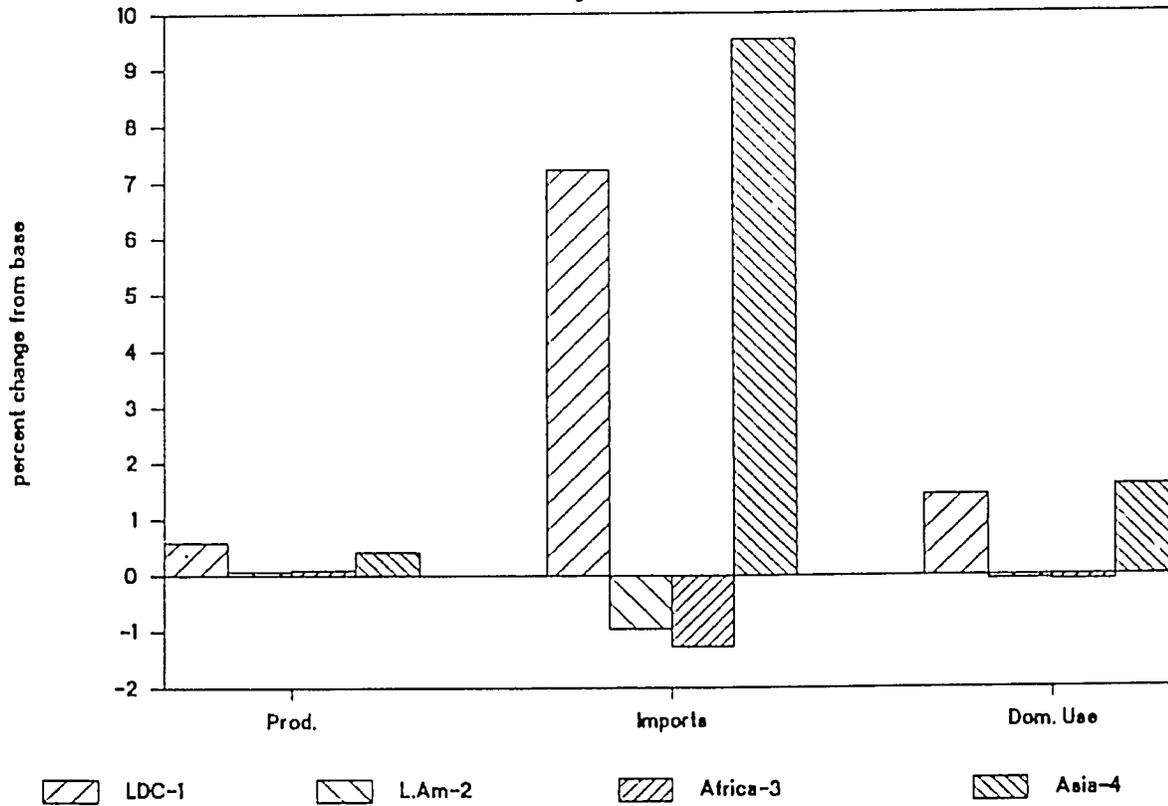


Figure 5.11. LDC ASIA FEED GRAINS

Percent Change from Baseline 1991/92

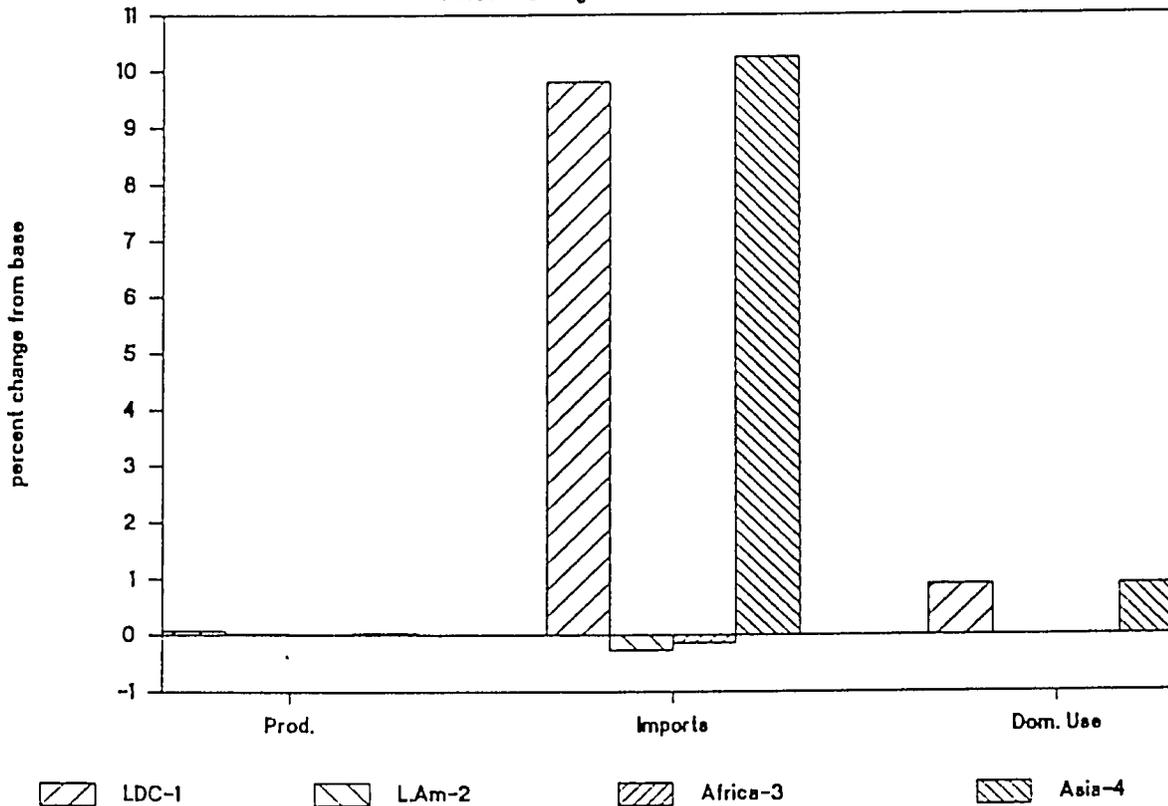


Table 5.7. LDC ASIA: FEED GRAINS a/
Comparison of baseline and scenarios 1, 2, 3, and 4. b/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	

Production (1000 mt)								('000 mt)	
	Baseline	104,213	111,677	114,206	117,848	121,298	124,700		
	Scen. 1	104,213	111,677	114,237	117,893	121,363	124,804	0.08%	104
	Scen. 2	104,213	111,677	114,215	117,863	121,321	124,736	0.03%	36
	Scen. 3	104,213	111,677	114,212	117,858	121,311	124,721	0.02%	21
	Scen. 4	104,213	111,677	114,220	117,867	121,324	124,745	0.04%	45
Imports (1000 mt)									
	Baseline	7,095	10,362	9,814	10,258	10,760	11,541		
	Scen. 1	7,095	10,534	10,194	10,869	11,619	12,673	9.81%	1132
	Scen. 2	7,095	10,356	9,806	10,245	10,740	11,510	-0.27%	-31
	Scen. 3	7,095	10,359	9,809	10,251	10,749	11,525	-0.14%	-16
	Scen. 4	7,095	10,543	10,208	10,892	11,650	12,723	10.24%	1182
Domestic Use (1000 mt)									
	Baseline	111,301	122,069	123,945	128,012	131,962	136,144		
	Scen. 1	111,301	122,243	124,354	128,662	132,878	137,371	0.90%	1227
	Scen. 2	111,301	122,065	123,947	128,013	131,963	136,147	0.00%	3
	Scen. 3	111,301	122,067	123,946	128,014	131,963	136,146	0.00%	2
	Scen. 4	111,301	122,251	124,357	128,660	132,874	137,365	0.90%	1221

a/ Excluding sorghum

b/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.

Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.

Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.

Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

Asia and production increases are higher in scenario 1. In scenarios 1 and 4 domestic use rises more than production so imports increase. In scenarios 2 and 3 production increases offset the very small domestic use increases leading to slight reductions in imports.

5.3.5. LDC Africa and Middle East: Wheat Sector

Of the three regions, LDC Africa and Middle East is the largest wheat importer and the one with the lowest self sufficiency ratio. In 1986/87, while wheat imports are only 17.6 percent of domestic use in Latin America and 12.1 percent of domestic use in LDC Asia, they make up 44.2 percent of domestic use in LDC Africa and Middle East.

The effect of the different income impacts on the LDC Africa and Middle east wheat sector are shown in Table 5.8. and Figures 5.12. and 5.14. Wheat production rises slightly in all scenarios in 1991/92, again in response to the high wheat/corn price ratios in 1990/91. Domestic use rises in scenarios 1 and 3 by 1.628 mmt and 1.580 mmt, respectively, as rising incomes lead to higher demand for wheat. Domestic use is tied to production in some of the LDC African and Middle Eastern regions leading to higher domestic use in the LDC scenario (1) than in scenario 3 even though prices are higher in the LDC scenario. Changes in net wheat imports reflect the movements in domestic use and production in each of the scenarios. Domestic use rises the most in the LDC scenario, followed by the LDC Africa and Middle East scenario; production increases are highest in the ALL LDC scenario, while production increases in scenario 3 are relatively small. Therefore imports increase the most (5 percent) in scenario 3, followed by scenario 1 (4.7 percent).

Table 5.8. LDC AFRICA AND MIDDLE EAST: WHEAT
Comparison of baseline and scenarios 1, 2, 3, and 4. a/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	
Production (1000 mt)								('000 mt)	
	Baseline	34,865	34,785	35,406	36,156	36,875	37,529		
	Scen. 1	34,865	34,785	35,484	36,392	37,056	37,756	0.60%	227
	Scen. 2	34,865	34,785	35,416	36,175	36,898	37,560	0.08%	31
	Scen. 3	34,865	34,785	35,422	36,192	36,925	37,592	0.17%	63
	Scen. 4	34,865	34,785	35,454	36,238	36,980	37,662	0.35%	133
Domestic use (1000 mt)									
	Baseline	60,529	62,133	63,267	63,918	65,830	67,702		
	Scen. 1	60,529	62,387	63,831	64,819	67,076	69,330	2.40%	1628
	Scen. 2	60,529	62,129	63,260	63,911	65,822	67,694	-0.01%	-8
	Scen. 3	60,529	62,355	62,788	64,763	67,028	69,282	2.33%	1580
	Scen. 4	60,529	62,115	63,255	63,915	65,820	67,691	-0.02%	-11
Imports (1000 mt)									
	Baseline	26,653	27,677	28,321	28,244	29,441	30,644		
	Scen. 1	26,653	27,936	28,847	29,049	30,542	32,081	4.69%	1437
	Scen. 2	26,653	27,672	28,311	28,226	29,413	30,608	-0.12%	-36
	Scen. 3	26,653	27,902	28,841	29,074	30,604	32,177	5.00%	1533
	Scen. 4	26,653	27,657	28,281	28,176	29,340	30,516	-0.42%	-128

- a/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.
 Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.
 Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.
 Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

Figure 5.12. LDC AFRICA WHEAT
Level Change from Baseline 1991/92

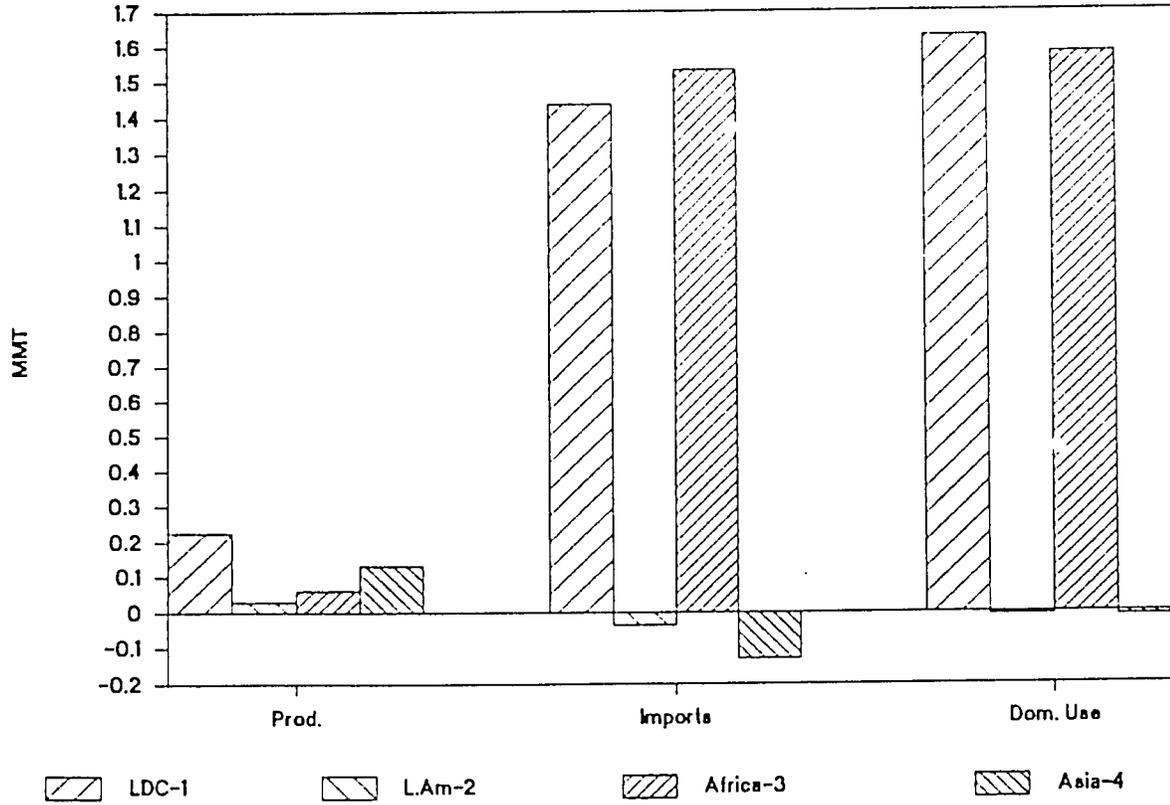


Figure 5.13. LDC AFRICA FEED GRAINS
Level Change from Baseline 1991/92

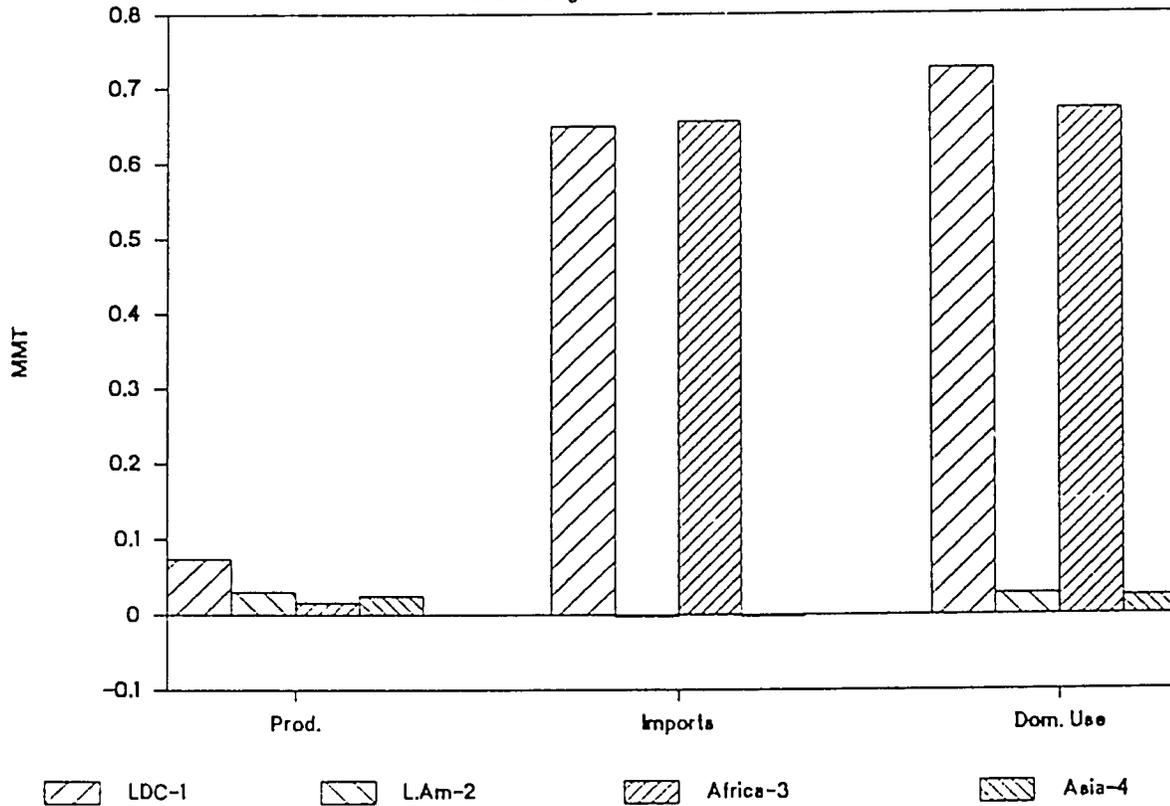


Figure 5.14. LDC AFRICA WHEAT
Percent Change from Baseline 1991/92

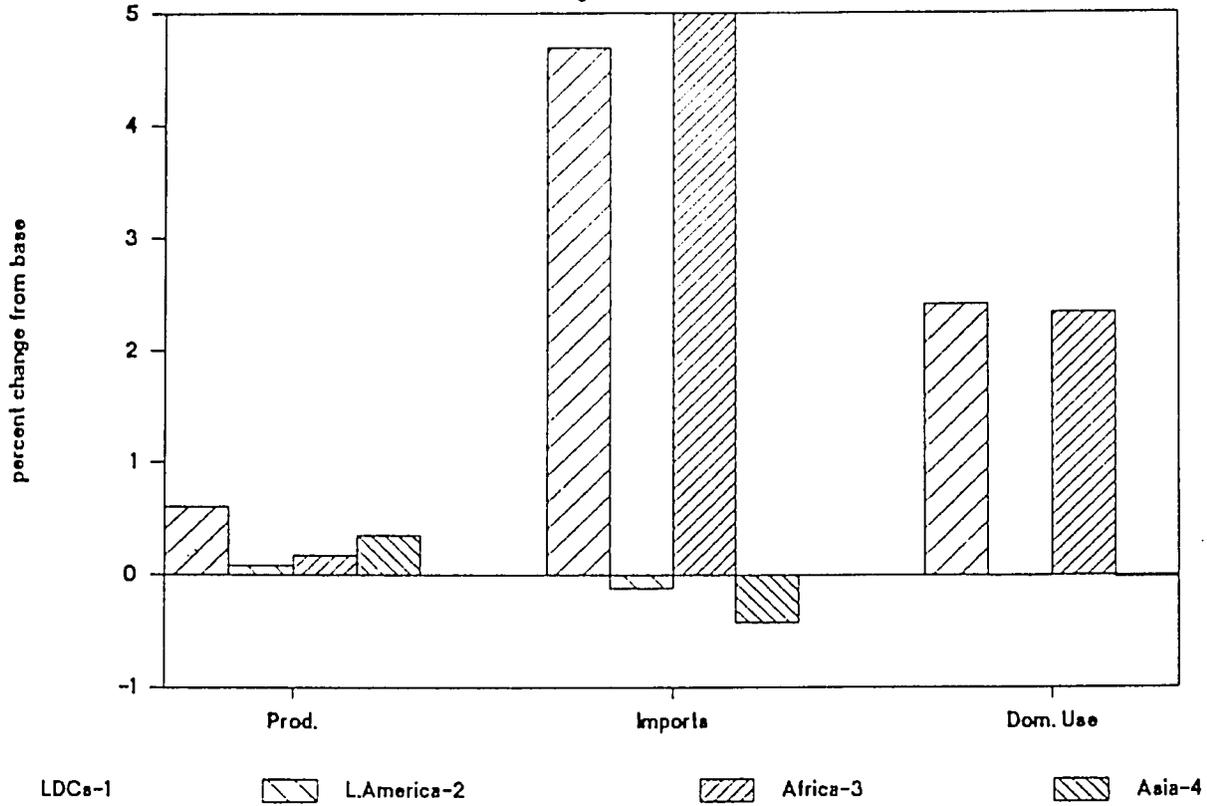
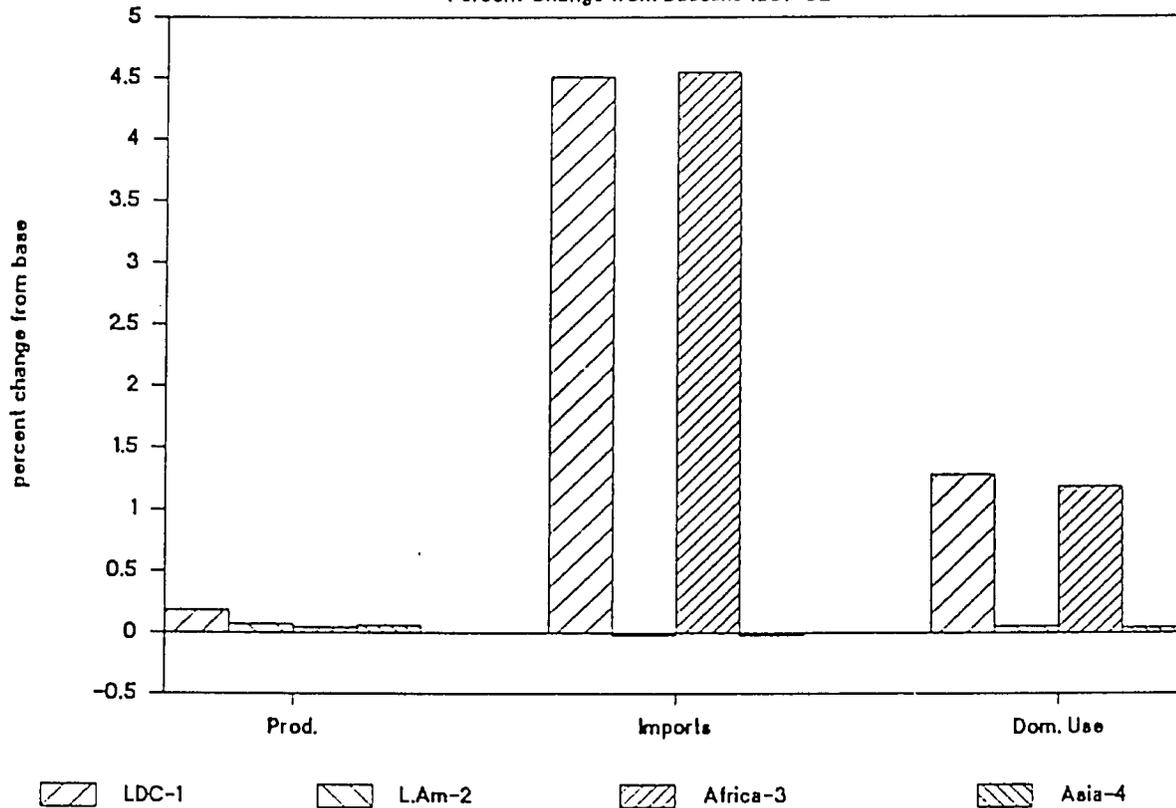


Figure 5.15. LDC AFRICA FEED GRAINS
Percent Change from Baseline 1991/92



5.3.6. LDC Africa and Middle East: Feed Grains Sector

LDC Africa and the Middle East is the largest feed grains importer of the three regions. Feed grains imports for this region in the 1996/87 baseline are 14.624 mmt compared to 7.095 mmt for LDC Asia and 1.433 mmt for Latin America net of Argentina (Table A.1.).

The impact of the different regional increases in LDC incomes on the LDC Africa and Middle East feed grains sector is shown in Table 5.9. and Figures 5.13. and 5.15. Production in 1991/92 rises slightly in all four scenarios as corn prices rise above baseline levels in 1990/91. The largest increases in domestic use occur in the ALL LDC and LDC Africa and Middle East scenarios as a result of the combination of increased incomes and slightly higher production. Increases in production in scenarios 2 and 4 offset the price rises in these scenarios resulting in slightly increased domestic use also. Net imports increase about 4.5 percent in both scenarios 1 and 3.

6. Country Study: Brazil

6.1. Introduction

This section provides a detailed description of a particular country, Brazil. The purpose of this section is to use a specific country to illustrate the interaction of international prices, economic growth, domestic agricultural production and consumption patterns, and domestic and foreign agricultural policies in the Brazil commodity model.

Brazil was chosen because it is a developing country that competes with the United States in agricultural markets, particularly in soybeans and soybean products. It is also a growing importer of wheat and feed grains. Brazil is also of interest because in addition to competing with

Table 5.9. LDC AFRICA AND MIDDLE EAST: FEED GRAINS a/
Comparison of baseline and scenarios 1, 2, 3, and 4. b/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	
Production (1000 mt)								('000 mt)	
	Baseline	39,630	39,768	40,165	40,748	41,393	42,072		
	Scen. 1	39,630	39,768	40,180	40,775	41,437	42,146	0.18%	74
	Scen. 2	39,630	39,768	40,172	40,760	41,411	42,102	0.07%	30
	Scen. 3	39,630	39,768	40,169	40,754	41,402	42,088	0.04%	16
	Scen. 4	39,630	39,768	40,172	40,757	41,406	42,097	0.06%	25
Imports (1000 mt)									
	Baseline	14,624	11,502	12,926	13,276	13,692	14,428		
	Scen. 1	14,624	11,595	13,144	13,623	13,181	15,078	4.51%	650
	Scen. 2	14,624	11,498	12,926	13,275	13,690	14,425	-0.02%	-3
	Scen. 3	14,624	11,603	13,143	13,626	14,187	15,084	4.55%	656
	Scen. 4	14,624	11,497	12,926	13,276	13,689	14,425	-0.02%	-3
Domestic Use (1000 mt)									
	Baseline	53,626	51,314	52,941	53,831	54,875	56,269		
	Scen. 1	53,626	51,417	53,174	54,206	55,411	56,995	1.29%	726
	Scen. 2	53,626	51,314	52,947	53,841	54,892	56,297	0.05%	28
	Scen. 3	53,626	51,417	53,161	54,187	55,379	56,941	1.19%	672
	Scen. 4	53,626	51,314	52,947	53,840	54,888	56,293	0.04%	24

a/ Excludes sorghum.

b/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.

Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.

Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.

Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

the United States in world markets for soybeans and soybean products, it has benefited from U.S. agricultural technology and is a recipient of U.S. official development assistance.

United States technology was used during the initial expansion of Brazil's soybean sector. Brazilians used commercial varieties from the southern United States because of similar growing conditions (Vocke, G. 1988). However, further expansion in the tropical areas was achieved through the development of new varieties in Brazil and large investments in transportation infrastructure.

From the above, it may be surmised that agricultural development in Brazil has not been compatible with U.S. agricultural interests. However, when the impact of LDC economic growth on agricultural trade is analyzed, the results indicate that at higher rates of LDC economic growth, the United States would benefit from expanded world trade. In the specific case of the soybean and soybean product market, the United States would pick up market share lost by Brazil.

This section is structured in the following manner: the key macroeconomic assumptions and model structure underlying the baseline results and a description of the income shocks are followed by a discussion of production and consumption patterns and agricultural policies affecting wheat, feed grains and soybeans in Brazil. Next is the analysis of the income impact results and the conclusion and implications for U.S. trade.

6.2. Macroeconomic Assumptions and Underlying Model Structure

The key macroeconomic assumptions underlying the baseline projections for Brazil show a slight decline in real GDP and exploding inflation in

1987/88. Real GDP growth rate is projected at -0.93 percent in 1987/88, recovering thereafter and reaching 10 percent in 1990/91. Consumer prices are projected to increase by 410 percent in 1987/88 with the exchange rate being devalued approximately in line with inflation. Uncertainties over political variables coupled with the unattractiveness of the debt-conversion program leads to a decline in private investment (WEFA 1987). Population is projected to grow from 135.6 million in 1985 to 150 million in 1990 (World Bank Development Report 1987).

The key elasticities of the Brazil commodity models are given in Tables 6.1 and 6.2. Since each of the three commodity models includes prices of some or all the other commodities and all commodity prices are changing in each of the scenarios, the price transmission elasticities have to be considered in evaluating the supply and demand responses. The price transmission elasticities for wheat (0.10) and corn (0.52) reflect the degree of protection from international markets received by each crop. Feed grain use in the Brazil submodel is estimated as total use reflecting both human consumption and feed use. Thus the estimated income elasticity of demand is higher than those of other studies that look only at food demand (de Janvry and Sautolet 1987, and Yotopoulos 1985) and somewhat lower than those for feed demand only (Christiansen 1987, and Yotopoulos 1985). The short run income elasticity of soymeal demand is 0.5 while soyoil is quite income elastic with a point elasticity at the mean of 1.48.

6.3. Income Shock

The effect of the income impact scenario on real GDP is shown in Figures 6.1 and 6.2. The effect of a one percentage point increase in

Table 6.1. Summary of estimated elasticities from the Brazil commodity models. a/

	Corn Price	Wheat Price	Soybean Price	Soymeal Price	Soyoil Price	Crushing Margin	Income
Wheat production	-0.49	0.72					
Wheat demand		-0.50					0.59
Feed grains production	0.29	-0.28	-0.02				
Feed grains demand	-0.13						0.49
Soybean production			0.20				
Soybean crush						0.04	
Soymeal demand				-0.11			0.50
Soyoil demand					-0.10		1.48

a/ Elasticities are point elasticities estimated at the mean

Table 6.2. Price transmission elasticities with respect to world price. a/

	U.S. Corn Price	U.S. Wheat Price	U.S. Soybean Price	U.S. Soymeal Price	U.S. Soyoil Price
Brazil					
Corn farm price	0.52				
Wheat farm price		0.1			
Soybean farm price			1.11		
Soymeal price				1.00	
Soyoil price					1.00

a/ Elasticities are point elasticities estimated at the mean

Figure 6.1. BRAZIL: GDP

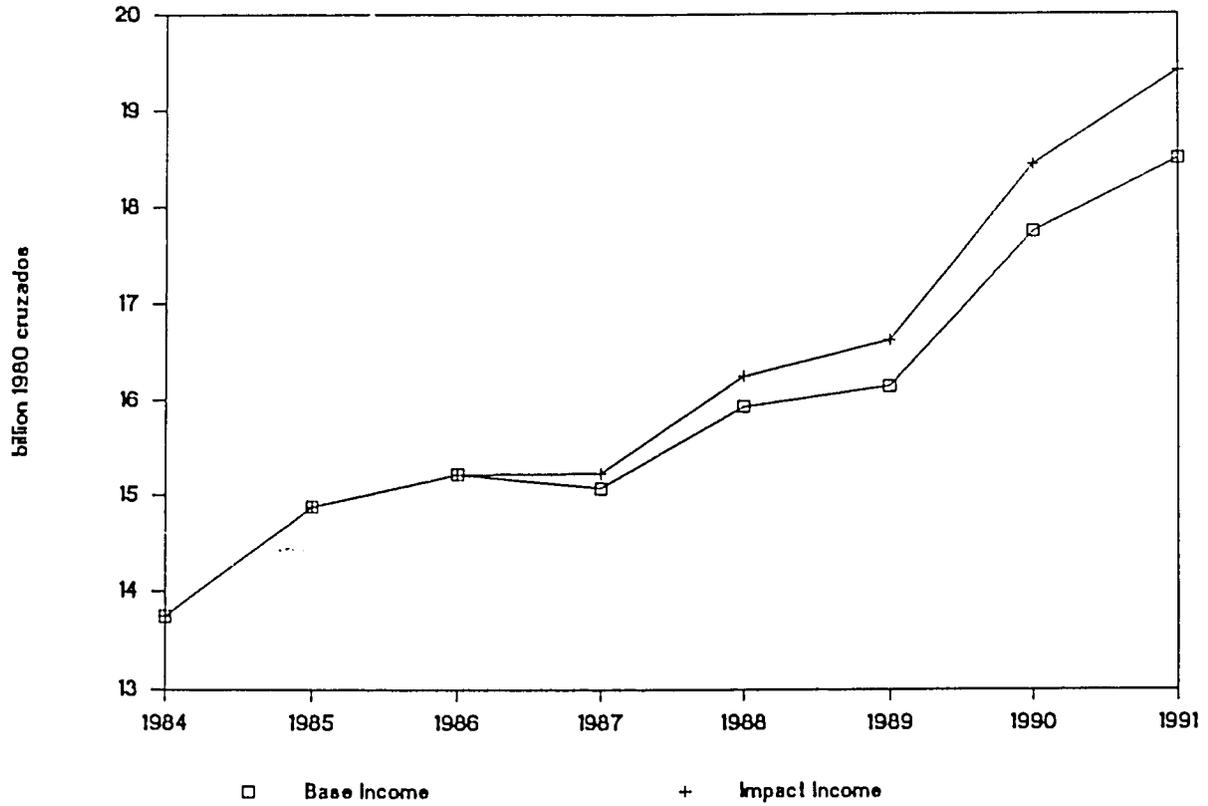
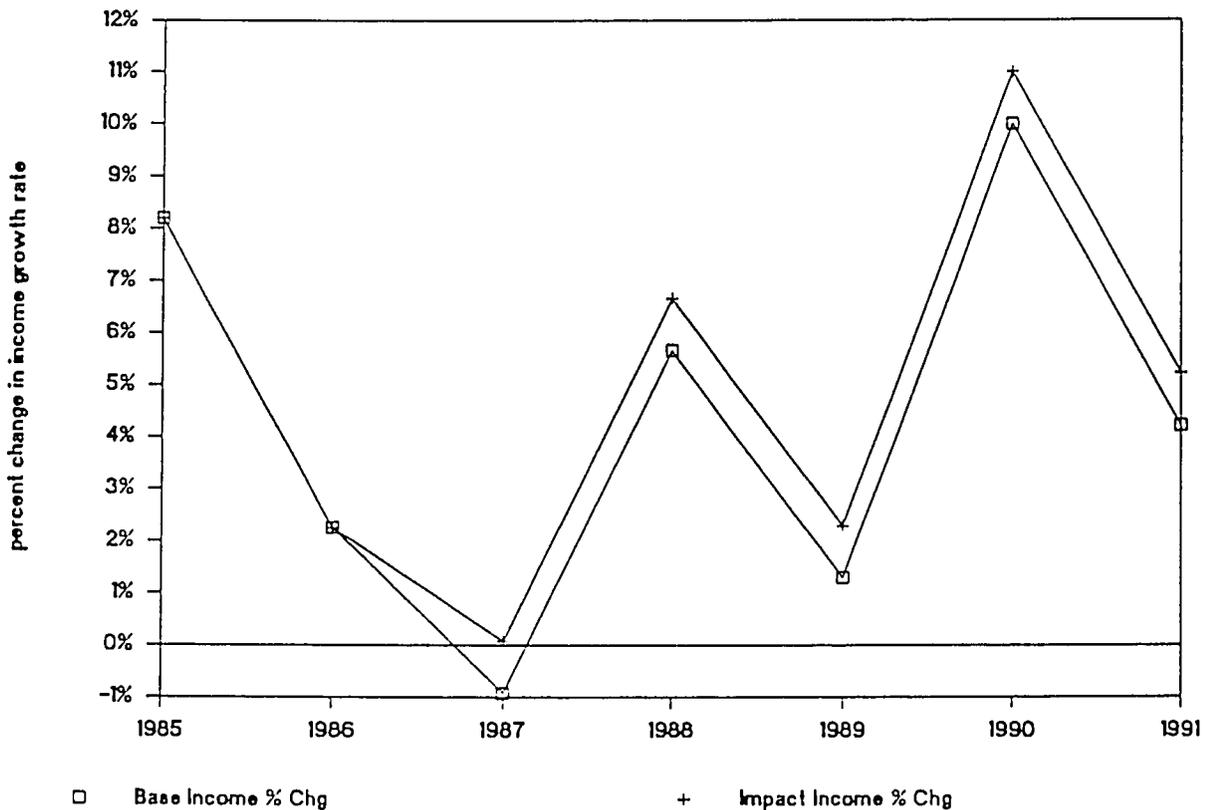


Figure 6.2. BRAZIL: GDP GROWTH RATE



real GDP growth rates every year for five years results in an increase of 4.90 percent in the real GDP level by the fifth year in the case of Brazil.

6.4. Agricultural Policies, Production and Consumption Patterns

The wheat sector is relatively more protected than feed grains, since wheat policy is formulated in an attempt to reach such goals as self sufficiency and the control of inflation. Wheat policies were initially formulated in 1963, and producers have received large subsidies in times of low world prices. Wheat production in Brazil is highly risky and subject to wide annual variations in yield. It is mainly produced as an offseason crop on soybean land. However, soybean yields may be reduced by as much as 15 percent because of the overlap period in the growing season of the two crops. Thus, wheat area planted is very responsive to the soybean/wheat price ratio (World Bank 1983).

Consumers have also benefited from the wheat policy. Per capita consumption has risen from a stable 30 kilograms in the 1960s to 57 kilograms in 1986/87. The goal of wheat self sufficiency has been difficult to achieve, as large consumer subsidies have stimulated the consumption of wheat at the expense of traditional food sources such as corn and cassava (World Bank 1983). Wheat self sufficiency rose rapidly from around 9 percent in 1965/66 to 47 percent in 1970/71. It reached 66 percent in 1986/87 and the baseline projection for 1991/92 is 56 percent. Brazil's wheat net imports have risen from 1.71 mmt in 1970/71 to 4.69 mmt in 1984/85. Baseline projections of imports are 3.67 mmt for 1991/92. Brazil's share of world wheat net imports shows large fluctuations due the variability of domestic wheat production. It was

3.7 percent in 1986/87, falls to 2.4 percent in 1987/88 and is projected to rise thereafter to almost 4 percent in 1991/92.

Corn has been an important food grain in rural Brazil (World Bank 1983). However, the major source of demand growth is feed use both at the farm level and, increasingly, in prepared animal rations with the growth of large and technologically advanced pork and poultry production sectors.

Corn production in Brazil has been affected significantly by the operation of the wheat program. The World Bank (1983) estimates the losses in corn production brought about by the substitution of wheat for corn to be of about the same magnitude as the level of Brazil's corn exports in the early 1970s. Since the mid-1970s Brazil has been a net importer of feed grains with imports projected at 2.4 mmt in 1991/92.

Brazil favors exports of the value added soybean products rather than soybeans. This is achieved through the use of higher export quotas and taxes on soybeans than on meal and oil. Brazil's share of the world market in soybeans and meal in 1970 was 2.9 and 12.5 percent respectively (World Bank 1983). In the 1986/87 crop year the soybean export share was 11 percent, the soymeal share 40.3 percent and the soyoil share 27.7 percent. Our baseline projections for the market shares in 1991/92 are 11.3 percent, 41.6 percent and 21 percent for soybeans, soymeal and soyoil, respectively. Per capita consumption of soyoil has grown rapidly in Brazil and is projected to rise from 12.9 kilograms in 1986/87 to 15.3 in 1991/92.

6.5. Results

Supply and use data for the baseline and four scenarios for the Brazil wheat, feed grains, soybean, soymeal and soyoil sectors are

contained in Tables A.3 to A.6 and Figures A.1 to A.10. By 1990/91 and 1991/92 the largest increases in all commodity prices, relative to the baseline, occur in Scenario 1, where all LDC income growth rates are increased by one percentage point (Figure 5.1.). Of the commodity price increases in this scenario, wheat price rises by the largest percentage in both 1990/91 and 1991/92. In percentage terms, the bean price rise exceeds the corn price rise in 1990/91, determining the production adjustments in 1991/92, while the corn price rise exceeds the bean price rise in 1991/92, determining demand adjustments in 1991/92.

Given that area harvested responds to lagged price changes, the commodity price interactions in 1990/91 determine production in 1991/92. Although area harvested and production of all three commodities expand in 1991/92, soybean area expands the most, by 1.2 percent or 132 thousand hectares over the baseline. Wheat area expands by 0.56 percent or 18 thousand hectares relative to the baseline. Feed grain area rises only marginally, 0.07 percent or 9 thousand hectares, since the bean/corn and wheat/corn price ratios are sufficiently higher in 1990/91 relative to the baseline to offset most of the positive effects from the higher corn price on feed grains area harvested .

By 1991/92 the crushing margin rises by 9.09 percent over the baseline in scenario 1 and crush increases by 293 thousand mt relative to the baseline. Since soybean production increases by only 249 thousand mt, this means that export levels are reduced. Brazil's market share is slightly reduced below the baseline level of 11.3 percent. Soymeal and soy oil production rise by approximately 1.8 percent relative to the baseline. However, all of this increase in production is not exported. The rise in income offsets the higher bean product prices and 57 percent

of the increased meal production is absorbed by the domestic market. Even with export increases of 106 thousand mt over the baseline, Brazil's market share is slightly reduced. Given the relatively income elastic demand for soyoil, domestic consumption increases by more than production and consequently exports of soyoil are 8.45 percent below baseline levels. Per capita consumption of soyoil in the 1991/92 scenario 1 is 16 kilograms, compared to 15.3 kilograms in the baseline. Brazil's share of world soyoil exports is reduced from almost 21 percent in the baseline to 18.6 percent. For soybeans and soybean products, the United States picks up most or all the share lost by Brazil.

In Scenario 2, the income growth rates of only the Latin American LDCs are increased. While the largest price impact of the income rise in Latin America is still on wheat, given the higher levels of feed grains imports and consumption in this region compared to wheat, this scenario is the most favorable one for corn prices. In scenario 2 the wheat/corn price ratio increases by the least amount of all the scenarios and the soybean/corn price ratio remains above baseline levels for the projection period up to 1990/91 and falls marginally below baseline levels in 1991/92. The soybean/wheat price ratio in this scenario remains very close to the baseline ratio over the projection period, barely falling below baseline levels in 1991/92. Thus, in this scenario Brazilian wheat area harvested is hardly affected, the increase in soybean area harvested is less than half the increase occurring in scenario 1, and corn area harvested increases the most of any of the scenarios, 0.13 percent or 17 thousand hectares.

Since the income increases are the same in Latin America in both scenarios 1 and 2, but the price rises are largest in scenario 1, demand increases more in scenario 2 than in scenario 1. Wheat domestic use rises by 275 thousand mt while production only rises by 3 thousand mt relative to the baseline. The difference is made up by increases in imports, leading Brazil to a 7.5 percent increase in wheat imports in 1991/92 compared to the baseline. Per capita consumption rises to about 57 kg from 55 kg in the baseline. Increases in domestic use of feed grains are proportionately higher than increases in production, with imports rising by 718 thousand mt to make up the difference. Per capita consumption rises to 173 kg from 168 kg in the baseline. Brazil's imports of feed grains rise by 30 percent compared to the baseline.

After scenario 1, the largest increase in crushing margin occurs in scenario 2, leading to a 151 thousand mt increase in crush in 1991/92. Since production increases by only 59 thousand mt, Brazil again decreases exports of soybeans in this scenario and loses market share. In scenario 2 increases in domestic use of meal outpace increases in production, leading to a 5 thousand mt reduction in exports and a loss of market share. The increase in soyoil demand is even more pronounced than in scenario 1 as incomes have increased by the same amount while prices are lower in scenario 2. Again, domestic soyoil demand increases far outweigh production increases, leading to a 92 thousand mt reduction in exports and loss of market share. As in scenario 1, the United States picks up most or all the share lost by Brazil in soybeans and soybean products.

In scenarios 3 and 4 the income growth rates of LDC African and Middle Eastern countries, and LDC Asian countries respectively, are increased. The effect on Brazil is through the price linkages. With the

same income level as in the baseline, it faces marginally higher prices in scenario 3 and substantially higher prices in scenario 4, especially for wheat. Scenarios 3 and 4 have a greater effect on wheat prices than the Latin American scenario. The African and Middle Eastern scenario has the smallest effect on feed grains prices and practically no impact on soybean prices. Except for scenario 1, the Asian scenario has the largest effect on all prices. In scenario 4 the soybean/wheat ratio is markedly reduced from baseline levels, while there is very little change in the soybean/corn ratio. The wheat/corn ratio is substantially increased.

Given that price changes in scenarios 3 and 4 markedly favor wheat and to a certain extent, soybeans, over corn, in 1991/92 Brazilian wheat area harvested and production increase relative to the baseline more than they do in scenario 2. Feed grains production falls in both scenarios 3 and 4 relative to the baseline. Soybean production increases marginally in scenario 3, and by 0.62 percent or 129 thousand mt in scenario 4 relative to the baseline.

Given the higher prices for wheat and feed grains and no compensatory increases in income, Brazil's demand for these commodities falls in both scenarios 3 and 4. Since higher wheat prices stimulate domestic wheat production, in scenario 4 imports fall by more (58 thousand mt) than domestic use (40 thousand mt). The opposite occurs with feed grains. Given that price ratios lead to a reduction in domestic production of feed grains, domestic use of feed grains falls by more (67 thousand mt) than imports (45 thousand mt).

The crushing margin remains essentially unchanged in scenario 3 and increases by 3.6 percent in scenario 4. This results in virtually no change in crush and soybean exports in scenario 3 but increased crush and

reduced exports in scenario 4. Domestic meal demand is unchanged and therefore all increases in meal production are exported. However, Brazil still loses soymeal market share to the United States since world meal demand is growing faster than Brazil can increase its crushing capacity while the United States can use its excess crushing capacity to expand into world markets. Domestic use of soyoil remains unchanged in scenario 3 and is reduced in scenario 4. Production increases thus translate into exports and in the case of scenario 4, exports rise by more than the increases in production. Brazil retains its world market share of oil in scenario 3 and increases it in scenario 4. The United States also maintains its share in scenario 3 and gains share in scenario 4. The United States' and Brazil's gain of soyoil market share in scenario 4 come at the expense of Argentina, South Korea and the EC-12.

6.6. Conclusions

Income increases in Brazil lead to increased imports of wheat and corn as domestic demand outpaces production growth. In scenarios 3 and 4 Brazil faces higher commodity prices without a compensating increase in income. Domestic use is reduced while production rises leading to a reduction in imports. While the model does not indicate specifically which of the wheat or feed grains exporting countries will gain the most from the increase in Brazilian wheat and feed grain imports, it does indicate that the United States will increase market share when higher Latin American incomes lead to expanding world markets.

The results of the income shocks indicate that at higher income levels - scenarios 1 and 2 - the increase in Brazilian domestic demand for soymeal and soyoil will reduce its share in the world market. In these

two scenarios the United States benefits the most in the soyoil and soymeal markets at the expense mainly of Brazil and Argentina. In the soybean market the United States also picks up share, mainly from China and Brazil in scenario 1 and from Brazil in scenario 2.

In scenarios 3 and 4 while Brazil responds to higher world prices by reducing domestic consumption and increasing production and exports of soybeans and soybean products, the United States is able to pick up soybean and soyoil share because Brazilian exports of soybean products do not increase as fast as world demand is increasing. The United States also picks up share in the soybean market in scenario 4 but losses marginally to Brazil and Argentina in scenario 3. Being the residual supplier of both soybeans and soybean products and having excess capacity in bean production and crush, the United States would increase its trade share of expanding markets, especially when crushing capacity is more fully utilized in Argentina and Brazil and is not growing as fast as world demand.

7. Conclusions

The general pattern that has emerged from this analysis is that a one percentage point increase in real GDP growth rates for developing countries leads to substantial trade and price effects for grains and soybeans. For equivalent changes in GDP growth rates, the net import effects are greatest when the income changes in Latin American LDCs and least when the income effects are in African LDCs. In general, the net import effects in each region are lower when income increases in all LDCs,

because of the price effects that accompany this general growth in demand (Figure 7.1 and 7.2).

The higher income growth scenario that includes all developing countries increases world trade in feed grains and wheat by about 3.4 percent and in soybeans and products by about 1.3 percent (Table 7.1). U.S. export impacts of this scenario are an increase of 4.7 percent for feed grains, 3.5 percent for wheat and 2.8 percent for soybeans and products. The fact that U.S. exports increase by a larger percentage than the increases in world trade indicate that U.S. trade shares are increasing.

The price effects of these income growth scenarios are quite significant. The effects on corn prices range from 1.5 percent for the Africa scenario to 8.3 percent for the All LDC scenario. Wheat price effects are even larger, ranging from 3.6 percent for the Latin American scenario to 18 percent for the All LDC scenario. The smallest price effects occur in soybeans, ranging from 0.5 percent for the Africa scenario to 7.3 percent for the All LDC scenario.

Obviously, the probability or feasibility of events or policies that would lead to a one percentage point increase in GDP growth rates would vary a great deal from country to country. This is an additional important element in evaluating the results of this analysis. If countries or regions that have the greatest import response to income growth also happen to be countries or regions where such increases in income growth can be most easily induced, that would be the best possible combination. The opposite would be true if the country or region with the greatest import response to income would be the ones where increases in income are the most difficult to generate.

Table 7.1. Changes from baseline in world and U.S. net trade and prices as a result of the income shocks, 1991-92. a/

Crop	Scenario	Change in World Trade		Change in U.S. Trade		Change in Crop Prices	
		(%)	('000 mt)	(%)	('000 mt)	(%)	(\$/mt)
Feed Grains b/						Corn	
	Scen. 1	3.40	2,900	4.67	2,582	8.29	6.7
	Scen. 2	1.32	1,124	1.94	1,076	2.93	2.37
	Scen. 3	0.84	717	0.91	505	1.46	1.19
	Scen. 4	1.03	882	1.47	811	3.41	2.76
Wheat						Wheat	
	Scen. 1	3.37	3,186	3.54	1,422	18.24	20.58
	Scen. 2	0.37	351	0.61	247	3.58	4.04
	Scen. 3	0.95	901	0.86	345	4.56	5.15
	Scen. 4	2.00	1,884	1.96	786	9.77	11.03
Soybe: and soybean products						Soybeans	
	Scen. 1	1.29	708	2.81	816	7.34	15.8
	Scen. 2	0.35	192	1.23	356	2.90	6.25
	Scen. 3	0.03	18	0.02	7	0.51	1.1
	Scen. 4	0.91	501	1.56	454	3.58	7.72

- a/ Scenario 1: 1 percentage point increase in GDP growth rates in all LDCs.
 Scenario 2: 1 percentage point increase in GDP growth rates in all LDC Latin America.
 Scenario 3: 1 percentage point increase in GDP growth rates in all LDC Africa and Middle East.
 Scenario 4: 1 percentage point increase in GDP growth rates in all LDC Asia.

Figure 7.1. LDC's WHEAT NET IMPORTS

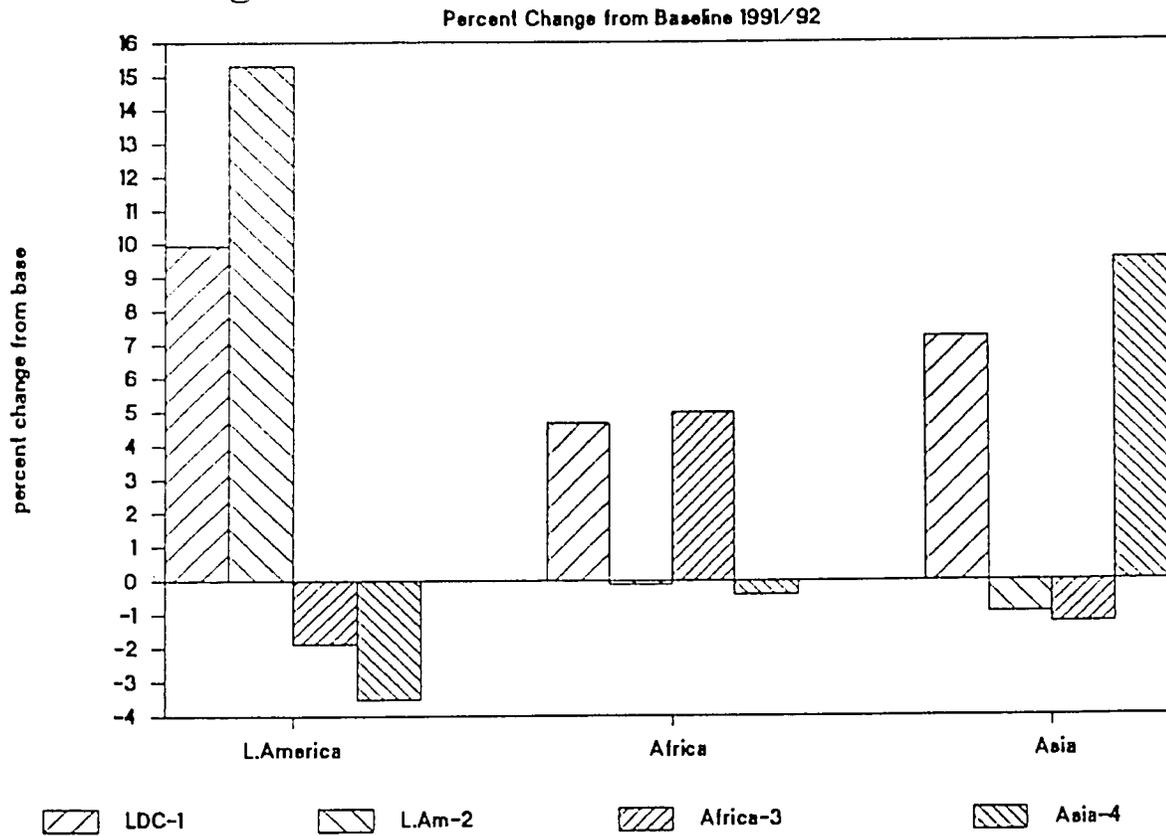
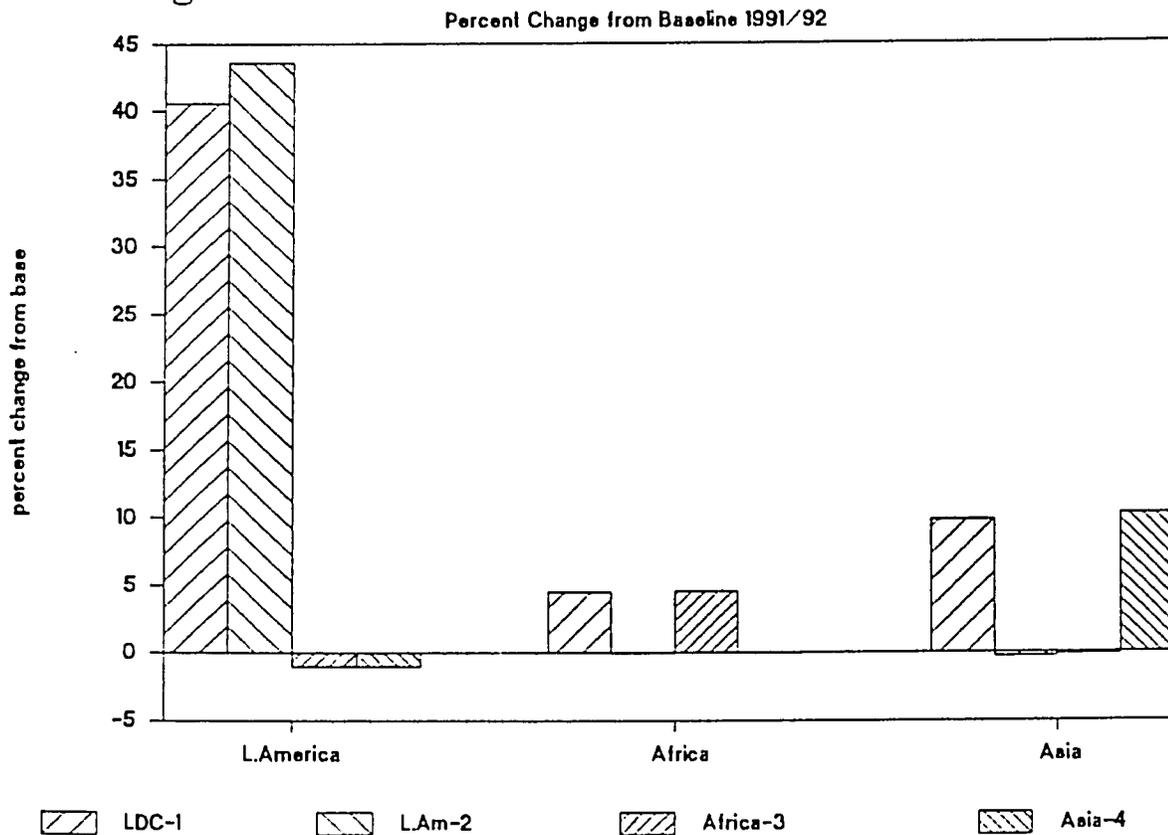


Figure 7.2. LDC FEED GRAINS NET IMPORTS



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**Appendix Figures
and
Tables**

Figure A.1. BRAZIL: WHEAT

Percent Change from Baseline 1991/92

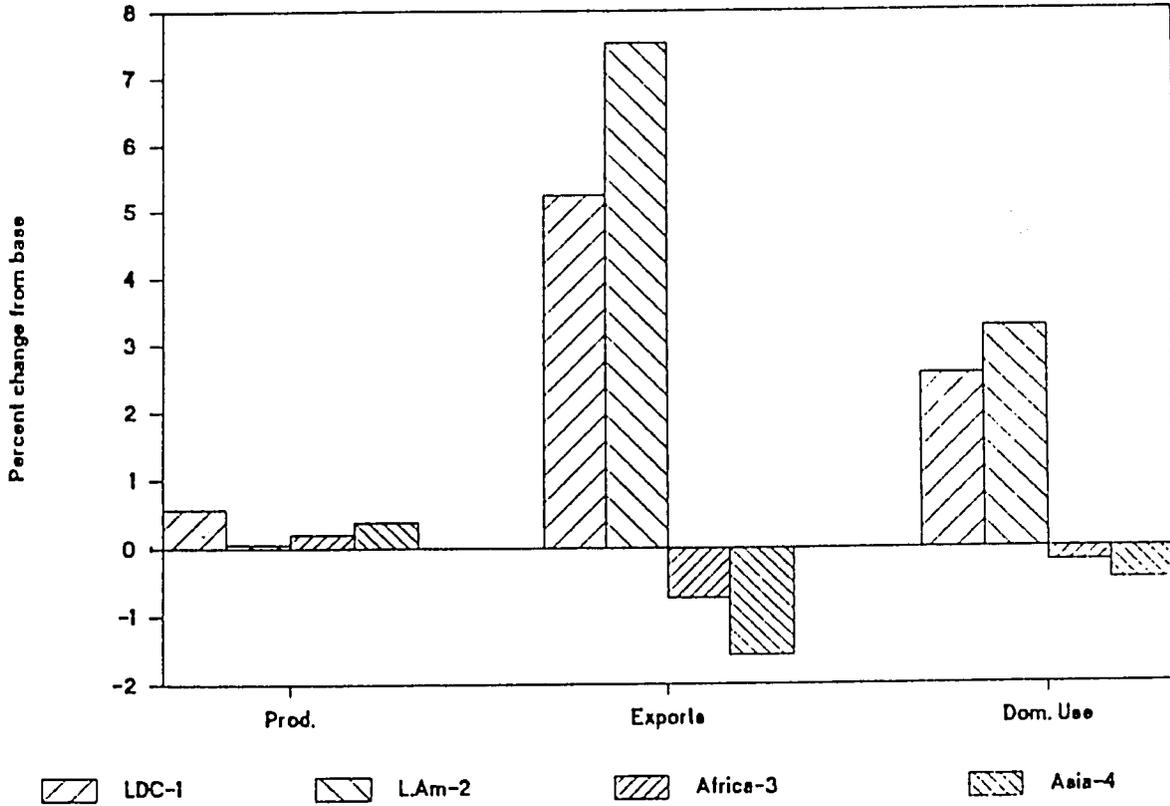


Figure A.2. BRAZIL: WHEAT

Change from Baseline 1991/92

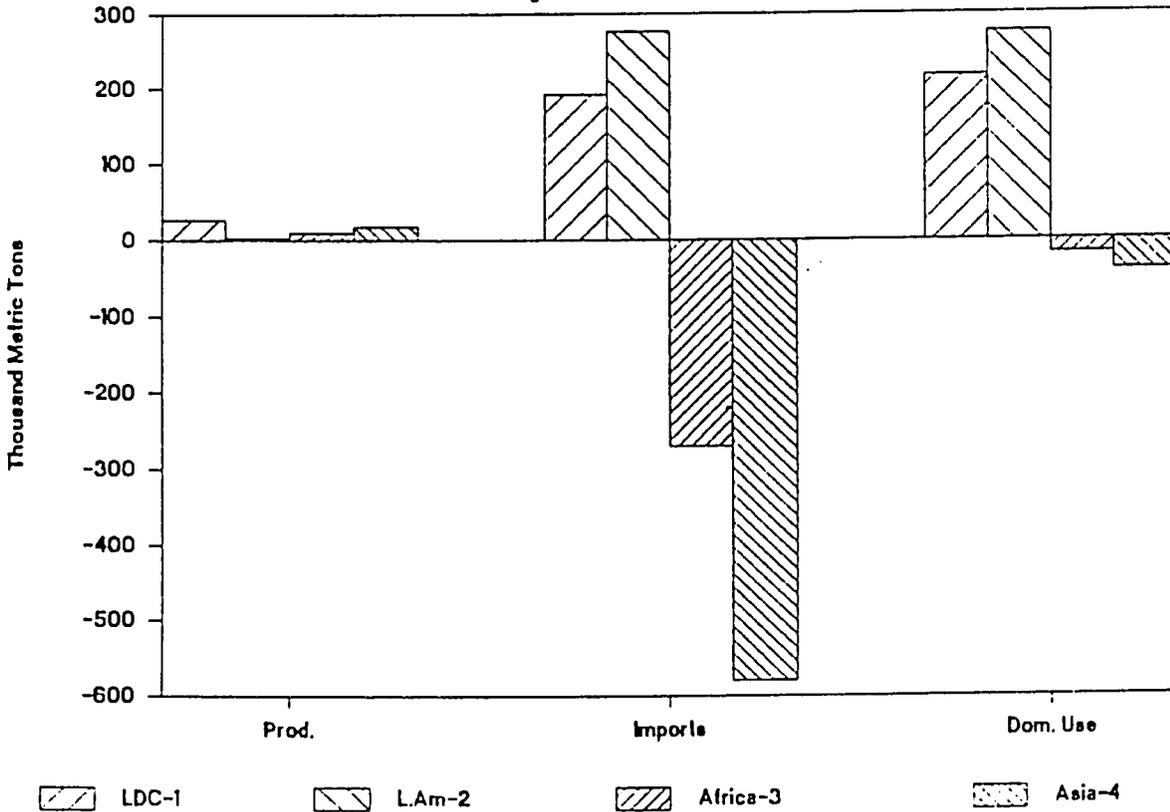


Figure A.3. BRAZIL: FEED GRAINS

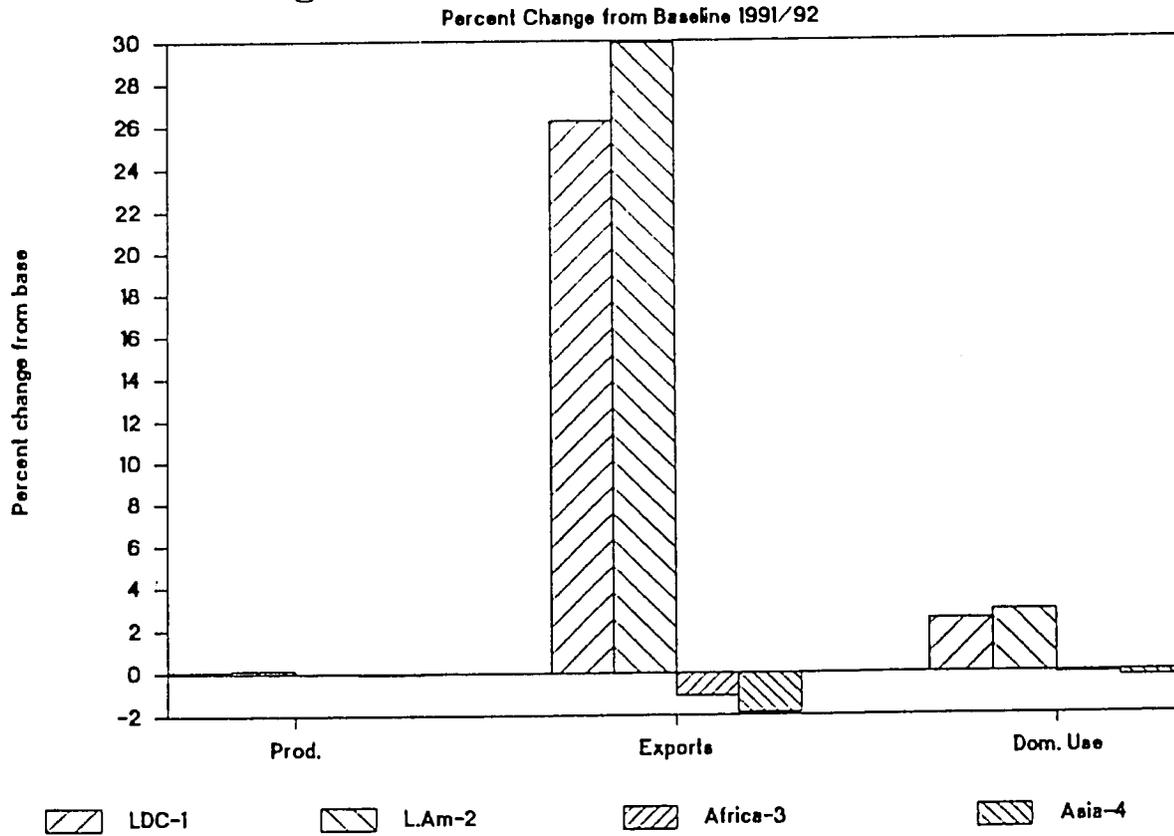


Figure A.4. BRAZIL: FEED GRAINS

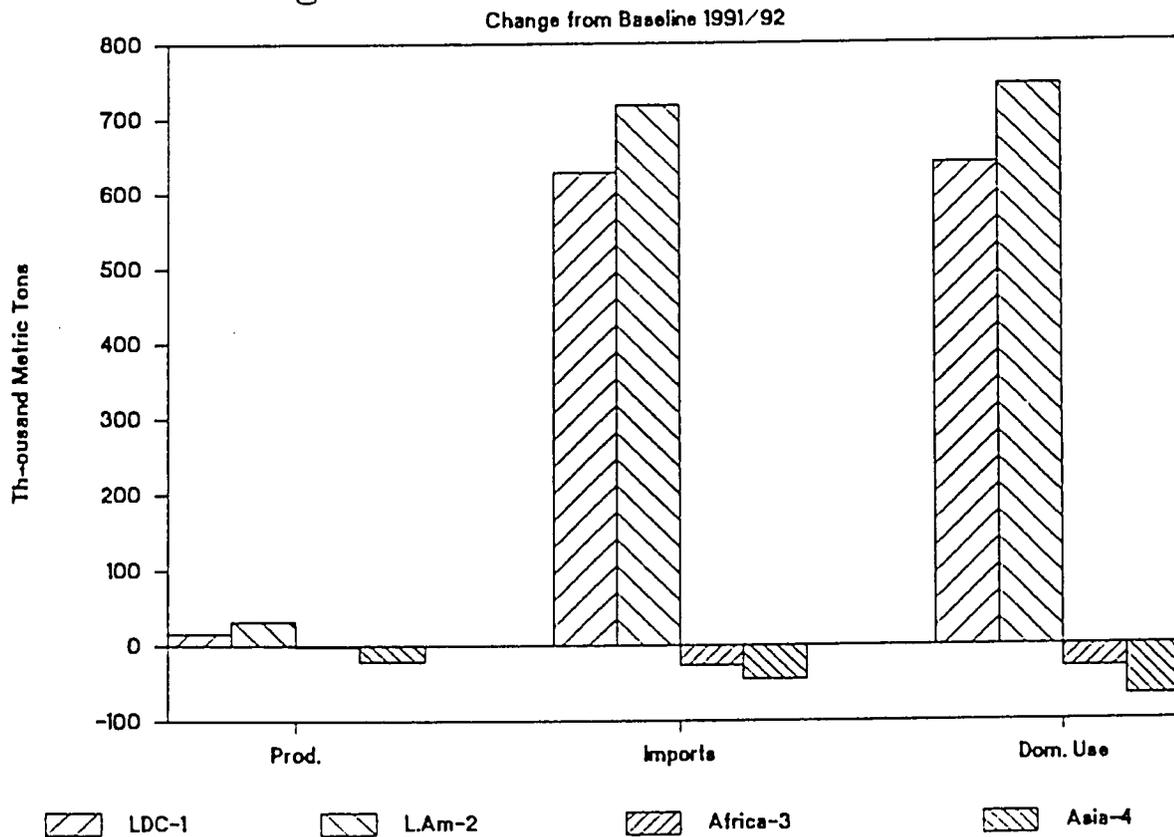


Figure A.5. BRAZIL: SOYBEANS

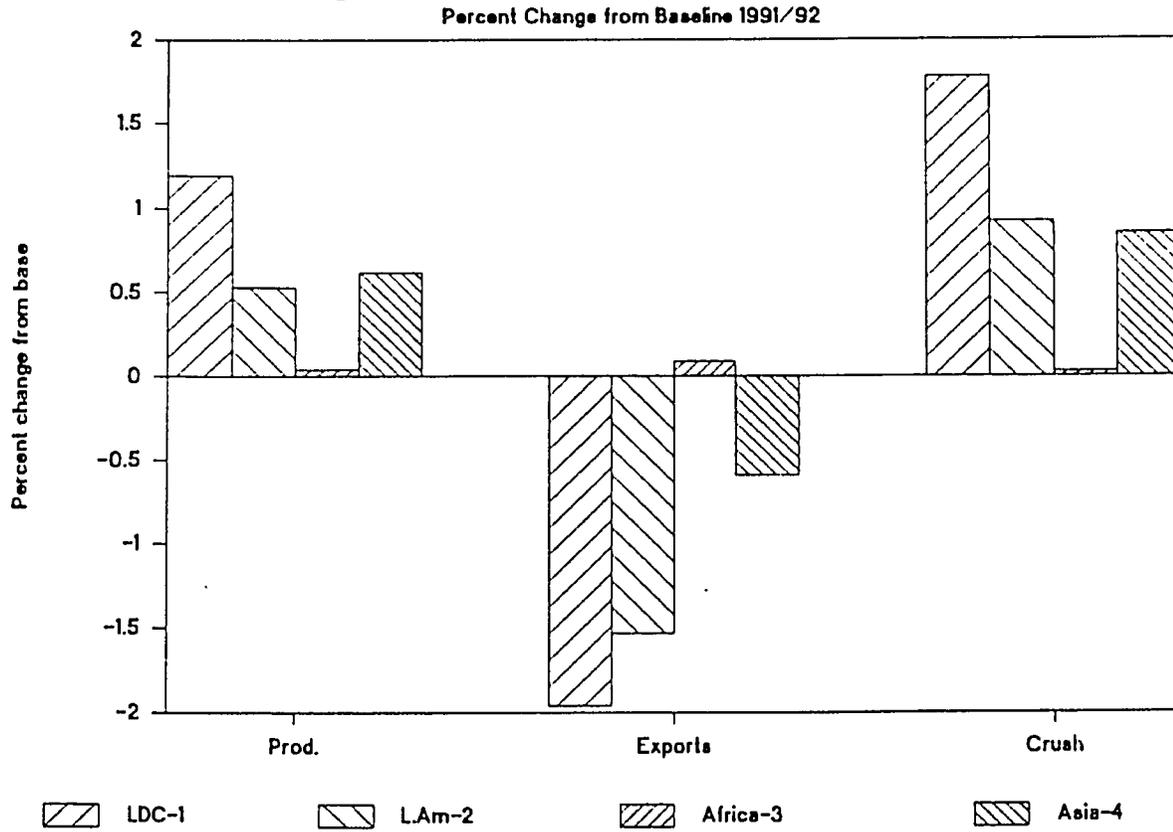


Figure A.6. BRAZIL: SOYBEANS

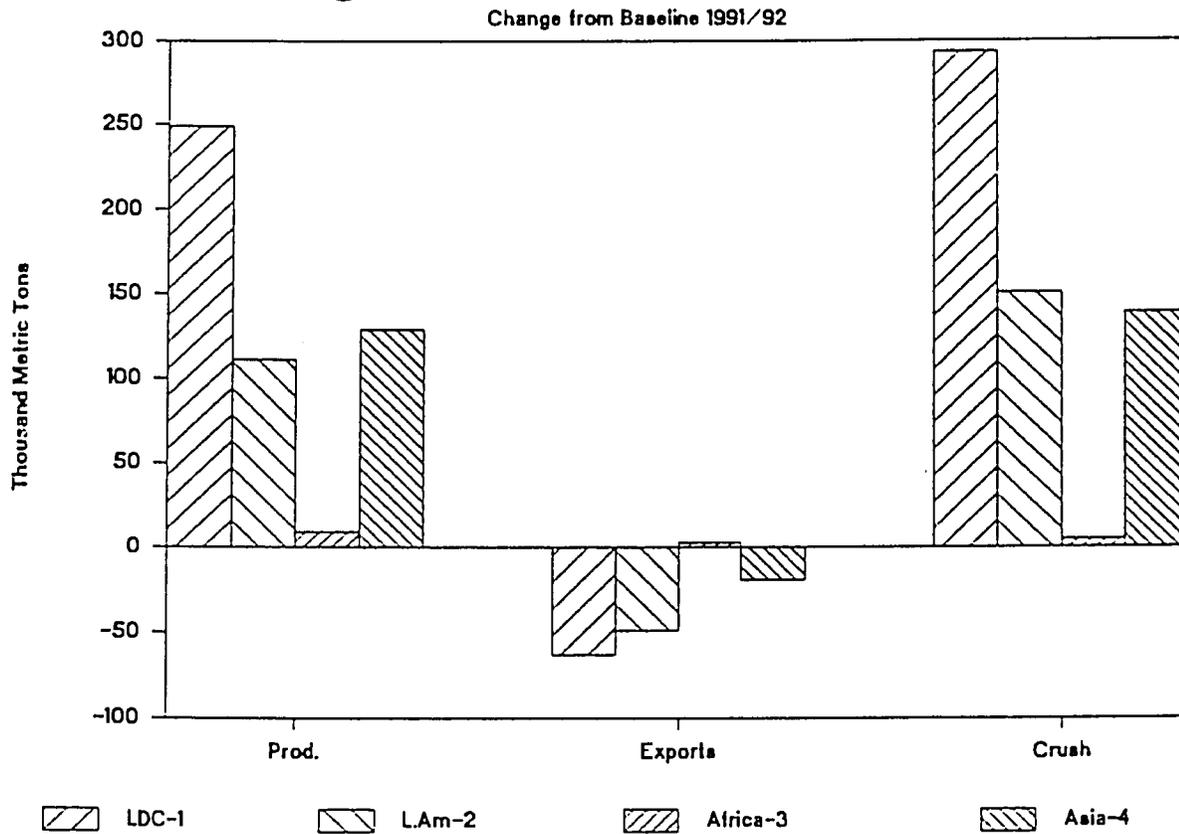


Figure A.7. BRAZIL: SOYMEAL

Percent Change from Baseline 1991/92

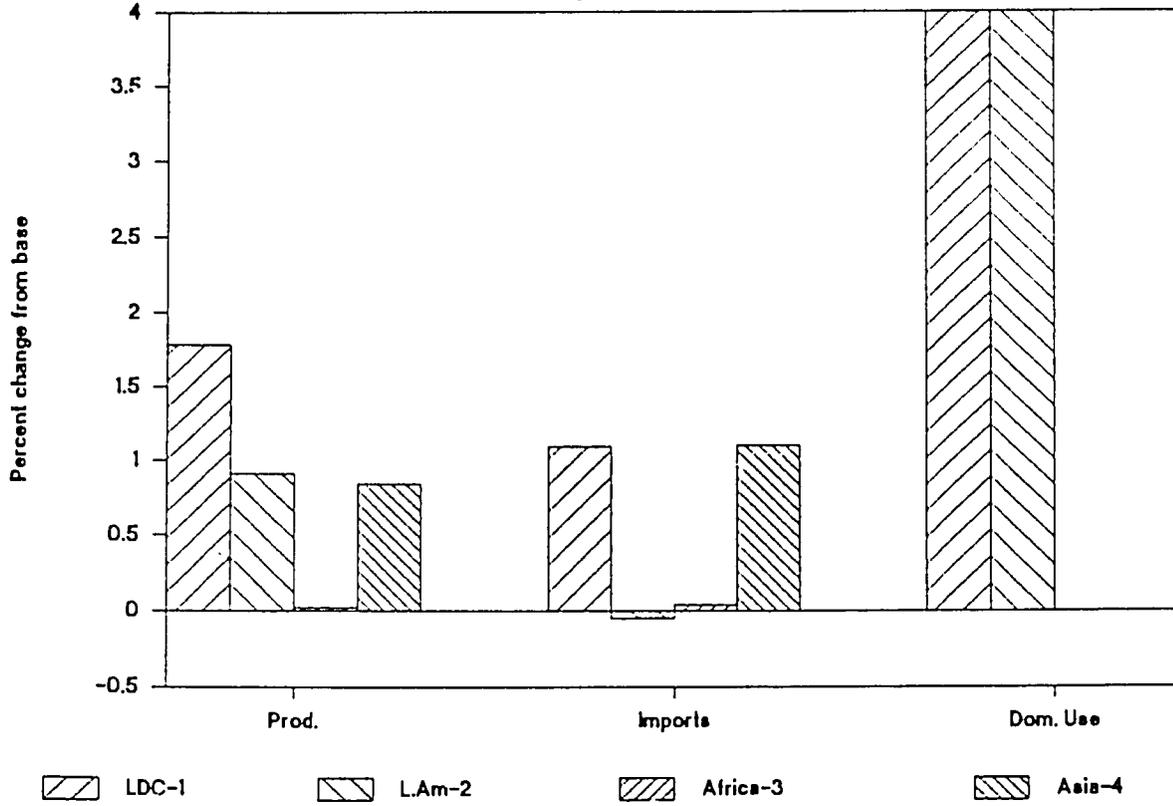


Figure A.8. BRAZIL: SOYMEAL

Change from Baseline 1991/92

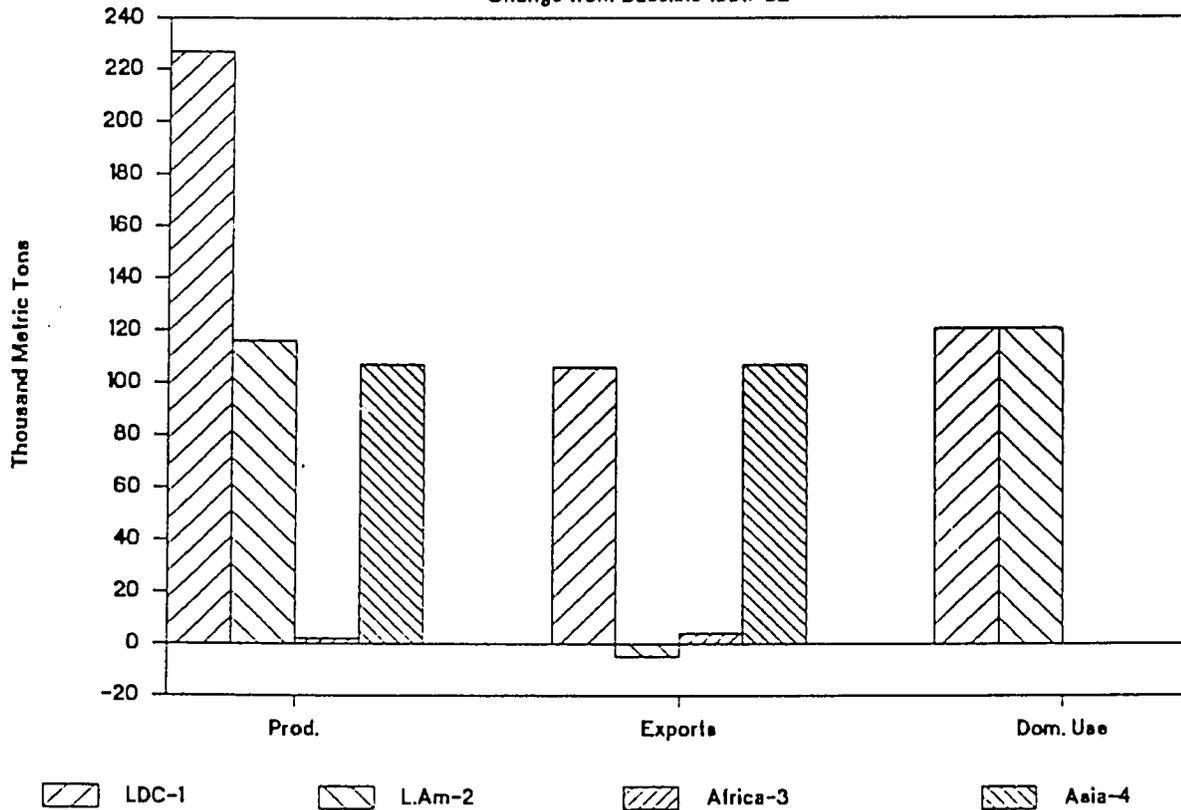


Figure A.9. BRAZIL: SOYOIL

Percent Change from Baseline 1991/92

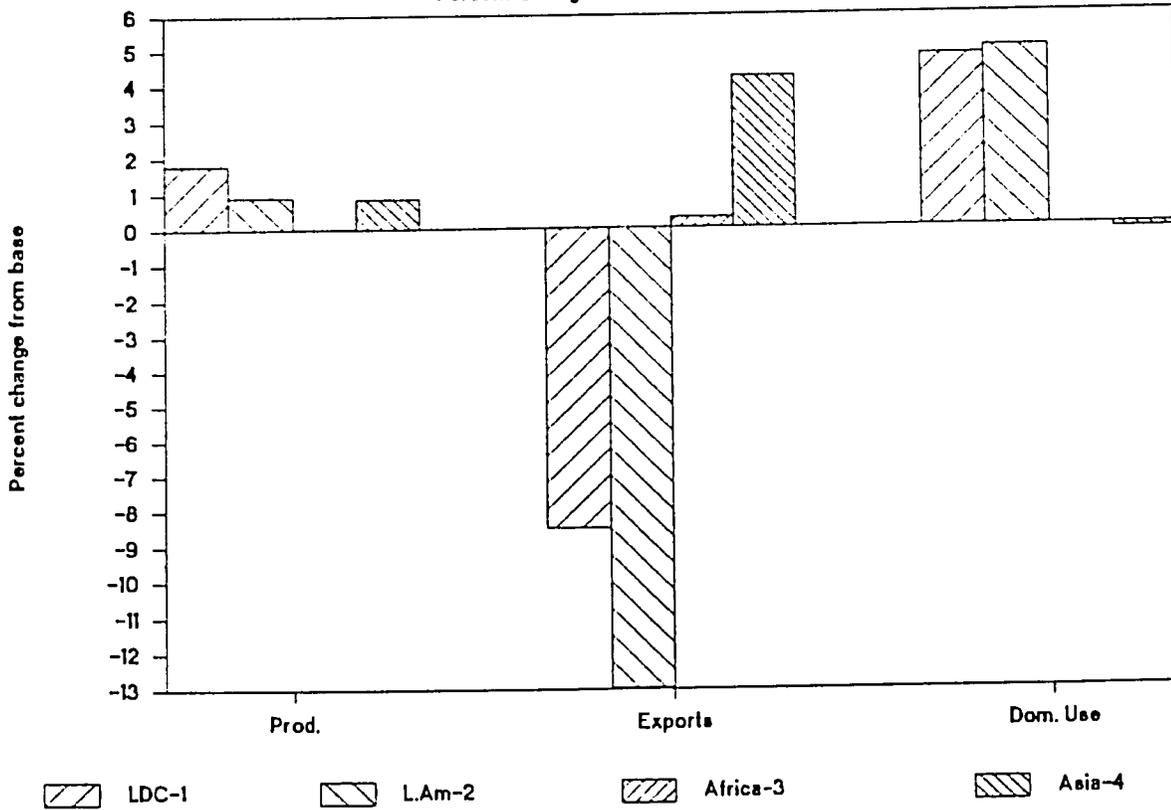


Figure A.10. BRAZIL: SOYOIL

Change from Baseline 1991/92

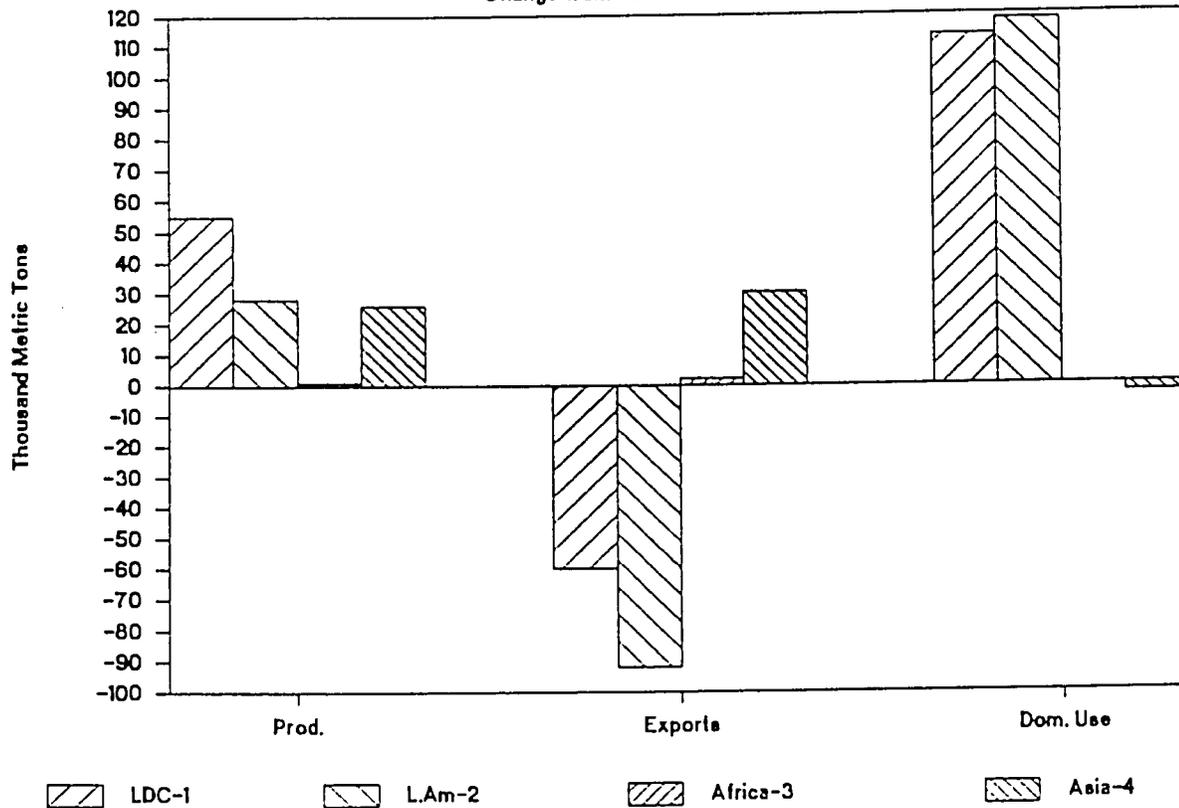


Table A.1. Latin America, Africa and Middle East, and Asia net trade. a/

Region Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	
Feed Grains (exc. sorghum)			(1000 mt)			('000 mt)		
L. America net imports								
Baseline	1,433	2,480	3,349	1,920	2,129	2,473		
Scen. 1	1,433	2,628	2,675	2,480	2,916	3,476	40.56%	1003
Scen. 2	1,433	2,658	2,714	2,500	2,958	3,550	43.55%	1077
Scen. 3	1,433	2,468	2,327	1,904	2,110	2,448	-1.01%	-25
Scen. 4	1,433	2,657	2,328	1,927	2,126	2,448	-1.01%	-25
LDC Africa and Middle East net imports								
Baseline	14,624	11,502	12,926	13,276	13,692	14,428		
Scen. 1	14,624	11,595	13,144	13,623	13,181	15,078	4.51%	650
Scen. 2	14,624	11,498	12,926	13,275	13,690	14,425	-0.02%	-3
Scen. 3	14,624	11,603	13,143	13,626	14,187	15,084	4.55%	656
Scen. 4	14,624	11,497	12,926	13,276	13,689	14,425	-0.02%	-3
LDC Asia net imports								
Baseline	7,095	10,362	9,814	10,258	10,760	11,541		
Scen. 1	7,095	10,534	10,194	10,869	11,619	12,673	9.81%	1132
Scen. 2	7,095	10,356	9,806	10,245	10,740	11,510	-0.27%	-31
Scen. 3	7,095	10,359	9,809	10,521	10,749	11,525	-0.14%	-16
Scen. 4	7,095	10,543	10,208	10,892	11,650	12,723	10.24%	1182
All LDC feed grains net imports (exc. sorghum)								
Baseline	23,152	24,344	26,089	25,454	26,581	28,442		
Scen. 1	23,152	24,763	26,013	26,972	27,716	31,227	9.79%	2785
Scen. 2	23,152	24,517	25,446	26,020	27,388	29,485	3.67%	1043
Scen. 3	23,152	24,324	25,062	25,701	26,548	28,398	-0.15%	-44
Scen. 4	23,152	24,697	25,462	26,095	27,465	29,596	4.06%	1154
Wheat								
L. America net imports								
Baseline	4,427	3,935	3,851	4,720	5,222	5,197		
Scen. 1	4,427	4,066	4,069	5,029	5,629	5,714	9.95%	517
Scen. 2	4,427	4,083	4,145	4,171	5,839	5,993	15.32%	796
Scen. 3	4,427	3,931	3,829	4,677	5,150	5,100	-1.87%	-97
Scen. 4	4,427	3,922	3,801	4,630	5,085	5,015	-3.50%	-182
LDC Africa and Middle East net imports								
Baseline	26,653	27,677	28,321	28,244	29,441	30,644		
Scen. 1	26,653	27,936	28,847	29,049	30,542	32,081	4.69%	1437
Scen. 2	26,653	27,672	28,311	28,226	29,413	30,608	-0.12%	-36
Scen. 3	26,653	27,902	28,841	29,074	30,604	32,177	5.00%	1533
Scen. 4	26,653	27,657	28,281	28,176	29,340	30,516	-0.42%	-128
LDC Asia net imports								
Baseline	21,315	24,361	23,866	25,073	26,029	27,303		
Scen. 1	21,315	24,866	24,755	26,342	27,650	29,278	7.23%	1975
Scen. 2	21,315	24,341	23,798	24,952	25,844	27,043	-0.95%	-260
Scen. 3	21,315	24,330	23,766	24,898	24,771	26,955	-1.27%	-348
Scen. 4	21,315	24,926	24,931	26,646	28,104	29,904	9.53%	2601
All LDC wheat net imports								
Baseline	52,395	55,973	56,038	58,037	60,692	63,144		
Scen. 1	52,395	56,868	57,671	60,420	63,821	67,073	6.22%	3929
Scen. 2	52,395	56,096	56,254	57,349	61,096	63,644	0.79%	500
Scen. 3	52,395	56,163	56,436	58,649	60,525	64,232	1.72%	1088
Scen. 4	52,395	56,505	57,013	59,452	62,529	65,435	3.63%	2291

Table A.2. Latin America, Africa and Middle East, and Asia market shares.

Region Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92

Feed Grains (exc. sorghum)	Percent						
L. America net import share							
Baseline	2.3	3.8	5.0	2.8	2.9	3.2	
Scen. 1	2.3	4.0	3.9	3.5	3.9	4.4	36.00%
Scen. 2	2.3	4.1	4.0	3.6	4.0	4.6	41.71%
Scen. 3	2.3	3.8	3.4	2.7	2.9	3.2	-1.79%
Scen. 4	2.3	4.1	3.4	2.8	2.9	3.2	-2.22%
LDC Africa and Middle East net import share							
Baseline	23.0	17.6	19.1	19.2	18.9	18.9	
Scen. 1	23.0	17.6	19.2	19.4	17.7	19.1	1.12%
Scen. 2	23.0	17.5	19.0	19.1	18.7	18.6	-1.30%
Scen. 3	23.0	17.7	19.4	19.6	19.5	19.6	3.72%
Scen. 4	23.0	17.6	19.0	19.1	18.7	18.6	-1.24%
LDC Asia net import share							
Baseline	11.2	15.9	14.5	14.9	14.9	15.1	
Scen. 1	11.2	16.0	14.9	15.4	15.6	16.0	6.25%
Scen. 2	11.2	15.8	14.4	14.7	14.7	14.9	-1.55%
Scen. 3	11.2	15.8	14.5	15.2	14.8	15.0	-0.92%
Scen. 4	11.2	16.1	15.0	15.7	15.9	16.4	8.90%
All LDC Feed Grains net import share (exc. sorghum)							
Baseline	36.4	37.2	38.6	36.9	36.7	37.2	
Scen. 1	36.4	37.7	38.0	38.3	37.3	39.5	6.23%
Scen. 2	36.4	37.4	37.4	37.4	37.4	38.1	2.34%
Scen. 3	36.4	37.3	37.3	37.6	37.1	37.7	1.36%
Scen. 4	36.4	37.7	37.5	37.5	37.6	38.3	2.79%
Wheat							
L. America net import share							
Baseline	5.4	4.4	4.3	5.3	5.7	5.5	
Scen. 1	5.4	4.5	4.5	5.5	6.0	5.9	6.36%
Scen. 2	5.4	4.6	4.6	4.6	6.3	6.3	14.89%
Scen. 3	5.4	4.4	4.3	5.2	5.6	5.4	-2.79%
Scen. 4	5.4	4.4	4.2	5.1	5.4	5.2	-5.39%
LDC Africa and Middle East net import share							
Baseline	32.6	31.2	31.6	31.4	32.0	32.5	
Scen. 1	32.6	31.2	31.7	31.7	32.3	32.9	1.27%
Scen. 2	32.6	31.1	31.5	31.3	31.9	32.3	-0.49%
Scen. 3	32.6	31.4	32.0	32.2	33.0	33.8	4.01%
Scen. 4	32.6	31.0	31.2	31.0	31.4	31.7	-2.37%
LDC Asia net import share							
Baseline	26.1	27.5	26.6	27.9	28.3	28.9	
Scen. 1	26.1	27.8	27.2	28.7	29.3	30.0	3.73%
Scen. 2	26.1	27.4	26.5	27.7	28.0	28.5	-1.32%
Scen. 3	26.1	27.4	26.4	27.6	26.7	28.3	-2.21%
Scen. 4	26.1	28.0	27.5	29.3	30.1	31.1	7.38%
All LDC Wheat net import share							
Baseline	64.1	63.1	62.4	64.6	66.0	66.9	
Scen. 1	64.1	63.6	63.4	65.8	67.5	68.7	2.75%
Scen. 2	64.1	63.1	62.6	63.7	66.2	67.2	0.42%
Scen. 3	64.1	63.2	62.7	64.9	65.3	67.4	0.76%
Scen. 4	64.1	63.4	63.0	65.3	66.9	68.0	1.60%

Table A.3. BRAZIL: WHEAT

Comparison of baseline and scenarios 1, 2, 3, and 4. a/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	
Area Harvested (1000 ha.)								('000 ha)	
	Baseline	3,800	3,595	3,417	3,306	3,253	3,237		
	Scen. 1	3,800	3,595	3,416	3,311	3,267	3,255	0.56%	18
	Scen. 2	3,800	3,595	3,416	3,305	3,252	3,238	0.03%	1
	Scen. 3	3,800	3,595	3,416	3,307	3,257	3,243	0.19%	6
	Scen. 4	3,800	3,595	3,417	3,311	3,262	3,248	0.34%	11
Production (1000 mt)								('000 mt)	
	Baseline	5,282	5,055	4,859	4,754	4,729	4,757		
	Scen. 1	5,282	5,055	4,857	4,761	4,750	4,784	0.57%	27
	Scen. 2	5,282	5,055	4,857	4,752	4,729	4,760	0.06%	3
	Scen. 3	5,282	5,055	4,858	4,755	4,735	4,767	0.21%	10
	Scen. 4	5,282	5,055	4,859	4,761	4,743	4,775	0.38%	18
Imports (1000 mt)									
	Baseline	3,000	2,174	2,665	3,141	3,582	3,674		
	Scen. 1	3,000	2,213	2,742	3,253	3,731	3,866	5.23%	192
	Scen. 2	3,000	2,223	2,764	3,296	3,799	3,950	7.51%	276
	Scen. 3	3,000	2,171	2,659	3,130	3,561	3,647	-0.73%	-27
	Scen. 4	3,000	2,167	2,649	3,112	3,537	3,616	-1.58%	-58
Domestic Use (1000 mt)									
	Baseline	8,000	7,250	7,509	7,873	8,287	8,425		
	Scen. 1	8,000	7,287	7,582	7,990	8,454	8,641	2.56%	216
	Scen. 2	8,000	7,297	7,604	8,022	8,500	8,700	3.26%	275
	Scen. 3	8,000	7,248	7,503	7,863	8,273	8,407	-0.21%	-18
	Scen. 4	8,000	7,243	7,494	7,851	8,256	8,385	-0.47%	-40
Ending Stocks (1000 mt)									
	Baseline	446	425	440	461	485	492		
	Scen. 1	446	427	444	468	495	504	2.44%	12
	Scen. 2	441	423	440	465	493	503	2.24%	11
	Scen. 3	446	425	439	461	484	490	-0.41%	-2
	Scen. 4	446	425	439	460	483	489	-0.61%	-3

a/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.

Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.

Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.

Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

Table A.4. BRAZIL: FEED GRAINS a/
Comparison of baseline and scenarios 1, 2, 3, and 4. b/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	

Area Harvested (1000 ha.)								('000 ha)	
	Baseline	13,500	12,454	12,343	12,582	12,693	12,677		
	Scen. 1	13,500	12,454	12,353	12,582	12,692	12,686	0.07%	9
	Scen. 2	13,500	12,454	12,349	12,588	12,702	12,694	0.13%	17
	Scen. 3	13,500	12,454	12,346	12,583	12,691	12,676	-0.01%	-1
	Scen. 4	13,500	12,454	12,344	12,574	12,678	12,666	-0.09%	-11
Production (1000 mt)								('000 mt)	
	Baseline	23,589	22,008	22,057	22,734	23,187	23,409		
	Scen. 1	23,588	22,007	22,074	22,734	23,185	23,425	0.07%	16
	Scen. 2	23,589	22,008	22,067	22,744	23,203	23,441	0.14%	32
	Scen. 3	23,589	22,008	22,061	22,735	23,183	23,407	-0.01%	-2
	Scen. 4	23,588	22,007	22,059	22,718	23,158	23,388	-0.09%	-21
Imports (1000 mt)									
	Baseline	407	1,996	2,619	2,006	2,181	2,401		
	Scen. 1	407	2,111	2,844	2,363	2,689	3,030	26.20%	629
	Scen. 2	407	2,121	2,876	2,398	2,742	3,119	29.90%	718
	Scen. 3	407	1,991	2,607	1,992	2,163	2,375	-1.08%	-26
	Scen. 4	407	1,986	2,601	1,994	2,162	2,356	-1.87%	-45
Domestic Use (1000 mt)									
	Baseline	24,206	24,012	24,667	24,742	25,360	25,806		
	Scen. 1	24,206	24,125	24,906	25,098	25,864	26,446	2.48%	640
	Scen. 2	24,206	24,134	24,932	25,142	25,934	26,550	2.88%	744
	Scen. 3	24,206	24,008	24,659	24,729	25,339	25,776	-0.12%	-30
	Scen. 4	24,206	24,002	24,652	24,715	25,313	25,739	-0.26%	-67
Ending Stocks (1000 mt)									
	Baseline	476	468	477	475	483	488		
	Scen. 1	474	468	479	479	489	498	2.05%	10
	Scen. 2	475	470	482	482	493	502	2.87%	14
	Scen. 3	475	467	476	474	481	487	-0.20%	-1
	Scen. 4	474	466	475	472	479	485	-0.61%	-3

a/ Excludes sorghum.

b/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.

Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.

Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.

Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

Table A.5. BRAZIL: SOYBEANS

Comparison of baseline and scenarios 1, 2, 3, and 4. a/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	

Area Harvested (1000 ha.)								('000 ha)	
	Baseline	9,270	10,300	10,515	10,909	11,045	11,133		
	Scen. 1	9,270	10,300	10,541	10,965	11,129	11,265	1.19%	132
	Scen. 2	9,270	10,300	10,526	10,932	11,081	11,192	0.53%	59
	Scen. 3	9,270	10,300	10,515	10,912	11,049	11,137	0.04%	4
	Scen. 4	9,270	10,300	10,530	10,939	11,089	11,202	0.62%	69
Production (1000 mt)								('000 mt)	
	Baseline	17,300	18,302	19,145	20,091	20,565	20,946		
	Scen. 1	17,300	18,302	19,193	20,195	20,721	21,195	1.19%	249
	Scen. 2	17,300	18,302	19,165	20,133	20,632	21,057	0.53%	111
	Scen. 3	17,300	18,302	19,145	20,097	20,572	20,955	0.04%	9
	Scen. 4	17,300	18,302	19,172	20,146	20,646	21,075	0.62%	129
Crush (1000 mt)									
	Baseline	13,800	14,229	14,607	15,319	15,917	16,417		
	Scen. 1	13,800	14,239	14,671	15,451	16,116	16,710	1.78%	293
	Scen. 2	13,800	14,235	14,640	15,383	16,015	16,568	0.92%	151
	Scen. 3	13,800	14,229	14,607	15,322	15,923	16,422	0.03%	5
	Scen. 4	13,800	14,233	14,639	15,384	16,011	16,556	0.85%	139
Exports (1000 mt)									
	Baseline	2,900	2,773	3,191	3,429	3,321	3,208		
	Scen. 1	2,900	1,763	3,171	3,391	3,267	3,145	-1.96%	-63
	Scen. 2	2,900	2,768	3,177	3,403	3,285	3,159	-1.53%	-49
	Scen. 3	2,900	2,773	3,192	3,430	3,323	3,211	0.09%	3
	Scen. 4	2,900	2,769	3,185	3,415	3,303	3,189	-0.59%	-19
Other Use (1000 mt)									
	Baseline	1,178	1,188	1,230	1,271	1,285	1,294		
	Scen. 1	1,178	1,188	1,233	1,276	1,293	1,307	1.00%	13
	Scen. 2	1,178	1,188	1,231	1,273	1,288	1,300	0.46%	6
	Scen. 3	1,178	1,188	1,230	1,271	1,285	1,294	0.00%	0
	Scen. 4	1,178	1,188	1,232	1,274	1,289	1,301	0.54%	7
Total Demand (1000 mt)									
	Baseline	17,878	18,190	19,029	20,018	20,523	20,918		
	Scen. 1	17,878	18,190	19,075	20,119	20,676	21,163	1.17%	245
	Scen. 2	17,878	18,190	19,048	20,059	20,589	21,027	0.52%	109
	Scen. 3	17,878	18,190	19,029	20,024	20,531	20,927	0.04%	9
	Scen. 4	17,878	18,190	19,055	20,072	20,603	21,046	0.61%	128
Ending Stocks (1000 mt)									
	Baseline	238	350	466	539	581	608		
	Scen. 1	238	350	468	543	588	619	1.81%	11
	Scen. 2	238	350	467	541	584	613	0.82%	5
	Scen. 3	238	350	466	539	581	609	0.16%	1
	Scen. 4	238	350	467	541	584	614	0.99%	6

a/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.

Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.

Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.

Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.

Table A.6. BRAZIL: SOYMEAL AND SOYOIL

Comparison of baseline and scenarios 1, 2, 3, and 4. a/

Activity	Scenario	86/87	87/88	88/89	89/90	90/91	91/92	Change from baseline in 1991/92	

Production (1000 mt)								('000 mt)	
	Baseline	10,735	11,070	11,365	11,918	12,384	12,774		
	Scen. 1	10,735	11,078	11,414	12,021	12,538	13,001	1.78%	227
	Scen. 2	10,735	11,075	11,390	11,968	12,460	12,890	0.91%	116
	Scen. 3	10,735	11,070	11,364	11,921	12,388	12,776	0.02%	2
	Scen. 4	10,735	11,073	11,389	11,968	12,457	12,881	0.84%	107
Domestic Consumption (1000 mt)									
	Baseline	2,900	2,899	2,840	2,842	2,933	3,028		
	Scen. 1	2,900	2,907	2,865	2,892	3,014	3,149	4.00%	121
	Scen. 2	2,900	2,908	2,866	2,892	3,015	3,149	4.00%	121
	Scen. 3	2,900	2,899	2,840	2,842	2,933	3,028	0.00%	0
	Scen. 4	2,900	2,898	2,839	2,842	2,932	3,028	0.00%	0
Exports (1000 mt)									
	Baseline	7,900	8,126	8,484	9,053	9,435	9,732		
	Scen. 1	7,900	8,126	8,508	9,106	9,506	9,838	1.09%	106
	Scen. 2	7,900	8,122	8,483	9,053	9,429	9,727	-0.05%	-5
	Scen. 3	7,900	8,126	8,484	9,056	9,439	9,736	0.04%	4
	Scen. 4	7,900	8,130	8,509	9,104	9,508	9,839	1.10%	107

SOYOIL								('000 mt)	
Production (1000 mt)									
	Baseline	2,580	2,661	2,732	2,865	2,977	3,070		
	Scen. 1	2,580	2,663	2,743	2,889	3,014	3,125	1.79%	55
	Scen. 2	2,580	2,662	2,738	2,877	2,995	3,098	0.91%	28
	Scen. 3	2,580	2,661	2,732	2,865	2,978	3,071	0.03%	1
	Scen. 4	2,580	2,662	2,737	2,877	2,994	3,096	0.85%	26
Domestic Consumption (1000 mt)									
	Baseline	1,800	1,820	1,969	2,018	2,246	2,349		
	Scen. 1	1,800	1,839	2,007	2,078	2,332	2,462	4.81%	113
	Scen. 2	1,800	1,840	2,009	2,080	2,335	2,467	5.02%	118
	Scen. 3	1,800	1,820	1,968	2,018	2,246	2,349	0.00%	0
	Scen. 4	1,800	1,819	1,967	2,016	2,243	2,346	-0.13%	-3
Exports (1000 mt)									
	Baseline	900	755	816	842	708	710		
	Scen. 1	900	739	786	805	656	650	-8.45%	-60
	Scen. 2	900	737	778	790	634	618	-12.96%	-92
	Scen. 3	900	755	816	843	709	712	0.28%	2
	Scen. 4	900	757	824	856	728	740	4.23%	30

- a/ Scenario 1 is a one percentage point increase in the GDP growth rates of all LDCs.
 Scenario 2 is a one percentage point increase in the GDP growth rates of LDC Latin America.
 Scenario 3 is a one percentage point increase in the GDP growth rates of LDC Africa and Middle East.
 Scenario 4 is a one percentage point increase in the GDP growth rates of LDC Asia.