LONG-TERM PROSPECTS FOR AGRICULTURAL DEVELOPMENT IN THE EUROPEAN CMEA COUNTRIES, INCLUDING THE SOVIET UNION

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FOREWORD

Understanding the nature and dimensions of the food supply problem and the policies available to alleviate it has been the focal point of the Food and Agriculture Program (FAP) at the International Institute for Applied Systems Analysis (IIASA) since the program began in 1977.

National agricultural systems are highly interdependent, and yet the major policy options exist at the national level. To explore these options, therefore, it is necessary both to develop policy models for national economies and to link them together by trade and by capital transfers. For greater realism the models in this scheme of analysis are kept descriptive rather than normative. Ultimately it is proposed to link models of some 20 countries (where the CMEA and EC countries with common agricultural policies are counted as single units), which together account for nearly 80% of such important agricultural attributes as area, production, population, exports, and imports.

As a first step towards the development of agricultural policy models of centrally planned economies, an agricultural model for Hungary (HAM) was formulated as a prototype for the Council for Mutual Economic Assistance (CMEA) countries.

The model and the results of the HAM project are described in detail in an earlier Research Report by Professor Csaba Csáki (RR-81-23). Based on the experience gained during that work, Professor Csáki has developed a model for the CMEA countries that is consistent with the FAP model system and is linked to it.

The model was also used to provide an explanatory and background analysis for the *Agriculture: Toward 2000* project of the Food and Agriculture Organization (FAO) of the United Nations.

In this report, Professor Csáki assesses the agricultural situation in the East European CMEA countries, including the Soviet Union, and presents the general features and the mathematical description of the model. Some projections for the year 2000 are also elaborated and discussed.

KIRIT S. PARIKH
Program Leader
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SUMMARY

The current status and the development potential of agriculture in the European member countries of the CMEA, particularly the Soviet Union, have been much discussed. In this report the principal supply and demand trends, agricultural policy in the CMEA countries, and expected future developments, are analyzed. In Sections 2–5 of the report the agricultural status in each country is discussed. Government policies on agricultural development are based on a mathematical model. The so-called CMEA Agricultural Model is an element of the model system of the Food and Agriculture Program at IIASA. The model is actually a descriptive, recursive simulation model, which is structured according to two submodels – smaller CMEA countries and the Soviet Union – with similar structures. Section 6 of the report describes the CMEA Agricultural Model and the two basic scenarios and additional variants computed by the model. Section 7 of the report is devoted to an analysis of future trends. The projections are made at the CMEA level – country-specific analysis was not the aim of this study. The work was initiated and supported by the Food and Agriculture Organization of the United Nations, and was used as an explanatory and background analysis for the Agriculture: Toward 2000 *project of the FAO.*

1 INTRODUCTION

The status and development potential of agriculture in the European member countries of the CMEA, particularly the Soviet Union, have often been the subject of discussion in both the Eastern and Western hemispheres. This concern is not surprising, since the CMEA and the Soviet Union can be regarded as countries disposing of about 25% of the world's agricultural resources. In 1978 they produced 35.5% of the wheat, 8.1% of the corn, 46% of the sugar beet, and 50.8% of the world's potatoes, as well as 11.1% of the cattle, 18.9% of the pigs, and 18.4% of the sheep.

Within the framework of IIASA's Food and Agriculture Program (FAP) a consistent set of models describing national food and agricultural systems has been developed for both market and centrally planned economies. The FAP research is much more than a methodological exercise; the models also offer opportunities for actual policy analyses and long-range projections. In this report just one example of these uses is presented. The work detailed here was initiated and supported by the Food and Agriculture Organization (FAO) of the United Nations.

The purpose of the study was to give explanatory and background analyses for the *Agriculture: Toward 2000 (AT 2000)* project, using the CMEA Agricultural Model developed within the framework of the FAP of IIASA. It must be emphasized at this point that the approach of the study was determined by the above circumstances; the aim was to elaborate a CMEA-level, long-range perspective that fitted the global analysis of *AT 2000*, and not to carry out detailed country-by-country analyses or to discuss country-specific problems. In this report, the agricultural situation in the European CMEA countries is assessed, and then the methodology of the projections is outlined. Based on several runs of IIASA's CMEA Agricultural Model, projections are elaborated for the year 2000, and these are discussed.

This report and the CMEA Agricultural Model are based on a broad range of source material, such as the official statistics published by the CMEA countries and by the Secretariat of the CMEA, the data banks of the FAO and IIASA, and analyses carried out by the OECD and by the Research Institute for Agricultural Economics in Budapest*. Corresponding to the objectives of *AT 2000*, answers are sought to the following questions: What kinds of long-term demand exist in the CMEA countries at the international market level? How do domestic development alternatives influence agricultural exports and imports of these countries? What concrete requirements should be taken into consideration in respect of those products that are important for the developing countries? Although the European member countries of the CMEA and the Soviet Union are treated as one aggregate region, in some parts of the analysis, especially in the assessment of the present situation, the smaller member countries (Bulgaria, Czechoslovakia, GDR, Romania, Poland, and Hungary) are treated together, and the Soviet Union (including its Asian territories) is treated separately. The projections for the year 2000 are made at CMEA level.

2 THE STATUS OF AGRICULTURE

2.1 Natural and Material Conditions for Agriculture

Considerable changes have recently taken place in agriculture in the CMEA countries, which have reduced the dependence on natural and climatic conditions but, as demonstrated by the results of recent years, these environmental factors are still significant. This analysis of agriculture in the smaller CMEA countries and the Soviet Union

*The author is especially grateful to Dr. Janos Nagy at the Research Institute for Agricultural Economics for providing data for the assessment of the present situation. The parameter estimation and computer programming of the CMEA Agricultural Model were done by Günther Fischer, Laszlo Zeöld, and Bozena Lopuch at IIASA. Many thanks are also due to Bonnie Riley for typing and grammatical correction, and Valerie Jones for editing the material.

begins with a brief outline of its development, as well as the natural and material conditions that underlie it.

The smaller CMEA countries are situated in the central part of Europe, where natural conditions for agriculture can generally be described as favorable. The climate is continental in character; mean annual temperatures lie in the range 8–11 °C, and the average precipitation ranges from 600 to 1000 mm yr^{-1}. In the north the climate is cooler and wetter, while continental influences dominate in the south, and the risk of drought is greater.

Throughout the CMEA the proportion of the total land under cultivation (i.e. under arable farming, permanent crops, pastures, and meadows) is high, as shown in Table 1, exceeding 60% in Hungary, Poland, and Romania. Opportunities to increase this

TABLE 1 The proportion of land under cultivation in the smaller CMEA countries, 1960–78 (%).

	1960	1978
Bulgaria	51.1	56.0
Hungary	76.8	72.0
GDR	57.3	58.1
Poland	65.2	60.9
Romania	61.1	63.0
Czechoslovakia	57.2	54.3

SOURCE: Statistical Yearbooks of the CMEA.

area are restricted, however, and frequently there are substantial losses of farmland to other activities such as industry or road construction, and because of the withdrawal of certain unproductive areas from cultivation. In Poland, where much of the land is privately owned, inheritance practices have caused excessive subdivision of farms, which is very uneconomical.

Compared with other countries, the amount of agricultural land per capita in the CMEA is also high (see Table 2). Arable farming is the largest sector, accounting for 65.1%

TABLE 2 The supply of agricultural and arable land per capita in the smaller CMEA countries, 1960–78 (ha).

	Total agricultural land per capita		Arable land per capita	
	1960	1978	1960	1978
Bulgaria	0.72	0.69	0.54	0.49
Hungary	0.72	0.63	0.54	0.50
GDR	0.37	0.37	0.28	0.30
Poland	0.69	0.54	0.54	0.42
Romania	0.79	0.68	0.53	0.47
Czechoslovakia	0.54	0.46	0.37	0.34

SOURCE: Statistical Yearbooks of the CMEA.

of the land under cultivation in Romania in 1975, and as much as 76.6% in Poland (see Table 3). The agricultural land area is likely to be reduced throughout the CMEA, and there has been a general trend towards an increase in the amount of permanent tree crops, especially in Romania and Poland. Apart from this development, however, further modifications to the overall structure of agriculture in the region are not likely.

TABLE 3 The cultivation structure of agricultural land in the smaller CMEA countries, 1960–75.

	Arable land (%)	Plantations (%)	Meadows (%)	Pasture (%)	Total agricultural land (10^3 ha)
Bulgaria					
1960	75.44	6.08	4.53	13.95	5672
1975	66.44	6.41	4.98	20.40	5955
Hungary					
1960	75.86	5.02	6.93	13.20	7141
1975	75.72	5.50	5.70	13.13	6770
GDR					
1960	75.70	3.20	13.60	7.60	7420
1975	74.65	3.78	11.60	10.00	6295
Poland					
1960	78.20	1.30	11.70	8.77	20,403
1975	76.60	1.93	13.25	8.22	19,209
Romania					
1960	67.50	3.60	9.53	19.30	14,547
1975	65.10	5.10	9.45	20.30	14,946
Czechoslovakia					
1960	69.90	4.09	14.73	22.20	7327
1975	69.54	5.08	12.86	11.93	7004

SOURCE: Calculations made on the basis of data in the Statistical Yearbook of the CMEA, 1977.

As shown in Table 4, there has been a considerable reduction in the agricultural labor force in recent years in the smaller CMEA countries, with the exception of Poland, although productivity has nevertheless been increased. This has been due to the introduction of mechanization, and the numbers of tractors and combine harvesters have increased substantially everywhere (see Table 5).

TABLE 4 Share of agriculture and forestry in total employment in the CMEA, 1950–78 (%).

	1950	1978
Bulgaria	79.5	35.7
Hungary	52.0	17.3
GDR	27.3	10.2
Poland	54.0	32.0
Romania	74.3	49.0
Czechoslovakia	38.6	11.4
Soviet Union	47.6	18.1

SOURCE: *Thirty Years of the CMEA*. Hungarian Central Statistical Bureau, 1979.

TABLE 5 Increases in tractors and combine harvesters in the CMEA countries (in thousands of tractor units*).

	No. of tractors (in kind)			Combine harvesters	
	1960	1975	1977	1960	1975
Bulgaria	25.8	64.7	65.0	7.5	10.3
Hungary	41.0	62.1	69.8	4.2	14.3
GDR	71.0	140.0	137.0	6.4	11.2
Poland	62.8**	411.0	482.0	3.1	21.1
Romania	44.2	120.0	139.0	17.6	38.1
Czechoslovakia	74.9	142.0	140.0	6.3	19.9

*1 tractor unit = 15 hp traction capacity.
**Excluding garden tractors.
SOURCE: Data calculated from the CMEA Yearbook, 1977.

The increase in the number of tractors was greatest in Poland and Romania in 1960–77, while that of combine harvesters was greatest in Poland and Hungary. During this period, the number of tractors almost trebled, and the total motor capacity grew to more than four times that of 1960.

The use of fertilizers increased dramatically in 1960–80, but the level of use is still not very high in some countries (see Table 6). Despite the substantial increase in fertilizer use, however, there are still regional disparities, although these have been diminishing since 1960. For example, in 1960 about 23.8 times as much fertilizer per hectare was used in GDR as in Romania, and by 1980 this figure had been reduced to only 2.4 times as much.

Considerable efforts have been made to extend irrigation and to improve soil fertility, but the irrigated land area is still only a relatively small proportion of the total (20.7% in Bulgaria, 8.3% in Hungary, 10.2% in the GDR, 3.3% in Poland, 6% in Romania, and 4.6% in Czechoslovakia).

The material and technological inputs to agriculture in the smaller CMEA countries have now reached levels whereby continually high yields can be achieved. A similar situation has also been reached in the USSR, but both natural and material–technical conditions are rather different.

TABLE 6 Fertilizer use in the smaller CMEA countries, 1960–80 (in kg of active ingredients per hectare).

	1960	1975	1980
Bulgaria	36.1	166.0	187.0
Hungary	29.4	276.0	303.0
GDR	188.0	370.0	360.0
Poland	48.6	236.0	245.0
Romania	7.9	114.0	151.0
Czechoslovakia	94.6	305.0	341.0

SOURCE: CMEA Yearbooks.

Although the USSR is the largest country in the world, only 553 X 10^6 ha were under some kind of agricultural use in 1978, out of a total of 2240 X 10^6 ha, a significant part of which experiences extreme climatic conditions similar to those in the northern states of the USA and the Canadian Prairies. The farmlands are generally located in relatively high latitudes, and only the southernmost zones extend as far south as 35–40° N – the latitude of San Francisco. Almost all extremes of climate are experienced in this vast country, such as severe cold, widely fluctuating precipitation levels or a high risk of drought, relatively short growing seasons, each of which is a fundamental constraint. A significant part of the country is not cultivated at all because of one or more of these factors, and it is unlikely that any form of agricultural activity, particularly arable farming, will be extended into the more remote areas. Efforts were made in the late 1950s and 1960s to extend farming into these marginal areas, and the total arable area in 1978 accounted for about 40% of the total agricultural area in the USSR. The extension of the area under grain crops in 1950–75 is shown in Table 7. In 1978 the total arable area amounted to 231 X 10^6 ha, or 0.86 per capita. The increase in the arable area cannot keep pace with the population growth, so that further per capita decreases can be expected.

TABLE 7 Development of arable farming in the USSR, 1950–78 (10^6 ha).

	Arable area, total	Under cereals	Fallow
1950	203.0	115.6	32.0
1963	218.5	130.0	7.4
1964	212.8	133.3	6.3
1965	209.1	128.0	14.7
1966	206.8	124.8	16.8
1967	206.9	122.2	17.7
1968	207.0	121.5	18.2
1969	208.6	122.7	16.9
1970	206.7	119.3	18.4
1971	207.3	117.9	18.8
1972	210.7	120.1	16.2
1973	215.0	126.7	13.5
1974	216.5	127.2	12.7
1975	218.0	128.5	10.8
1978	231.0	133.3	–

SOURCE: *Narodnoe Chozyaistovo SSSR* (vol. 1960–73), SSSR v tsifrakh, 1974; *Sel'skoe Chozyaistvo SSSR*, 1971; N. Gusev (1975) *Ekonomika Sel'skovo Chozyaistva*, No. 2, Feb, p1, and Statistical Yearbooks of the CMEA.

Irrigation and soil improvement have become increasingly important factors in raising Soviet agricultural production levels. The total area irrigated was 15.15 X 10^6 ha in 1976, of which about 12 X 10^6 ha were harvested. About 6.3% of the cultivated area was irrigated in 1975, compared with 4.9% in 1970.

The levels of technological and other inputs to Soviet agriculture have been lower than in Western Europe and North America, but these are improving rapidly. The major characteristics of mechanization and fertilizer use are outlined in Table 8. In 1979 in the

TABLE 8 Mechanization and fertilizer use in the USSR, 1965–76.

	1965	1970	1975	1976
Total agricultural hp (10^6 hp)	228.8	318.9	454.9	486.9
Number of tractors (10^3 tractor units)	1613	1977	2336	2402
Number of combine harvesters (10^3 tractor units)	520	623	680	605
Number of motor trucks (10^3 tractor units)	945	1136	1396	1442
Fertilizers used (10^3 t active ingredients)	6303	10,360	17,665	18,255

SOURCE: Statistical Yearbook of the USSR, 1977.

USSR the density of tractors was 90 ha/tractor while the same indicator in the US was 44 ha/tractor, and in the EEC the average was 11 ha/tractor. At this time, high-performance Soviet combine harvesters were introduced, although in comparison with other developed countries their numbers are relatively low, and there are problems with the provision of maintenance facilities and the lack of an adequate infrastructure such as access roads, etc. The fertilizer used in 1980 was 81 kg ha^{-1} (active ingredients) compared to 106 kg in the US and 306 kg (on average) in the EEC.

2.2 The Development of Agricultural Production

As a result of technological improvements to agriculture (such as irrigation, fertilizers, machinery, etc), the output of the smaller CMEA countries grew more rapidly during the 1970s than the world average. Table 9 presents the relevant data, showing that the annual growth over two decades was between 2.5 and 3.5%. The only exception was Romania, where output increased by 5.8% per annum during 1961–78. The growth of agriculture was relatively fast in the late 1960s and early 1970s, but slowed down toward the end of that decade. Of course, in the actual growth rates there are substantial variations between countries.

TABLE 9 Annual growth of agricultural production in the CMEA countries, 1966–78 (%).

	1966–70	1971–75	1976–78	1976–78
	Annual growth in the given period on the basis of the previous five years			For the whole period 1964–65
Bulgaria	4.7	2.3	2.8	3.3
Hungary	3.0	3.5	4.1	3.5
GDR	3.7	2.1	1.9	2.6
Poland	3.0	3.2	1.0	2.4
Romania	4.2	4.8	7.4	5.8
Czechoslovakia	3.5	2.8	2.5	2.9
USSR	4.1	2.5	2.6	3.1

SOURCE: *Thirty Years of the CMEA*. Hungarian Central Statistical Bureau, 1979.

In general, the percentage rate of increase in animal husbandry was greater than that in crop growing in the 1970s, resulting in a reversal of the relative importance of the two sectors. The relative position of animal husbandry increased everywhere in the CMEA; for example, in 1971–75 its share increased from 34.5 to 57.7% in Bulgaria, and from 38.2 to 54.8% in Romania.

The improvements achieved in total production and in the yields of some crops up to 1980 are summarized in Tables 10 and 11; cereal grain yields increased significantly in all countries, particularly in Hungary and Czechoslovakia. Wheat output increased most of all, while that of rye declined further, yielding its place to wheat, barley, and corn. Vegetable, fruit, and sugarbeet production showed slower rates of increase, and the output of potatoes was considerably reduced in most countries, mainly because of the changing role of the potato in diets.

TABLE 10 Average annual gross production of major crops in the smaller CMEA countries, 1961–80 (10^6 t).

	Bulgaria	Hungary	GDR	Poland	Romania	Czechoslovakia
Grain						
1961–65	4.86	8.90	5.97	15.43	11.10	5.66
1971–75	7.46	11.52	8.76	21.24	14.98	9.44
1976–80	9.80	–	9.70	26.40	21.40	10.60
Index 1976–80 (1971–75 = 100)	131.30	–	110.70	124.30	133.60	112.30
Sugarbeet						
1961–65	1.44	3.09	5.40	11.44	2.64	6.30
1971–75	1.71	3.09	5.50	12.70	4.76	6.90
1976–80	2.44	–	7.50	21.10	7.32	9.00
Index 1976–80 (1971–75 = 100)	142.90	–	137.20	152.80	153.80	131.10
Potatoes						
1961–65	0.40	1.99	12.10	43.70	2.60	5.63
1971–75	0.35	1.57	10.80	47.10	3.40	4.60
1976–80	0.37	1.00	14.20	49.80	–	4.00
Index 1976–80 (1971–75 = 100)	105.30	–	131.60	105.80	–	97.50
Vegetables						
1961–65	0.89	0.79	0.89	1.08	1.30	0.81
1971–75	1.56	1.63	1.14	3.76	2.60	1.80
1976–80	2.24	–	1.55	5.10	–	–
Index 1976–80 (1971–75 = 100)	142.00	–	135.80	135.50	–	–
Fruit						
1961–65	1.90	1.60	0.55	0.74	1.82	0.44
1971–75	2.13	2.20	0.57	1.15	2.30	0.52
1976–80	1.29	–	0.60	2.40	–	–
Index 1976–80 (1971–75 = 100)	60.40	–	105.10	205.80	–	–

TABLE 11 Development of yields of the major crops in the smaller CMEA countries, 1961–80 (100 kg ha^{-1}, annual averages).

	Bulgaria	Hungary	GDR	Poland	Romania	Czechoslovakia
Grain and leguminous crops						
1961–65	19.0	20.3	25.3	17.0	15.9	21.8
1971–75	33.1	35.0	35.7	25.1	24.1	33.9
1980	39.7	47.6	43.9	26.0	28.4	45.1
Corn						
1961–65	25.1	26.1	19.8	23.5	17.7	26.3
1971–75	39.7	41.7	31.2	42.6	26.8	44.1
1980	37.7	53.2	30.0	35.4	33.9	49.3
Sugarbeet						
1961–65	205.0	246.0	243.0	267.0	149.0	270.0
1971–75	293.0	330.0	277.0	307.0	221.0	346.0
1980	273.5	376.4	277.7	226.0	234.0	331.0
Potatoes						
1961–65	85.5	79.1	166.0	154.0	85.1	114.0
1971–75	118.0	117.0	171.0	177.0	114.0	153.0
1980	84.4	149.6	180.4	113.0	141.0	136.0

SOURCE: Yearbooks of the CMEA.

Grain yields were similar in Bulgaria, Hungary, the GDR, and Czechoslovakia, but significantly lower in Poland and Romania. Corn and sugarbeet yields were highest in Czechoslovakia, and potato yields were highest in Poland and the GDR. When comparing gross production figures with yields it is clear that increasing specific yields is the best method of raising output levels.

The development of livestock rearing in each of the CMEA countries is outlined in Table 12, and Table 13 presents data for the output of various animal products.

In most of the CMEA countries about 20% of the meat produced was beef, but around 30% in Czechoslovakia and Poland. Pork was the most important meat, however, exceeding 50% of the total produced in all countries, but as high as 60% in Hungary, the GDR, and Poland. Poultry meat production in the late 1970s exceeded that of beef in Bulgaria, Hungary, and Romania. The share of mutton and goat meat was significant only in Bulgaria and Romania. As well as adding to the meat produced, cattle rearing has contributed to increased milk production, particularly in Bulgaria, Poland, and Romania, and as a result of improved poultry breeding methods, egg production has also increased.

The output of the agricultural sector has increased in all CMEA countries. In the USSR over the period 1952–70, for example, the increase was much greater than in other parts of the world (see Tables 14 and 15). The production of vegetables and fruits such as grapes has been outstanding, but that of animal products was only moderate. No significant changes took place in the crop structure, and grains and leguminous crops continued to occupy about 60% of the total cultivated area. Of all livestock, pigs have become particularly important (in 1980 there were 116×10^6 cattle, 73×10^6 pigs, and 141×10^6 sheep).

TABLE 12 Development of livestock rearing in the smaller CMEA countries, 1960–80.

	Bulgaria	Hungary	GDR	Poland	Romania	Czechoslovakia
Cattle (10^3)						
1960	1642	1965	4675	8695	4530	4387
1975	1725	1904	5532	12,764	6126	4555
1980	1843	1918	5723	11,335	6485	5002
Index 1980 (1960 = 100)	112.1	97.6	122.4	130.4	143.2	114.0
Pigs (10^3)						
1960	2553	6388	8316	12,615	4300	5962
1975	3889	6953	11,501	21,647	8813	6683
1980	3806	8330	12,871	18,728	11,542	7894
Index 1980 (1960 = 100)	149.1	130.4	154.7	148.5	268.4	132.4
Sheep (10^3)						
1960	9933	2250	2015	3662	11,500	646
1975	10,014	2039	1883	3178	13,865	805
1980	10,468	3090	2036	3486	15,873	903
Index 1980 (1960 = 100)	105.3	137.3	101.0	95.1	138.0	139.8
Poultry (10^6)						
1960	23.4	39.6	36.9	71.9	38.0	28.2
1975	38.1	56.1	47.1	99.8	78.6	40.1
1980	39.9	61.3	32.3	79.3	87.5	45.3
Index 1980 (1960 = 100)	170.5	154.8	187.5	110.3	230.2	160.1

SOURCE: Based on Yearbooks of the CMEA.

TABLE 13 Development of animal products in the smaller CMEA countries, 1960–75 (10^6 t at slaughter).

	Bulgaria	Hungary	GDR	Poland	Romania	Czechoslovakia
Total meat						
1960	307	916	1021	1751	561	802
1975	657	1422	1718	3062	1328	1349
Index 1975 (1960 = 100)	214	174	168	175	237	168
Beef						
1960	44	151	232	396	169	240
1975	112	229	417	870	260	431
% of total meat production 1975	17.0	16.1	24.2	28.4	19.6	31.9
Pork						
1960	162	499	687	1215	276	483
1975	329	892	1132	1852	724	738
% of total meat production 1975	50.0	62.7	65.8	60.5	54.5	54.7

TABLE 13 *Continued.*

	Bulgaria	Hungary	GDR	Poland	Romania	Czechoslovakia
Mutton and goat meat						
1960	60.5	9.7	30.9	35.5	54.3	9.7
1975	90.4	16.7	13.9	25.9	71.4	6.7
% of total meat production 1975	13.7	1.1	0.8	0.8	5.4	0.4
Poultry						
1960	36.3	122	57.5	68.3	61.3	45.8
1975	123	280	127	254	273	134
% of total meat production 1975	18.7	19.7	7.4	8.3	20.5	9.9
Other animal products						
Milk (t)						
1960	1115	1652	5780	16,395	3343	4093
1975	1803	1835	7417	21,658	4581	5562
Index 1975 (1960 = 100)	161.0	111.0	128.0	129.5	137.0	135.8
Eggs (10^6)						
1960	1202	1848	3512	5589	2179	2267
1975	1817	4001	5047	8013	4973	4499
Index 1975 (1960 = 100)	151.0	216.5	143.7	143.3	228.0	198.0

SOURCE: Statistical Yearbooks of the CMEA, 1976, 1977.

TABLE 14 Development of agricultural production in the USSR, 1961–80 (average annual figures).

	Gross agricultural production (10^9 roubles)	Cereals (10^6 t)	Meat (10^6 t)	Milk (10^6 t)	Cotton (10^6 t)
1961–65	66.5	130.5	7.9	51.7	5.0
1966–70	80.5	167.6	11.6	80.6	6.1
1971–75	92.0	180.2	14.1	87.5	7.7
1976–80	–	220.0	15.4	95.3	–
Index 1971–75 (1966–70 = 100)	113.0	107.4	121.6	108.6	126.2
Index 1971–75 (1961–65 = 100)	136.8	138.1	178.4	169.2	154.0
Index 1976–80 (1971–75 = 100)	–	121.0	110.0	109.0	–

SOURCE: "Guidelines for Soviet Economic Development", *Soviet Life*, March 1976, p2. Figure for 1975 grain output from *Pravda*, 1 February 1976.

The relatively moderate and widely fluctuating crop yields achieved in the USSR up to 1975, as shown in Table 16, can be attributed to bad weather conditions resulting in serious crop failures. This is one of the main problems facing Soviet agriculture and therefore in maintaining food supplies. The reduction of this vulnerability is the most important task facing Soviet economists.

TABLE 15 Development of world agricultural and food production, 1952–70 (1952 = 100).

	Agricultural production		Food production	
	Total	Per capita	Total	Per capita
Africa	160	105	160	105
North America	130	100	140	105
South America	165	105	170	105
Asia	165	115	170	115
Europe	165	145	170	145
Oceania	185	125	190	130
USSR	225	170	225	175
World average	165	115	170	120

SOURCE: UN Statistical Yearbook 1969 (New York: United Nations, 1970).

TABLE 16 Fluctuations in grain yields in the USSR, 1956–75.

	Five-year averages	Yields in each year		Difference between max. and min. annual yields	
		Max.	Min.	(100 kg ha^{-1})	% of five-year average
1956–60	10.1	11.1	8.4	2.7	27
1961–65	10.2	11.4	8.3	3.1	30
1966–70	13.7	15.6	12.1	3.5	25
1971–75	14.7	17.6	10.9	6.7	46

SOURCE: *Zernovoe Khozyaystvo*, No. 9, 1976.

The major indicators of CMEA grain and meat production are summarized in Table 17. The high intensity of Hungarian and GDR production can be seen in every respect. In all CMEA countries agricultural production is carried out on several different types of farms; with the exception of Poland, where most of the land has remained in the hands of peasant farmers, the most common types of farms are cooperatives and state farms (see Table 18). Some privately owned farms do still continue to operate, however. The private and state-owned (household) sectors produce mainly meat, vegetables, and fruits. In 1977 a considerable proportion of the cattle and pigs were reared on these farms in Bulgaria (22.2 and 25.3%, respectively), Poland (75 and 76%), and Romania (42 and 43%), while the situation was rather different in the GDR (only 0.8% of cattle and 2.4% of pigs), and Czechoslovakia (4.4 and 8.5%, respectively).

2.3 The Position of Agriculture in the National Economy

In spite of the absolute increases in production, the contribution of agriculture to the gross domestic product (GDP) or national income decreased in the smaller CMEA countries until the mid-1970s, but since then a slight increase in the share of agriculture in the total national income has been observed. As shown in Table 19, agriculture contributed the largest share to the generation of national income in 1977 in Bulgaria and Hungary, for example. The two countries in which agriculture contributed the smallest share were the GDR (10.9%) and Czechoslovakia (9.1%). This reduction in the importance

TABLE 17 Major indicators of grain and meat production in the CMEA (averages of 1976–78).

	Grain production (kg ha^{-1} arable land)	Meat production (kg ha^{-1} total agric. land)	Grain production (kg per capita)	Meat production (kg per capita)
Bulgaria	3425	102	895	69.7
Hungary	4077	194	1162	124.6
GDR	3506	276	525	104.2
Poland	2615	142	594	79.5
Romania	3015	99	889	68.4
Czechoslovakia	3802	190	674	89.1
USSR	1704	24	815	55.9

SOURCE: FAO Production Yearbook, 1979.

TABLE 18 Proportion of total agricultural land occupied by cooperative and state farms in the smaller CMEA countries, 1960–77 (%).

	Cooperative farms			State farms		
	1960	1970	1977	1960	1970	1977
Bulgaria	79.9	68.0	90.7	6.6	15.6	–
Hungary	48.6	67.6	69.8	12.2	12.8	12.6
GDR	72.8	78.2	82.1	6.2	6.5	7.8
Poland	1.1	1.2	1.4	11.2	14.0	16.7
Romania	50.2	54.1	54.1	11.8	14.0	13.6
Czechoslovakia	62.1	55.7	61.7	15.5	20.2	20.0

SOURCE: Statistical Yearbooks of the CMEA, 1972, 1978.

TABLE 19 Share of agriculture and forestry in national incomes of the CMEA countries, 1950–77 (%).

	1950	1960	1970	1975	1977
Bulgaria	42.5	32.2	22.6	21.9	18.3
Hungary	47.7	29.2	16.8	16.3	18.3
GDR	28.4	16.4	11.6	10.0	10.1
Poland	47.9	30.3	17.5	15.1	15.8
Romania	27.3	34.9	19.1	16.6	16.9
Czechoslovakia	16.2	14.7	10.1	8.3	9.1
USSR	22.2	20.7	22.0	16.8	17.1

SOURCE: *Thirty Years of the CMEA*. Hungarian Central Statistical Bureau, 1979.

of agriculture has come about despite significant increases in output as described above, mainly because of the vigorous growth achieved in other sectors of the economy.

In the USSR between 1965 and 1975, while the total GDP more than doubled, the amount contributed by agriculture increased by only 70%. The share of agriculture in national income was 20.7% in 1960, decreasing to 17.1% in 1977. Investments in agriculture from the productive fixed funds of the USSR have increased slowly, but were

greater than those of industry. Although a relatively large proportion of the labor force is employed in agriculture, productivity is significantly lower than in other sectors of the economy.

Agricultural investments increased in all the other CMEA countries in real terms, but fell behind those in other sectors. This relative decrease is obvious in Bulgaria, for example, where the growth of agricultural investments was 193.5% between 1965 and 1973, while the total increased by 393%. In Romania, the respective figures were 341.4 and 498%. If we compare the share of agriculture in the generation of national income and fixed funds with the data in Table 20, it becomes even more obvious, especially in Bulgaria and Romania, that a considerable part of the income provided by agriculture was

TABLE 20 Rate of agricultural investments in the smaller CMEA countries, 1960–75 (total national investments = 100).

	1960	1975	1975/1960
Bulgaria	29.7	14.6	0.49
Hungary	14.1	13.8	0.98
GDR	12.0	12.0	1.06
Poland	12.6	13.5	1.07
Romania	19.6	13.5	0.69
Czechoslovakia	16.8	12.3	0.75

SOURCE: Statistical Yearbook of the CMEA, 1977.

reallocated to other sectors of the economy. The GDR was an exception, however, because the rate of agricultural investments increased more rapidly than the total, so that the relative share increased, and the contribution to the fixed funds of the economy grew even more rapidly than before. Apart from the GDR, however, an overall decrease in agricultural investments has generally been observed in the other smaller CMEA countries.

The trend in the USSR has been similar to that in the GDR, but with the difference that over the past 15 years, agricultural investments have increased, and in 1971–75 amounted to over a third of all investments. It is worth noting that in recent years the so-called complex development program in the USSR has increased the investments. One of the most important of these was related to the "black earth" (non-chernozem) zones, for which 35 billion (10^9) roubles were allocated in 1970–80. Irrigation and soil improvement schemes accounted for a significant proportion of this, as well as inter-farm cooperation and various agro-industrial integration projects. For these purposes 37.9 billion roubles were spent between 1971 and 1975. Apart from direct investments, there has been encouragement of some industry to provide a sound technological basis for agriculture, and up to 1975 a total of 320 billion roubles were invested, 213 billion of which (i.e. 66.5%) were allocated between 1966 and 1975.

3 THE CONSUMPTION OF AGRICULTURAL PRODUCTS

The consumption of agricultural products has a determinant importance in all the CMEA countries. The per capita food consumption has now reached a level of 3000–3200

calories per day, largely due to income increases, although the income and price elasticity of demand for most commodities is very small according to available data. In addition to incomes, demand is influenced by target consumption figures and the availability of supplies, which have played an important role in the improvement of diets.

The per capita consumption of basic foodstuffs in the smaller CMEA countries is outlined in Table 21, although the data from different countries are not always directly comparable (e.g. on meat consumption) because consumers' habits may simply reflect the production potential determined by natural conditions. However, if we disregard this and try to establish a precedent, then we may state that Czechoslovakia consumed the most meat and eggs, Poland most milk and potatoes, and Bulgaria most vegetables.

TABLE 21 The per capita consumption of major agricultural products in the smaller CMEA countries, 1960–79 (kg yr^{-1}).

	Bulgaria	Hungary[a]	GDR[a]	Poland	Romania	Czechoslovakia[b]
Meat and meat products (converted into meat)						
1960	32.7	47.6*	55.0*	49.9	–	56.8**
1975	60.6	70.5*	77.8*	78.4	45.7	82.0**
1979	65.4	73.0*	88.6*	81.3	–	84.0**
Milk and dairy products (converted into fresh)						
1960	126	114	–	363	–	173
1975	198	125	–	432	132.6	212
1979	229	157	–	457	–	226
Eggs***						
1960	84	160	197	143	–	179
1975	146	270	268	209	–	295
1979	187	324	284	221	–	310
Vegetables (converted into fresh)						
1960	122	84.1	60.7	–	–	63.1
1975	127	185	96.6	94	112.6	78
1979	141	83.1	96.8	118.6	–	70
Potatoes						
1960	34.8	97.6	174	223	–	100
1975	23.1	65.0	142	173	–	98
1979	27.4	60.0	140	160	–	86
Bakery products (converted into flour)						
1960	190	133	102	145	–	126
1975	157	118	94.2	120	–	107
1979	159	118	94.5	120	–	108

*Excluding bacon.
**Including fish.
***Number of eggs.
SOURCE: Statistical Yearbooks of the CMEA; *Ekonomicseszkoja Informacija*, November 1979.

In recent years real incomes have risen in all CMEA countries, so that people have therefore been able to spend more money on food. However, the income elasticity of consumption is relatively small in all the CMEA countries, and there is also a high demand elasticity for meat products and tropical fruits, so that, in addition to the general quantitative increase, there has also been a change in the consumption patterns in recent years. The further augmentation of average daily food intake levels is undesirable, even though the dietary structure may not be ideal. Most of it consists of carbohydrates and starch, and the level of animal proteins is inadequate (see Table 22). The situation is improving, but only slowly, and the recent significant increase in fruit, vegetable, and dairy produce consumption is a favorable trend. The present per capita level of meat consumption can be described as moderate in most of the CMEA countries, and the targets envisaged in the plans may not be reached.

TABLE 22 The consumption of major foodstuffs in the USSR, 1970–79 (kg per capita).

	1970	1974	1975	1979	Index 1979 (1975 = 100)
Cereals (converted into flour)	149	142	141	139	98.6
Potatoes	130	121	120	119	99.2
Vegetables (converted into fresh)	82	87	87	95	106.7
Fruits (converted into fresh)	35	–	50	41*	–
Meat (weight at slaughter)	48	55	57	58	101.7
Milk and dairy products (converted into milk)	307	316	315	319	100.9
Eggs**	159	205	215	233	107.8

*1977 data.
**Number of eggs per capita.
SOURCE: Statistical Yearbooks of the CMEA.

4 THE DEVELOPMENT OF AGRICULTURAL FOREIGN TRADE

Agriculture has traditionally been a major branch of foreign trade, but its importance varies throughout the smaller CMEA countries. Tables 23 and 24 show that the foreign trade balance of agriculture is usually negative, and in 1975 the deficit amounted to about 2 billion roubles. Bulgaria, Hungary, and Romania are net exporters of food and have considerable positive trade balances, while those of the GDR, Poland, and the USSR are usually negative. Under the impact of recent changes in the world economy, the endeavor for self-sufficiency in food and raw materials has strengthened in the CMEA countries, although the dependence of agriculture on natural and climatic conditions has so far precluded the accomplishment of this target.

The characteristics of the agricultural foreign trade of the smaller CMEA countries in the 1970s may be summarized as follows.

(a) The agricultural share of total foreign trade is on the whole decreasing, but there are differences between the various CMEA countries. The role of agriculture is greatest in Bulgaria and smallest in Czechoslovakia.

TABLE 23 Development of exports and imports in the smaller CMEA countries, 1960–75.

	Exports (10^6 roubles)		Imports at current prices		Index 1975 (1960 = 100)	
	1960	1975	1960	1975	Exports	Imports
Bulgaria						
total trade	515	3494	596	4027	678	707
agriculture	290.4	1181	95	511.4	407	538
Hungary						
total trade	787	3999	856	4646	508	543
agriculture	215.6	1007.7	249	882.7	467	354
GDR						
total trade	1987	7517	1975	413	378	425
agriculture	117.2	684	774	1901	584	245.6
Poland						
total trade	1193	7686	1346	9371	644	696
agriculture	274.4	807	456.3	1722	294	377
Romania						
total trade	645	3980	583	3980	617	683
agriculture	231.5	899.5	107	620.8	388.5	580
Czechoslovakia						
total trade	1737	5831	1635	6340	335.6	388
agriculture	180.6	419.8	606	1103	232.4	182

SOURCE: Statistical Yearbook of the CMEA, 1976; author's own calculations.

TABLE 24 Agricultural foreign trade as percentages of total trade in the smaller CMEA countries, 1960–75.

	Exports			Imports		
	1960	1975	1975/60	1960	1975	1975/60
Bulgaria	56.4	33.8	0.59	16.7	12.7	0.76
Hungary	27.4	25.2	0.91	29.2	19.0	0.65
GDR	5.9	9.1	1.54	39.2	22.6	0.57
Poland	23.0	15.5	0.45	33.9	17.7	0.52
Romania	35.9	22.6	0.62	19.4	15.6	0.84
Czechoslovakia	10.4	7.2	0.69	37.1	17.4	0.47

SOURCE: Statistical Yearbook of the CMEA, 1976.

(b) The most important agricultural commodity imported into the CMEA countries is grain, particularly in the GDR, Poland, and Czechoslovakia. The total quantity of fruit imported into these countries trebled between 1960 and 1975, mainly due to the increased demand for citrus fruits. The most important exports, on the other hand, were cereals (from Hungary and Romania), meat products, vegetables, and fruits. Hungary and Bulgaria exported fresh, preserved, or canned vegetables and fruits, and Hungary and Poland exported meat products. The development of this trade in major foodstuffs is outlined in Tables 25 and 26.

TABLE 25 Imports of major agricultural products into the smaller CMEA countries, 1960–75 (10^3 t).

	Bulgaria	Hungary	GDR	Poland	Romania	Czechoslovakia
Meat and meat products						
1960	15.2	25.2	97.0	18.1	3.5	99.4
1975	18.0	11.9	23.8	16.0	2.8	31.9
Cereals						
1960	154.0	340.0	2200.0	2122.0	–	2010.0
1975	653.0	172.0	3360.0	3963.0	–	885.0
Vegetables (fresh)						
1960	–	0.2	116.0	16.4	–	78.3
1975	–	5.4	129.0	31.6	–	71.0
Vegetables (canned)						
1960	–	2.2	28.6	0.9	–	18.5
1975	–	3.7	123.0	11.1	–	15.0
Fruit (fresh)						
1960	3.2	18.1	171.0	45.3	15.9	104.0
1975	32.4	79.5	487.0	196.0	75.8	335.0
Fruit (canned)						
1960	0.1	3.3	47.7	0.1	–	2.7
1975	0.9	12.8	117.0	18.3	–	30.1

SOURCE: Statistical Yearbook of the CMEA, 1976.

TABLE 26 Exports of major agricultural products from the smaller CMEA countries, 1960–75 (10^3 t).

	Bulgaria	Hungary	GDR	Poland	Romania	Czechoslovakia
Meat and meat products						
1960	32.4	51.7	–	110.0	54.9	11.0
1975	98.8	249.0	–	209.0	165.0	16.1
Cereals						
1960	174.0	38.4	–	89.3	707.0*	80.4
1975	195.0	1285.0	–	104.0	1163.0*	73.2
Vegetables (fresh)						
1960	247.0	92.2	17.8	37.0	25.7	15.1
1975	184.0	62.8	9.8	1.5	15.0	36.5
Vegetables (canned)						
1960	76.0	47.4	–	12.6	–	2.9
1975	253.0	289.0	1.6	29.9	–	13.3
Fruit (fresh)						
1960	129.0	55.8	0.1	32.2	56.4	10.1
1975	159.0	399.0	–	48.3	93.8	21.0
Fruit (canned)						
1960	72.0	18.4	–	0.8	–	4.3
1975	191.0	91.7	–	32.1	–	10.5

*Wheat and corn.
SOURCE: Statistical Yearbook of the CMEA, 1976.

(c) The general characteristics of agricultural trade of the CMEA as a whole are also prevalent in the smaller member states.

The trends outlined above, and also those of Soviet foreign trade, have not changed during recent years. Agriculture has become increasingly important in the foreign trade of the USSR, and imports to meet consumer demands have grown considerably. Bilateral and multilateral trade agreements, and contracts for the mutual supply of goods have been established between the USSR and other CMEA countries, amounting to 50.7 billion roubles in 1975. The increase in Soviet foreign trade was greatest in 1974 and 1975, when the increases on previous years reached 26 and 28%, respectively, although this represented only 3% of the national income. About 62–64% of Soviet foreign trade is with other CMEA countries, and although the share of agricultural products is relatively modest, it is gradually increasing: food and raw materials for the food industry accounted for 12% in 1970, and about 15% in the late 1970s. Agricultural exports are relatively small, however, representing 8.4% in 1970 and 4.8% in 1975, while imports increased from 15.9% in 1970 to about 25% in 1975–80.

Up to 1973, the USSR was a net exporter of wheat, and imports of meat products were relatively small, but as a result of the disastrous weather conditions of 1972 and 1975, this position was reversed, thereby increasing the burden on the balance of payments. In the late 1970s, about $14–15 \times 10^6$ t of grain imports were necessary annually to improve living standards and to alleviate food shortages. However, imports of vegetables and fruits, both fresh and processed, were relatively modest because these crops were less badly affected by the weather (see Table 27).

Most of the exports of cereal grains from the USSR are destined for other socialist states (mainly the GDR, Czechoslovakia, Poland, and Cuba), while the main source of imports is the United States. In 1979–81 other countries such as Argentina, Canada, and Australia became further important sources of Soviet grain imports, and most of the meat and meat products come from Western Europe and Hungary. Most canned vegetables and about 40% of fresh fruits are imported from other CMEA countries, and a considerable amount of cane sugar is imported from Cuba. In recent years, cotton has been the only agricultural crop in the USSR that has provided a significant surplus, enabling about 0.6×10^6 t to be exported.

5 AGRICULTURAL POLICY: GOVERNMENT CONTROL

5.1 Policy Objectives

The agricultural policies of the CMEA countries are based on the practice that agriculture forms an integral part of a centrally planned national economy. The basic targets for agricultural production are formulated in national economic plans, and these are implemented by an integrated system of smaller-scale plans drawn up for specific sectors of the economy, both for regions and for farms. Efforts to satisfy individual demands at a steadily increasing level are an important aspect of economic planning, and these are equally emphasized in all countries. With respect to agriculture, the quantity of produce needed to meet planned levels of consumption and for industry are the most important considerations in economic planning. These general targets depend, of course, on specific

TABLE 27 Development of foreign trade in the major agricultural products in the USSR, 1970–75 (10^3 t).

	1970	1973	1974	1975
Cereals				
exports	570	4853.3	7029.5	15,910
imports	2159	23,900	7131	15,909
Raw sugar				
exports (white)	1079	42.9	95.2	53.3
imports	3003	2485	1856	3236
Meat and meat products				
exports	–	75	55.9	–
imports	165	129	515	515
Vegetables (fresh)				
exports	–	–	–	–
imports	163	162	196	144
Vegetables (canned)				
exports	–	–	–	–
imports	249	351	339	322
Fruit (fresh)				
exports	–	–	–	–
imports	679	828	901	860
Fruit (canned)				
exports	–	–	–	–
imports	207	165	160	170
Cotton				
exports	517	728	739	800
imports	258	131	140	137

SOURCES: *The Foreign Trade of the Soviet Union*, 1973, 1974, 1975; Statistical Review, Moscow; *International Relations*, 1974, 1975; Statistical Yearbook of the CMEA, 1973, 1976.

conditions and on the economic situation of each particular country. The development of industry is usually central to economic policies, and although food production is also important, it remains a secondary economic and political objective.

Ideally, increases in food production should be achieved by improving efficiency and productivity, rather than by extending the area under cultivation (since in any case little or no possibility exists for this). In order to achieve this, the following methods are being used in the CMEA countries:

(i) the concentration and specialization of agriculture by means of large-scale, state-owned and cooperative farms, and agro-industrial complexes, and

(ii) the introduction of new technology and modern production methods throughout the entire food-producing sector.

The most important objectives of CMEA agricultural policy are to produce the quantity of food needed for the planned level of personal consumption and to cover industrial demand for agricultural products. This general target, of course, depends on the specific conditions and on the actual economic situation in each country, and in spite of the

similarity between the basic objectives, no uniform agricultural policy prevails throughout the CMEA. The development of industry is central to economic policy in all countries, but, in addition, an increase in agricultural and food production is a politically important task.

Agricultural investment policy in the CMEA countries is developed according to central plans, or is determined by them. Thus the scale of investments or their share of the total at any time reflects the state of the economy in each country, and varies throughout the region in both space and time. Agriculture is often allotted considerable finance in excess of its eventual contribution to the national income, but the reverse case is not infrequent, such as when a part of the income does not remain in that sector, but is redistributed for the development of industry. If the situation in recent years is considered, it can be seen that the status of agriculture was different in various CMEA countries, and its role in the development plans and the corresponding investment also varied.

In the smaller CMEA countries in the 1970s the development of agriculture was not the main target, so that investments did not increase at the same rate as those in other sectors of the economy. In some countries, such as Bulgaria and Romania, a considerable part of the income produced in agriculture was redistributed to other sectors of the economy. The USSR represents a different case, where the development of agriculture has been stressed, and during the last two decades, the share of agricultural investments surpassed the levels in other CMEA countries. In the period up to 1975, a total of 320 billion roubles were invested in agriculture, 66.5% of which was allocated in 1966–75. The redistribution of investment goods, such as agricultural machinery to improve efficiency, was continued in the USSR in 1976–80. The share of agriculture within all investments was higher than its eventual contribution to the generation of national income (about 30% of all investments was allocated to agriculture and food production).

An important general characteristic of agricultural policy in the CMEA countries is the vigorous effort for self-sufficiency; i.e. in each country, domestic demands for all commodities that can be produced should be met as far as possible from domestic production. It can be observed that the treatment of agriculture and food production depends upon the state of the balance of payments. In those countries where natural conditions are favorable for agriculture this sector is utilized to augment foreign currency receipts. This is particularly true in Hungary, Bulgaria, and Romania, where the maximization of foreign currency receipts from agricultural exports is one of the most important economic-political targets.

Details of future agricultural policies are not easily available. Each CMEA country has certain preconceptions about the development of agriculture in the long term, up to 1990, and, in some cases, even up to 2000. The five-year plans represent the documents in which the decisions that are intended to be implemented are fixed. The present plan period in each country started on 1 January 1981. According to available plan documents, the development of agriculture will receive more attention than before in each country. Moderate increases (8–10%) in production are planned in Czechoslovakia and the GDR. In the USSR the total growth target is 12–14% for the five-year period 1981–85, with the production of 238–243 $\times$ 10^6t of grain annually. The targets are most ambitious in Bulgaria and Romania, where a 20–25% increase in production is expected.

Based on conclusions reported at various forums as well as upon the characteristics of the economic situation and on analyses of the actual result of the current plan period, it is probable that the general rate of economic growth in the CMEA will be slower in the 1980s than in previous periods. The agricultural growth rate will probably be closer to the rate of

general economic growth, but it will remain at the same relatively moderate level of the late 1970s. It is also probable that, because of balance of payments problems, efforts toward food self-sufficiency will increase and a greater stress will be laid on the development of agriculture.

In connection with this slower economic growth, agricultural investments will increase only slowly as a proportion of the total, with a slight decrease in the USSR. Grain and meat production will receive the greatest emphasis. Efforts to establish a production structure better adapted to world market demands will certainly be confirmed in the food-exporting countries, and this will presumably further consolidate the role of the grain economy.

5.2 Methods of Economic Management

In order to accomplish their economic-political goals, the CMEA countries use various strategies to improve the efficient management of agriculture. In centrally planned economies, so-called direct and indirect policy instruments are used to realize targets of the national plans, and those applied to agriculture are generally more complicated than in any other sector of the economy. The following list of policy instruments shows their complexity: the *direct* economic regulations of governments are, among others,

(i) the determination of the type, size, location, and scheduling of the most important agricultural investments;
(ii) the setting of targets for farm production;
(iii) the central distribution of technical and financial resources;
(iv) the determination of labor movements within agriculture, and between agriculture and other sectors of the economy;
(v) the establishment of new production organizations in agriculture.

The *indirect* economic regulators of government include, for example,

(i) price regulation and pricing policy;
(ii) state budget and tax policy;
(iii) the regulation of the depreciation system;
(iv) the control of wages and the system of personal incentives in agriculture;
(v) centralized credit and interest rate policy;
(vi) state subsidies;
(vii) export tariffs, import restrictions;
(viii) exchange rates.

In the CMEA countries, the methods of agricultural management are not uniform, even though policy goals are similar. Both direct and indirect means may be used, but their roles are different. In countries with centralized economic management systems, governments usually use direct economic regulators, while in those with decentralized economic management systems, state control is effected by indirect means.

The application of direct means of economic management is determinant in the majority of the CMEA countries. In the course of the changes that have taken place in

recent years, the role of economic stimulators (indirect means) has increased, but in spite of this agricultural management has remained centralized (except in Hungary, Poland and Bulgaria). In Hungary the use of indirect means of control increased after the economic reforms introduced in 1968, and the decentralized management system was extended even further in the 1970s. Conditions in Poland are dominated by the large proportion of privately owned farms, so that specific methods have to be used to influence the individual producers.

Considerable effort has been made in all countries to improve the governmental economic management of agriculture.

Bulgaria. A decision was made about the organization of agro-industrial complexes in April 1977, which made further decentralization of planning necessary, although the centralized nature of the system, did not change in practice. In recent years some buying-up prices were modified and the role of other economic stimulators was significantly increased. From practical experience, some reorganization of the complexes was also undertaken.

GDR. In addition to medium-term agricultural plans, the one-year plans are also important in economic management. Agricultural management continues to be characterized by the disaggregation of plans and by very close central control of targets. One of the main aims of management is the specialization of farms. The transition to production based on cooperation between individual farms is supported through pricing and credit policy, and by cheap machines and implements, and the concentration process will also accelerate by means of preferential credit.

Poland. Considerable steps were made in the development of centralized economic management by the Sixth Congress of the Polish Workers' Party. The previous system was modified and indirect economic and financial regulators were increased while targets were reduced. But on the whole these steps were not sufficient to increase agricultural production up to the desired level. The failures of agricultural production can definitely be considered to be one of the sources of the present overall economic problems of Poland.

Romania. Agricultural management in Romania is effected by direct means. The central organs have paid close attention to the consolidation of agricultural agencies and the associations of the farmers' cooperatives. Organizational measures have played a significant role in recent years, but agricultural prices have also been raised several times to give more incentive to farmers.

Czechoslovakia. Both direct and indirect means of economic management are used, although direct regulators are more common. Agricultural prices have also been raised several times to provide incentives.

Hungary. In the management of Hungarian agriculture, central plans are implemented by indirect means. Farms and other food-producing enterprises are not bound by any obligatory targets, and economic decisions are influenced by the central organs only through economic and financial regulators. These regulators are determined for each five-year plan period, but some modifications may be made in relation to the targets set in the one-year plans.

As stated above, the raising of agricultural prices and the increasing role of economic stimulators have been observed in all socialist countries. It must be emphasized, however, that domestic prices are not determined directly by world market prices – not even in Hungary, where a decentralized system of management is applied. The internal pricing

system expresses the preferences made and the targets set by government, and price changes do not usually follow world market trends.

USSR. The management of Soviet agriculture is effected mostly by direct means; the major elements of the central plans are broken down for the republics, territories, and for farms. Economic stimulators also play an important role and prices have risen in recent years, but the nature of the system has not changed essentially. The increased support and stimulation of household and private farming is a new characteristic, but its effect on the increased development of this sector has not yet manifested itself.

In general it can be remarked that the application of direct means of economic management is determinant in the majority of the CMEA countries. The basic nature of the government management system is not changed, but serious efforts to improve the efficiency will be made, using indirect economic incentives. The further development of the domestic producer and consumer price system agricultural products seems to be unavoidable. The modification of low food price policies might also affect consumer demands and a wider range of price incentives will probably increase the overall efficiency of production.

The production potential of household farming by cooperative farm members and industrial workers is under-utilized in most CMEA countries, and production could be increased through this channel without heavy government investment. Encouragement of the utilization of these reserves is an economic necessity in the present situation, and the extension of these activities will make a great contribution to the fulfilment of national targets in the next 5–10 years.

6 METHODS OF FORECASTING – THE CMEA AGRICULTURAL MODEL

To project the development of agriculture in the CMEA countries up to the year 2000 is a rather complex task. As stated above, no official long-term targets for either consumption or production have yet been published. The majority of available estimates were elaborated before the recent changes in the world economy, and may therefore need to be adjusted accordingly. In several research institutes dealing with the economic problems of the socialist countries, forecasts and calculations have been made, such as the forecast elaborated in *Agriculture: Toward 2000* by the FAO, and other material. Making use of all these sources of information and considering their main conclusions, our forecasts have been made by means of mathematical methods. In using the complex mathematical model of the CMEA countries, including the Soviet Union, we applied the model structure elaborated within the framework of the Food and Agriculture Program (FAP) of IIASA. Below we outline the major characteristics of the CMEA Agricultural Model and then describe the most important attributes of the models that served as the basis of our forecasts. The details of the FAP agricultural models are not discussed here; for further information see Keyzer (1977, 1980), Fischer and Frohberg (1980), and Parikh and Rabar (1981).

6.1 General Characteristics of the CMEA Agricultural Model

The CMEA Agricultural Model was developed as part of IIASA's Food and Agriculture Model system. The main goal is not straightforward optimization, but the creation

of a tool to enable the dynamic behavior of an agricultural system and the interactions of its elements to be understood, so that the model can be used for medium- and long-range projections. Unlike the normative agricultural models developed in the past, this model is descriptive in character, reflecting the present operation of centrally planned agricultural systems, decision-making, and economic management practices. At the same time, various normative elements such as government policy and published plan targets, which influence the operation of the system, are also considered. The FAP models describe an objective structure, but they enable the feasibility of normative targets and plans to be assessed.

In the CMEA Agricultural Model a large part of the economic environment and the most important factors of food production are taken into consideration. Food and agriculture are modeled as disaggregated parts of an economic system that is closed at a national as well as international level. Our model therefore has the following features:

(i) The food consumption sphere is incorporated.
(ii) The non-food production sectors of the economy are represented by assuming that they produce only one aggregated commodity.
(iii) The economic, technical, biological, and human aspects of food production are included.
(iv) Both the production of agricultural raw materials and food processing are modeled.
(v) Under "other", agricultural production, and food processing, all other products not individually represented are aggregated.
(vi) Basic financial equilibrium is maintained.

The major elements of the model are outlined in Figure 1. The basic methodology used is a simulation technique, and the model (which is actually a system of interconnected smaller models) is structured according to the main elements of a centrally planned agricultural system.

As Figure 1 shows, two spheres are differentiated within the model. The economic management and planning submodel describes the decision-making and control activities of the government. The submodel of the real sphere covers the realization of central plan targets including the whole national economy, with a disaggregated food production sector. The major blocks of the latter submodel are related to production, consumption, and trade, and they also update available resources and other model parameters. Other suitable techniques (e.g. linear and nonlinear programming, econometric methods, heuristic routines) can also be employed to describe the subsystems according to the specific conditions and objectives of the investigation.

The model is dynamic, with a one-year time increment. Subperiods within one year are not considered. The random effects of weather and animal diseases can also be taken into account.

The CMEA Agricultural Model has certain specific features that are not typical of other FAP models. The most important of these are:

(i) The modeling of central planning and economic management activities plays a crucial role in the system.
(ii) Certain overall economic targets are considered exogenously.

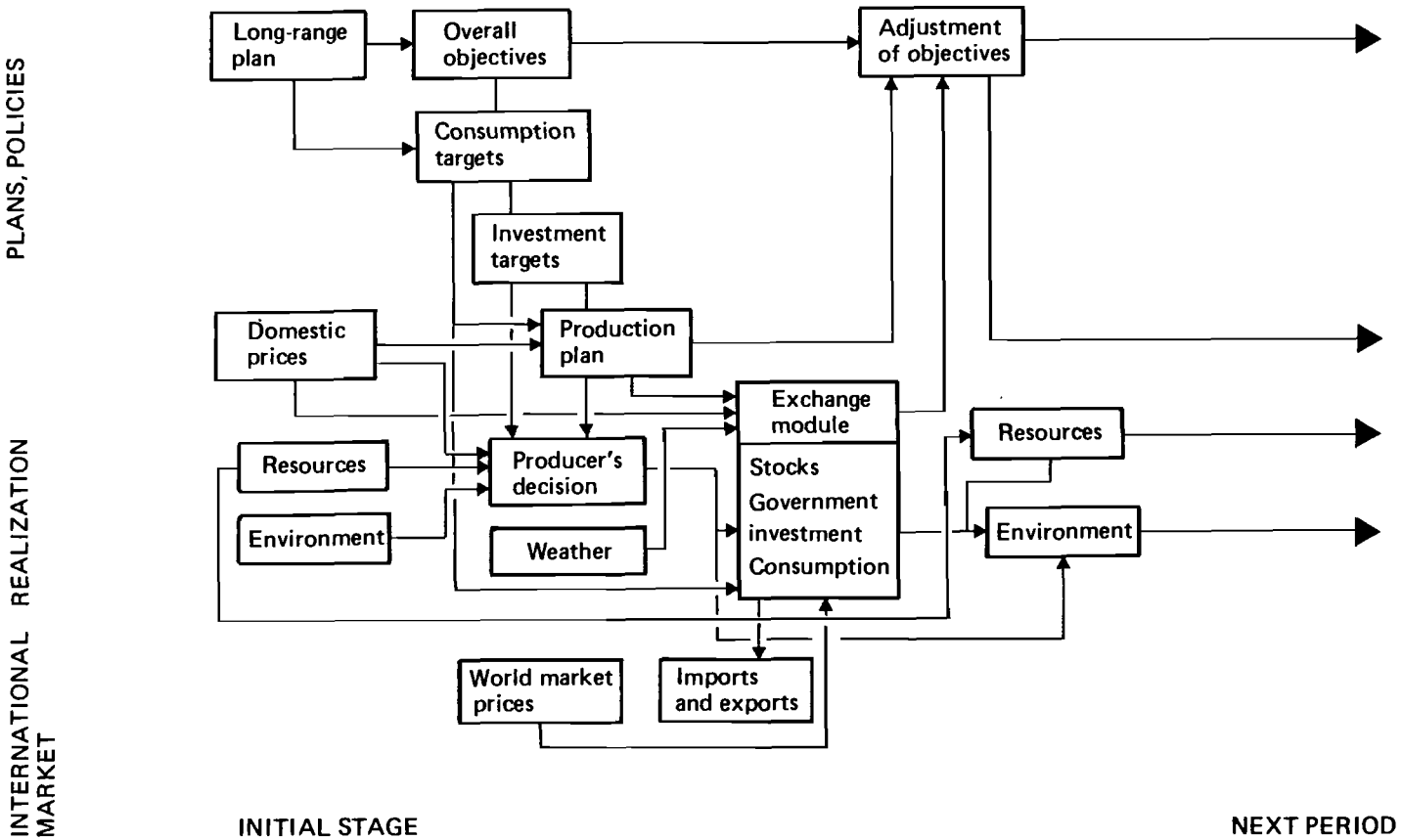

FIGURE 1 The structure of the CMEA Agricultural Model.

(iii) Only the implementation of a certain policy structure is considered endogenously.
(iv) The domestic market included in the model is not directly related to the international market.
(v) Domestic prices express government policy objectives instead of being related to a certain market equilibrium.

According to these specific features, long-range government objectives, such as the growth of the whole economy, the growth rate of food production and consumption, a given relation between consumption and accumulation, and a positive balance of payments in food and agriculture, are considered exogenously, as they are determined by the long-range development plan of the national economy. The model focuses on the development of food and agriculture (production structure, investments, etc) and its interaction with the rest of the economy. The major steps towards the solution can be described as follows.

(1) The overall growth targets are chosen for a given year, based on long-range objectives and previous results. After setting targets for gross and net production, planned consumption and accumulation levels are calculated, determining the targets for consumption of individual commodities and investment funds in food and agriculture, as well as in the rest of the economy.

(2) A detailed production plan for food and agriculture is determined, considering the available resources and minimum required production of certain commodities.

(3) The behavior of producers (state and cooperative farms, private producers) is determined, and the random effects on the final output of food and agriculture, as well as the rest of the economy, are calculated. In the model both direct and indirect instruments of government can be manipulated to realize the production targets of the central planners. According to the economic management system of the government (more or less decentralization) in a given country, the producers' decision model and relations between government and producers can be modeled in various ways.

(4) The exchange module compares supply and demand. Here export and import figures, consumption, and investment levels are calculated, satisfying the balance of trade and equilibrium constraints. The model can be linked with other IIASA national models through this part of the model. To express the reaction of a centrally planned economy to changing world market conditions, a special equilibrium type of model has been developed.

(5) As the final results for a given year are obtained, overall government objectives and policy instruments (prices, tax rates, etc) are adjusted, based on the analysis of the performance of the whole system. The available resources and some of the model parameters are also updated.

As a first step in the realization of IIASA's objectives in the modeling of centrally planned agricultural systems, the Hungarian Agricultural Model (HAM) was developed as a prototype for the CMEA countries (see Csáki 1981). The experience gained with HAM, and with the basic linked system elaborated at IIASA were used in constructing the CMEA Agricultural Model. The most important task set for the model is to obtain a realistic picture of the development trends that can be expected, and the probable import

demands and the potential exports of agricultural products from the region. We should like to point out that this model does not aim to provide a detailed description and study of the agricultural development problems of each individual country, but in spite of this it can be a useful means of assistance for the elaboration of projections and of the various possibilities for development.

The CMEA Agricultural Model covers the European CMEA countries (Bulgaria, Czechoslovakia, GDR, Hungary, Poland, and Romania) and the Soviet Union (including its Asian territories). The model is divided into two major parts: the first submodel describes the agricultural system of the Soviet Union, and the second includes the smaller CMEA countries. The two submodels have a completely consistent structure and can be operated independently of each other (see Figure 2). Correspondingly, when describing the methodology, we do not deal with the two model parts separately, but mention the differences only as far as is necessary.

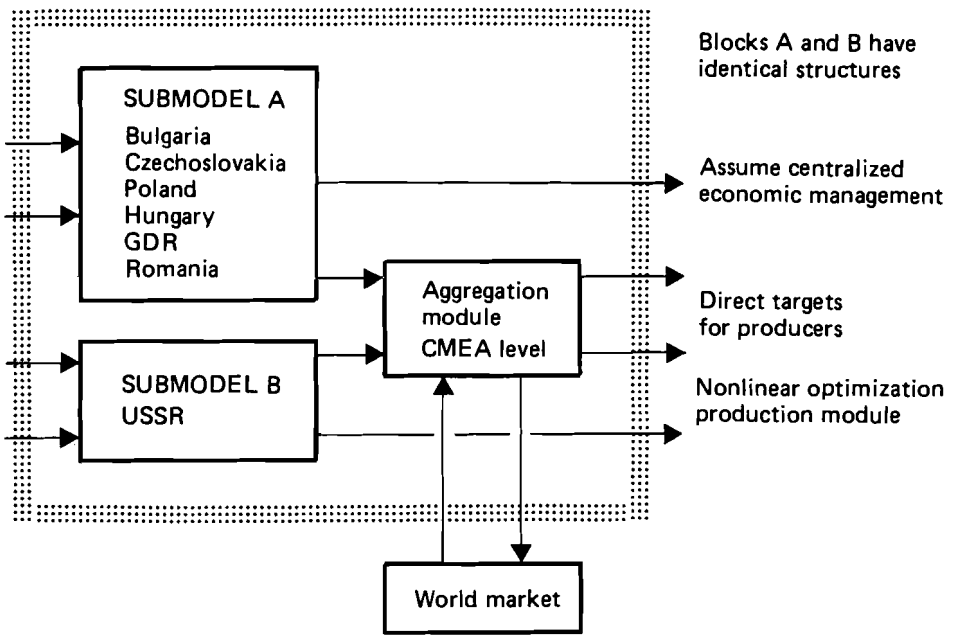

FIGURE 2 The structure of the CMEA Agricultural Model.

With respect to its fundamental principles, our model is similar to or includes the most important general characteristics of the Hungarian or other IIASA agricultural models. We assume that the most important long-range policy objectives, such as the required growth rate of the whole economy, the required growth in the rate of consumption, and the extent of the agricultural share of total investments are determined from CMEA data from previous years and by using published plan targets. We assume also that decisions concerning agricultural development are made centrally and that they are usually forwarded to the producing enterprises in a direct way. Therefore we do not model the producers' decisions separately.

The commodity classification follows that used in *AT 2000*, and only cereals, vegetables, and certain industrial crops are aggregated. Correspondingly, in both submodels 22 products are taken into consideration, as follows:

1 Wheat
2 Rice
3 Feedgrains
4 Sugar
5 Vegetables
6 Bananas
7 Citrus fruits
8 Other fruits
9 Vegetable oil
10 Cacao
11 Coffee
12 Tea
13 Cotton
14 Other non-food products
15 Rubber
16 Other feeds
17 Beef
18 Mutton
19 Pork
20 Poultry
21 Dairy products
22 Eggs

Aggregation of these products as compared to the FAO list is carried out using IIASA aggregating coefficients, but FAO measurements and units are otherwise retained. Two types of prices are taken into consideration in the model: domestic and international prices. Domestic prices are expressed in roubles, and for the other CMEA countries the rouble price is calculated on the basis of a weighted average of prices valid in the respective countries, using the CMEA exchange rates published in Hungary. The prices used in *AT 2000* were taken to be world market prices; in the course of the calculations neither domestic nor international prices are modified.

The model is based on data available from the FAO, but we also made use of CMEA Yearbooks, statistical yearbooks of the countries in question, and other analyses and statistical abstracts prepared on the agriculture of the CMEA countries. The model itself, i.e. its parts relating to the Soviet Union and to the smaller CMEA countries, is equally divided into four blocks.

6.2 Modeling of Government Economic Management and Major Policy Objectives

As mentioned above, the major government objectives are taken into consideration in an exogenous manner within the model. The first block of the model serves to determine these economic-political tasks. Within this scope, the following are assessed:

(i) targets for the general development of the economy,
(ii) estimated provisions for consumption,
(iii) required stockpiling, and
(iv) planned investments.

When assessing the overall objectives of economic policy, we determine the extent of the planned national income and consumption, as well as of the total investment required for a given period according to economic development, i.e. by the required rate of growth of consumption indicated in advance, as follows:

$PNIC_t = NIC_{t-1}(1 + a_1)$ (planned national income)
$PCONS_t = CONS_{t-1}(1 + a_2)$ (planned personal consumption)
$PINV_t = PNIC_t - PCONS_t$ (planned investments)

where

$PNIC_t$ = planned national income for period t,
NIC_{t-1} = actual national income in period $t-1$,
$PCONS_t$ = planned consumption in period t,
$CONS_{t-1}$ = actual consumption in period $t-1$,
$PINV_t$ = planned investments in period t.

With respect to foodstuffs, FAO forecasts are used as target figures for consumption in the model. In another version of the model, however, the probable development of consumption is projected by means of trend functions. Using these targets we calculate the expected consumption of non-agricultural products as a residual value subtracted from the total consumption. The required extent of stockpiling is fixed at a certain percentage of total consumption, which varies according to the type of product, and can also be varied in the course of the computations.

The expected total investment is calculated by applying the exogenous (a_3) parameter, which expresses the share of agriculture within all investments as follows:

$PINVA_t = a_3 PINV_t$ (planned agricultural investments)
$PINVN_t = PINV_t - PINVA_t$ (planned investment in other sectors of the economy)

where

$PINVA_t$ = planned investment in agriculture in period t, and
$PINVN_t$ = planned investment in the rest of the economy in period t.

6.3 The Production Model

The production model block follows the methodology of the simplified IIASA model system, using a nonlinear programming model, where linear constraints are applied with a nonlinear objective function. Most of the model parameters are estimated statistically and appear as Greek characters, while certain other parameters assessed on the basis of expert estimates or of calculation appear in Roman type. For further details on the methodology used in constructing the nonlinear production model, see Fischer and Frohberg (1980).

The allocation model can be written for any year t as follows:

$$\max \sum_{i=1}^{13} p_{it} Y_{it} - \sum_{i=11,13} \sum_{j=1,13} a_{ij} p^x_{jt} Y_{it}$$

so that

$$Y_i = \alpha_i(t) K_{it}^{\beta_i} L_{it}^{\gamma_i} F_{it}^{\delta_i} \qquad (i = 1, \ldots, 10)$$

$$Y_i = \alpha_i(t) K_{it}^{\beta_i} L_{it}^{\gamma_i} \qquad (i = 11, \ldots, 13)$$

$$\alpha_i(t) = \beta_{1i}/[1 + e^{-\beta_{2i}(t-1964)}]$$

$$Y_{it} \geqslant YLB_{it} \qquad (i = 1, \ldots, 13)$$

$$Y_{it} \geqslant YUB_{it} \qquad (i = 1, \ldots, 13)$$

$$\sum_{i=1}^{13} K_{it} \leqslant TK_t$$

$$\sum_{i=1}^{13} L_{it} \leqslant TL_t$$

$$\sum_{i=1}^{10} F_{it} \leqslant TL_t$$

where i refers to:

(1) Wheat
(2) Rice
(3) Other grains
(4) Oilseeds
(5) Sugar, raw
(6) Vegetables, roots
(7) Fruits
(8) Tea
(9) Seed cotton
(10) Other non-food products
(11) Bovine production [(in protein) = 0.147 X meat + 0.035 X milk]
(12) Pork
(13) Poultry and eggs (in protein)

Description of variables:

Y_{it} = net production of commodity i in year t (gross production minus seed use and wastage; beef and lamb products and milk are aggregated by using their respective protein contents).
TK_t = capital stock in agriculture in year t.
TL_t = agricultural labor force in year t.
TF_t = fertilizer (nitrogen) input in year t net of the quantity used for roughage production.
K_{it} = capital employed in the production of commodity i in year t.
L_{it} = labor employed in the production of commodity i in year t.
F_{it} = fertilizer applied to crop i in year t.
p_{it} = expected price of commodity i in year t.

The feed requirement coefficients are derived using an algorithm that tries to allocate the given total feed consumption figures based on known physiological requirements. The algorithm works by first trying to meet the requirements of pigs and poultry, and then treating bovine animals as a residual.

Based on the FAO time series, three sets of parameters of the production block are estimated. Appendix A compares actual and estimated data, using the third set of parameters in the model. Various other statistical methods are also used to test the validity of the parameters. The lower bounds of certain products in the module, as minimum production requirements expressing a required rate of self-sufficiency, can be given in advance. As can be seen from the list of commodities, only those that can be produced in the CMEA countries in question appear in the production module: milk and eggs do not count as independent products, since they are assessed after the solution of the model as by-products of beef and poultry production, respectively.

Three major production factors are taken into consideration: the available capital, labor, and fertilizers. In the course of model formulation and specification, the greatest problems occur in the assessment of capital stock, since accounting practices in the CMEA differ from those in the West and are not uniform; in several countries such data are not published at all. Finally, for these countries it was decided to express the value of invested capital by the value of fixed assets, since we were able to obtain concrete information about the latter. The assessment of the pool of fixed assets for a given year, taking investments and depreciation into consideration, is carried out as follows:

$$CSA_t = CSA_{t-1} + \frac{INVA_{t-1} + DEPA_{t-1}}{p_{nt}} = DEPA_{t-1} \text{ (agriculture)}$$

$$CSN_t = CSN_{t-1} + \frac{INVN_{t-1} + DEPN_{t-1}}{p_{nt}} = DEPN_{t-1} \text{ (other sectors of the economy)}$$

where

CSA_t = capital stock in agriculture in period t.
CSN_t = capital stock in the rest of the economy in period t.
$DEPA_{t-1}$ = depreciation in agriculture in period $t-1$.
$DEPN_{t-1}$ = depreciation in the rest of the economy in period $t-1$.
p_{nt} = price of investment goods.

Different values can also be indicated as depreciation rates.

With respect to the available labor force and the growth of the total population, we accept the projections of the FAO in *AT 2000* as a starting point. As alternative possibilities, however, other demographic forecasts or even a submodel describing this area can be considered.

The available quantity of fertilizers can be handled in two ways. It is possible to take levels given exogenously into consideration, or the model can be run using the following function:

$$FERT_t = FERT_{70} 1.001 \left(\frac{CSA_t}{CSA_{70}} \right)^{1.369}$$

where

$FERT_t$ = fertilizer availability in period t.

Non-agricultural production is taken into consideration as an aggregated activity, and the aggregation is performed according to the rules of the IIASA Agricultural Model. In this respect, there are again two possible solutions that could be applied to the model: one is the representation of the non-agricultural sector by a Cobb–Douglas production function, determined as explained in Fischer and Frohberg (1980):

$$Y_t^{NA} = \theta_t (K_t^{NA})^{\theta t} (L_t^{NA})^{1-\theta t} + u_{Nt}$$

where

Y_t^{NA} = non-agricultural production in year t.

K_t^{NA} = capital stock in the non-agricultural sector in year t.

L_t^{NA} = labor force in the non-agricultural sector in year t.

u_{Nt} = error term, identically and independently distributed.

θ_t = time variable; t = year minus 1965.

We can, however, also apply trends fixed in advance concerning the development of non-agricultural production, or the coefficients of these trends can even be discretionally modified.

6.4 The Consumption and Trade Block

A very important part of the model is designed to compare supply and demand, as well as to create equilibrium within the system and with external conditions. On the basis of results supplied by the production block, we assess first of all the quantity of feed and other intermediate inputs and of industrial utilization. The determination of feed inputs is performed by a matrix including preliminarily fixed coefficients of feed usage, and these are assessed statistically. In the basic version of the model, computations are performed with fixed coefficients of feeds used for the entire time horizon modeled. It is also possible to take certain increases or reductions of these coefficients into account. With respect to other uses such as seed wastage or industrial use, we apply coefficients used in *AT 2000*. After the subtraction of the above, we obtain the net production, i.e. the quantity of produce that in a given year will cover stockpiling, personal consumption, investments, and foreign trade. This solution renders the establishment of domestic equilibrium possible, without the modification of domestic prices. We assume that all those demands that do not belong to the category of inputs separable from production can be modified according to the actual conditions of a given economic year.

These so-called non-committed demands can be adjusted further. The non-committed demand for a specific commodity consists of various elements; therefore, let q_{ih} express the hth type of demand for commodity i. To reach a solution, first we define a target level of the hth demand of commodity i ($q_{ih}^{(t)}$) and introduce a vector λ that indicates the extent to which the target ($q_{ih}^{(t)}$) is realized. Obviously the realization levels are constrained between two bounds:

$$\lambda^* \leqslant \lambda \leqslant \lambda^{**}$$

Let us assume that

y = vector of supply after the deduction of committed expenditures;
p_i^W = world market price of commodity i;
k = preliminary fixed balance of foreign trade.

The solution of this module is equal to the determination of such values of λ that satisfy

$$p^W Q\lambda = p^W y = k$$

and

$$\lambda^* \leqslant \lambda \leqslant \lambda^{**}$$

where Q is a matrix of non-committed demands.

During the solution procedure a strict preference ordering of various types of demands is followed. In case of changes in world market prices, a new λ vector has to be calculated. If no solution can be obtained, λ^* and λ^{**} have to be adjusted so that a solution can be reached; the calculation of λ is easily programmed. It is worthwhile to consider 1 as an initial value of λ_i. It is obvious that, when the target is realized, $\lambda_i = 1$ and that $\lambda_i^* < 1$ and $\lambda_i^{**} > 1$ throughout.

As the above description shows, a basic assumption in the model is that a balance of trade equilibrium has to be maintained. Deficit or surplus can only be given exogenously (k). One should also remember this assumption when analyzing model results.

After the elaboration of final consumption figures for a given year, calculations concerning the financial results of the year may be made. First of all, the development of the national income is assessed as follows:

$$NICA_t = \Sigma_i \, YN_{t,i} p_{it} \quad \text{(national income from agriculture)}$$

$$NICN_t = YN_{t,n} p_{nt} \quad \text{(national income from other sectors of economy)}$$

$$NIC_t = NICA_t + NICN_t \quad \text{(total national income)}$$

$$a_1 = \frac{NIC_t - NIC_{t-1}}{NIC_{t-1}} \quad \text{(growth of national income)}$$

Summarizing with respect to the value of personal incomes,

$$CON_t = \Sigma_i TC_{s,i} p_{it} + TC_{t,n} p_{nt} \quad \text{(value of private consumption)}$$

The development of the gross national income:

$$GNPA_t = NICA_t + DEPA_t \quad \text{(gross national income from agriculture)}$$
$$GNPN_t = NICN_t + DEPN_t \quad \text{(gross national income from the rest of the economy)}$$
$$GNP_t = GNPA_t + GNPN_t \quad \text{(total gross national income)}$$

The calculation of total depreciation:

$$DEPA_t = BETA1.\ CSA_t \quad \text{(depreciation in agriculture)}$$
$$DEPN_t = BETA2.\ CSN_t \quad \text{(depreciation in the rest of the economy)}$$

where $BETA1$ and $BETA2$ are depreciation coefficients.

The balance of foreign trade activities for various products:

$$ZNEX_{t,i} = YSN_{t,i} - CINT_{t,i} - TC_{t,i} - S_{t,i} \quad \text{(agricultural products)}$$
$$ZNEX_{t,n} = YSN_t - TC_t - S_{t,n} - INVN_t - INVA_t \quad \text{(industrial products)}$$

6.4.1 Revision of Basic Policy Parameters

After completing the calculations for the year, corresponding to the descriptive character of the model, a revision of the basic economic objectives can be made. The objective of the system should be the maintenance of the exogenously fixed parameters of national income growth; therefore, based on an analysis of the actual performance of the system for the year, the parameters used to determine the fundamental objectives can be modified.

The first part of checking starts from the calculation of the actual growth rate of national income, and if this falls outside the limits of required growth, then the accumulation, the scale, or the required growth rate of consumption may be modified. If the increase is more rapid than required, then we envisage increased consumption and, if national income growth is slower than required, we reduce the growth of consumption. The course of the adjustment is as follows.

$$SA2 = \frac{NIC_t}{NIC_{t-1}} - 1$$

(1) If $SA2_{\min} \leqslant SA2 \leqslant SA2_{\max}$, no change in $A2$

$$A2_{t+1} = A2_t$$

(2) If $SA2 > SA2_{\max}$, increase $A2$

$$A2_{t+1} = A2_t + 0.5(SA2 - SA2_{\max})$$
$$A2_{t+1} = \min(A2_{t+1}, A2_{\max})$$

(3) If $SA2 < SA2_{\min}$, decrease $A2$

$$A2_{t+1} = A2_t - 0.5(SA2_{\min} - SA2)$$

$$A2_{t+1} = \max(A2_{t+1}, A3_{\min})$$

where $A2$ is the desired growth rate of consumption (a_2 in Section 6.2).

The other sphere of modifications is dependent on the growth of agriculture: if this is more rapid than required, we reduce the agricultural share of total investments, while if the rate is slower than required, we increase the rate of agricultural investments, i.e.

(1) If $SA3_{\min} \leqslant SA3 \leqslant SA3_{\max}$, no change in $A3$

$$A3_{t+1} = A3_t$$

(2) If $SA3 > SA3_{\max}$, decrease $A3$

$$A3_{t+1} = A3_t - 0.5(SA3 - SA3_{\max})$$

$$A3_{t+1} = \max(A3_{t+1}, A3_{\min})$$

(3) If $SA3 < SA3_{\min}$, increase $A3$

$$A3_{t+1} = A3_t + 0.5(SA3_{\min} - SA3)$$

$$A3_{t+1} = \min(A3_{t+1}, A3_{\max})$$

where $SA3$ is the actual growth rate of agriculture and $A3$ is the desired agricultural share of total investments (a_3 in Section 6.2).

6.5 Scenarios Computed by the CMEA Agricultural Model

To forecast the future development of agriculture in the CMEA countries, two basic scenarios have been calculated by the model, which are consistent with the assumptions used in *AT 2000*. As with other developed countries, we assume moderate rates of economic growth (growth rates of the FAO Normative Medium Scenario). Using this basic assumption, the two scenarios are as follows.

(1) *Constant-SSR Scenario*, where SSRs (self-sufficiency ratios) of 1975 are used as minimum requirements in the production modules.
(2) *Free Trade Scenario*, where most of the restrictions on the SSRs are removed, and we assume that production develops according to our production model, whose coefficients are estimated on the basis of a time series.

These scenarios are directly comparable with other *AT 2000* projections and serve as a basic source of information for our projections. These basic versions are based on FAO projections for population growth and consumer demands. As far as the agricultural labor force is concerned, the original FAO forecasts have been modified; in the case of the USSR we assume that a smaller labor force will migrate from agriculture than that indicated in the FAO forecast. In contrast, in the case of the smaller CMEA countries, we postulate

that migration from agriculture will exceed the FAO level. Agricultural investments are estimated at 20% of the total in the USSR and 13.5% in the smaller CMEA countries (Appendix B contains the initial data used to compute the two basic scenarios).

Several other model versions have been computed to delimit the spectrum of likely production possibilities, and to point out some of the policy problems and options that governments might face. Starting from the two basic scenarios, several other model versions have been computed, mainly running the Soviet Union and the smaller CMEA country submodels separately (a list of model variants computed by the USSR and smaller CMEA submodels is presented in Appendix C). The main questions investigated were:

(i) What influence is exerted by the migration from agriculture on the development potential of agriculture? What would be the effects of a labor migration level greater or smaller than the FAO forecast on the expected development of production?
(ii) How is agricultural production influenced by higher or lower levels of investment than that considered in the basic version?
(iii) What is the potential impact of alternative feeding efficiencies on total agricultural output and projected exports and imports?
(iv) Several computations were performed to determine the influence exerted by overall economic development on agriculture by modifying those coefficients that express the required overall rate of development.
(v) Several computations were performed to demonstrate the effects of foreign trade by modifying the requirements regarding the level of self-sufficiency – in certain versions all constraints were completely removed.
(vi) A special series of computations was performed to demonstrate the effect of the balance of payments on agricultural development. Other computations were also carried out assuming (*a*) further drawing on credits, and (*b*) credit repayment obligations.

7 PROJECTED AGRICULTURAL DEVELOPMENT – RESULTS OF THE COMPUTATIONS

The basic scenarios and the 39 additional model runs have enabled a relatively detailed assessment to be made of the future course of agricultural production in the CMEA countries. Obviously, an analysis of future trends can be performed in several ways, under many aspects, and at various depths. We present in this section only the most important conclusions and findings, but add that the results may, of course, form the basis of still further investigations. Appendix D presents the two basic scenarios in detail, and shows that our model produces realistic forecasts in an aggregated manner. The real interrelations of the CMEA countries are reflected by the model parameters and structure (the results of scenarios computed by the submodels of the smaller CMEA countries and the USSR are listed in Appendixes E and F).

7.1 Future Agricultural Development in the CMEA Countries

The two basic scenarios and related calculations give reliable information on the possible lower and upper ranges of production. First of all, it is necessary to point out that the future course of agricultural development in CMEA countries will depend largely on national situations. Efforts to satisfy growing consumer demands for food and to maintain or increase levels of self-sufficiency will be the main driving forces of future development, but of course, changes in world market conditions might also have some influence. High world market prices might represent an additional reason for conserving foreign exchange by restricting imports and utilizing export potential in a surplus situation. Low international prices first have an influence on exporting countries, which might then restrain agricultural development and invest more in other areas. However, the CMEA countries' reactions to world market changes are much more moderate and lag behind those of other developed countries.

Our two basic scenarios are similar as far as the projected growth of agricultural production is concerned (2–3% per annum), in contrast to the relatively moderate overall growth of the economy. Agricultural production is expected to exceed domestic demand, parallel to the increase in the SSRs of the major agricultural commodities. This development reflects the fact that substantial production reserves exist in the area, especially in the USSR. In our opinion, the significant investment allotted to agriculture in recent years will bear fruit in the future, and a moderate food surplus can be forecast by the end of the century.

Domestic food demands are forecast according to FAO projections in our scenarios. On the whole, the CMEA region can expect a relatively moderate growth of both domestic food demand and consumption. Regarding the total calorie consumption, each CMEA country has already reached a daily intake level of 3000 calories per capita, and further increases are not desirable, although the details of consumption will change. Government planners use accepted norms of optimal diet to plan the growth of consumption, but in addition to rising personal incomes, the dynamics of food consumption are significantly influenced by supply. In the future, structural changes in food consumption will be determined by the fast-growing demand for meat and meat products, as well as for fruit and vegetables.

The projected growth of agriculture assumes that the present level of investment will be maintained, and that some of this will be used to provide more modern equipment and other resources to improve production. In the smaller CMEA countries, this will be about 13.5% of total investment, or maybe even higher. Model runs also indicate that, due to consumer pressures and the need for foreign exchange, lower levels of investment are not very likely. The results also demonstrate that, by increasing agricultural investment, governments can significantly increase output.

In the USSR, on the other hand, agricultural investments will probably fall below the present level, but this is already relatively high at about 20% of the total, and is greater than the contribution of agriculture to the total national income. However, an agricultural share of less than 15% would seriously threaten the realization of the main government objectives. Substantial investment must also continue to reduce fluctuations of yields and the unfavorable impact of weather conditions. On the whole, agriculture has to remain at the top of the government list of priorities.

The availability of labor will still remain a very important factor in agricultural development in the region. Migration from agriculture to industry and other sectors of the economy will undoubtedly continue, and this may limit production growth, especially that of labor-intensive products. The FAO predicts an agricultural labor force in the USSR of 7.5% of the total working population in the year 2000, and of 15% in the smaller CMEA countries. However, considering several possible levels of out-migration, and comparisons with other developed countries, our calculations indicate that the labor force will be larger in the USSR, and smaller in the other CMEA countries than these FAO projections. We therefore anticipate an overall agricultural labor force of 10% of the total working population in 2000, and this figure is used in the basic scenarios.

7.2 Constant-SSR Scenario

This scenario was designed to correspond to the *AT 2000* Constant-SSR Scenario. The actual SSRs of the Soviet Union and the smaller CMEA countries in 1975 were considered in both submodels as minimum requirements. It should be mentioned that, in *AT 2000* projections, "constant" is taken to mean "unchanged" and not a minimum requirement. However, for policy analysis reasons our interpretation is probably more realistic, but in any case it is acceptable. In analyzing the results presented in Table 28

TABLE 28 Agricultural output and SSRs of the CMEA countries, Constant-SSR Scenario.

	1975		1990		2000	
	Total output	SSR	Total output	SSR	Total output	SSR
Total cereals*	254,369	0.93	390,056	0.98	437,650	0.99
Wheat*	108,868	0.93	151,725	0.98	166,508	1.00
Rice*	2135	0.75	3837	0.79	5182	0.80
Coarse grain*	143,366	0.92	234,494	0.97	265,959	0.99
Total meat*	22,945	1.11	33,830	1.38	37,595	1.32
Beef and veal*	8551	0.99	13,604	1.35	14,744	1.32
Mutton and lamb*	1159	1.02	1845	1.49	1991	1.43
Pork*	10,564	1.25	14,357	1.49	15,816	1.42
Poultry*	2671	1.07	4024	1.12	5042	1.04
Milk and milk products***	129,507	1.00	203,398	1.13	221,520	1.14
Sugar*	11,798	0.75	16,109	0.88	19,268	0.95
Vegetable oil*	4937	1.11	6258	1.05	7361	1.06
Citrus fruit**	135	0.11	135	0.08	135	0.06
Other fruit**	26,753	1.09	41,032	1.25	45,598	1.16
Vegetables**	17,847	0.99	24,069	1.01	26,740	1.02
Cotton*	7662	1.00	11,021	1.20	12,105	1.20
Other non-food products**	1135	0.90	2139	1.40	3104	1.74
All commodities**	138,890	1.00	205,560	1.10	230,409	1.11
Total trade**	7491	5.4	22,249	10.8	23,196	10.1

*10^3t.
**In US$ million (1972).
***In milk equivalent.

one should remember that upper bounds are not given in the model, so that production growth above minimum requirements is allowed. Thus agricultural growth almost follows the trends of the Free Trade Scenario and is substantially higher than the original *AT 2000* projection (see Figure 3).

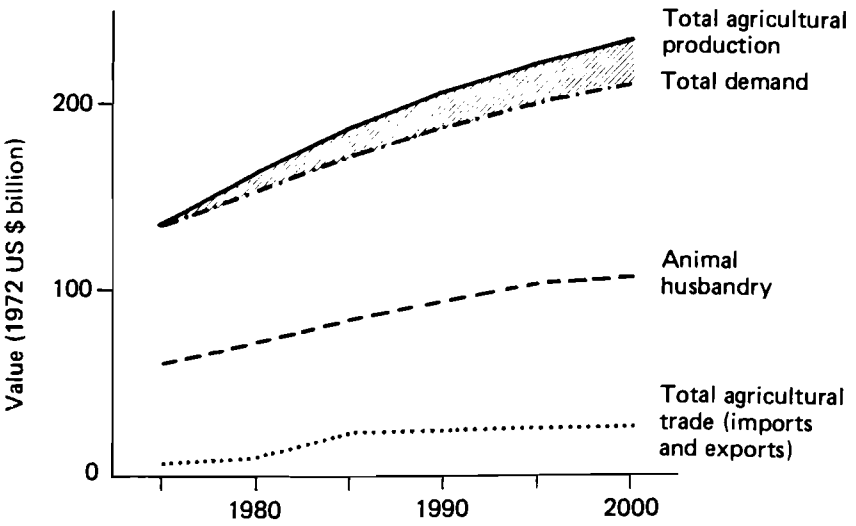

FIGURE 3 General indicators of the Constant-SSR Scenario.

The scenario also demonstrates the considerable agricultural potential of the region. As one can see from Table 29, the production of various commodities at least parallels or even exceeds demand; SSRs therefore remain stable or show a continuous increase up to 2000. On the whole, the overall food SSR increases. This scenario reflects the realization of existing long-range policy objectives in the CMEA countries aiming at self-sufficiency in food. The projected food SSR for 2000 is 1.01; practically all cereals are produced domestically, and the substantial wheat surplus allows an increase in meat production above the projected, relatively moderate level.

In line with past trends, growth of animal husbandry is faster than that of arable farming. The substantial meat surplus will probably be consumed domestically, since the projected 66 kg per capita consumption leaves enough room for further increases, and there is no question that demand will rise. If we assume that the future demand for and consumption of meat will be higher than the FAO estimates, then obviously we must also assume that the projected SSR for meat will not be around 1.4, but much less, probably somewhere close to 1.0–1.1. The projected grain output of 437×10^6 t appears to be realistic, and is expected to grow continuously, until the present grain deficit disappears.

The volume of agricultural trade (see Figure 3) grows at a faster rate than production, but remains relatively low (10% of output). An SSR of around 1.0 for meat should reduce this level even further. Apart from tropical fruits, coffee, and citrus fruits, the

TABLE 29 Agricultural output and SSRs of the CMEA countries, Free Trade Scenario.

	1975		1990		2000	
	Total output	SSR	Total output	SSR	Total output	SSR
Total cereals*	254,369	0.93	378,740	0.93	420,710	0.93
Wheat*	108,868	0.93	147,969	0.95	158,439	0.94
Rice*	2135	0.75	1722	0.36	955	0.15
Coarse grain*	143,366	0.92	229,049	0.93	261,316	0.94
Total meat*	22,945	1.11	35,043	1.42	39,998	1.40
Beef and veal*	8551	0.99	14,002	1.39	15,581	1.39
Mutton and lamb*	1159	1.02	1895	1.53	2097	1.17
Pork*	10,564	1.25	14,974	1.55	17,024	1.52
Poultry meat*	2671	1.07	4173	1.16	5295	1.09
Milk and milk products***	129,507	1.00	209,886	1.15	235,007	1.17
Sugar*	11,798	0.75	14,710	0.80	16,968	0.84
Vegetable oil*	4937	1.11	5834	0.99	6636	0.96
Citrus fruit**	135	0.11	135	0.08	135	0.06
Other fruit**	26,753	1.09	40,074	1.22	44,978	1.12
Vegetables**	17,847	0.99	22,413	0.94	23,455	0.89
Cotton*	7662	1.00	15,437	1.68	20,680	2.06
Other non-food products**	1135	0.90	2247	1.47	3374	1.89
All commodities**	138,890	1.00	206,124	1.10	232,410	1.10
Total trade**	7491	5.4	30,794	14.9	41,592	17.9

*10^3 t.
**In US$ million (1972).
***In milk equivalent.

SSRs for rice, sugar, and tea are considerably lower than 1. On the other hand, temperate fruits, cotton, and most meat products have SSRs considerably higher than 1.

7.3 Free Trade Scenario

This scenario reflects a less constrained production development than that of the Constant-SSR Scenario. Constraints on minimum levels of producing various commodities have been removed, and the structural changes and developments are limited only by available resources.

As Figure 4 shows, overall agricultural growth is somewhat higher in this case, but the basic patterns of development are the same as those of the Constant-SSR Scenario (see Table 29). Without restricting the SSRs of commodities, the rate of animal husbandry will be higher than in the Constant-SSR Scenario (the SSR of meat is 1.40). A higher meat consumption level than FAO estimates is a strong possibility, similar to the Constant-SSR Scenario, with the development of animal husbandry based partly on imported feeds. The Free Trade Scenario, which allows restricted agricultural development, obviously leads to the rapid growth of agricultural trade, and explores trade potential to a greater extent than the Constant-SSR Scenario. Trade potential has great importance for *AT 2000*, even if we know that it cannot be fully realized.

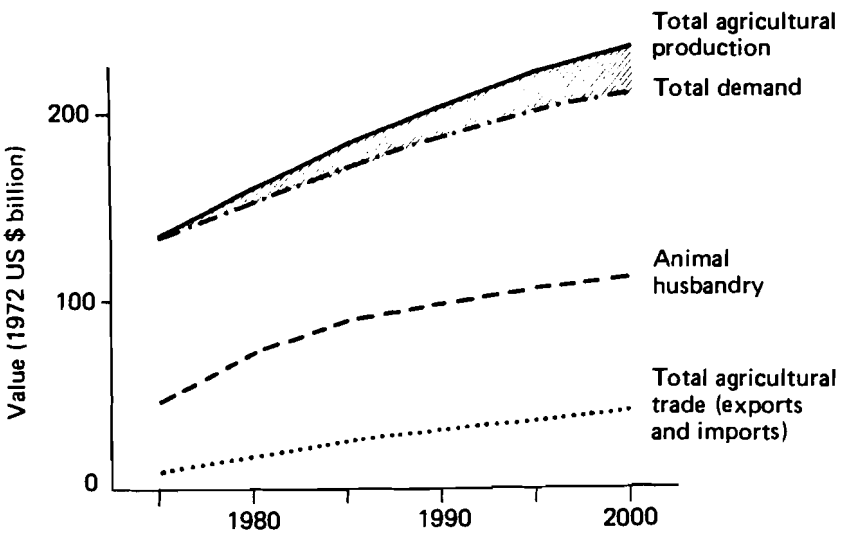

FIGURE 4 General indicators of the Free Trade Scenario.

The fastest growing area of agriculture in this scenario is animal husbandry. Production growth rates lead to substantial increases in the SSRs of animal products, generally to levels greatly in excess of domestic needs as identified by FAO demand projections. The meat surplus seems to be substantial, even if consumption above the projected level is expected. Meat production is partly based on imported feeds, so that by reducing the meat surplus, grain self-sufficiency could be achieved.

In addition to animal products, a surplus can be expected for cotton, other non-food, and other fruit products. The SSR increases especially for cotton production. On the import side, rice is most important (SSR only 0.15), and there are also deficits in sugar, vegetables, vegetable oil, and tea; obviously, tropical and Mediterranean produce must be imported.

In the Free Trade Scenario the agricultural trade of the area shows a significant increase. In 2000, agricultural trade (exports and imports) amounts to 17.9% of output, which is a rather unrealistic figure. First of all, it reflects the influence of high meat SSRs due to low consumption levels, and, obviously, the realization of the trade potential depends largely on the extent of trade restrictions in other countries (such as meat import restrictions in the EC).

7.4 Future Trends in Cereal Production

The grain sector, especially feed grains, is the main obstacle to agricultural develop- in the CMEA countries at present. The failure to raise grain output for meat sufficiently to meet increasing consumer demand, together with a relatively low level of livestock feed conversion rates, have resulted in an overall negative grain balance.

The main reason for excessive feed consumption is the physiologically unbalanced composition of animal feed, particularly a lack of digestible protein. Significant losses of

nutrients and vitamins, caused by the generally low level of harvesting and feeding techniques, and especially because of inadequate storage facilities, exert a negative influence on feeding efficiency. According to OECD estimates, an increase in the digestible protein content of 1 kg of feed from the present 85–86 g to 105–110 g could in itself be sufficient to improve the feed conversion ratio by 25–30%, which could save about 20–25 X 10^6 t of grain per year in the Soviet Union alone.

The CMEA region has the potential to be self-sufficient in grain, and the importance placed on an increase in meat production will ensure that the investments required to improve livestock feeding efficiency will also be forthcoming. Our scenarios forecast that 420–430 X 10^6 t of grain will be produced annually by the year 2000, and it is likely that actual development will follow the line of the Constant-SSR Scenario (see Figure 5). Grain needs will therefore be satisfied by domestic production, as will the feed requirements necessary to produce enough meat to reach the projected levels of consumption and/or exports,

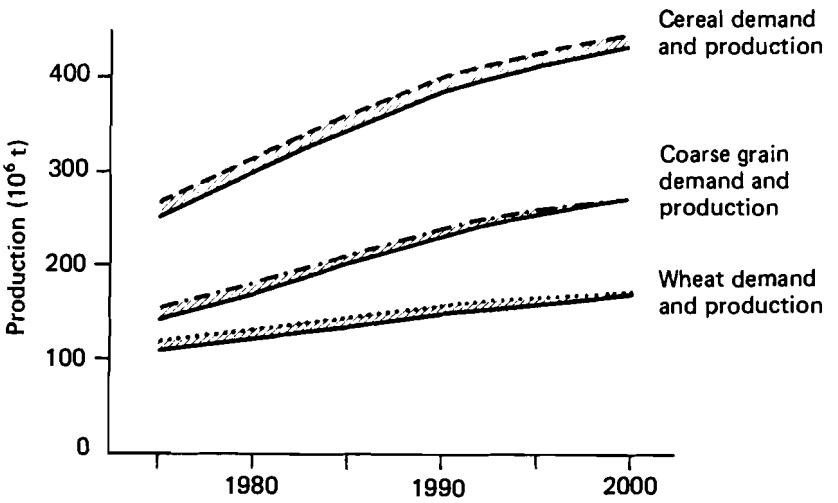

FIGURE 5 Cereal production in the Constant-SSR Scenario.

so that the area might once more become a net exporter of limited quantities of grain. But we should mention that, given the apparently low capital productivity in agriculture, it is highly unlikely that most of the CMEA countries, especially the USSR, will put more capital into agriculture than is necessary to gain full SSR in cereals. Substantial grain imports, as in the Free Trade Scenario (see Figure 6) to produce enough meat for export, are not likely to happen, except under very favorable market conditions, or if investment levels fall well below expectations.

In our classification, protein feeds do not appear as a separate commodity. The CMEA area has a deficit in this respect, and the relatively low feed conversion rates are partly the cause of this. Therefore, even though the computed results do not show it, increasing demand can be expected for protein feeds. Although the projected growth of vegetable oil production will meet consumer needs, and some surplus might occur,

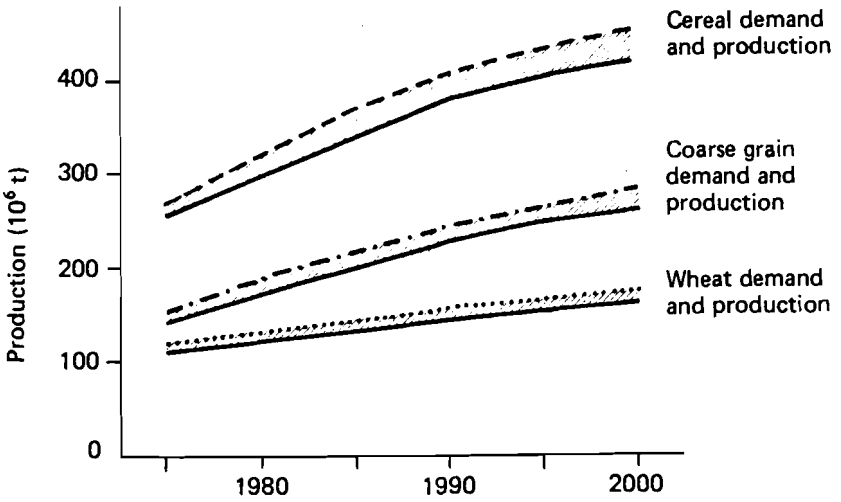

FIGURE 6 Cereal production in the Free Trade Scenario.

considering the production potential and given natural conditions, the deficit in protein feeds is not likely to disappear until 2000.

As far as cereals are concerned, rice has the lowest projected SSR; in the Free Trade Scenario, it drops continuously, so that most of the domestic requirement is imported. When irrigation projects and climatic conditions in Soviet Central Asia are taken into account, the actual trends will probably be closer to the Constant-SSR Scenario, where the rice SSR is about 0.80. The forecast of 10^6 t of imported rice is likely to be realistic.

7.5 Development of Animal Husbandry

Meat production and animal husbandry will be the fastest growing sector of CMEA agriculture in the future, and both scenarios, as well as the related calculations, project considerable growth. The existing meat surplus (SSR = 1.11 in 1975) is associated with a moderate level of consumption. The need for foreign exchange in these countries encourages meat exports and limits imports and domestic supply (projections for meat production and consumption can be seen in Figure 7).

The production of sufficient meat to satisfy the increasing domestic demand is the focus of current agricultural policy, which also assumes the domestic production of all animal feeds. One of the most important constraints on future meat supply will be the growth of domestic feed production.

(1) Meat production along the lines of the relatively moderate FAO demand projections seems to be the lower bound of technical feasibility. In the event of shortages of animal feed, large imports of grain can be expected, rather than significant meat imports.

(2) If grain production develops favorably, it will at first result in an increase in domestic meat consumption and only in the event of further improvements in the harvests can meat exports be considered probable.

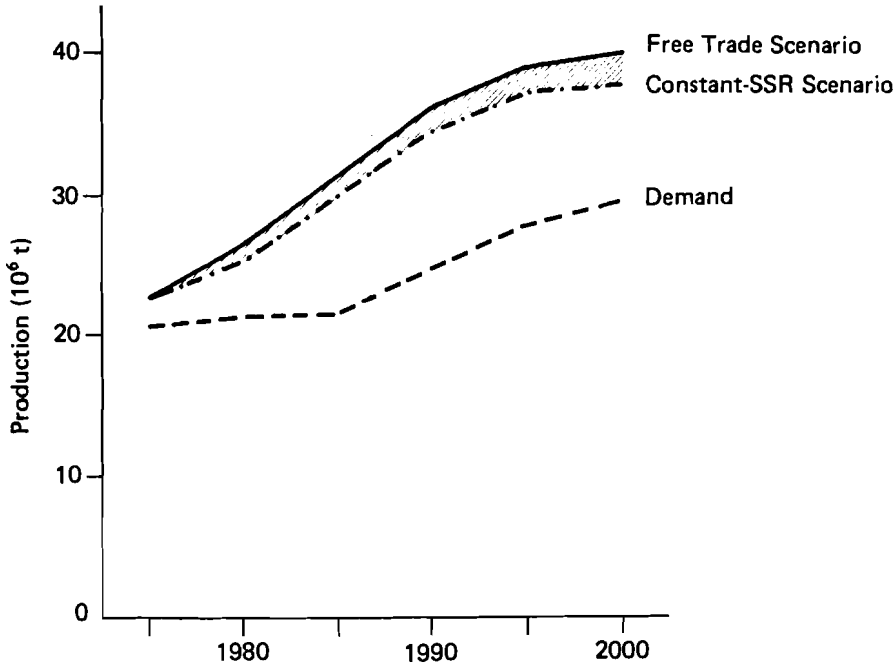

FIGURE 7 Projected meat demand in the CMEA countries.

(3) An improvement in feeding efficiencies can be expected, and if it is accomplished, it will advantageously influence the overall meat production potential.

Together with feed availability, the development of animal husbandry depends on further capital inputs and investments, as well as the availability of adequate labor in the agricultural sector.

Our computations clearly demonstrate that meat production is very sensitive to the level of agricultural investment; any reduction in the level will make itself felt first in meat production. This is not very surprising and leads to the conclusion that the realization of a meat surplus projected by our two scenarios is doubtful from the point of view of present investment trends.

The availability of labor is a very important factor in production growth, particularly in animal husbandry. Calculated results, even the comparison of the two basic scenarios, indicate that there is serious competition between the labor-extensive and labor-intensive branches of agriculture, and labor may become a major limiting factor during the second half of the projected period. Higher out-migration than is projected in the basic scenarios may result in a reduction in cattle and pig husbandry, as well as in fruit production, in turn leading to a grain surplus and a further increase in poultry production.

On the whole, the 40 X 10^6 t of meat in 2000 shown in the Free Trade Scenario is almost certainly the upper limit of technically feasible production development. Actual growth is at best more likely to follow the Constant-SSR Scenario and is expected to be around 33–36 X 10^6 t. Substantial surpluses of meat will probably not appear on

international markets. Exports can be expected from the smaller CMEA countries, but not exceeding $4-5 \times 10^6$ t, which is double the present quantity exported.

The internal structure of meat production is not likely to change markedly. Growth will be fastest in poultry, but beef, mutton, and lamb production have similar rates of increase. Pork production will increase at a somewhat lower rate. SSRs will increase in each case, except for poultry, where demand growth will exceed the growth in production.

7.6 Other Commodities

A moderate increase in the sugar SSR is forecast in both basic scenarios, with a deficit of $1-2 \times 10^6$ t in 2000. The main source of cane sugar will probably be Cuba, which is a full member of the CMEA but is not covered in this modeling exercise.

Vegetables and vegetable oil production will probably follow domestic demands, although a slight increase in the SSR is forecast by the Constant-SSR Scenario, and the Free Trade Scenario projects a slight deficit in vegetable oils and a substantial increase in vegetable production. The area will probably be at or near the self-sufficiency level in both products, but considerable trade in these commodities cannot be expected. Substantial growth in temperate fruit production is shown in both basic scenarios, and will exceed consumption even though the increase in the latter is considerable. The exporting position of the area will remain with an increase in the surplus; this surplus will influence European markets and increase the competition, but will not be marketable without difficulties.

Almost all tropical and Mediterranean fruits are imported, although some citrus fruits and tea are produced in the USSR. The forecast consumption of these commodities is moderate, and reflects the supply situation in the past, rather than demand. The SSRs of citrus fruits (0.06) and tea (0.72) in 2000 demonstrate production potential.

According to our forecasts, a rapid increase in non-food agricultural production is expected in the CMEA area. The USSR already produces a cotton surplus, and this is expected to exceed the needs of the other CMEA countries, none of which is a producer. It is not likely that the surplus predicted by the Free Trade Scenario will actually occur, but a surplus of about $1-1.5 \times 10^6$ t seems to be realistic for 2000. Surpluses can also be expected in other non-food products such as tobacco.

7.7 Trade with Developing Countries

Concerning the products of developing countries, our projections forecast only a moderate trade potential. Obviously, there is more potential for products from developing countries in the Free Trade Scenario than in the Constant-SSR Scenario. The major imports will be sugar, rice, protein feeds, tropical and citrus fruits, coffee, and tea, in which the CMEA will not become self-sufficient in the foreseeable future. With the exception of protein feeds and sugar, imports of these commodities will be determined to a great extent by the state of the balance of payments.

As indicated, the projected consumption of tropical and citrus fruits, coffee, and tea reflects the supply situation in the past. Although the consumption of competing products is relatively high, there definitely are possibilities for further increases. Imports

of 0.7×10^6 t of bananas, 2×10^6 t of citrus fruits, 0.4×10^6 t of coffee, and 0.5×10^6 t of cocoa in 2000 projected by the two basic scenarios are likely to be the lower rather than the upper limits of imports.

Comparing per capita consumption levels of these products with those in the other developed countries, a further increase of 30–40% seems to be realistic, but the balance of payments in the CMEA will determine to what extent these demands will be satisfied. From the point of view of the developing countries, to increase the exports of the above commodities to the CMEA, a corresponding increase in imports of industrial goods from the CMEA countries should be considered. The CMEA countries offer very substantial import potential for most of the tropical and Mediterranean products on the basis of an increase of bilateral trade; otherwise the projected lower bounds seem to be more probable.

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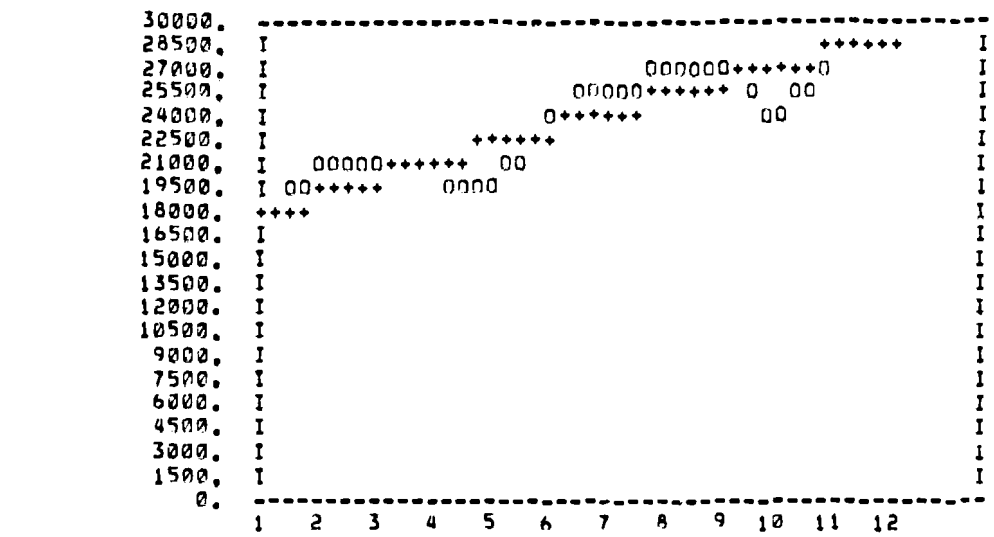
APPENDIX A Validity of the Production Modules

TABLE A.1 Validity of the production module in the East European submodel – comparison of observed and predicted production.

PLOTS FOR COMMODITY 1

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

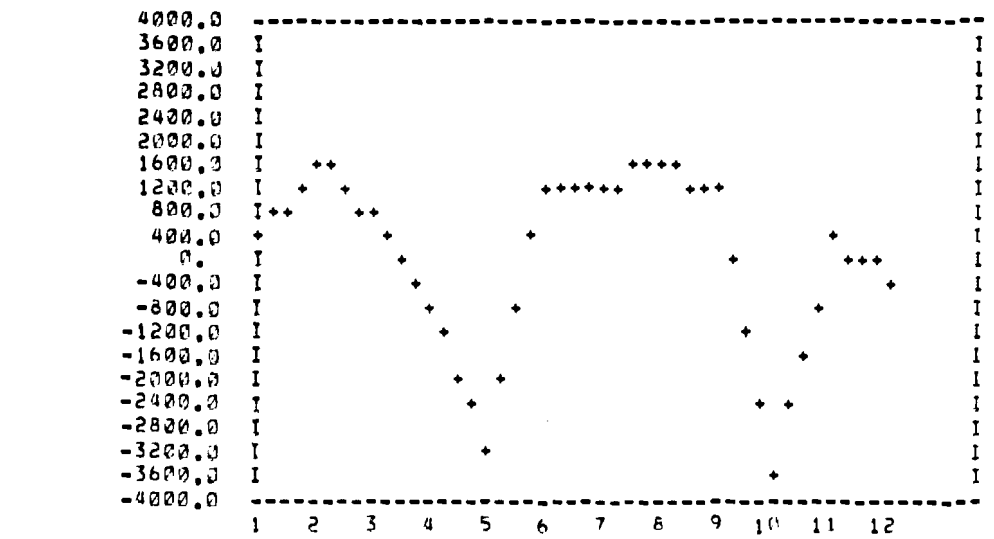


TABLE A.1 *Continued.*

PLOTS FOR COMMODITY 2

OBSERVED VS PREDICTED PRODUCTION

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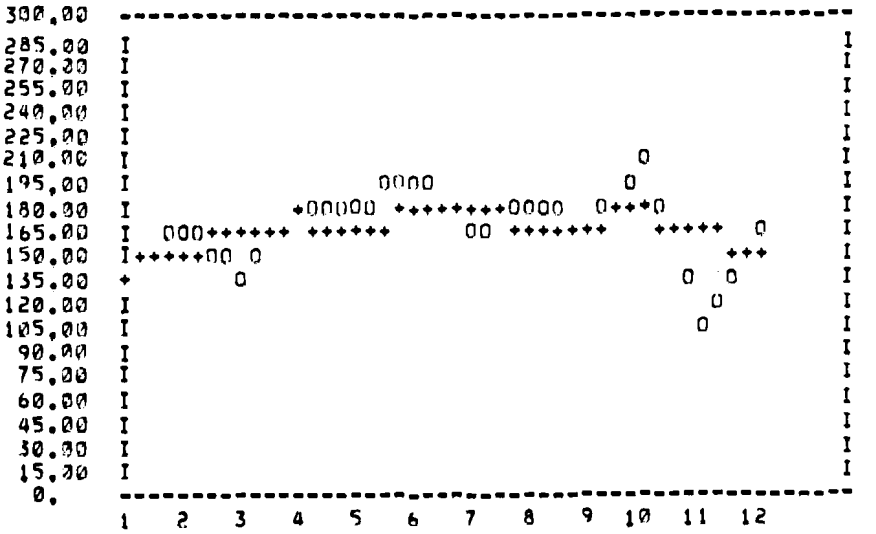

PLOT OF RESIDUALS

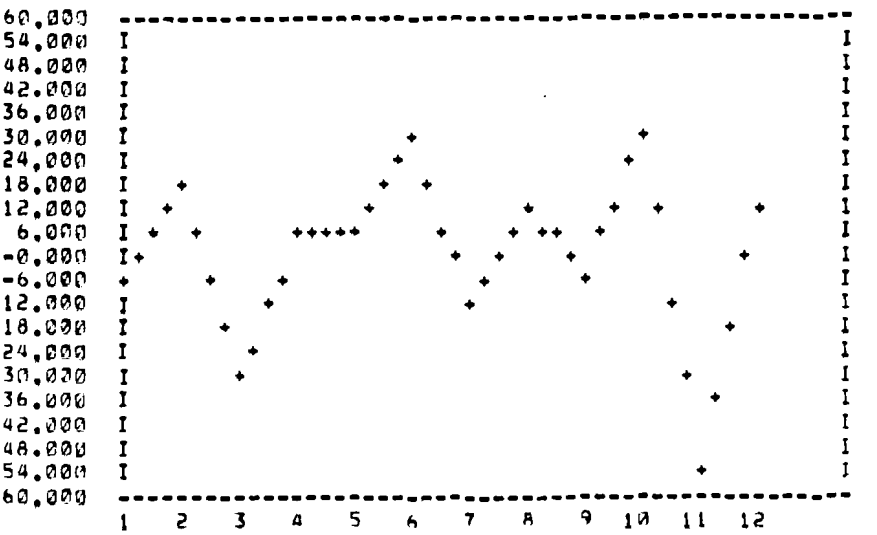

TABLE A.1 *Continued.*

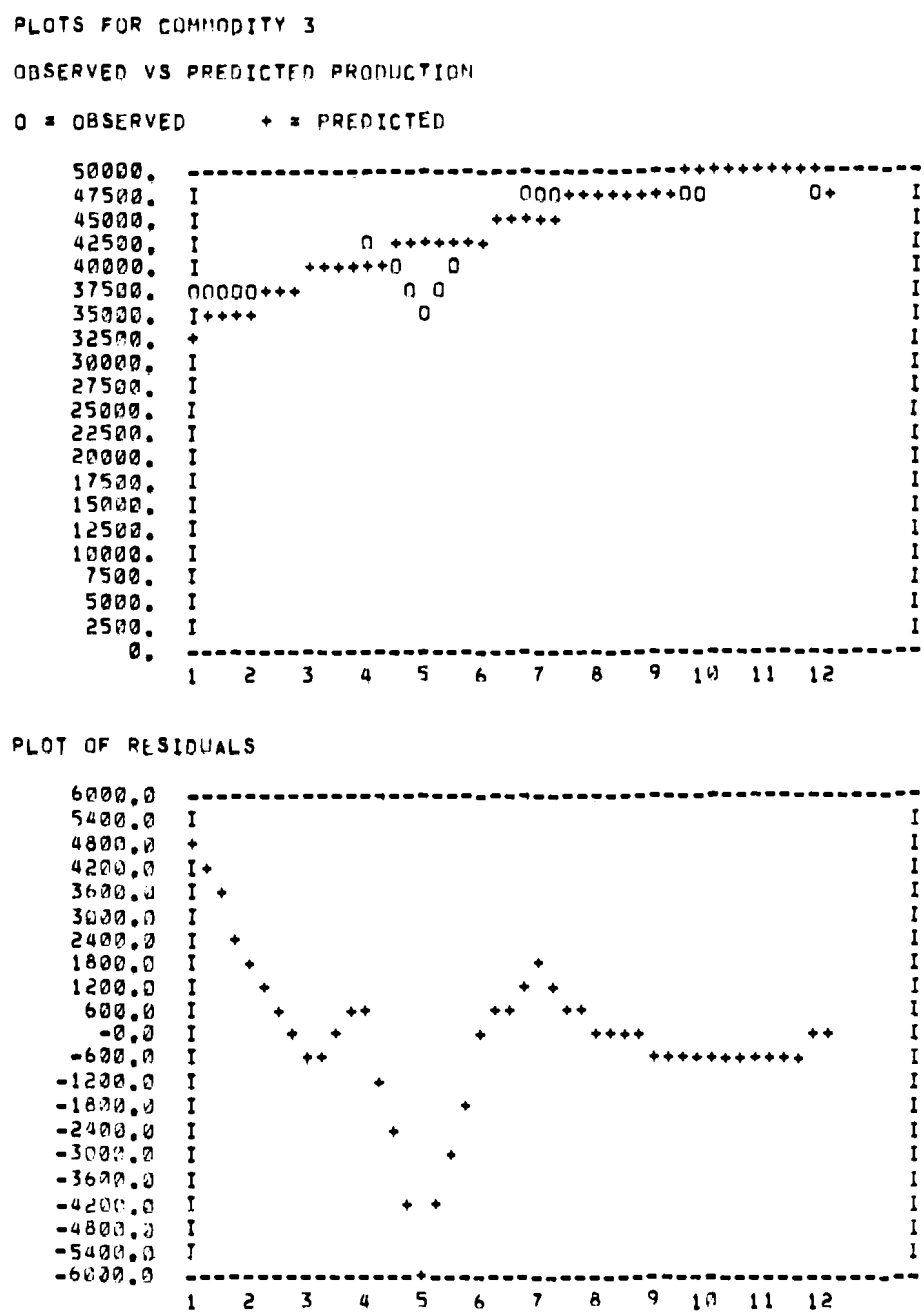

TABLE A.1 *Continued.*

PLOTS FOR COMMODITY 4

OBSERVED VS PREDICTED PRODUCTION

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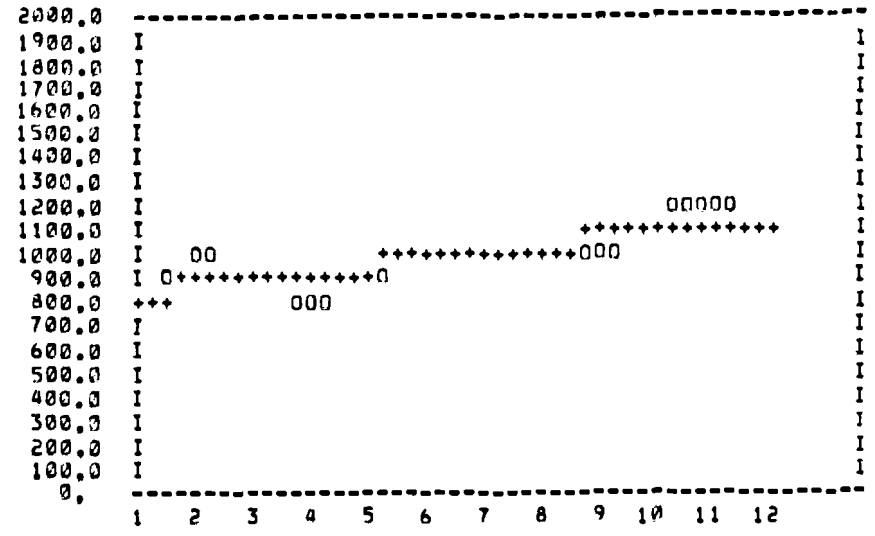

PLOT OF RESIDUALS

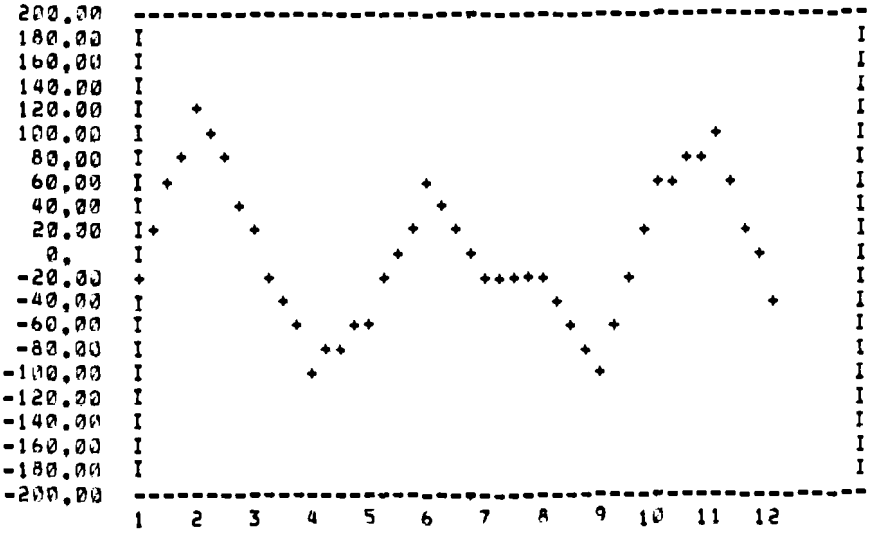

TABLE A.1 *Continued.*

PLOTS FOR COMMODITY 5

OBSERVED VS PREDICTED PRODUCTION

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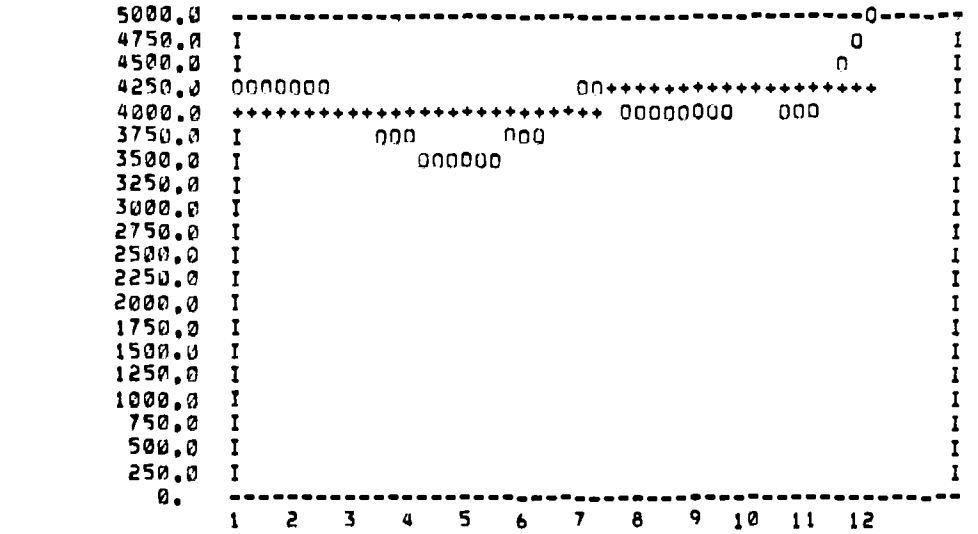


PLOT OF RESIDUALS

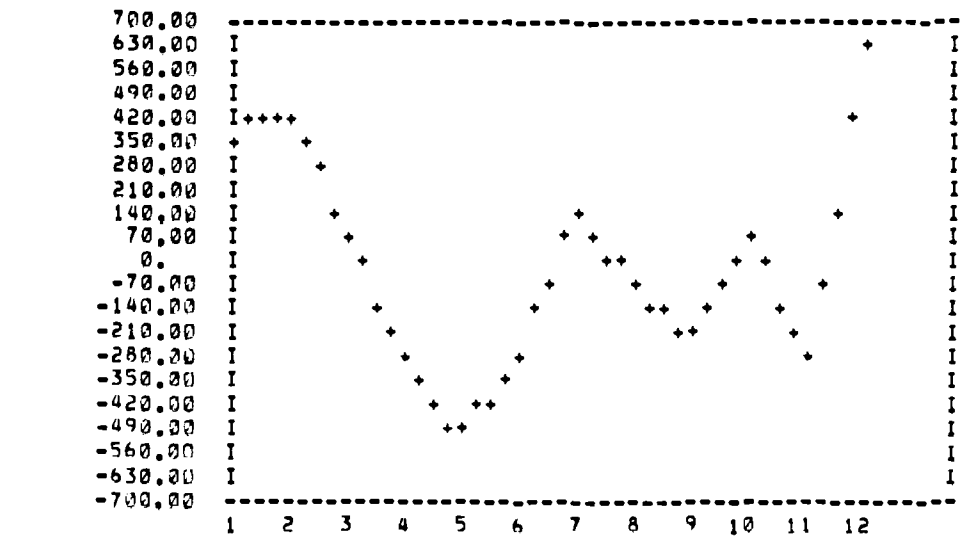
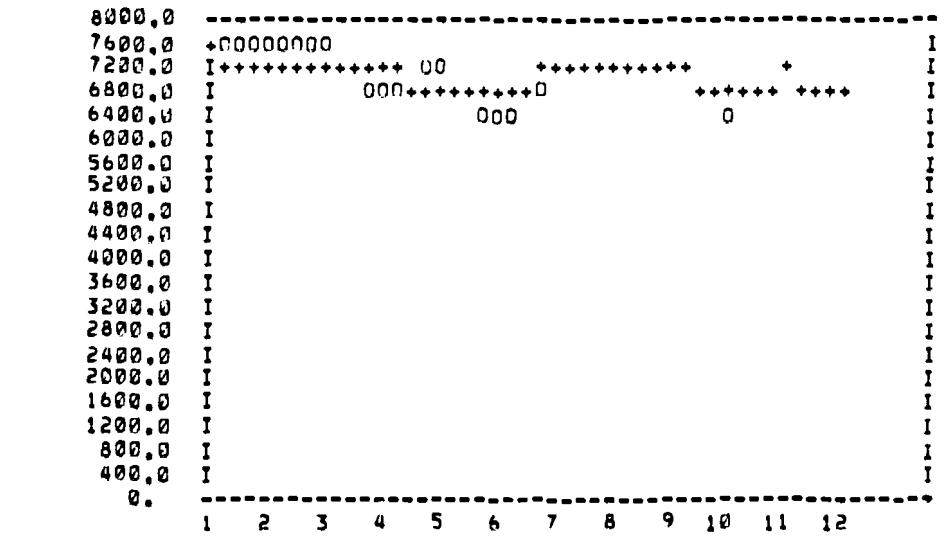


TABLE A.1 *Continued.*

PLOTS FOR COMMODITY 6

OBSERVED VS PPEDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

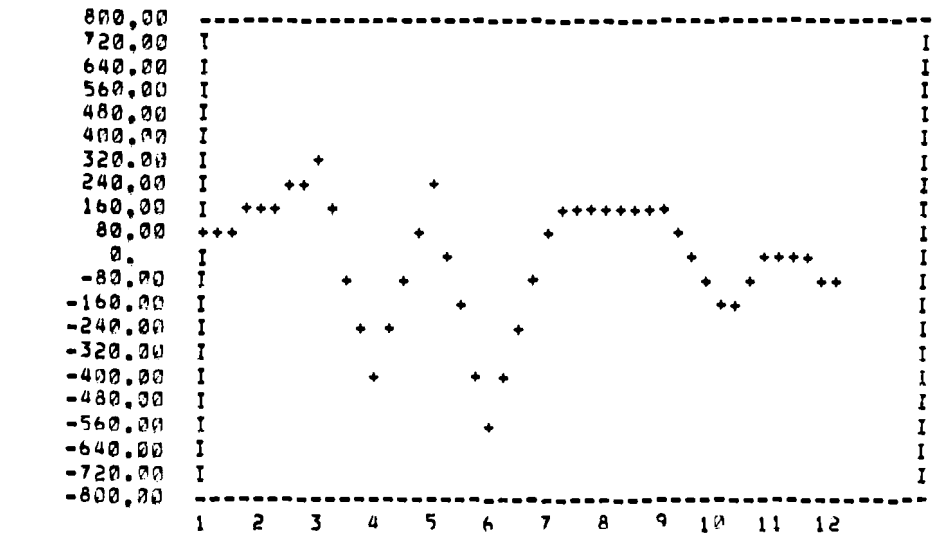
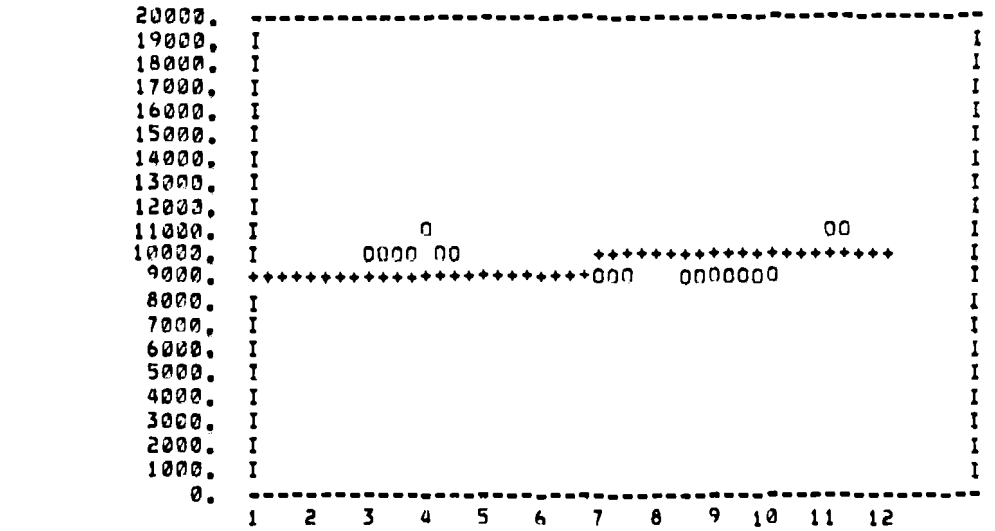


TABLE A.1 *Continued.*

PLOTS FOR COMMODITY 7

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

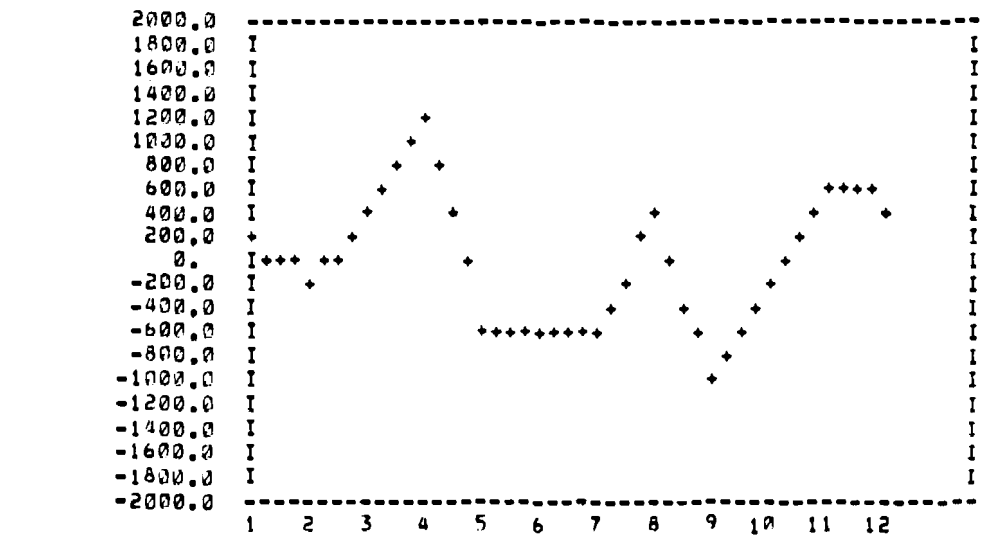
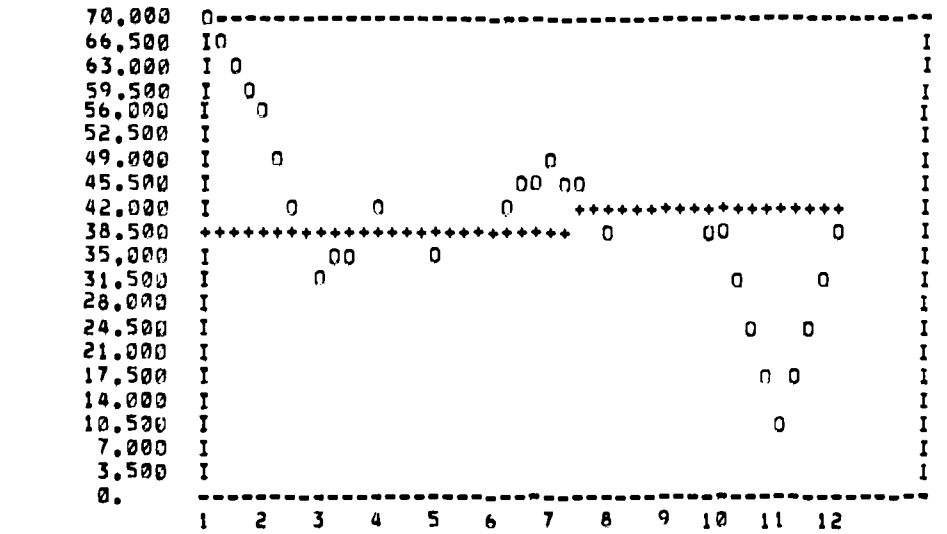


TABLE A.1 *Continued.*

PLOTS FOR COMMODITY 8

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

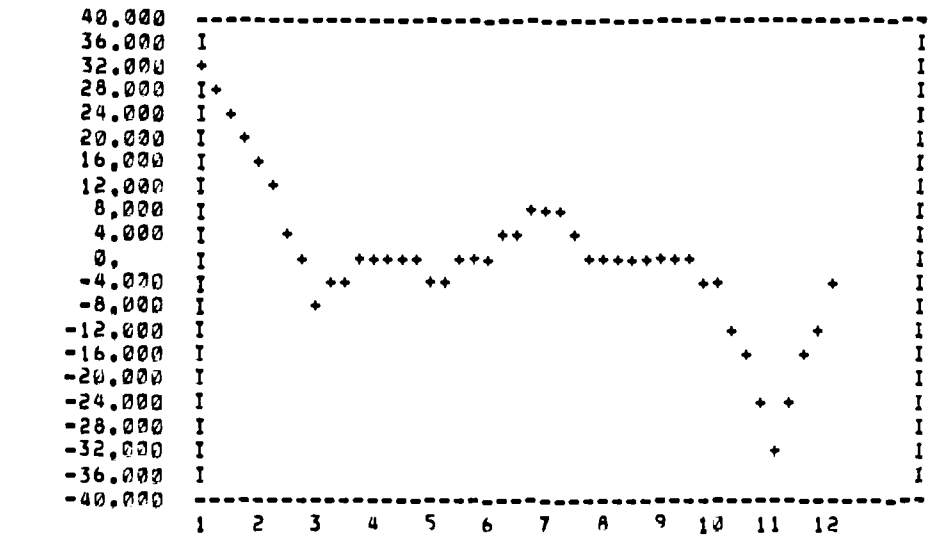
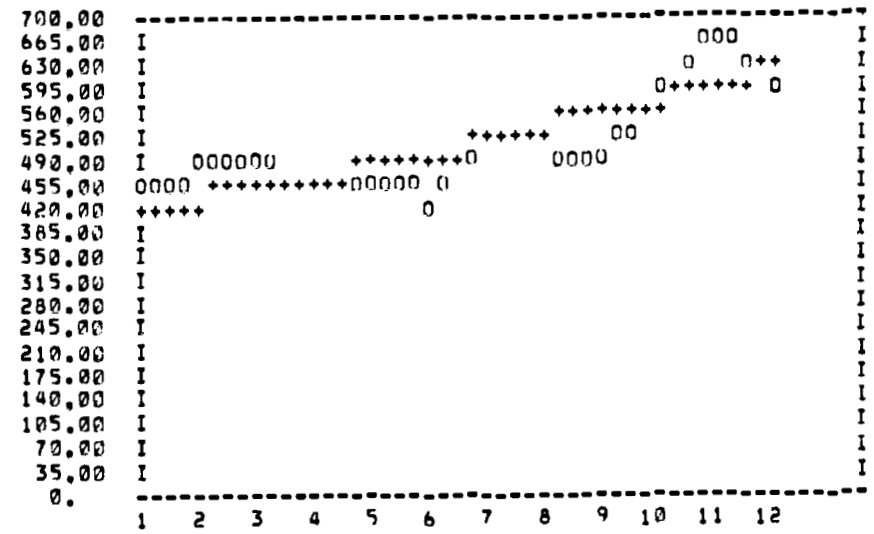


TABLE A.1 *Continued.*

PLOTS FOR COMMODITY 9

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

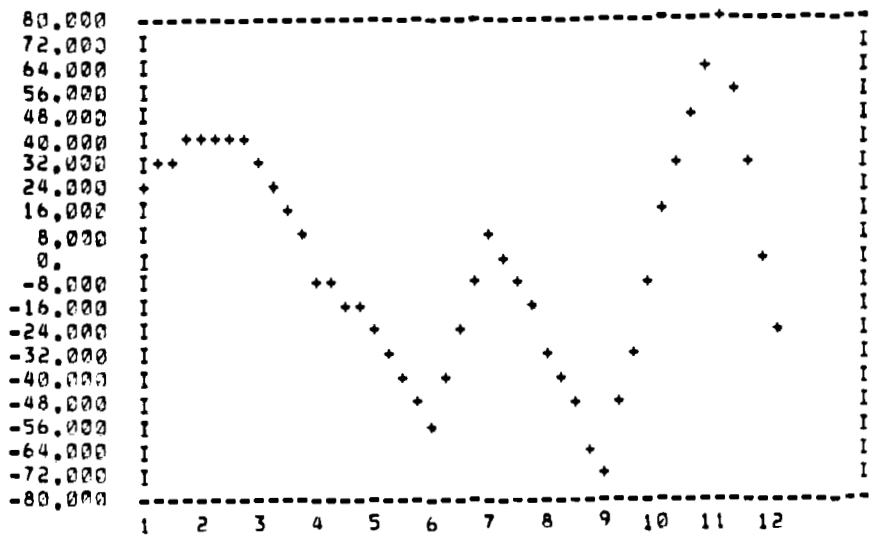
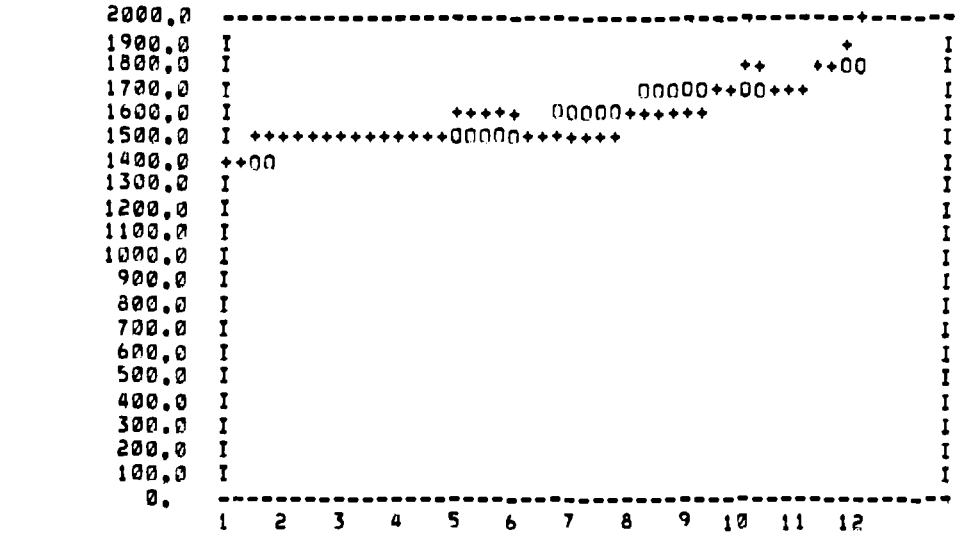


TABLE A.1 *Continued.*

PLOTS FOR COMMODITY10

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

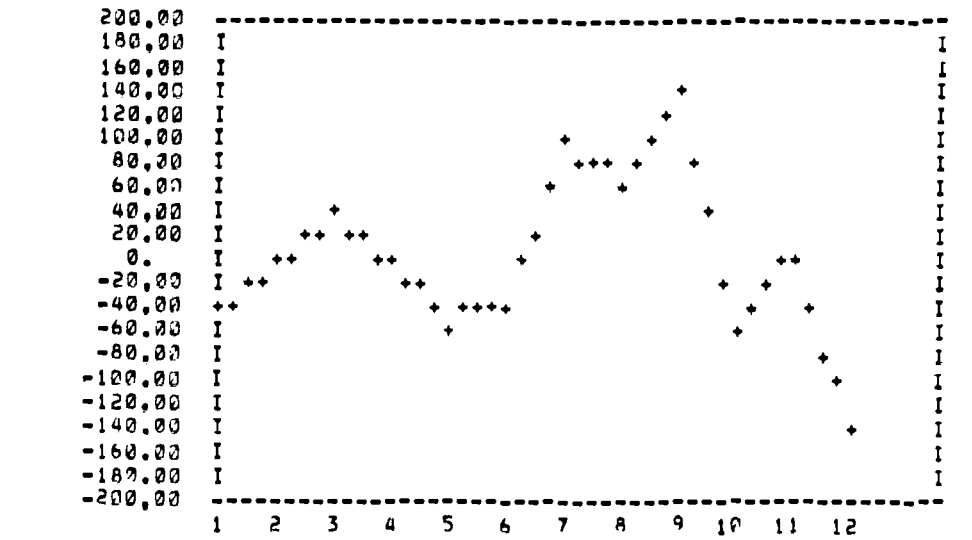
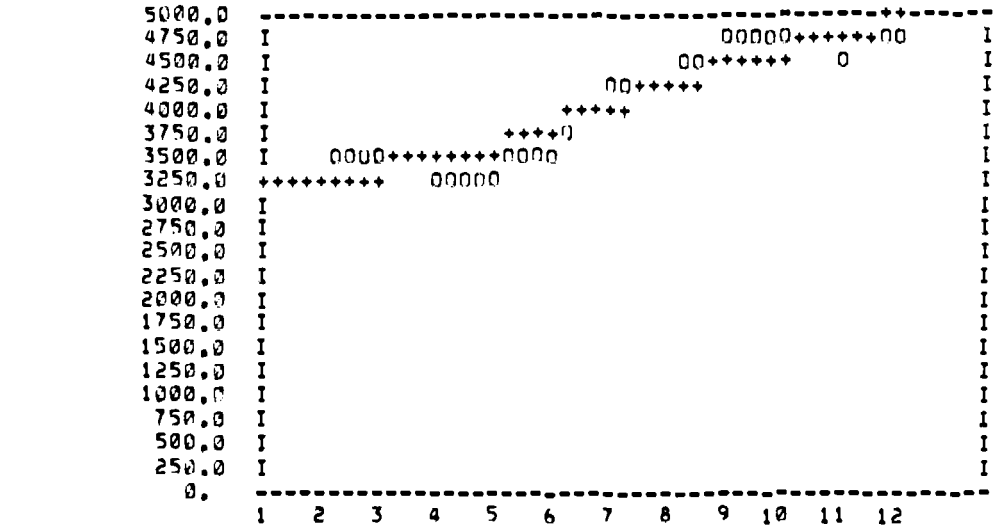


TABLE A.1 *Continued.*

PLOTS FOR COMMODITY11

OBSERVED VS PREDICTED PRODUCTION

0 = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

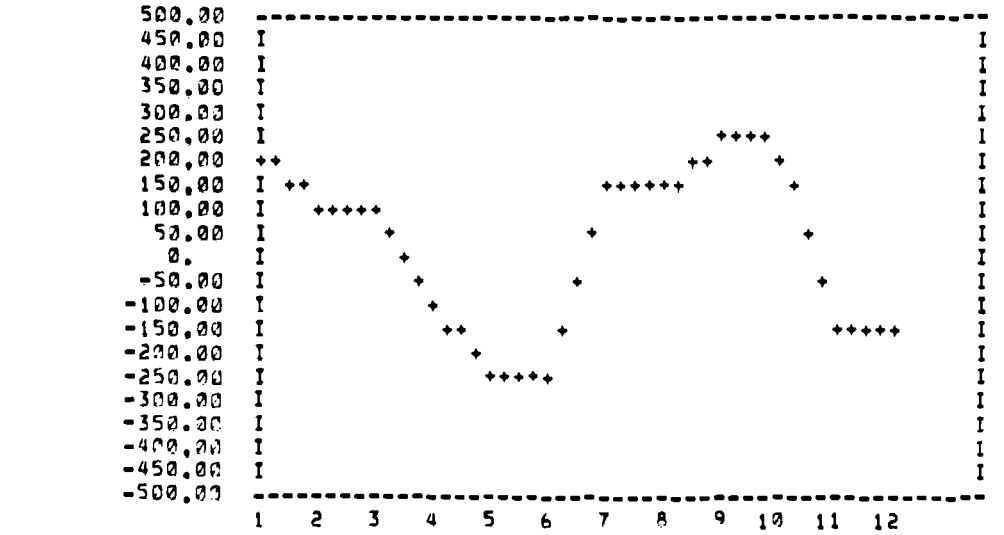
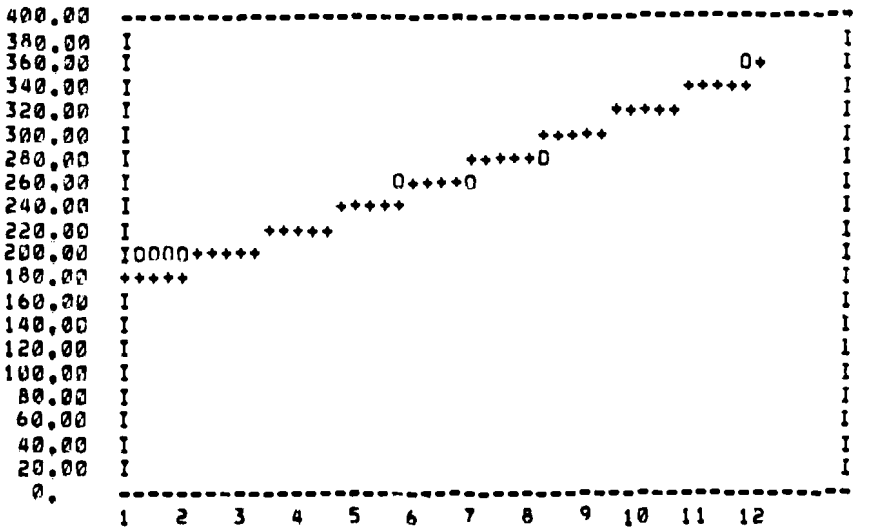


TABLE A.1 *Continued.*

PLOTS FOR COMMODITY12

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

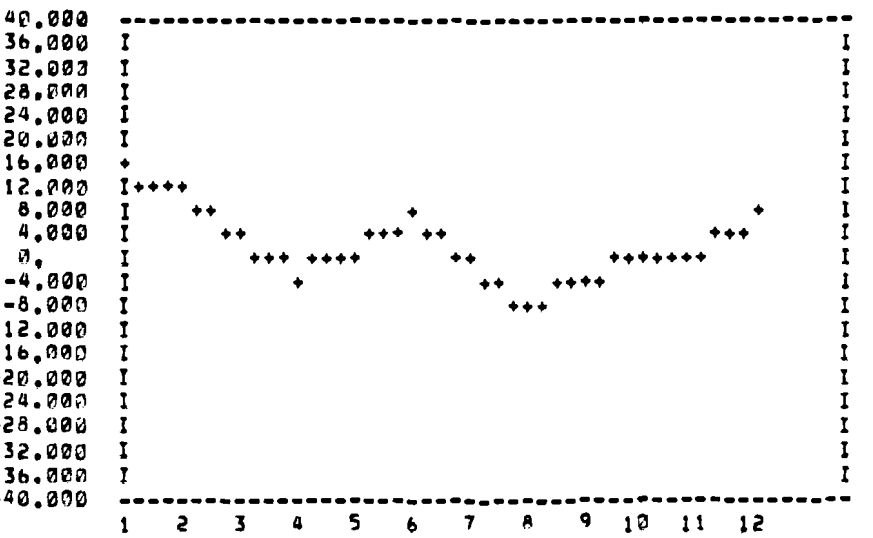
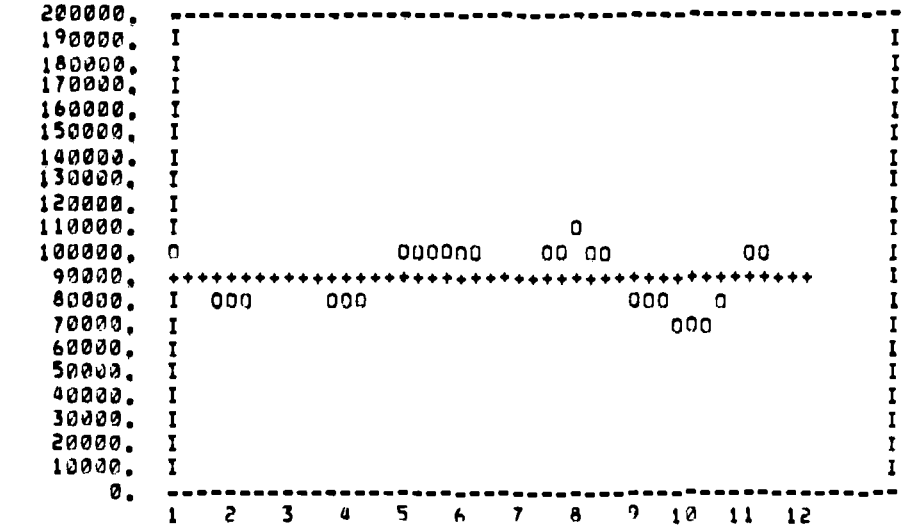


TABLE A.2 Validity of the production module in the Soviet submodel – comparison of observed and predicted production.

PLOTS FOR COMMODITY 1

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

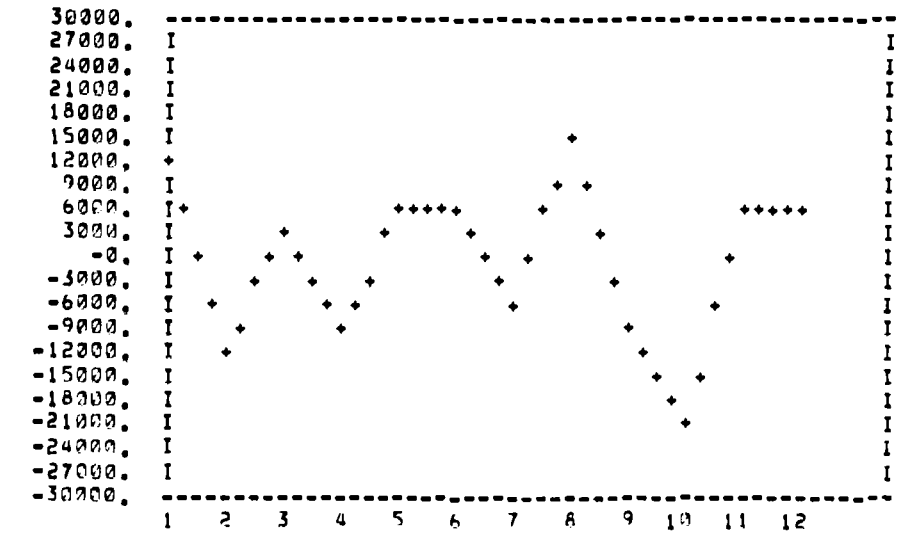
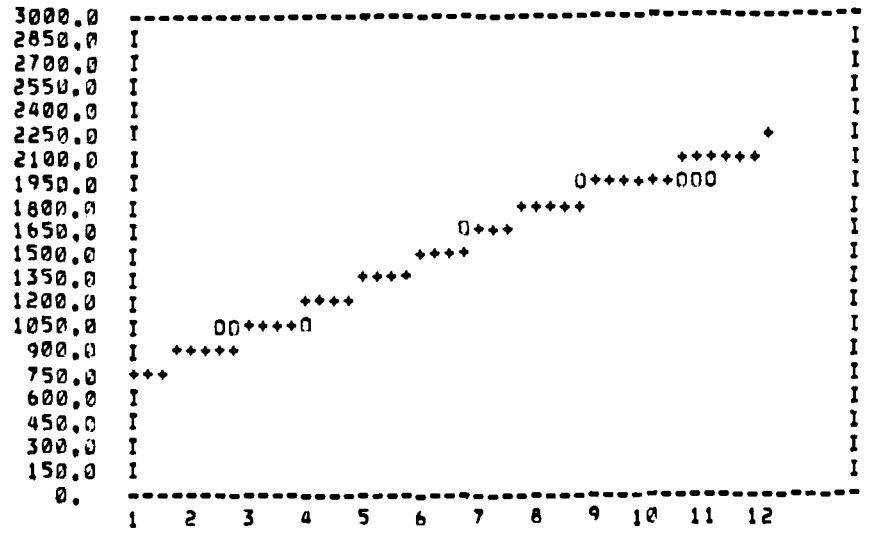


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY 2

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

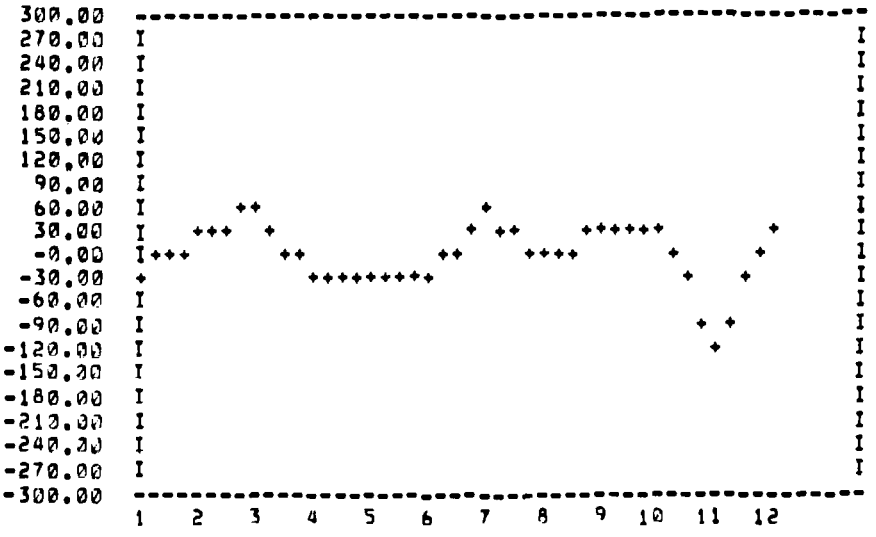
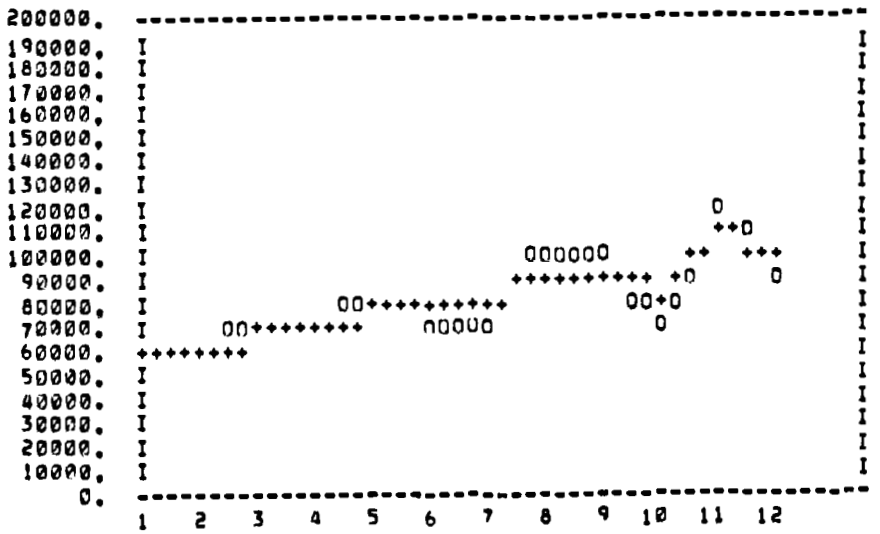


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY 3

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

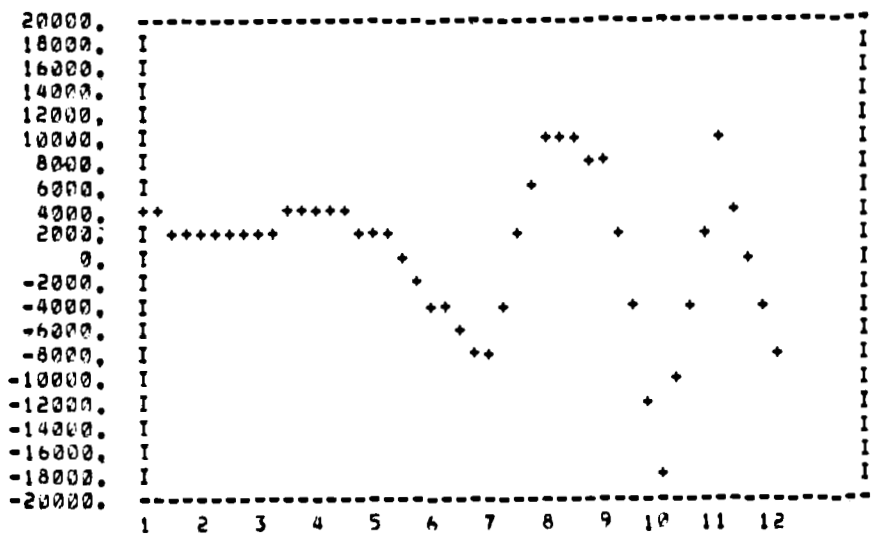
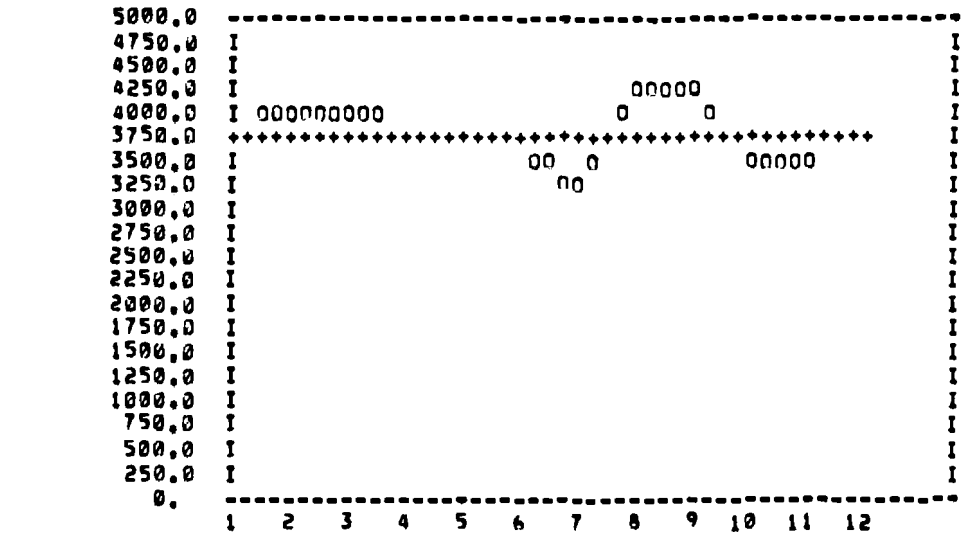


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY 4

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

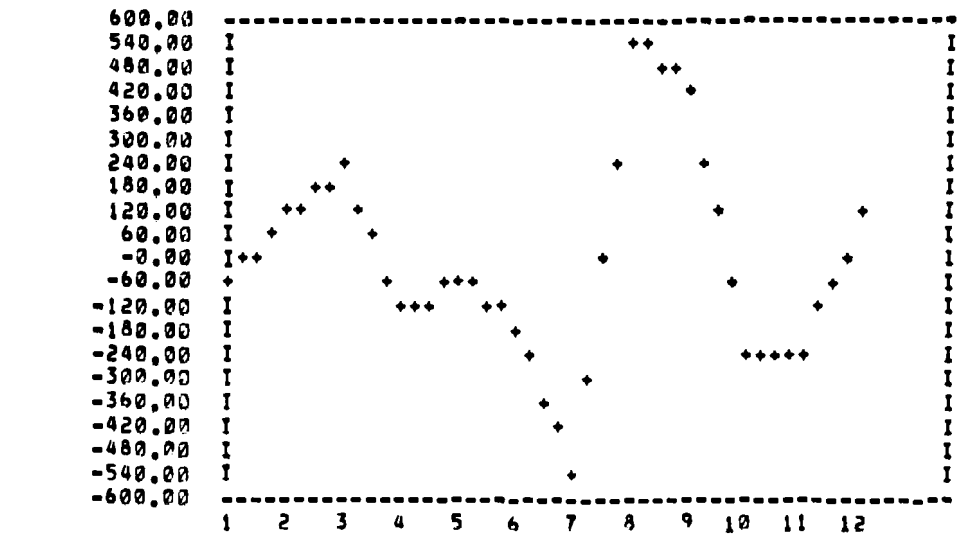
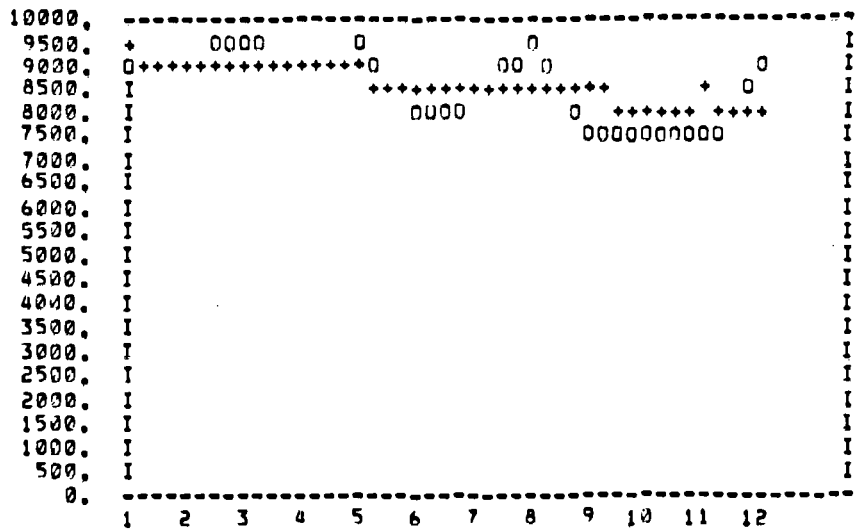


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY 5

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

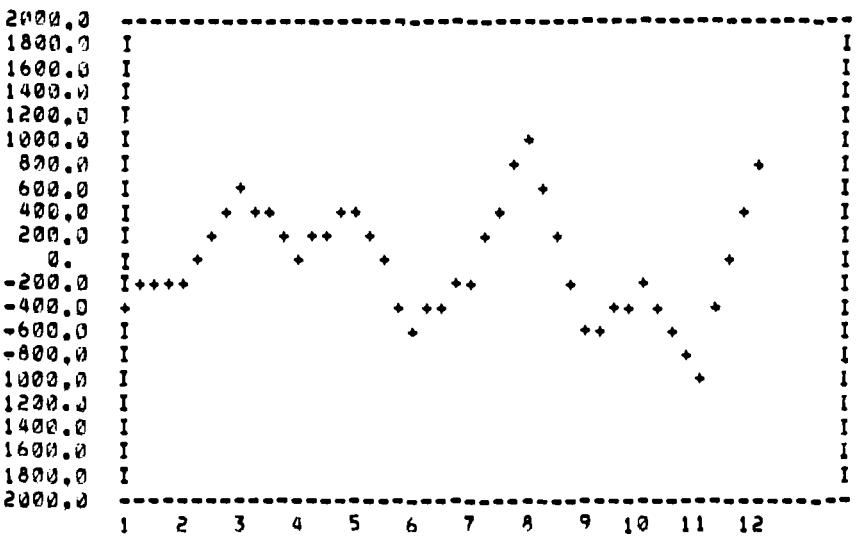
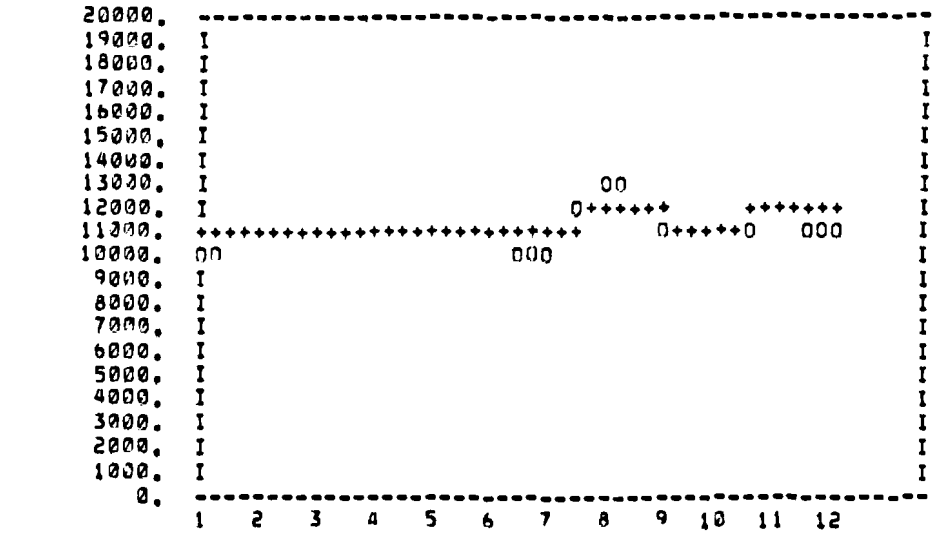


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY 6

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

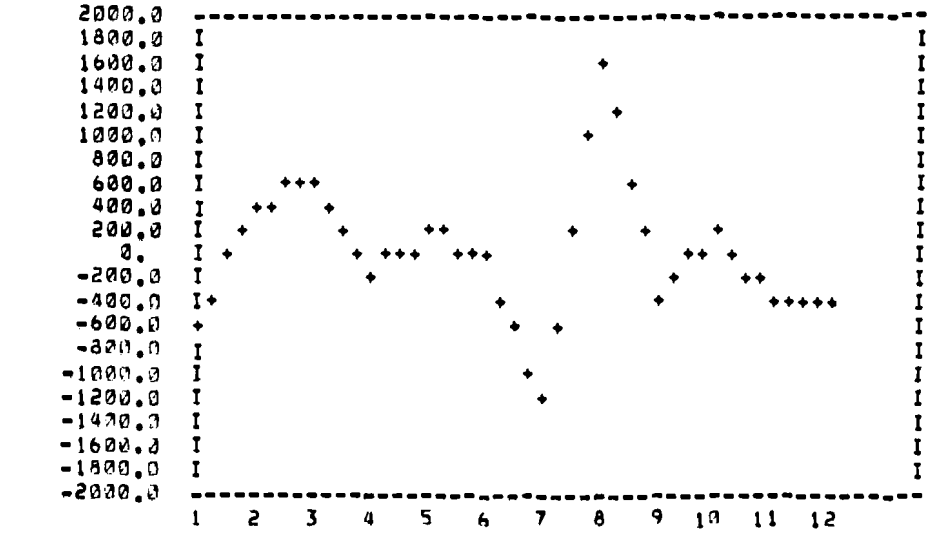
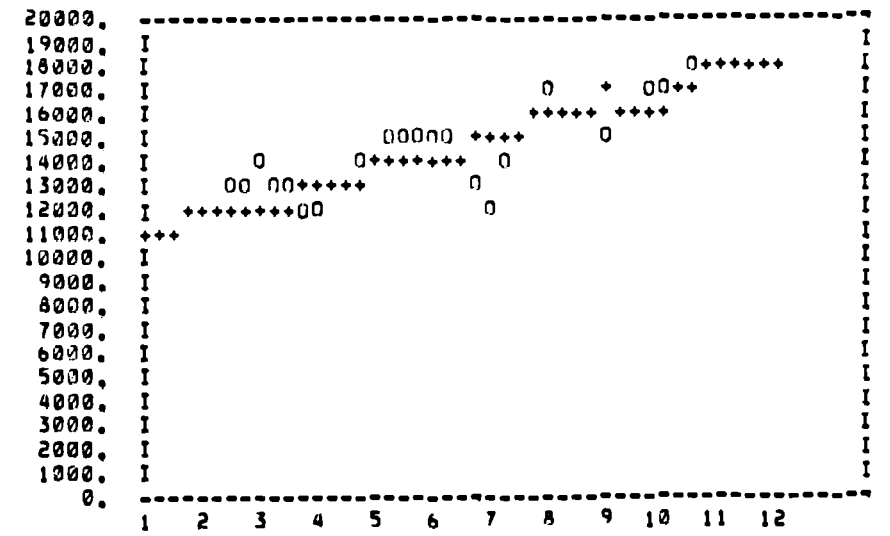


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY 7

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

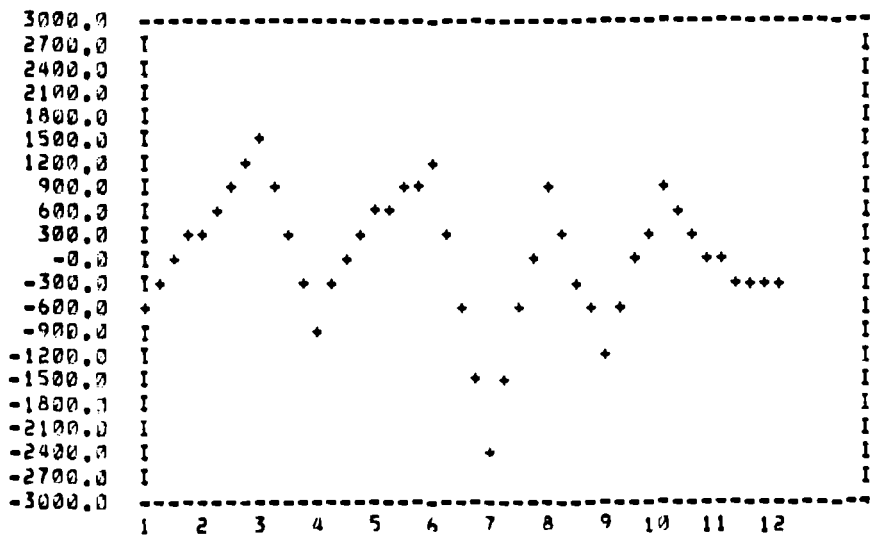
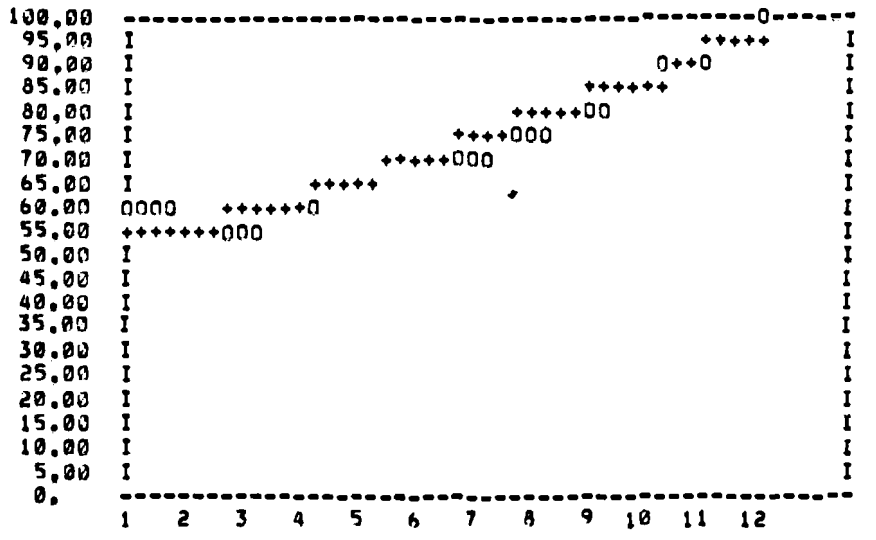


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY 8

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

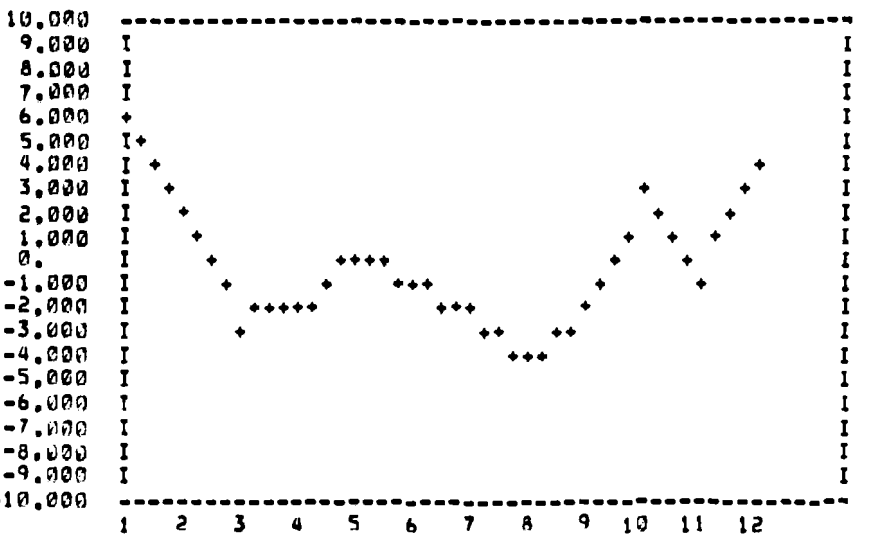
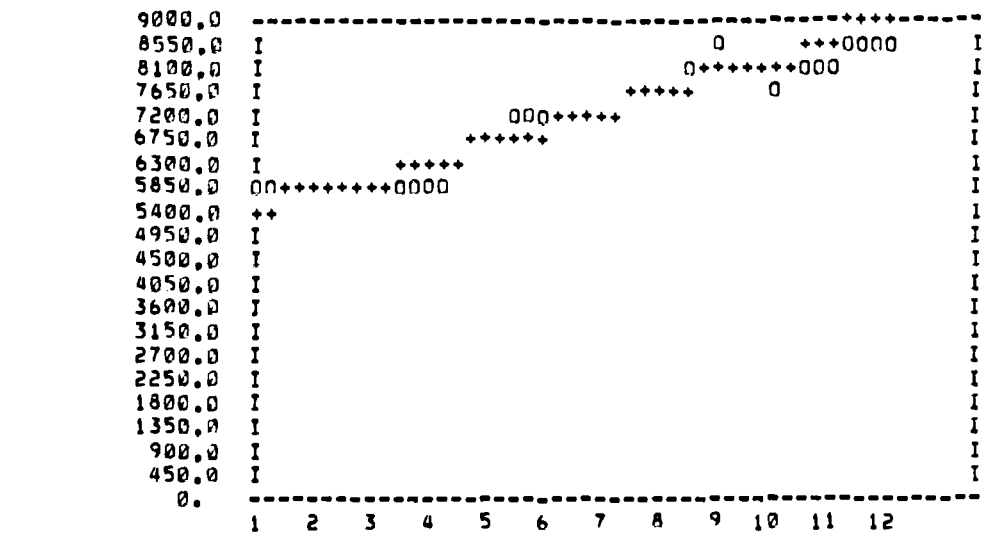


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY 9

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

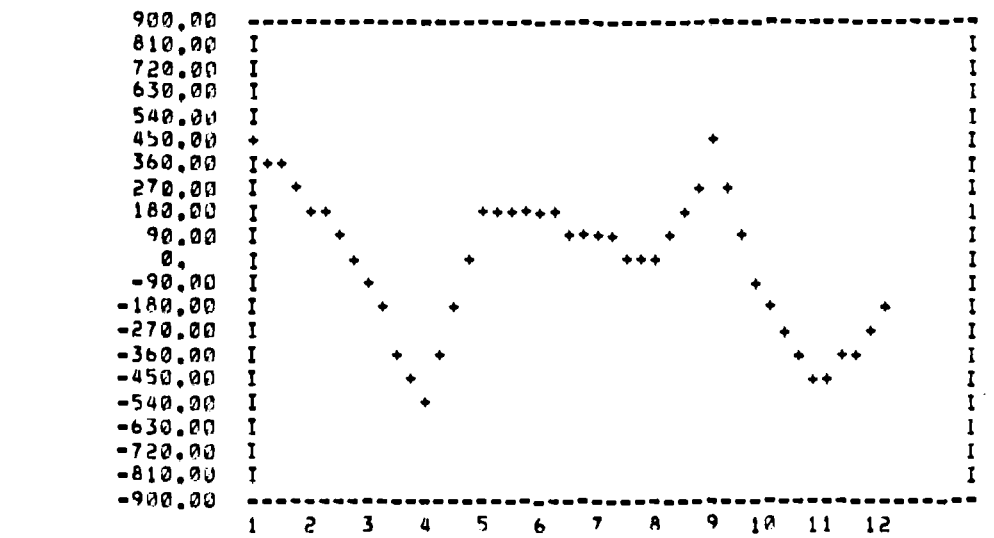
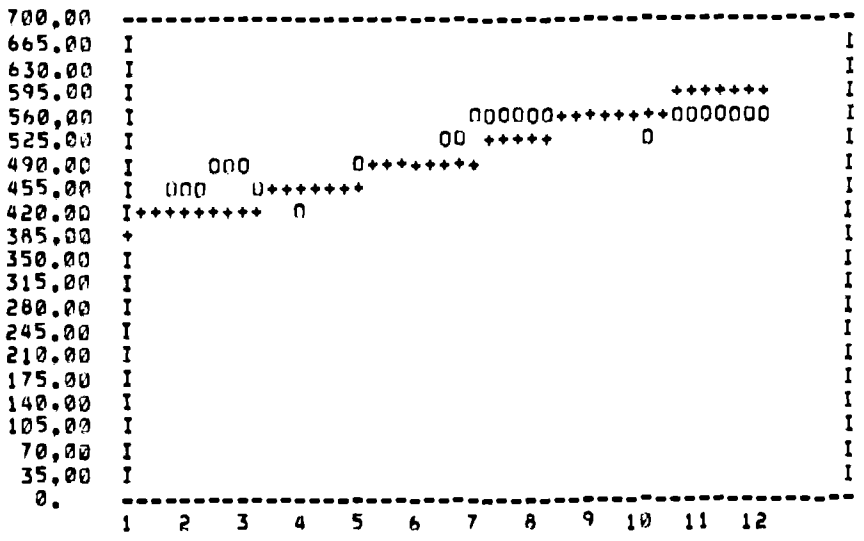


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY10

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

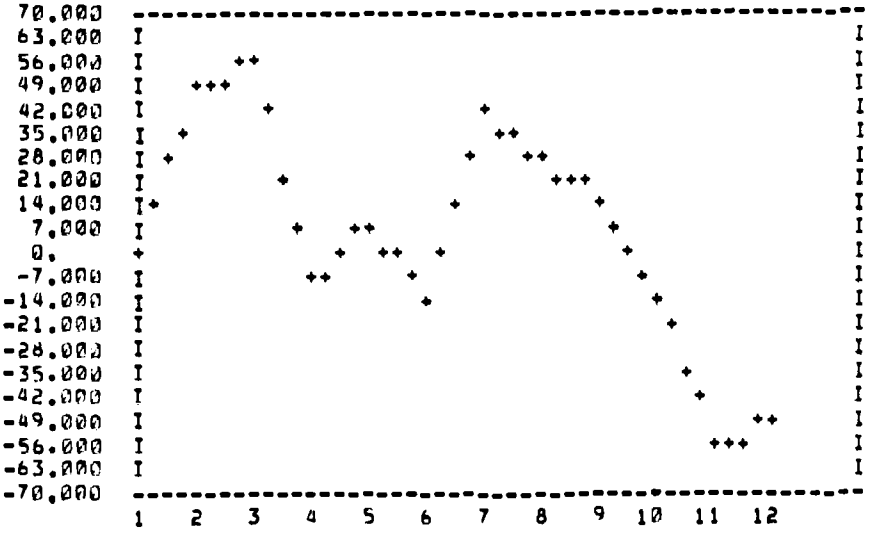
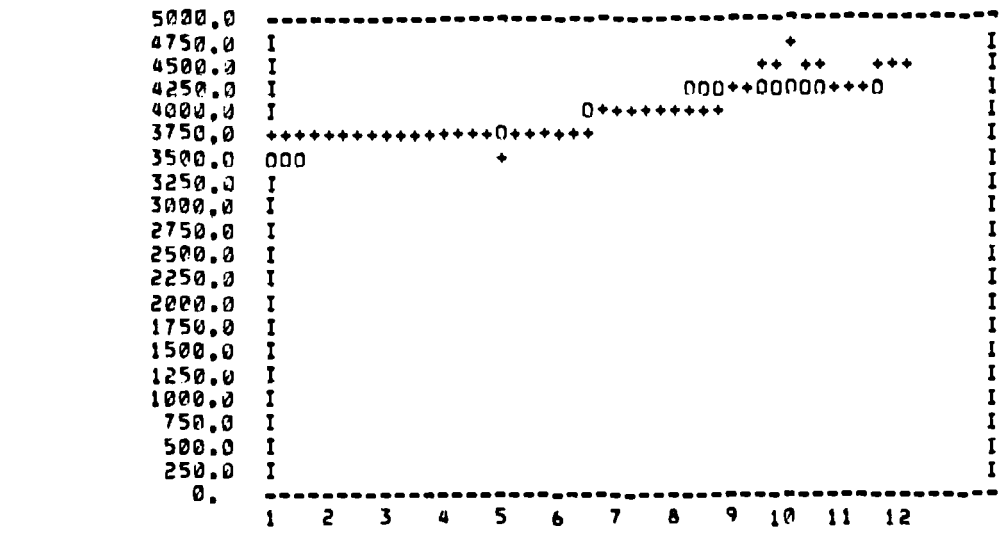


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY11

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

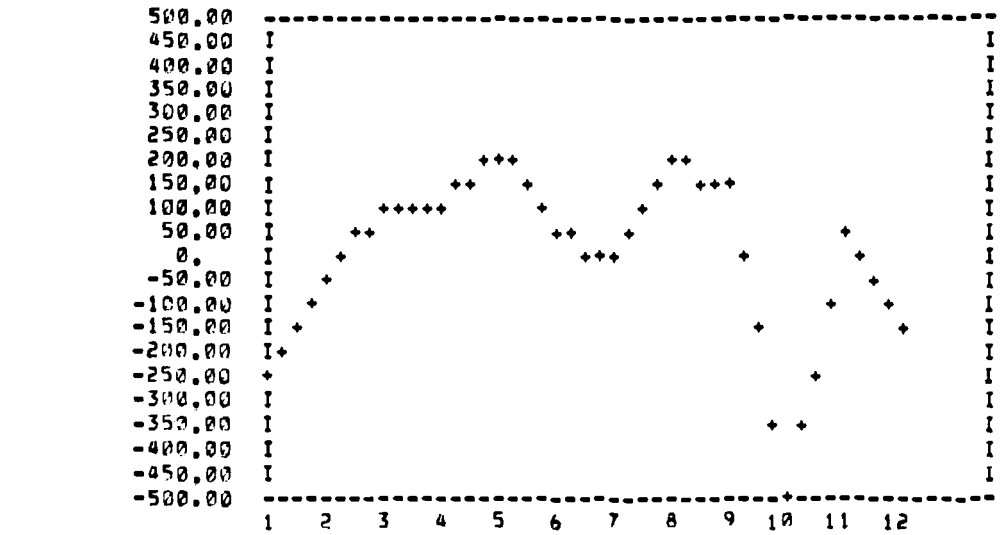
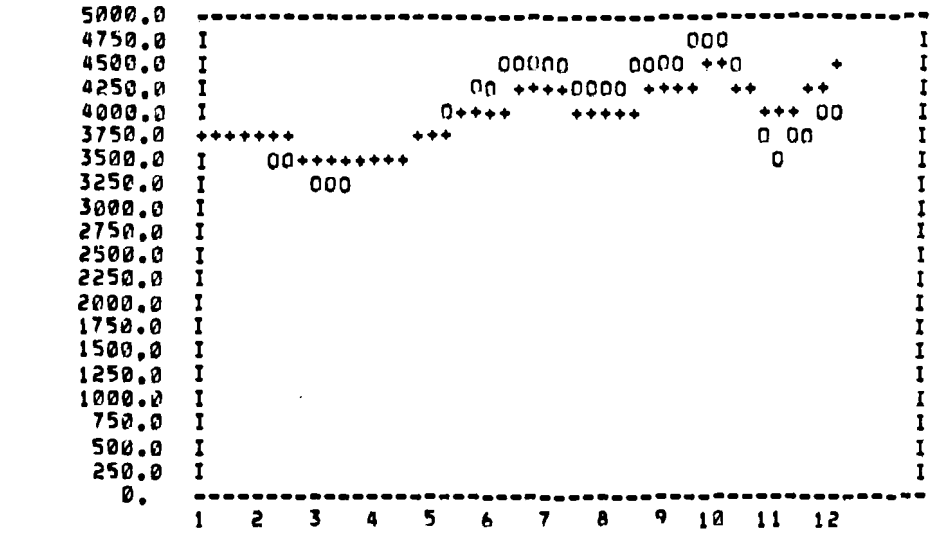


TABLE A.2 *Continued.*

PLOTS FOR COMMODITY12

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS

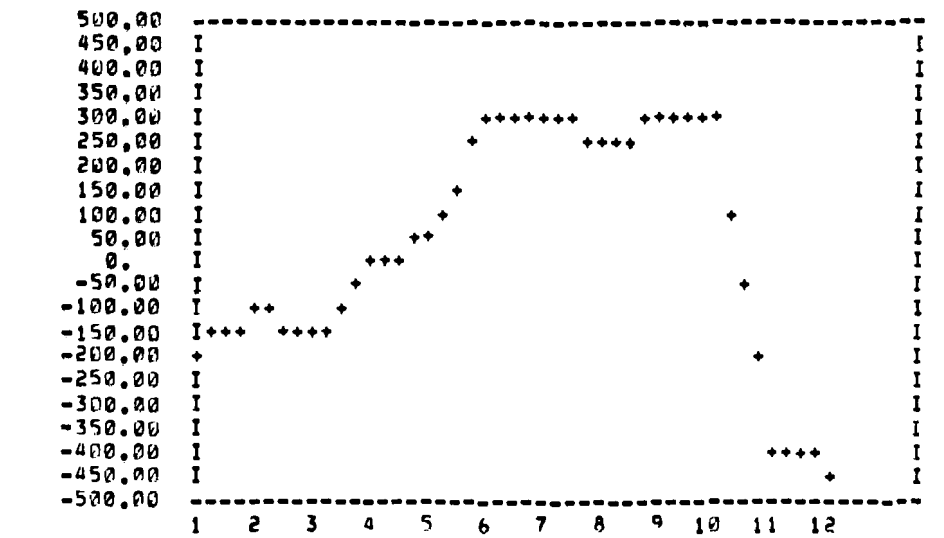
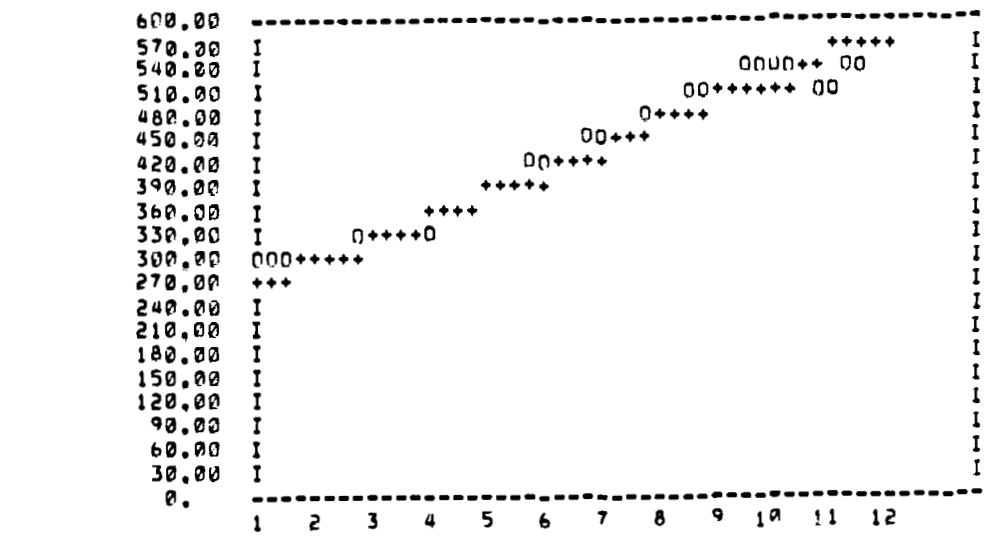


TABLE A.2 *Continued.*

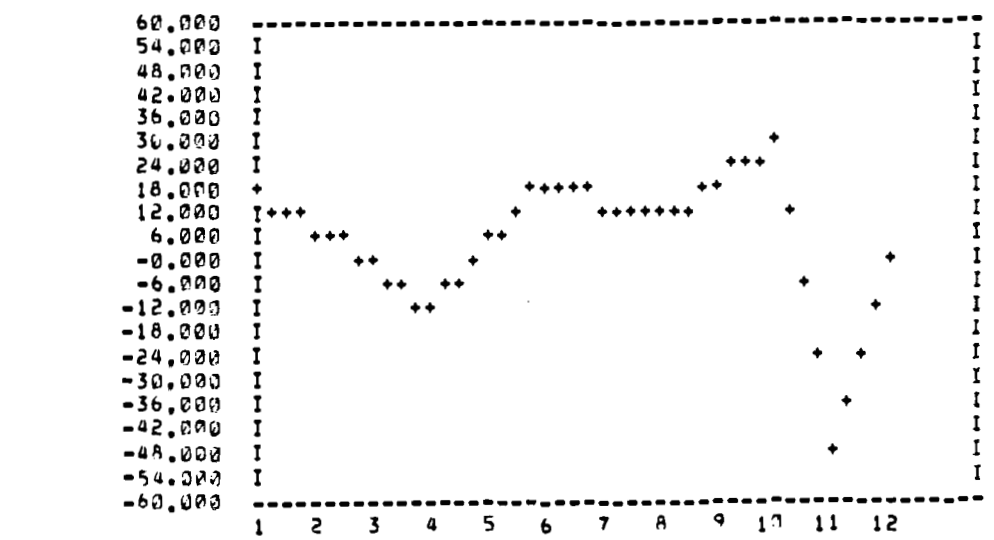
PLOTS FOR COMMODITY13

OBSERVED VS PREDICTED PRODUCTION

O = OBSERVED + = PREDICTED



PLOT OF RESIDUALS



APPENDIX B Initial Data in the Basic Scenarios

TABLE B.1 Initial data of the Soviet submodel – Constant-SSR Scenario

```
USSR
csa          171218.
csn          1116506.
a2           0.04
a2min        0.01
a2max        0.08
s2min        0.025
s2max        0.075
a3           0.2
a3min        0.1
a3max        0.3
s3min        0.015
s3max        0.045
a4min        0.6
a4max        0.85
exchr        0.9
shmlk        0.745
shbeef       0.875
shpltr       0.315
pyn1         .4659
pyn2         .2689
pyn3         1.106
pyn4         0.000
pinva        13329.
pinvn        70920.
depa         0.00
depn         0.00
rho          1.00
nprod        3
lmin         0.95,0.95,0.95,0.95,0.95,0.95,0.75,0.75,1.0,1.0,
lmax         1.05,1.05,1.05,1.05,1.05,1.05,1.25,1.25,1.1,1.1,
st1          4.,4.,4.,4.,4.,4.,4.,4.,4.,4.,
st2          4.,4.,4.,4.,4.,4.,4.,4.,4.,4.,
k11          999,0,999,0,40,40,999,60,999,80,
k12          0,999,0,999,40,40,60,999,80,999,
popt         254380., 266666., 279558., 291637., 301727., 311817.,
alt          0.035,0.035,0.035,0.035,0.035,0.035,
lftt         126605., 134560., 138912., 143194., 146745., 150296.,
lfat         25992.,23203.,20415.,17626.,14838.,12050.,
fertt        7339., 9367., 11954., 15257., 18562., 22584.,
balt         0., 0., 0., 0., 0., 0.,
  y,cint,seed,waste,feed,pw,
 1           82339.6,0.,9179.6,10725.2,32245.,159.,
 2           1974.5,0.,120.4,61.6,0.,230.,
 3           94652.,1518.1,9713.7,10896.6,67323.8,130.,
 4           7594.,0.,0.,0.,0.,208.,
 5           11350.,0.,1308.4,875.,2870.0,1420.,
 6           0.,0.,0.,2.4,0.,120.,
 7           134.7,0.,0.,53.1,0.,218.,
 8           16921.,0.,0.,1474.4,0.,210.,
 9           4074.4,911.7,292.7,96.,107.,760.,
10           0.,0.,0.,0.,0.,1421.,
11           0.,0.,0.,0.,0.,1586.,
12           86.4,0.,0.,0.,0.,1200.,
13           7629.,6120.,0.,0.,0.,420.,
14           552.15,741.,0.,0.,0.,1130.,
15           0.,244.,0.,0.,0.,656.,
16           0.,0.,0.,0.,0.,91.,
17           6421.2,0.,0.,0.,0.,1200.,
18           925.3,0.,0.,0.,0.,1108.,
19           5161.8,0.,0.,0.,0.,1626.,
20           1453.,0.,0.,0.,0.,1144.,
21           90519.3,0.,0.,3506.7,37578.2,209.,
22           3155.9,0.,95.9,159.8,0.,902.,
23           356800.,0.,0.,0.,0.,1000.,
```

TABLE B.1 *Continued.*

```
   hcons, pd, ssh, wsh, stfr
 1          37849.3,107.,0.115,0.1192,0.1,
 2          2112.4,193.,0.06,0.027,0.1,
 3          11414.8,96.,0.1115,0.1134,0.1,
 4          11365.1,238.,0.,0.,0.1,
 5          7011.5,1507.,0.115,0.0781,0.1,
 6          21.7,0.,0.,0.1,0.03,
 7          519.6,0.,0.,0.0928,0.03,
 8          14808.5,286.,0.,0.0828,0.03,
 9          2139.8,628.,0.07,0.,0.1,
10          172.2,0.,0.,0.,0.1,
11          50.4,0.,0.,0.,0.1,
12          130.0,1383.,0.,0.,0.1,
13          0.,610.,0.,0.,0.1,
14          0.,1035.,0.,0.,0.1,
15          0.,0.,0.,0.,0.03,
16          0.,0.,0.,0.,0.,
17          6862.0,2233.,0.,0.,0.1,
18          942.3,2233.,0.,0.,0.1,
19          4282.4,2148.,0.,0.,0.1,
20          1498.7,2000.,0.,0.,0.1,
21          49313.6,198.,0.,0.0387,0.03,
22          2941.7,2000.,0.03,0.05,0.03,
23          287800.,900.,0.,0.,0.025,
 pf1, pf2, pf3,
 1          5.,0.,0.9,0.,10.,0.,
 2          0.,0.,0.,0.,0.,0.,
 3          11.5,0.,1.7,0.,20.,0.,
 4          0.,0.,0.,0.,0.,0.,
 5          0.13,0.,0.5,0.,0.,0.,
 6          0.,0.,0.,0.,0.,0.,
 7          0.,0.,0.,0.,0.,0.,
 8          0.,0.,0.,0.,0.,0.,
 9          0.,0.,0.01,0.,0.13,0.,
10          0.,0.,0.,0.,0.,0.,
11          0.,0.,0.,0.,0.,0.,
12          0.,0.,0.,0.,0.,0.,
13          0.,0.,0.,0.,0.,0.,
14          0.,0.,0.,0.,0.,0.,
15          0.,0.,0.,0.,0.,0.,
16          0.,0.,0.,0.,0.,0.,
17          0.,0.,0.,0.,0.,0.,
18          0.,0.,0.,0.,0.,0.,
19          0.,0.,0.,0.,0.,0.,
20          0.,0.,0.,0.,0.,0.,
21          3.5,0.,5.85,0.,0.,0.,
22          0.,0.,0.,0.,0.,0.,
23          0.,0.,0.,0.,0.,0.,
   ifunc, neta, t1, t2,
 1          3,-0.3,0.,0.,
 2          2,0.3,0.,3.6,
 3          2,-0.4,0.,0.,
 4          3,0.2,-0.1,0.,
 5          2,0.,0.,0.,
 6          2,1.,55.7,0.,
 7          2,1.,-1.9,-2.1,
 8          2,0.7,0.,0.,
 9          3,0.4,0.6,0.2,
10          2,0.7,0.,0.,
11          2,1.,0.,0.,
12          2,0.4,0.,0.,
13          0,0.,0.,0.,
14          0,0.,0.,0.,
15          0,0.,0.,0.,
16          0,0.,0.,0.,
17          3,0.40,0.,-0.5,
```

TABLE B.1 *Continued.*

```
18          3,0.3,-0.8,-0.4,
19          2,1.20,0.,-1.2,
20          2,1.90,0.,0.,
21          2,0.,0.,0.,
22          2,0.5,0.,0.,
23          0,0.,0.,0.,
            ipr, ys, r3,
 1          1,66224.,2.52,
 2          2,2009.3,2.5,
 3          3,66567.,2.31,
 4          9,3434.8,1.,
 5          4,7702.,1.1,
 6          5,11107.,1.1,
 7          8,17158.,1.1,
 8          12,86.314,1.1,
 9          13,7864.,0.47,
10          14,542.19,0.47,
11          0,4255.1,0.7,
12          0,4761.5,0.,
13          0,540.62,0.,
parameters of allocation model
 1          145719.,0.33327le-01,0.,0.,0.125433,0.583692,0.124032,1.000000,
 2          79688.6,0.122214,0.,0.,0.117775,0.464124,0.118652,0.,
 3          72148.5,0.330040e-01,0.,0.,0.255557,0.565784,0.786596d-01,0.,
 4          151143.,0.262824e-01,0.,0.,0.101648,0.418975,0.470392d-01,0.,
 5          158450.,0.,0.,0.,0.228695,0.399239,0.487832d-01,0.,
 6          21362.1,0.,0.,0.,0.310398,0.385262,0.574238d-01,0.,
 7          95780.6,0.109227e-01,0.,0.,0.347888,0.317797,0.520073d-01,0.,
 8          9619.56,0.349097e-01,0.,0.,0.283939,0.318163,0.474769d-01,0.,
 9          212452.,0.,0.,0.,0.396484,0.785158d-01,0.250000d-01,0.,
10          46332.6,0.,0.,0.,0.374542,0.100458,0.250000d-01,0.,
11          11682.3,0.209552e-01,0.,0.,0.328571,0.328571,0.,0.,
12          157589.,0.128864e-01,0.,0.,0.250000,0.250000,0.,0.,
13          11273.0,0.950927e-01,0.,0.,0.250000,0.250000,0.,0.,
    cint
 1          0.,0.,0.,0.,0.,0.,
 2          0.,0.,0.,0.,0.,0.,
 3          1518.1,1706.6,1970.,2306.2,2520.7,2735.3,
 4          0.,0.,0.,0.,0.,0.,
 5          0.,0.,0.,0.,0.,0.,
 6          0.,0.,0.,0.,0.,0.,
 7          0.,0.,0.,0.,0.,0.,
 8          0.,0.,0.,0.,0.,0.,
 9          911.7,1022.1,1132.5,1254.4,1366.5,1478.7,
10          0.,0.,0.,0.,0.,0.,
11          0.,0.,0.,0.,0.,0.,
12          0.,0.,0.,0.,0.,0.,
13          6120.,6516.,6927.,7314.3,7673.7,8033.1,
14          741.,789.9,845.,904.9,993.,1081.2,
15          244.,283.,309.,330.,358.,386.,
16          0.,0.,0.,0.,0.,0.,
17          0.,0.,0.,0.,0.,0.,
18          0.,0.,0.,0.,0.,0.,
19          0.,0.,0.,0.,0.,0.,
20          0.,0.,0.,0.,0.,0.,
21          0.,0.,0.,0.,0.,0.,
22          0.,0.,0.,0.,0.,0.,
23          0.,0.,0.,0.,0.,0.,
            ssrall
 1          0.93,0.93,0.93,0.93,0.93,0.93,
 2
 3          0.96,0.96,0.96,0.96,0.96,0.96,
 4          0.67,0.67,0.67,0.67,0.67,0.67,
 5          0.96,0.96,.96,.96,.96,.96,
 6
 7
```

TABLE B.1 *Continued.*

```
 8
 9          1.00,1.00,1.00,1.00,1.00,1.00,
10
11
12
13
14
15
16
17          0.00,0.00,0.00,0.00,0.00,0.00
18          0.00,0.00,0.00,0.00,0.00,0.00
19
20          1.00,1.00,1.00,1.00,1.00,1.00,
21          0.00,0.00,0.00,0.00,0.00,0.00,
22
23

            pmratt
 1          0.0
 2
 3          0.0
 4          0.0
 5          0.0
 6
 7
 8
 9          0.0
10
11
12
13
14
15
16
17            0.00,0.00,0.00,0.00,0.00,0.00
18            0.00,0.00,0.00,0.00,0.00,0.00
19
20
21            0.00,0.00,0.00,0.00,0.00,0.00,
22
23
```

TABLE B.2 Initial data of the Soviet submodel – Free Trade Scenario.

```
USSR
csa          171218.
csn          1116506.
a2           0.04
a2min        0.01
a2max        0.08
s2min        0.025
s2max        0.075
a3           0.2
a3min        0.1
a3max        0.3
s3min        0.015
s3max        0.045
a4min        0.6
a4max        0.85
exchr        0.9
shmlk        0.745
shbeef       0.875
shpltr       0.315
pyn1         .4659
pyn2         .2689
pyn3         1.106
pyn4         0.000
pinva        13329.
pinvn        70920.
depa         0.00
depn         0.00
rho          1.00
nprod        3
lmin         0.95,0.95,0.95,0.95,0.95,0.95,0.75,0.75,1.0,1.0,
lmax         1.05,1.05,1.05,1.05,1.05,1.05,1.25,1.25,1.1,1.1,
st1          4.,4.,4.,4.,4.,4.,4.,4.,4.,4.,
st2          4.,4.,4.,4.,4.,4.,4.,4.,4.,4.,
k11          999,0,999,0,40,40,999,60,999,80,
k12          0,999,0,999,40,40,60,999,80,999,
popt         254380., 266666., 279558., 291637., 301727., 311817.,
alt          0.035,0.035,0.035,0.035,0.035,0.035,
lftt         126605., 134560., 138912., 143194., 146745., 150296.,
lfat         25992.,23203.,20415.,17626.,14838.,12050.,
fertt        7339., 9367., 11954., 15257., 18562., 22584.,
balt         0., 0., 0., 0., 0., 0.,
  y,cint,seed,waste,feed,pw,
 1           82339.6,0.,9179.6,10725.2,32245.,159.,
 2           1974.5,0.,120.4,61.6,0.,230.,
 3           94652.,1518.1,9713.7,10896.6,67323.8,130.,
 4           7594.,0.,0.,0.,0.,208.,
 5           11350.,0.,1308.4,875.,2870.0,1420.,
 6           0.,0.,0.,2.4,0.,120.,
 7           134.7,0.,0.,53.1,0.,218.,
 8           16921.,0.,0.,1474.4,0.,210.,
 9           4074.4,911.7,292.7,96.,107.,760.,
10           0.,0.,0.,0.,0.,1421.,
11           0.,0.,0.,0.,0.,1586.,
12           86.4,0.,0.,0.,0.,1200.,
13           7629.,6120.,0.,0.,0.,420.,
14           552.15,741.,0.,0.,0.,1130.,
15           0.,244.,0.,0.,0.,656.,
16           0.,0.,0.,0.,0.,91.,
17           6421.2,0.,0.,0.,0.,1200.,
18           925.3,0.,0.,0.,0.,1108.,
19           5161.8,0.,0.,0.,0.,1626.,
20           1453.,0.,0.,0.,0.,1144.,
21           90519.3,0.,0.,3506.7,37578.2,209.,
22           3155.9,0.,95.9,159.8,0.,902.,
23           356800.,0.,0.,0.,0.,1000.,
```

TABLE B.2 *Continued.*

```
   hcons, pd, ssh, wsh, stfr
 1          37849.3,107.,0.115,0.1192,0.1,
 2          2112.4,193.,0.06,0.027,0.1,
 3          11414.8,96.,0.1115,0.1134,0.1,
 4          11365.1,238.,0.,0.,0.1,
 5          7011.5,1507.,0.115,0.0781,0.1,
 6          21.7,0.,0.,0.1,0.03,
 7          519.6,0.,0.,0.0928,0.03,
 8          14808.5,286.,0.,0.0828,0.03,
 9          2139.8,628.,0.07,0.,0.1,
10          172.2,0.,0.,0.,0.1,
11          50.4,0.,0.,0.,0.1,
12          130.0,1383.,0.,0.,0.1,
13          0.,610.,0.,0.,0.1,
14          0.,1035.,0.,0.,0.1,
15          0.,0.,0.,0.,0.03,
16          0.,0.,0.,0.,0.,
17          6862.0,2233.,0.,0.,0.1,
18          942.3,2233.,0.,0.,0.1,
19          4282.4,2148.,0.,0.,0.1,
20          1498.7,2000.,0.,0.,0.1,
21          49313.6,198.,0.,0.0387,0.03,
22          2941.7,2000.,0.03,0.05,0.03,
23          287800.,900.,0.,0.,0.025,
 pf1, pf2, pf3,
 1          5.,0.,0.9,0.,10.,0.,
 2          0.,0.,0.,0.,0.,0.,
 3          11.5,0.,1.7,0.,20.,0.,
 4          0.,0.,0.,0.,0.,0.,
 5          0.13,0.,0.5,0.,0.,0.,
 6          0.,0.,0.,0.,0.,0.,
 7          0.,0.,0.,0.,0.,0.,
 8          0.,0.,0.,0.,0.,0.,
 9          0.,0.,0.01,0.,0.13,0.,
10          0.,0.,0.,0.,0.,0.,
11          0.,0.,0.,0.,0.,0.,
12          0.,0.,0.,0.,0.,0.,
13          0.,0.,0.,0.,0.,0.,
14          0.,0.,0.,0.,0.,0.,
15          0.,0.,0.,0.,0.,0.,
16          0.,0.,0.,0.,0.,0.,
17          0.,0.,0.,0.,0.,0.,
18          0.,0.,0.,0.,0.,0.,
19          0.,0.,0.,0.,0.,0.,
20          0.,0.,0.,0.,0.,0.,
21          3.5,0.,5.85,0.,0.,0.,
22          0.,0.,0.,0.,0.,0.,
23          0.,0.,0.,0.,0.,0.,
   ifunc, neta, t1, t2,
 1          3,-0.3,0.,0.,
 2          2,0.3,0.,3.6,
 3          2,-0.4,0.,0.,
 4          3,0.2,-0.1,0.,
 5          2,0.,0.,0.,
 6          2,1.,55.7,0.,
 7          2,1.,-1.9,-2.1,
 8          2,0.7,0.,0.,
 9          3,0.4,0.6,0.2,
10          2,0.7,0.,0.,
11          2,1.,0.,0.,
12          2,0.4,0.,0.,
13          0,0.,0.,0.,
14          0,0.,0.,0.,
15          0,0.,0.,0.,
16          0,0.,0.,0.,
17          3,0.40,0.,-0.5,
```

TABLE B.2 *Continued.*

```
18          3,0.3,-0.8,-0.4,
19          2,1.20,0.,-1.2,
20          2,1.90,0.,0.,
21          2,0.,0.,0.,
22          2,0.5,0.,0.,
23          0,0.,0.,0.,
            ipr, ys, r3,
 1          1,66224.,2.52,
 2          2,2009.3,2.5,
 3          3,66567.,2.31,
 4          9,3434.8,1.,
 5          4,7702.,1.1,
 6          5,11107.,1.1,
 7          8,17158.,1.1,
 8          12,86.314,1.1,
 9          13,7864.,0.47,
 10         14,542.19,0.47,
11          0,4255.1,0.7,
12          0,4761.5,0.,
13          0,540.62,0.,
parameters of allocation model
 1          145719.,0.333271e-01,0.,0.,0.125433,0.583692,0.124032,1.000000,
 2          79688.6,0.122214,0.,0.,0.117775,0.464124,0.118652,0.,
 3          72148.5,0.330040e-01,0.,0.,0.255557,0.565784,0.786596d-01,0.,
 4          151143.,0.262824e-01,0.,0.,0.101648,0.418975,0.470392d-01,0.,
 5          158450.,0.,0.,0.,0.228695,0.399239,0.487832d-01,0.,
 6          21362.1,0.,0.,0.,0.310398,0.385262,0.574238d-01,0.,
 7          95780.6,0.109227e-01,0.,0.,0.347888,0.317797,0.520073d-01,0.,
 8          9619.56,0.349097e-01,0.,0.,0.283939,0.318163,0.474769d-01,0.,
 9          212452.,0.,0.,0.,0.396484,0.785158d-01,0.250000d-01,0.,
10          46332.6,0.,0.,0.,0.374542,0.100458,0.250000d-01,0.,
11          11682.3,0.209552e-01,0.,0.,0.328571,0.328571,0.,0.,
12          157589.,0.128864e-01,0.,0.,0.250000,0.250000,0.,0.,
13          11273.0,0.950927e-01,0.,0.,0.250000,0.250000,0.,0.,
    cint
 1          0.,0.,0.,0.,0.,0.,
 2          0.,0.,0.,0.,0.,0.,
 3          1518.1,1706.6,1970.,2306.2,2520.7,2735.3,
 4          0.,0.,0.,0.,0.,0.,
 5          0.,0.,0.,0.,0.,0.,
 6          0.,0.,0.,0.,0.,0.,
 7          0.,0.,0.,0.,0.,0.,
 8          0.,0.,0.,0.,0.,0.,
 9          911.7,1022.1,1132.5,1254.4,1366.5,1478.7,
10          0.,0.,0.,0.,0.,0.,
11          0.,0.,0.,0.,0.,0.,
12          0.,0.,0.,0.,0.,0.,
13          6120.,6516.,6927.,7314.3,7673.7,8033.1,
14          741.,789.9,845.,904.9,993.,1081.2,
15          244.,283.,309.,330.,358.,386.,
16          0.,0.,0.,0.,0.,0.,
17          0.,0.,0.,0.,0.,0.,
18          0.,0.,0.,0.,0.,0.,
19          0.,0.,0.,0.,0.,0.,
20          0.,0.,0.,0.,0.,0.,
21          0.,0.,0.,0.,0.,0.,
22          0.,0.,0.,0.,0.,0.,
23          0.,0.,0.,0.,0.,0.,
            ssratt
 1          0.95,0.96,0.97,0.98,0.99,1.00,
 2          0.87,0.87,0.87,0.87,0.87,0.87,
 3          0.96,0.97,0.98,0.99,0.99,1.00,
 4          0.67,0.73,0.79,0.85,0.91,0.95,
 5          0.96,0.96,0.96,0.96,0.98,0.98,
 6
 7          0.24,0.24,0.24,0.24,0.24,0.24,
```

TABLE B.2 *Continued.*

```
 8            1.00,1.00,1.00,1.00,1.00,1.00,
 9            1.10,1.10,1.10,1.10,1.10,1.10,
10
11
12            0.67,0.67,0.67,0.67,0.67,0.67,
13            1.00,1.00,1.00,1.00,1.00,1.00,
14            0.75,0.75,0.75,0.75,0.75,0.75,
15
16
17            0.94,0.94,0.94,0.94,0.94,0.94
18            0.99,0.99,0.99,0.99,0.99,0.99
19            1.00,1.00,1.00,1.00,1.00,1.00
20            1.00,1.00,1.00,1.00,1.00,1.00
21            0.97,0.97,0.97,0.97,0.97,0.97
22            0.00,0.00,0.00,0.00,0.00,0.00
23
              pmratt
 1            0.0
 2
 3            0.0
 4            0.0
 5            0.0
 6
 7
 8
 9            0.0
10
11
12
13            1.50,1.50,1.50,1.50,1.50,1.50,
14            1.50,1.50,1.50,1.50,1.50,1.50,
15
16
17            0.00,0.00,0.00,0.00,0.00,0.00
18            0.00,0.00,0.00,0.00,0.00,0.00
19
20
21            0.00,0.00,0.00,0.00,0.00,0.00,
22
23
```

TABLE B.3 Initial data of the East European submodel – Free Trade Scenario.

```
 CMEA in Europe (excl. USSR)
csa          133145.
csn          951487.
a2           0.045
a2min        0.
a2max        0.1
s2min        0.03
s2max        0.08
a3           0.135
a3min        0.075
a3max        0.25
s3min        0.01
s3max        0.04
a4min        0.6
a4max        0.85
exchr        0.9
shmlk        0.795
shbeef       0.9
shpltr       0.438
pyn1         0.5932
pyn2         0.1119
pyn3         1.322
pyn4         0.000
pinva        8860.
pinvn        65807.
depa         0.00
depn         0.00
rho          1.00
nprod        3
lmin         0.95,0.95,0.95,0.95,0.95,0.95,0.75,0.75,1.0,1.0,
lmax         1.05,1.05,1.05,1.05,1.05,1.05,1.25,1.25,1.1,1.1,
st1          4.,4.,4.,4.,4.,4.,4.,4.,4.,4.,
st2          4.,4.,4.,4.,4.,4.,4.,4.,4.,4.,
k11          9999,0,9999,0,40,40,9999,60,9999,80,
k12          0,9999,0,9999,40,40,60,9999,80,9999,
popt         106186.,110041.,113538.,116479.,119163.,121846.,
alt          0.045,0.045,0.045,0.045,0.045,0.045,
lftt         56162.,58442.,60931.,62379.,63878.,65376.,
lfat         17319.,15568.,13953.,12120.,10387.,8564.,
fertt        4141.7,5285.9,6746.4,8610.3,10475.7,12745.3,
balt         0.,0.,0.,0.,0.,0.,
   y, cint, seed, waste, feed, pw,
 1           26528.3, 647.3, 1675.3, 1484.3, 11705.2, 159.,
 2           160.8, 31., 14.4, 13.1, 0.,230.,
 3           48713.6, 2139.2, 2242.1, 2322., 42819.4, 130.,
 4           4204.5, 0., 0., 14.1, 11.7, 208.,
 5           6497.5, 0., 571.1, 672.7, 2580.1, 1420.,
 6           0., 0., 0., 19.4, 0., 120.,
 7           0., 0., 0., 46.4, 0., 218.,
 8           9831.8, 0., 0., 634.7, 82.7, 210.,
 9           862.4, 93.9, 8.3, 6.4, 16.6, 760.,
10           0., 0., 0., 0.6, 0., 1421.,
11           0., 0., 0., 0., 0., 1586.,
12           0., 0., 0., 0., 0., 1200.,
13           33., 1683., 0., 0., 0., 420.,
14           583.2, 530.3, 0., 0., 0., 1130.,
15           0., 230., 0., 0., 0., 656.,
16           0., 0., 0., 0., 0., 91.,
17           2130.,103.6, 0., 16.6, 0., 1200.,
18           234.2, 0., 0., 0.9, 0., 1108.,
19           5402.4,114.9, 0., 66.7, 0., 1626.,
20           1217.6,3.2, 0., 13., 0., 1144.,
21           38988.1, 1555., 0., 901.7, 15698.6, 209.,
22           1564.9, 0., 73.4, 27.3, 0., 902.,
23           252600.,16.4, 0., 0., 0., 1000.,
```

TABLE B.3 *Continued.*

```
            hcons,pd, ssh, wsh, stfr
 1          13308.,183.9, 0.0627, 0.0484, 0.1,
 2          534.,390., 0.0898, 0.0222, 0.1,
 3          7025.9,166.8, 0.065, 0.0431, 0.1,
 4          4319.6,292., 0., 0.0034, 0.1,
 5          2450.,879., 0.085, 0.1035, 0.1,
 6          186.1,0., 0., 0.0916, 0.03,
 7          635.1,0., 0., 0.0669, 0.03,
 8          7702.4,225., 0., 0.0677, 0.03,
 9          888.4,1069., 0.02, 0.0051, 0.1,
10          123.7,0., 0., 0.0044, 0.1,
11          145.4,0., 0., 0., 0.1,
12          20.9,0., 0., 0., 0.1,
13          0.,946., 0., 0., 0.1,
14          0.,2847., 0., 0., 0.1,
15          0.,0., 0., 0., 0.03,
16          0.,0., 0., 0., 0.,
17          1741.1,1987., 0., 0.0074, 0.1,
18          207.,1987., 0., 0.0041, 0.1,
19          4202.2,1945., 0., 0.0129, 0.1,
20          1014.2,1890., 0., 0.0127, 0.1,
21          21155.1,218., 0., 0.0232, 0.03,
22          1336.1,1890., 0.0489, 0.0181, 0.03,
23          203750.,900., 0., 0., 0.025,
            pf1, pf2, pf3,
 1          4., 0., 0.6, 0., 6.8, 0.,
 2          0., 0., 0., 0., 0., 0.,
 3          15., 0., 2.,0., 23.2, 0.,
 4          0.001, 0., 0.0025, 0., 0., 0.,
 5          0.3, 0., 0.42, 0., 0., 0.,
 6          0., 0., 0., 0., 0., 0.,
 7          0., 0., 0., 0., 0., 0.,
 8          0.01, 0., 0.014, 0., 0., 0.,
 9          0., 0., 0.002, 0., 0.02, 0.,
10          0., 0., 0., 0., 0., 0.,
11          0., 0., 0., 0., 0., 0.,
12          0., 0., 0., 0., 0., 0.,
13          0., 0., 0., 0., 0., 0.,
14          0., 0., 0., 0., 0., 0.,
15          0., 0., 0., 0., 0., 0.,
16          0., 0., 0., 0., 0., 0.,
17          0., 0., 0., 0., 0., 0.,
18          0., 0., 0., 0., 0., 0.,
19          0., 0., 0., 0., 0., 0.,
20          0., 0., 0., 0., 0., 0.,
21          1.9, 0., 2.75, 0., 0., 0.,
22          0., 0., 0., 0., 0., 0.,
23          0., 0., 0., 0., 0., 0.,
            ifunc, neta, t1, t2,
 1          3, -0.22, 0., 0.,
 2          2, 0.2, 0., 0.,
 3          3, -0.15, 0., 0.,
 4          3, 0.25, -0.4, -0.1,
 5          2, 0.2, 0., 0.,
 6          2, 0.59, 8.3, -1.5,
 7          2, 0.82, 0.8, 0.8,
 8          2, 0.53, 0., 0.,
 9          3, 0.14, 0.1, 0.6,
10          2, 0.46, 0., 0.,
11          2, 0.88, 0., 0.,
12          2, 0.84, 0., 0.,
13          0, 0., 0., 0., 0.,
14          0, 0., 0., 0., 0.,
15          0, 0., 0., 0., 0.,
16          0, 0., 0., 0., 0.,
17          3, 0.5, 0., 0.,
```

TABLE B.3 *Continued.*

```
18          2, 0.69, -1., -1.,
19          3, 0.14, 0.1, -0.2,
20          3, 0.58, 0., 0.,
21          3, 0.2, 0., 0.,
22          2, 0.43, 0., 0.,
23          0, 0., 0., 0., 0.,
            ipr, ys, r3
 1          1, 26528.3, 2.52,
 2          2, 204.7, 2.5,
 3          3, 48973., 2.31,
 4          9, 1137.4, 1.,
 5          4, 4239.5, 1.1,
 6          5, 6497.5, 1.1,
 7          8, 9436.4, 1.1,
 8          12, 0., 1.1,
 9          13, 37.782, 0.47,
10          14, 584.73, 0.47,
11          0, 1701.1, 0.7,
12          0, 4847.6, 0.,
13          0, 319.1, 0.,
parameters of allocation model
01          166131.,0.373652e-01,0.,0.,0.167748,0.403351,0.136846,1.000000,
02          10630.2,0.202671e-01,0.,0.,0.138387,0.570318,0.191295,0.,
03          33651.3,0.169477e-01,0.,0.,0.251367,0.508062,0.140571,0.,
04          59232.9,0.471159e-01,0.,0.,0.122023,0.359098,0.571289d-01,0.,
05          32432.4,0.,0.,0.,0.377723,0.339563,0.461721d-01,0.,
06          4656.20,0.,0.,0.,0.388272,0.448845,0.628829d-01,0.,
07          64228.1,0.,0.,0.,0.348510,0.331318,0.584686d-01,0.,
08          0.,
09          13096.8,0.,0.,0.,0.296051,0.178949,0.250000d-01,0.,
10          10208.2,0.,0.,0.,0.465204,0.749028d-01,0.284267d-01,0.,
11          34318.9,0.401869e-01,0.,0.,0.250000,0.250000,0.,0.,
12          112852.,0.412845e-01,0.,0.,0.250000,0.250000,0.,0.,
13          7856.96,0.937392e-01,0.,0.,0.250000,0.250000,0.,0.,
           cint
 1          647.3, 702.9, 780., 887.1, 961.5, 1036.,
 2          3.1, 3.5, 4., 4.7, 5.1, 5.5,
 3          2139.2, 2371.4, 2693., 2962.9, 3332.4, 3701.9,
 4          0., 0., 0., 0., 0., 0.,
 5          0., 0., 0., 0., 0., 0.,
 6          0., 0., 0., 0., 0., 0.,
 7          0., 0., 0., 0., 0., 0.,
 8          0., 0., 0., 0., 0., 0.,
 9          93.9, 105.9, 118., 130.5, 135.3, 140.1,
10          0., 0., 0., 0., 0., 0.,
11          0., 0., 0., 0., 0., 0.,
12          0., 0., 0., 0., 0., 0.,
13          1683., 1740., 1812., 1849.8, 1933.2, 2016.6,
14          530.3, 559.6, 592.9, 619.3, 658.7, 698.,
15          230., 266., 290., 309., 335.5, 362.,
16          0., 0., 0., 0., 0., 0.,
17          0., 0., 0., 0., 0., 0.,
18          0., 0., 0., 0., 0., 0.,
19          0., 0., 0., 0., 0., 0.,
20          0., 0., 0., 0., 0., 0.,
21          1555., 1834.4, 2217.2, 2592.9, 2850.3, 3107.6,
22          0., 0., 0., 0., 0., 0.,
23          0., 0., 0., 0., 0., 0.,
           ssratt
 1          0.00,0.00,0.00,0.00,0.00,0.00
 2           0.00,0.00,0.00,0.00,0.00,0.00,
 3          0.87,0.85,0.85,0.85,0.85,0.85,
 4           0.00,0.00,0.00,0.00,0.00,0.00,
 5           0.00,0.00,0.00,0.00,0.00,0.00,
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TABLE B.3 *Continued.*

```
 8
 9
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23
            pmratt
 1          0.00,0.00,0.00,0.00,0.00,0.00
 2           0.00,0.00,0.00,0.00,0.00,0.00,
 3           0.00,0.00,0.00,0.00,0.00,0.00,
 4           0.00,0.00,0.00,0.00,0.00,0.00,
 5           0.00,0.00,0.00,0.00,0.00,0.00,
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TABLE B.4 Initial data of the East European submodel – Constant-SSR Scenario.

```
 CMEA in Europe (excl. USSR)
csa          133145.
csn          951487.
a2           0.045
a2min        0.
a2max        0.1
s2min        0.03
s2max        0.08
a3           0.135
a3min        0.075
a3max        0.25
s3min        0.01
s3max        0.04
a4min        0.6
a4max        0.85
exchr        0.9
shmlk        0.795
shbeef       0.9
shpltr       0.438
pyn1         0.5932
pyn2         0.1119
pyn3         1.322
pyn4         0.000
pinva        8860.
pinvn        65807.
depa         0.00
depn         0.00
rho          1.00
nprod        3
lmin         0.95,0.95,0.95,0.95,0.95,0.95,0.75,0.75,1.0,1.0,
lmax         1.05,1.05,1.05,1.05,1.05,1.05,1.25,1.25,1.1,1.1,
st1          4.,4.,4.,4.,4.,4.,4.,4.,4.,4.,
st2          4.,4.,4.,4.,4.,4.,4.,4.,4.,4.,
k11          9999,0,9999,0,40,40,9999,60,9999,80,
k12          0,9999,0,9999,40,40,60,9999,80,9999,
popt         106186.,110041.,113538.,116479.,119163.,121846.,
alt          0.045,0.045,0.045,0.045,0.045,0.045,
lftt         56162.,58442.,60931.,62379.,63878.,65376.,
lfat         17319.,15568.,13953.,12120.,10387.,8564.,
fertt        4141.7,5285.9,6746.4,8610.3,10475.7,12745.3,
balt         0.,0.,0.,0.,0.,0.,
   y, cint, seed, waste, feed, pw,
 1           26528.3, 647.3, 1675.3, 1484.3, 11705.2, 159.,
 2           160.8, 31., 14.4, 13.1, 0.,230.,
 3           48713.6, 2139.2, 2242.1, 2322., 42819.4, 130.,
 4           4204.5, 0., 0., 14.1, 11.7, 208.,
 5           6497.5, 0., 571.1, 672.7, 2580.1, 1420.,
 6           0., 0., 0., 19.4, 0., 120.,
 7           0., 0., 0., 46.4, 0., 218.,
 8           9831.8, 0., 0., 634.7, 82.7, 210.,
 9           862.4, 93.9, 8.3, 6.4, 16.6, 760.,
10           0., 0., 0., 0.6, 0., 1421.,
11           0., 0., 0., 0., 0., 1586.,
12           0., 0., 0., 0., 0., 1200.,
13           33., 1683., 0., 0., 0., 420.,
14           583.2, 530.3, 0., 0., 0., 1130.,
15           0., 230., 0., 0., 0., 656.,
16           0., 0., 0., 0., 0., 91.,
17           2130., 103.6, 0., 16.6, 0., 1200.,
18           234.2, 0., 0., 0.9, 0., 1108.,
19           5402.4, 114.9, 0., 66.7, 0., 1626.,
20           1217.6, 3.2, 0., 13., 0., 1144.,
21           38988.1, 1555., 0., 901.7, 15698.6, 209.,
22           1564.9, 0., 73.4, 27.3, 0., 902.,
23           252600., 16.4, 0., 0., 0., 1000.,
```

TABLE B.4 *Continued.*

```
            hcons,pd, ssh, wsh, stfr
 1          13308.,183.9, 0.0627, 0.0484, 0.1,
 2          534.,390., 0.0898, 0.0222, 0.1,
 3          7025.9,166.8, 0.065, 0.0431, 0.1,
 4          4319.6,292., 0., 0.0034, 0.1,
 5          2450.,879., 0.085, 0.1035, 0.1,
 6          186.1,0., 0., 0.0916, 0.03,
 7          635.1,0., 0., 0.0669, 0.03,
 8          7702.4,225., 0., 0.0677, 0.03,
 9          888.4,1069., 0.02, 0.0051, 0.1,
10          123.7,0., 0., 0.0044, 0.1,
11          145.4,0., 0., 0., 0.1,
12          20.9,0., 0., 0., 0.1,
13          0.,946., 0., 0., 0.1,
14          0.,2847., 0., 0., 0.1,
15          0.,0., 0., 0., 0.03,
16          0.,0., 0., 0., 0.,
17          1741.1,1987., 0., 0.0074, 0.1,
18          207.,1987., 0., 0.0041, 0.1,
19          4202.2,1945., 0., 0.0129, 0.1,
20          1014.2,1890., 0., 0.0127, 0.1,
21          21155.1,218., 0., 0.0232, 0.03,
22          1336.1,1890., 0.0489, 0.0181, 0.03,
23          203750.,900., 0., 0., 0.025,
            pf1, pf2, pf3,
 1          4., 0., 0.6, 0., 6.8, 0.,
 2          0., 0., 0., 0., 0., 0.,
 3          15., 0., 2.,0., 23.2, 0.,
 4          0.001, 0., 0.0025, 0., 0., 0.,
 5          0.3, 0., 0.42, 0., 0., 0.,
 6          0., 0., 0., 0., 0., 0.,
 7          0., 0., 0., 0., 0., 0.,
 8          0.01, 0., 0.014, 0., 0., 0.,
 9          0., 0., 0.002, 0., 0.02, 0.,
10          0., 0., 0., 0., 0., 0.,
11          0., 0., 0., 0., 0., 0.,
12          0., 0., 0., 0., 0., 0.,
13          0., 0., 0., 0., 0., 0.,
14          0., 0., 0., 0., 0., 0.,
15          0., 0., 0., 0., 0., 0.,
16          0., 0., 0., 0., 0., 0.,
17          0., 0., 0., 0., 0., 0.,
18          0., 0., 0., 0., 0., 0.,
19          0., 0., 0., 0., 0., 0.,
20          0., 0., 0., 0., 0., 0.,
21          1.9, 0., 2.75, 0., 0., 0.,
22          0., 0., 0., 0., 0., 0.,
23          0., 0., 0., 0., 0., 0.,
            ifunc, neta, t1, t2,
 1          3, -0.22, 0., 0.,
 2          2, 0.2, 0., 0.,
 3          3, -0.15, 0., 0.,
 4          3, 0.25, -0.4, -0.1,
 5          2, 0.2, 0., 0.,
 6          2, 0.59, 8.3, -1.5,
 7          2, 0.82, 0.8, 0.8,
 8          2, 0.53, 0., 0.,
 9          3, 0.14, 0.1, 0.6,
10          2, 0.46, 0., 0.,
11          2, 0.88, 0., 0.,
12          2, 0.84, 0., 0.,
13          0, 0., 0., 0., 0.,
14          0, 0., 0., 0., 0.,
15          0, 0., 0., 0., 0.,
16          0, 0., 0., 0., 0.,
17          3, 0.5, 0., 0.,
```

TABLE B.4 *Continued.*

```
18          2, 0.69, -1., -1.,
19          3, 0.14, 0.1, -0.2,
20          3, 0.58, 0., 0.,
21          3, 0.2, 0., 0.,
22          2, 0.43, 0., 0.,
23          0, 0., 0., 0., 0.,
            ipr, ys, r3
 1          1, 26528.3, 2.52,
 2          2, 204.7, 2.5,
 3          3, 48973., 2.31,
 4          9, 1137.4, 1.,
 5          4, 4239.5, 1.1,
 6          5, 6497.5, 1.1,
 7          8, 9436.4, 1.1,
 8          12, 0., 1.1,
 9          13, 37.782, 0.47,
10          14, 584.73, 0.47,
11          0, 1701.1, 0.7,
12          0, 4847.6, 0.,
13          0, 319.1, 0.,
parameters of allocation model
01          166131.,0.373652e-01,0.,0.,0.167748,0.403351,0.136846,1.000000,
02          10630.2,0.202671e-01,0.,0.,0.138387,0.570318,0.191295,0.,
03          33651.3,0.169477e-01,0.,0.,0.251367,0.508062,0.140571,0.,
04          59232.9,0.471159e-01,0.,0.,0.122023,0.359098,0.571289d-01,0.,
05          32432.4,0.,0.,0.,0.377723,0.339563,0.461721d-01,0.,
06          4656.20,0.,0.,0.,0.388272,0.448845,0.628829d-01,0.,
07          64228.1,0.,0.,0.,0.348510,0.331318,0.584686d-01,0.,
08          0.,
09          13096.8,0.,0.,0.,0.296051,0.178949,0.250000d-01,0.,
10          10208.2,0.,0.,0.,0.465204,0.749028d-01,0.284267d-01,0.,
11          34318.9,0.401869e-01,0.,0.,0.250000,0.250000,0.,0.,
12          112852.,0.412845e-01,0.,0.,0.250000,0.250000,0.,0.,
13          7856.96,0.937392e-01,0.,0.,0.250000,0.250000,0.,0.,
           cint
 1          647.3, 702.9, 780., 887.1, 961.5, 1036.,
 2          3.1, 3.5, 4., 4.7, 5.1, 5.5,
 3          2139.2, 2371.4, 2693., 2962.9, 3332.4, 3701.9,
 4          0., 0., 0., 0., 0., 0.,
 5          0., 0., 0., 0., 0., 0.,
 6          0., 0., 0., 0., 0., 0.,
 7          0., 0., 0., 0., 0., 0.,
 8          0., 0., 0., 0., 0., 0.,
 9          93.9, 105.9, 118., 130.5, 135.3, 140.1,
10          0., 0., 0., 0., 0., 0.,
11          0., 0., 0., 0., 0., 0.,
12          0., 0., 0., 0., 0., 0.,
13          1683., 1740., 1812., 1849.8, 1933.2, 2016.6,
14          530.3, 559.6, 592.9, 619.3, 658.7, 698.,
15          230., 266., 290., 309., 335.5, 362.,
16          0., 0., 0., 0., 0., 0.,
17          0., 0., 0., 0., 0., 0.,
18          0., 0., 0., 0., 0., 0.,
19          0., 0., 0., 0., 0., 0.,
20          0., 0., 0., 0., 0., 0.,
21          1555., 1834.4, 2217.2, 2592.9, 2850.3, 3107.6,
22          0., 0., 0., 0., 0., 0.,
23          0., 0., 0., 0., 0., 0.,
            ssratt
 1          0.93,0.95,0.96,0.97,0.98,0.99,
 2          0.27,0.27,0.27,0.27,0.27,0.27,
 3          0.87,0.89,0.91,0.93,0.94,0.95,
 4          0.97,0.97,0.97,0.97,0.97,0.97,
 5          1.10,1.10,1.10,1.10,1.10,1.10,
 6
 7
```

TABLE B.4 *Continued.*

```
 8           1.18,1.18,1.18,1.18,1.18,1.18,
 9           0.90,0.91,0.92,0.93,0.94,0.95,
10
11
12
13
14           1.0,1.0,1.0,1.0,1.0,1.0,
15
16
17
18
19
20
21
22
23
             pmratt
 1           0.00,0.00,0.00,0.00,0.00,0.00
 2            0.00,0.00,0.00,0.00,0.00,0.00,
 3            0.00,0.00,0.00,0.00,0.00,0.00,
 4            0.00,0.00,0.00,0.00,0.00,0.00,
 5            0.00,0.00,0.00,0.00,0.00,0.00,
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APPENDIX C Model Variants

I Model Variants for the CMEA Countries, Excluding the Soviet Union

(1) FAO/1 version
Standard model structure, using the forecasts of the FAO for agricultural population and labor capacity, and taking into account the pool of fixed assets calculated at gross value. Autarchy limitation is applied only for vegetables (SSR $\geqslant$ 1).

(2) FAO/2 version
Similar to FAO/1, but fixed assets are considered at net value. Labor forecasts taken into account in the East European model are outlined in Table C.1.

TABLE C.1 Forecasts for the agricultural labor force in the East European model (in thousands).

Year	FAO forecast	Modified forecasts		
		A	B	C
1975	17,319	17,319	17,319	17,319
1980	15,788	15,568	15,373	15,161
1985	14,347	13,953	13,428	13,003
1990	12,742	12,120	11,482	10,845
1995	11,324	10,387	9537	8687
2000	9905	8564	7592	6530

(3) A/1 version
Forecast for labor force according to version A, fixed assets at net value. No prescribed figure in the model about autarchy.

(4) A/2 version
The same as A/1, but SSR $\geqslant$ 0.3 for rice and SSR $\geqslant$ 1 for vegetables are prescribed.

(5) A/3 version
The same as A/2, but SSR $\geqslant$ 0.95 also prescribed for corn.

(6) A/4 version
The same as A/1, but in addition the autarchy levels of 1974–76 are set as lower limits.

(7) A/I version
The same as A/2, but agriculture accounts for 20% instead of 13.5% of total investments.

(8) A/II version
The same as A/2, but agriculture accounts for 25% instead of 13.5% of total investments.

(9) A/III version
The same as A/2, but agriculture accounts for 10% instead of 13.5% of total investments.

(10) A/IV version
The same as A/2, but agriculture accounts for 7.5% instead of 13.5% of total investments.

(11) A/a version
The same as A/2, but instead of the remainder of the balance of payments an obligation of $500 million credit reimbursement is included.

(12) A/b version
The same as A/2, but instead of the remainder of the balance of payments an obligation of $1 billion credit reimbursement is included.

(13) A/c version
The same as A/2, but there is the allocation of $500 million new credits taken into account in the balance of payments.

(14) A/A version
The same as A/2, but the required annual rate of overall economic growth prescribed is 4.1% instead of 4.8%.

(15) A/T version
The same as A/2, but we assume that the specific coefficients of feed conversion will be improved by 10% by the year 2000.

(16) A/M version
The same as A/2, but the growth in the amount of fertilizer available is 20% smaller than in version A/2.

(17) B/1 version
This is a standard version of the model without autarchy limitations, using the agricultural labor force forecast C.

(18) B/2 version
The same as B/1, but there is a prescribed SSR $\geqslant$ 0.3 for rice and SSR $\geqslant$ 1.0 for vegetables.

(19) C/1 version
Includes forecast C for the agricultural labor force and the quantities of fixed assets taken into account in the FAO/1 version.

(20) C/2 version
The same as C/1, except that fixed assets are taken into account according to the FAO/2 version (net value).

(21) C/3 version
The same as C/1, but with a prescribed SSR $\geqslant$ 0.3 for rice and SSR $\geqslant$ 1.0 for vegetables.

(22) C/4 version
The same as C/1, but prescribed SSR $\geqslant$ 1.0 for pork and beef.

II Model Variants for the Soviet Union

(1) FAO/1 version
This is a standard model version making use of FAO forecasts for the labor force and not including autarchy limitations.

(2) FAO/2 version
The same as FAO/1, but with a prescribed SSR $\geqslant$ 1.0 for meat products.

(3) FAO/3 version
The same as FAO/2, but a 10% improvement in feed conversion is assumed for 2000.

(4) A/1 version
This is a standard version of the model assuming that a smaller number migrate from agriculture than forecast by the FAO. The agricultural labor force will amount to 10% of the total and will decrease linearly. Agriculture will account for 20% of total investments. SSR $\geqslant$ 1.0 is prescribed for meat products.

(5) A/2 version
The same as version A/1, but agriculture accounts for 15% instead of 20% of total investments.

(6) A/3 version
The same as version A/1, but agriculture accounts for 10% instead of 20% of total investments.

(7) A/4 version
The same as version A/1, but agriculture accounts for 7.5% instead of 20% of total investments.

(8) A/5 version
The same as version A/1, but agriculture accounts for 15% instead of 20% of total investments.

(9) A/6 version
The same as version A/1, but agriculture accounts for 30% instead of 20% of total investments.

(10) A/I version
The same as version A/1, but the required annual rate of economic growth is 3.5% instead of 4.2%.

(11) A/II version
The same as version A/2, but the required annual rate of economic growth is 3.5% instead of 4.2%.

(12) A/III version
The same as version A/2, but the required annual rate of economic growth is 2.5% instead of 4.2%.

(13) A/IV version
The same as version A/2, but the required annual rate of economic growth is 5% instead of 4.2%.

(14) A/a version
The same as version A/1, but with $1 billion new allocation of credits annually in the balance of payments.

(15) A/b version
The same as version A/1, but with $1 billion new allocation of credits annually.

(16) A/c version
The same as version A/1, but with $1.5 billion credit reimbursements annually.

(17) A/T version
The same as version A/1, but with a 10% improvement in feed conversion efficiency by the year 2000.

APPENDIX D The Scenarios

TABLE D.1 Constant-SSR Scenario.

IIASA - FAP agriculture programming system - basic data set

Normative Medium Constant SSR Scenario 2

sum for CMEA 1975

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	51157.3	647.3	43950.2	10854.9	12209.5	-1870.8	116948.4	8080.5	0.	-8080.5	108867.9	0.93	159.
rice	2646.4	31.0	0.	134.8	74.7	-26.9	2860.0	724.7	0.	-724.7	2135.3	0.75	230.
c.gr	18440.7	3657.3	110143.2	11955.8	13218.6	-2324.9	155090.7	11725.0	0.	-11725.0	143365.6	0.92	130.
suga	15684.7	0.	11.7	0.	14.1	-78.5	15632.0	3833.5	0.	-3833.5	11798.5	0.75	208.
vege	9461.5	0.	5450.1	1879.5	1547.7	-361.9	17976.9	129.4	0.	-129.4	17847.5	0.99	1420.
bana	207.8	0.	0.	0.	21.8	-0.3	229.3	229.3	0.	-229.3	0.	0.	120.
citr	1154.7	0.	0.	0.	99.5	-1.7	1252.5	1117.8	0.	-1117.8	134.7	0.11	218.
frui	22510.9	0.	82.7	0.	2109.1	-144.6	24558.1	0.	2194.7	2194.7	26752.8	1.09	210.
vego	3028.2	1005.6	123.6	301.0	102.4	-105.3	4455.5	0.	481.3	481.3	4936.8	1.11	760.
coco	295.9	0.	0.	0.	0.6	-1.5	295.0	295.0	0.	-295.0	0.	0.	1421.
coff	195.8	0.	0.	0.	0.	-1.0	194.8	194.8	0.	-194.8	0.	0.	1586.
teas	150.9	0.	0.	0.	0.	-0.8	150.1	63.7	0.	-63.7	86.4	0.58	1200.
cott	0.	7803.0	0.	0.	0.	-174.6	7628.4	0.	33.6	33.6	7662.0	1.00	420.
o.nf	0.	1271.3	0.	0.	0.	-11.0	1260.3	125.0	0.	-125.0	1135.4	0.90	1130.
rubb	0.	474.0	0.	0.	0.	-0.7	473.3	473.3	0.	-473.3	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	8603.1	103.6	0.	0.	16.6	-69.8	8653.5	102.3	0.	-102.3	8551.2	0.99	1200.
mutt	1149.3	0.	0.	0.	0.9	-8.2	1142.0	0.	17.5	17.5	1159.5	1.02	1108.
pigm	8484.6	114.9	0.	0.	66.7	-223.4	8442.8	0.	2121.4	2121.4	10564.2	1.25	1626.
poul	2512.9	3.2	0.	0.	13.0	-31.3	2497.8	0.	172.8	172.8	2670.6	1.07	1144.
milk	70468.7	1555.0	53276.8	0.	4408.4	-249.0	129459.9	0.	47.5	47.5	129507.4	1.00	209.
eggs	4277.8	0.	0.	169.3	187.1	-19.2	4615.0	0.	105.8	105.8	4720.8	1.02	902.
cgrn	18440.7	3657.3	110143.2	11955.8	13218.6	-2324.9	155090.7	11725.0	0.	-11725.0	143365.6	0.92	
cere	72244.4	4335.6	154093.4	22945.5	25502.8	-4222.6	274899.1	20530.2	0.	-20530.2	254368.8	0.93	
meat	20749.9	221.7	0.	0.	97.2	-332.7	20736.1	102.3	2311.7	2209.4	22945.5	1.11	
cer$	11140.0	585.5	21306.7	3311.2	3676.9	-605.9	39414.4	2975.7	0.	-2975.7	36438.6	0.92	
fod$	21652.8	764.3	7850.4	2897.6	2743.6	-629.2	35279.6	1259.7	826.7	-433.0	34846.6	0.99	
nfd$	0.	5024.8	0.	0.	0.	-86.2	4938.6	451.7	14.1	-437.6	4501.0	0.91	
liv$	46854.4	639.8	11134.9	152.7	1234.4	-561.2	59454.9	122.8	3771.8	3649.0	63103.9	1.06	
tfo$	79647.2	1989.6	40292.0	6361.5	7654.9	-1796.3	134148.9	4358.2	4598.5	240.3	134389.1	1.00	
gvp$	79647.2	7014.3	40292.0	6361.5	7654.9	-1882.5	139087.4	4809.9	4612.6	-197.3	138890.1	1.00	
gdp	602717.0			tot pop	360566.0			lab for	0.	ag lab	0.		

notes

TABLE D.1 *Continued.*

IIASA - FAP agriculture programming system - basic data set

Normative Medium Constant SSR Scenario 2

sua for CMEA 1980

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	53724.4	702.9	50062.5	12833.0	12804.8	153.4	130281.1	5067.7	0.	-5067.7	125213.4	0.96	159.
rice	2750.6	3.5	0.	140.6	75.4	3.2	2973.2	715.1	0.	-715.1	2258.2	0.76	230.
c.gr	19353.8	4078.0	128536.4	16698.6	15783.9	312.0	184762.6	10566.7	0.	-10566.7	174195.9	0.94	130.
suga	16225.6	0.	16.6	0.	15.2	16.4	16273.7	3327.6	0.	-3327.6	12946.1	0.80	208.
vege	9923.7	0.	6520.6	2128.8	1794.5	20.1	20387.6	0.	111.2	111.2	20498.9	1.01	1420.
bana	365.9	0.	0.	0.	34.2	1.1	401.2	401.2	0.	-401.2	0.	0.	120.
citr	1193.9	0.	0.	0.	92.1	0.8	1286.9	1152.2	0.	-1152.2	134.7	0.10	218.
frui	23389.2	0.	101.1	0.	2225.3	13.1	25728.7	0.	3079.6	3079.6	28808.3	1.12	210.
vego	3210.5	1128.0	157.9	306.1	5.5	8.4	4816.4	0.	331.9	331.9	5148.4	1.07	760.
coco	308.0	0.	0.	0.	0.6	0.5	309.1	309.1	0.	-309.1	0.	0.	1421.
coff	210.6	0.	0.	0.	0.	0.7	211.3	211.3	0.	-211.3	0.	0.	1586.
teas	157.1	0.	0.	0.	0.	0.2	157.4	59.3	0.	-59.3	98.1	0.62	1200.
cott	0.	8256.0	0.	0.	0.	9.5	8265.5	0.	1463.3	1463.3	9728.7	1.18	420.
o.nf	0.	1349.5	0.	0.	0.	1.6	1351.1	32.1	0.	-32.1	1319.0	0.98	1130.
rubb	0.	549.0	0.	0.	0.	0.4	549.5	549.5	0.	-549.5	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	8949.8	0.	0.	0.	17.5	13.3	8980.5	0.	988.1	988.1	9968.6	1.11	1200.
mutt	1152.2	0.	0.	0.	1.1	0.8	1154.1	0.	195.0	195.0	1349.1	1.17	1108.
pigm	8705.7	0.	0.	0.	75.8	12.9	8794.4	0.	2755.6	2755.6	11550.1	1.31	1626.
poul	2551.8	0.	0.	0.	17.3	6.1	2575.3	0.	443.9	443.9	3019.2	1.17	1144.
milk	73000.1	1834.4	70457.1	0.	5144.7	214.9	151560.2	2145.3	0.	-2145.3	149414.9	0.99	209.
eggs	4451.5	0.	0.	193.6	211.6	2.2	4858.9	0.	490.6	490.6	5349.5	1.10	902.
cgrn	19353.8	4078.0	128536.4	16698.6	15783.9	312.0	184762.6	10566.7	0.	-10566.7	174195.9	0.94	
cere	75828.8	4784.4	178598.9	29672.2	28664.1	468.5	318017.0	16349.5	0.	-16349.5	301667.5	0.95	
meat	21359.5	0.	0.	0.	111.7	33.1	21504.4	0.	4382.7	4382.7	25887.1	1.20	
cer$	11690.8	642.7	24669.7	4243.6	4105.2	65.7	45417.7	2343.9	0.	-2343.9	43073.8	0.95	
fod$	22707.7	857.3	9400.5	3255.6	3044.7	40.2	39305.9	1144.9	1056.9	-87.9	39218.0	1.00	
nfd$	0.	5352.6	0.	0.	0.	6.1	5358.7	396.7	614.6	217.8	5576.5	1.04	
liv$	48553.4	383.4	14725.5	174.6	1431.4	91.7	65360.0	448.4	6832.9	6384.5	71744.6	1.10	
tfo$	82952.0	1883.4	48795.7	7673.8	8581.3	197.5	150083.6	3937.1	7889.8	3952.7	154036.3	1.03	
gvp$	82952.0	7236.0	48795.7	7673.8	8581.3	203.6	155442.3	4333.9	8504.4	4170.6	159612.9	1.03	
gdp	718250.9			tot pop	376707.0			lab for	193002.0	ag lab	38771.0		

notes

IIASA - FAP agriculture programming system - basic data set

Normative Medium Constant SSR Scenario 2

sua for CMEA 1985

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	55266.4	780.0	59808.4	14233.5	14216.3	271.6	144576.3	6086.7	0.	-6086.7	138489.6	0.96	159.
rice	3749.7	4.0	0.	196.4	103.6	87.0	4140.7	959.4	0.	-959.4	3181.3	0.77	230.
c.gr	19862.2	4663.0	153387.8	19427.6	18368.9	628.7	216338.2	13891.5	0.	-13891.5	202446.8	0.94	130.
suga	17009.9	0.	19.4	0.	16.0	12.0	17057.4	2741.3	0.	-2741.3	14316.1	0.84	208.
vege	10484.8	0.	7472.7	2245.3	1910.8	35.4	22149.0	425.0	0.	-425.0	21724.0	0.98	1420.
bana	526.3	0.	0.	0.	49.5	0.3	576.1	576.1	0.	-576.1	0.	0.	120.
citr	1289.1	0.	0.	0.	94.8	-0.9	1383.0	1248.3	0.	-1248.3	134.7	0.10	218.
frui	25623.1	0.	118.6	0.	2750.2	15.0	28506.9	0.	6942.3	6942.3	35449.3	1.24	210.
vego	3584.9	1250.5	184.3	339.3	6.2	20.2	5385.4	0.	288.7	288.7	5674.2	1.05	760.
coco	337.5	0.	0.	0.	0.7	0.6	338.8	338.8	0.	-338.8	0.	0.	1421.
coff	251.5	0.	0.	0.	0.	0.9	252.4	252.4	0.	-252.4	0.	0.	1586.
teas	169.8	0.	0.	0.	0.	0.3	170.1	46.6	0.	-46.6	123.5	0.73	1200.
cott	0.	8739.0	0.	0.	0.	10.1	8749.1	0.	1687.0	1687.0	10436.0	1.19	420.
o.nf	0.	1437.9	0.	0.	0.	1.8	1439.7	0.	264.7	264.7	1704.4	1.18	1130.
rubb	0.	599.0	0.	0.	0.	0.3	599.3	599.3	0.	-599.3	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	9241.4	0.	0.	0.	20.5	-24.2	9237.7	0.	2809.4	2809.4	12047.1	1.30	1200.
mutt	1136.8	0.	0.	0.	1.3	-5.3	1132.8	0.	500.5	500.5	1633.2	1.44	1108.
pigm	8649.1	0.	0.	0.	89.0	-55.9	8682.1	0.	4455.3	4455.3	13137.4	1.51	1626.
poul	2850.4	0.	0.	0.	20.7	6.6	2877.7	0.	754.6	754.6	3632.3	1.26	1144.
milk	78034.4	2217.2	81061.8	0.	6198.5	110.0	167621.9	0.	12583.1	12583.1	180205.0	1.08	209.
eggs	4817.9	0.	0.	232.9	255.6	2.4	5308.8	0.	1137.4	1137.4	6446.2	1.21	902.
cgrn	19862.2	4663.0	153387.8	19427.6	18368.9	628.7	216338.2	13891.5	0.	-13891.5	202446.8	0.94	
cere	78878.4	5447.0	213196.3	33857.4	32688.8	987.3	365055.3	20937.6	0.	-20937.6	344117.7	0.94	
meat	21877.6	0.	0.	0.	131.4	-78.7	21930.3	0.	8519.7	8519.7	30450.0	1.39	
cer$	12231.9	731.1	29450.0	4833.9	4672.2	144.9	52064.0	2994.3	0.	-2994.3	49069.6	0.94	
fod$	24420.2	950.4	10776.3	3446.1	3323.2	71.2	42987.4	1882.3	1677.3	-205.0	42782.4	1.00	
nfd$	0.	5688.2	0.	0.	0.	6.5	5694.6	393.1	1007.6	614.5	6309.1	1.11	
liv$	50328.4	463.4	16941.9	210.1	1720.3	-93.0	69571.1	0.	15689.1	15689.1	85260.2	1.23	
tfo$	86980.5	2144.9	57168.1	8490.1	9715.8	123.1	164622.5	4876.7	17366.4	12489.7	177112.2	1.08	
gvp$	86980.5	7833.1	57168.1	8490.1	9715.8	129.5	170317.1	5269.8	18374.0	13104.2	183421.3	1.08	
gdp	935067.6			tot pop	393096.0			lab for	199843.0	ag lab	34368.0		

notes

TABLE D.1 *Continued.*

IIASA - FAP agriculture programming system - basic data set

Normative Medium Constant SSR Scenario 2

sum for CMEA 1990

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	55204.2	887.1	66902.0	15620.0	15610.5	136.7	154360.4	2635.4	0.	-2635.4	151725.0	0.98	159.
rice	4470.0	4.7	0.	236.2	123.9	14.9	4849.6	1013.1	0.	-1013.1	3836.5	0.79	230.
c.gr	19677.1	5269.1	171743.1	22547.5	21228.6	353.5	240818.9	6324.5	0.	-6324.5	234494.4	0.97	130.
suga	18200.5	0.	21.8	0.	17.1	23.8	18263.1	2154.3	0.	-2154.3	16108.9	0.88	208.
vege	11038.7	0.	8199.7	2485.0	2119.3	25.3	23868.0	0.	200.5	200.5	24068.5	1.01	1420.
bana	564.1	0.	0.	0.	53.1	0.2	617.4	617.4	0.	-617.4	0.	0.	120.
citr	1534.2	0.	0.	0.	112.1	1.5	1647.8	1513.1	0.	-1513.1	134.7	0.08	218.
frui	29446.7	0.	133.1	0.	3183.6	25.2	32788.5	0.	8243.2	8243.2	41031.7	1.25	210.
vego	3953.1	1384.9	201.6	376.0	6.8	11.0	5933.3	0.	325.1	325.1	6258.4	1.05	760.
coco	385.9	0.	0.	0.	0.8	1.0	387.6	387.6	0.	-387.6	0.	0.	1421.
coff	305.8	0.	0.	0.	0.	1.1	306.9	306.9	0.	-306.9	0.	0.	1586.
teas	190.3	0.	0.	0.	0.	0.4	190.7	47.8	0.	-47.8	142.9	0.75	1200.
cott	0.	9164.1	0.	0.	0.	8.9	9173.0	0.	1847.5	1847.5	11020.5	1.20	420.
o.nf	0.	1524.2	0.	0.	0.	1.8	1526.0	0.	613.4	613.4	2139.4	1.40	1130.
rubb	0.	639.0	0.	0.	0.	0.2	639.2	639.2	0.	-639.2	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	10014.9	0.	0.	0.	22.9	16.1	10053.9	0.	3549.6	3549.6	13603.5	1.35	1200.
mutt	1232.8	0.	0.	0.	1.4	2.0	1236.3	0.	608.7	608.7	1845.0	1.49	1108.
pigm	9533.2	0.	0.	0.	99.9	19.5	9652.6	0.	4704.6	4704.6	14357.2	1.49	1626.
poul	3543.6	0.	0.	0.	22.9	15.2	3581.7	0.	442.7	442.7	4024.4	1.12	1144.
milk	81882.6	2592.9	88902.5	0.	7002.0	73.6	180453.5	0.	22944.1	22944.1	203397.6	1.13	209.
eggs	5405.6	0.	0.	258.0	283.5	3.8	5951.0	0.	1194.1	1194.1	7145.0	1.20	902.
cgrn	19677.1	5269.1	171743.1	22547.5	21228.6	353.5	240818.9	6324.5	0.	-6324.5	234494.4	0.97	
cere	79351.2	6160.9	238645.1	38403.6	36963.0	505.1	400028.9	9973.0	0.	-9973.0	390055.9	0.98	
meat	24324.5	0.	0.	0.	147.1	52.9	24524.5	0.	9305.6	9305.6	33830.1	1.38	
cer$	12363.6	827.1	32964.0	5469.1	5270.3	71.1	56965.2	1474.2	0.	-1474.2	55490.9	0.97	
fod$	26526.9	1052.5	11824.8	3814.5	3714.9	53.6	46987.2	1498.9	2262.9	764.0	47751.2	1.02	
nfd$	0.	5990.5	0.	0.	0.	5.9	5996.4	419.3	1469.1	1049.8	7046.2	1.18	
liv$	54927.9	541.9	18580.6	232.8	1936.8	89.6	76309.6	0.	18962.4	18962.4	95272.0	1.25	
tfo$	93818.4	2421.6	63369.4	9516.3	10922.0	214.3	180262.0	2973.1	21225.3	18252.2	198514.2	1.10	
gvp$	93818.4	8412.0	63369.4	9516.3	10922.0	220.2	186258.4	3392.5	22694.4	19302.0	205560.3	1.10	
gdp	1197257.1			tot pop	408116.0			lab for	205573.0	ag lab	29746.0		

notes

IIASA - FAP agriculture programming system - basic data set

Normative Medium Constant SSR Scenario 2

sua for CMEA 1995

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	55179.5	961.5	72470.6	16507.8	16494.0	94.3	161707.8	1256.8	0.	-1256.8	160451.0	0.99	159.
rice	5198.3	5.1	0.	276.4	144.5	14.7	5639.0	1138.1	0.	-1138.1	4500.9	0.80	230.
c.gr	19419.3	5853.1	186224.3	24301.1	22813.9	241.1	258852.8	5471.5	0.	-5471.5	253381.2	0.98	130.
suga	19214.3	0.	24.1	0.	18.0	19.3	19275.7	1434.4	0.	-1434.4	17841.3	0.93	208.
vege	11527.3	0.	8756.9	2652.6	2271.2	19.1	25227.1	0.	516.0	516.0	25743.0	1.02	1420.
bana	598.5	0.	0.	0.	56.3	0.2	655.0	655.0	0.	-655.0	0.	0.	120.
citr	1769.3	0.	0.	0.	128.6	1.3	1899.3	1764.6	0.	-1764.6	134.7	0.07	218.
frui	33141.6	0.	146.7	0.	3472.4	22.5	36783.3	0.	8069.5	8069.5	44852.8	1.22	210.
vego	4295.1	1501.8	225.7	410.2	7.2	9.9	6449.9	0.	369.3	369.3	6819.1	1.06	760.
cocn	432.6	0.	0.	0.	0.8	0.9	434.3	434.3	0.	-434.3	0.	0.	1421.
coff	358.4	0.	0.	0.	0.	1.0	359.5	359.5	0.	-359.5	0.	0.	1586.
teas	209.7	0.	0.	0.	0.	0.4	210.1	55.1	0.	-55.1	154.9	0.74	1200.
coll	0.	9606.9	0.	0.	0.	9.2	9616.1	0.	1946.9	1946.9	11563.1	1.20	420.
o.nf	0.	1651.7	0.	0.	0.	2.7	1654.4	0.	956.8	956.8	2611.2	1.58	1130.
rubb	0.	693.5	0.	0.	0.	0.3	693.8	693.8	0.	-693.8	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	10644.6	0.	0.	0.	25.3	12.0	10681.9	0.	3893.3	3893.3	14575.1	1.36	1200.
mutt	1315.2	0.	0.	0.	1.6	1.6	1318.3	0.	655.4	655.4	1973.7	1.50	1108.
pigm	10347.1	0.	0.	0.	110.1	15.7	10473.0	0.	4862.1	4862.1	15335.1	1.46	1626.
poul	4208.5	0.	0.	0.	24.4	13.2	4246.1	0.	301.2	301.2	4547.2	1.07	1144.
milk	85087.9	2850.3	94149.3	0.	7490.4	43.6	189621.5	0.	28691.8	28691.8	218313.4	1.15	209.
eggs	5967.9	0.	0.	291.9	330.2	3.4	6593.4	0.	1582.6	1582.6	8176.0	1.24	902.
cgrn	19419.3	5853.1	186224.3	24301.1	22813.9	241.1	258852.8	5471.5	0.	-5471.5	253381.2	0.98	
cere	79797.1	6819.7	258694.9	41085.4	39452.5	350.1	426199.6	7866.4	0.	-7866.4	418333.2	0.98	
meat	26515.3	0.	0.	0.	161.4	42.6	26719.3	0.	9711.9	9711.9	36431.2	1.36	
cer$	12493.7	915.0	35732.0	5847.5	5621.6	49.7	60659.4	1172.9	0.	-1172.9	59486.5	0.98	
fod$	28485.0	1141.4	12637.1	4078.5	3995.8	43.0	50380.8	1716.7	2707.9	991.2	51372.0	1.02	
nfd$	0.	6356.3	0.	0.	0.	7.1	6363.4	455.2	1899.0	1443.8	7807.2	1.23	
liv$	59036.1	595.7	19677.2	263.3	2102.3	69.1	81743.7	0.	21072.5	21072.5	102816.1	1.26	
tfo$	100014.8	2652.0	68046.3	10189.2	11719.7	161.8	192783.8	2889.6	23780.4	20890.8	213674.6	1.11	
gvp$	100014.8	9008.3	68046.3	10189.2	11719.7	168.9	199147.2	3344.7	25679.3	22334.6	221481.8	1.11	
gdp	1486149.9			tot pop	420890.0			lab for	210623.0	ag lab	25225.0		

notes

TABLE D.1 *Continued.*

IIASA - FAP agriculture programming system - basic data set

Normative Medium Constant SSR Scenario 2

sua for CMEA 2000

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	55598.1	1036.0	75116.5	17110.9	17089.5	38.2	165989.2	0.	519.1	519.1	166508.3	1.00	159.
rice	5942.2	5.5	0.	317.7	165.5	15.0	6445.9	1264.1	0.	-1264.1	5181.9	0.80	230.
c.gr	19287.4	6437.2	193106.7	25435.0	23780.7	75.9	268123.0	2163.5	0.	-2163.5	265959.5	0.99	130.
suga	20122.4	0.	25.5	0.	18.7	17.5	20184.1	915.6	0.	-915.6	19268.5	0.95	208.
vege	12004.1	0.	9002.7	2747.2	2366.1	12.0	26132.1	0.	608.5	608.5	26740.5	1.02	1420.
bana	629.1	0.	0.	0.	59.2	0.2	688.4	688.4	0.	-688.4	0.	0.	120.
citr	1979.1	0.	0.	0.	143.0	1.2	2123.3	1988.6	0.	-1988.6	134.7	0.06	218.
frui	36542.8	0.	155.5	0.	3591.2	20.8	40310.3	0.	6287.5	6287.5	46597.8	1.16	210.
vego	4615.1	1618.8	249.6	443.1	7.7	9.4	6943.8	0.	417.2	417.2	7361.0	1.06	760.
coco	475.6	0.	0.	0.	0.9	0.8	477.4	477.4	0.	-477.4	0.	0.	1421.
coff	407.0	0.	0.	0.	0.	0.9	408.0	408.0	0.	-408.0	0.	0.	1586.
teas	227.7	0.	0.	0.	0.	0.3	228.0	70.6	0.	-70.6	157.4	0.69	1200.
cott	0.	10049.7	0.	0.	0.	9.2	10058.9	0.	2045.7	2045.7	12104.6	1.20	420.
o.nf	0.	1779.2	0.	0.	0.	2.7	1781.9	0.	1322.6	1322.6	3104.5	1.74	1130.
rubb	0.	748.0	0.	0.	0.	0.3	748.3	748.3	0.	-748.3	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	11148.1	0.	0.	0.	26.8	9.7	11184.6	0.	3560.0	3560.0	14744.5	1.32	1200.
mutt	1385.0	0.	0.	0.	1.6	1.4	1388.1	0.	603.4	603.4	1991.4	1.43	1108.
pigm	11017.3	0.	0.	0.	116.7	13.0	11147.0	0.	4669.5	4669.5	15816.4	1.42	1626.
poul	4793.7	0.	0.	0.	24.8	11.7	4830.1	0.	212.2	212.2	5042.4	1.04	1144.
milk	88120.2	3107.6	95616.3	0.	7557.3	19.4	194420.8	0.	27099.3	27099.3	221520.1	1.14	209.
eggs	6488.7	0.	0.	324.1	381.5	3.2	7197.5	0.	2029.1	2029.1	9226.6	1.28	902.
cgrn	19287.4	6437.2	193106.7	25435.0	23780.7	75.9	268123.0	2163.5	0.	-2163.5	265959.5	0.99	
cere	80827.8	7478.7	268223.2	42863.7	41035.7	129.1	440558.2	3427.6	519.1	-2908.5	437649.7	0.99	
ment	28344.1	0.	0.	0.	169.9	35.8	28549.7	0.	9045.0	9045.0	37594.8	1.32	
cer$	12714.2	1002.8	37047.4	6100.3	5846.8	19.4	62730.8	572.0	82.5	-489.5	62241.4	0.99	
fod$	30328.9	1230.3	13006.2	4237.8	4159.5	31.9	52994.5	1926.3	2501.5	575.2	53569.7	1.01	
nfd$	0.	6722.1	0.	0.	0.	7.1	6729.2	490.9	2353.7	1862.8	8592.0	1.28	
liv$	62580.3	649.5	19983.8	292.3	2175.6	54.6	85736.2	0.	20269.8	20269.8	106006.0	1.24	
tfo$	105623.4	2882.6	70037.4	10630.4	12181.9	105.9	201461.5	2498.3	22853.8	20355.6	221817.1	1.10	
gvp$	105623.4	9604.7	70037.4	10630.4	12181.9	113.0	208190.7	2989.2	25207.6	22218.4	230409.1	1.11	
gdp	1799781.5			tot pop	433663.0			lab for	215672.0	ag lab	20614.0		

notes

TABLE D.2 Free Trade Scenario (note: in our computations this scenario was called a Normative Medium Scenario).

IIASA - FAP agriculture programming system - basic data set

Normative Medium Scenario

sua for CMEA 1975

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	51157.3	647.3	43950.2	10854.9	12209.5	-1870.8	116948.4	8080.5	0.	-8080.5	108867.9	0.93	159.
rice	2646.4	31.0	0.	134.8	74.7	-26.9	2860.0	724.7	0.	-724.7	2135.3	0.75	230.
c.gr	18440.7	3657.3	110143.2	11955.8	13218.6	-2324.9	155090.7	11725.0	0.	-11725.0	143365.6	0.92	130.
suga	15684.7	0.	11.7	0.	14.1	-78.5	15632.0	3833.5	0.	-3833.5	11798.5	0.75	208.
vege	9461.5	0.	5450.1	1879.5	1547.7	-361.9	17976.9	129.4	0.	-129.4	17847.5	0.99	1420.
bean	207.8	0.	0.	0.	21.8	-0.3	229.3	229.3	0.	-229.3	0.	0.	120.
citr	1154.7	0.	0.	0.	99.5	-1.7	1252.5	1117.8	0.	-1117.8	134.7	0.11	218.
frui	22510.9	0.	82.7	0.	2109.1	-144.6	24558.1	0.	2194.7	2194.7	26752.8	1.09	210.
vego	3028.2	1005.6	123.6	301.0	102.4	-105.3	4455.5	0.	481.3	481.3	4936.8	1.11	760.
coco	295.9	0.	0.	0.	0.6	-1.5	295.0	295.0	0.	-295.0	0.	0.	1421.
coff	195.8	0.	0.	0.	0.	-1.0	194.8	194.8	0.	-194.8	0.	0.	1586.
leas	150.9	0.	0.	0.	0.	-0.8	150.1	63.7	0.	-63.7	86.4	0.58	1200.
cott	0.	7803.0	0.	0.	0.	-174.6	7628.4	0.	33.6	33.6	7662.0	1.00	420.
o.nf	0.	1271.3	0.	0.	0.	-11.0	1260.3	125.0	0.	-125.0	1135.4	0.90	1130.
rubb	0.	474.0	0.	0.	0.	-0.7	473.3	473.3	0.	-473.3	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	8603.1	103.6	0.	0.	16.6	-69.8	8653.5	102.3	0.	-102.3	8551.2	0.99	1200.
mutt	1149.3	0.	0.	0.	0.9	-8.2	1142.0	0.	17.5	17.5	1159.5	1.02	1108.
pigm	8484.6	114.9	0.	0.	66.7	-223.4	8442.8	0.	2121.4	2121.4	10564.2	1.25	1626.
poul	2512.9	3.2	0.	0.	13.0	-31.3	2497.8	0.	172.8	172.8	2670.6	1.07	1144.
milk	70468.7	1555.0	53276.8	0.	4408.4	-249.0	129459.9	0.	47.5	47.5	129507.4	1.00	209.
eggs	4277.8	0.	0.	169.3	187.1	-19.2	4615.0	0.	105.8	105.8	4720.8	1.02	902.
cgrn	18440.7	3657.3	110143.2	11955.8	13218.6	-2324.9	155090.7	11725.0	0.	-11725.0	143365.6	0.92	
cere	72244.4	4335.6	154093.4	22945.5	25502.8	-4222.6	274899.1	20530.2	0.	-20530.2	254368.8	0.93	
meat	20749.9	221.7	0.	0.	97.2	-332.7	20736.1	102.3	2311.7	2209.4	22945.5	1.11	
cer$	11140.0	585.5	21306.7	3311.2	3676.9	-605.9	39414.4	2975.7	0.	-2975.7	36438.6	0.92	
fod$	21652.8	764.3	7850.4	2897.6	2743.6	-629.2	35279.6	1259.7	826.7	-433.0	34846.6	0.99	
nfd$	0.	5024.8	0.	0.	0.	-86.2	4938.6	451.7	14.1	-437.6	4501.0	0.91	
liv$	46854.4	639.8	11134.9	152.7	1234.4	-561.2	59454.9	122.8	3771.8	3649.0	63103.9	1.06	
ifo$	79647.2	1989.6	40292.0	6361.5	7654.9	-1796.3	134148.9	4358.2	4598.5	240.3	134389.1	1.00	
gvp$	79647.2	7014.3	40292.0	6361.5	7654.9	-1882.5	139087.4	4809.9	4612.6	-197.3	138890.1	1.00	
gdp	602717.0			tot pop	360566.0			lab for	0.	ag lab	0.		

notes

TABLE D.2 *Continued.*

IIASA - FAP agriculture programming system - basic data set

Normative Medium Scenario

sua for CMEA 1980

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	53822.7	702.9	51372.4	12595.7	12547.4	198.4	131239.5	7776.3	0.	-7776.3	123463.2	0.94	159.
rice	2745.8	3.5	0.	135.6	75.1	3.0	2963.1	764.2	0.	-764.2	2198.8	0.74	230.
c.gr	19390.7	4078.0	132521.7	16620.2	15888.8	449.3	188948.7	15868.6	0.	-15868.6	173080.1	0.92	130.
suga	16201.6	0.	17.5	0.	15.2	15.8	16250.2	3922.6	0.	-3922.6	12327.6	0.76	208.
vege	9918.8	0.	6733.1	2019.6	1661.7	27.2	20360.6	1156.3	0.	-1156.3	19204.2	0.94	1420.
bana	364.7	0.	0.	0.	34.1	1.1	399.9	399.9	0.	-399.9	0.	0.	120.
citr	1185.6	0.	0.	0.	91.5	0.8	1277.9	1143.2	0.	-1143.2	134.7	0.11	218.
frui	23286.9	0.	107.0	0.	2232.1	12.3	25638.3	0.	3170.3	3170.3	28808.6	1.12	210.
vego	3203.9	1128.0	160.2	281.5	5.9	8.3	4787.9	0.	66.6	66.6	4854.5	1.01	760.
coco	306.7	0.	0.	0.	0.6	0.5	307.8	307.8	0.	-307.8	0.	0.	1421.
coff	209.0	0.	0.	0.	0.	0.7	209.7	209.7	0.	-209.7	0.	0.	1586.
teas	156.7	0.	0.	0.	0.	0.2	156.9	57.0	0.	-57.0	99.9	0.64	1200.
cott	0.	8256.0	0.	0.	0.	9.5	8265.5	0.	1534.6	1534.6	9800.0	1.19	420.
o.nf	0.	1349.5	0.	0.	0.	1.6	1351.1	0.	22.1	22.1	1373.2	1.02	1130.
rubb	0.	549.0	0.	0.	0.	0.4	549.5	549.5	0.	-549.5	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	8924.6	0.	0.	0.	18.5	12.6	8955.8	0.	1277.5	1277.5	10233.3	1.14	1200.
mutt	1149.1	0.	0.	0.	1.1	0.7	1151.0	0.	231.6	231.6	1382.6	1.20	1108.
pigm	8669.5	0.	0.	0.	80.3	11.9	8761.7	0.	3181.2	3181.2	11942.9	1.36	1626.
poul	2529.2	0.	0.	0.	18.3	5.5	2553.0	0.	559.6	559.6	3112.6	1.22	1144.
milk	73869.2	1834.4	72193.1	0.	5246.9	232.8	153376.3	0.	306.4	306.4	153682.7	1.00	209.
eggs	4437.0	0.	0.	199.5	215.0	2.0	4853.6	0.	628.6	628.6	5482.2	1.13	902.
cgrn	19390.7	4078.0	132521.7	16620.2	15888.8	449.3	188948.7	15868.6	0.	-15868.6	173080.1	0.92	
cere	75959.2	4784.4	183894.1	29351.5	28511.3	650.7	323151.3	24409.1	0.	-24409.1	298742.2	0.92	
meat	21272.4	0.	0.	0.	118.2	30.8	21421.5	0.	5249.9	5249.9	26671.4	1.25	
cer$	11710.1	642.7	25396.0	4194.5	4077.9	90.7	46111.9	3475.1	0.	-3475.1	42636.8	0.92	
fod$	22667.5	857.3	9705.3	3081.8	2857.8	49.9	39219.7	2777.5	716.4	-2061.2	37158.5	0.95	
nfd$	0.	5352.6	0.	0.	0.	6.1	5358.7	360.4	669.5	309.1	5667.8	1.06	
liv$	48413.7	383.4	15088.4	179.9	1465.5	92.2	65623.0	0.	8233.5	8233.5	73856.5	1.13	
tfo$	82791.3	1883.4	50189.7	7456.3	8401.1	232.8	150954.6	6252.7	8949.9	2697.2	153651.8	1.02	
gvp$	82791.3	7236.0	50189.7	7456.3	8401.1	238.8	156313.3	6613.1	9619.4	3006.3	159319.5	1.02	
gdp	718309.5			tot pop	376707.0			lab for	193002.0	ag lab	38771.0		

notes

IIASA - FAP agriculture programming system - basic data set

Normative Medium Scenario

sua for CMEA 1985

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	55465.4	780.0	61276.3	13911.9	13858.7	277.0	145569.3	9208.1	0.	-9208.1	136361.2	0.94	159.
rice	3739.0	4.0	0.	128.8	101.6	86.9	4060.3	1956.8	0.	-1956.8	2103.4	0.52	230.
c.gr	19939.1	4663.0	157810.5	19197.5	18341.9	633.7	220585.7	20699.6	0.	-20699.6	199886.1	0.91	130.
suga	16966.5	0.	20.5	0.	17.4	12.4	17016.8	3657.9	0.	-3657.9	13358.9	0.79	208.
vege	10479.4	0.	7702.8	2130.2	1776.8	34.5	22123.7	1761.4	0.	-1761.4	20362.2	0.92	1420.
bana	524.8	0.	0.	0.	49.4	0.3	574.5	574.5	0.	-574.5	0.	0.	120.
citr	1275.7	0.	0.	0.	93.7	-0.9	1368.5	1233.8	0.	-1233.8	134.7	0.10	218.
frui	25422.7	0.	124.9	0.	2732.8	15.3	28295.7	0.	6769.5	6769.5	35065.2	1.24	210.
vego	3569.6	1250.5	186.9	311.0	6.3	20.5	5344.8	21.9	0.	-21.9	5322.9	1.00	760.
coco	335.1	0.	0.	0.	0.7	0.6	336.4	336.4	0.	-336.4	0.	0.	1421.
coff	249.3	0.	0.	0.	0.	1.0	250.3	250.3	0.	-250.3	0.	0.	1586.
teas	168.9	0.	0.	0.	0.	0.3	169.1	43.1	0.	-43.1	126.0	0.74	1200.
cott	0.	8739.0	0.	0.	0.	10.1	8749.1	0.	3812.5	3812.5	12561.6	1.44	420.
o.nf	0.	1437.9	0.	0.	0.	1.8	1439.7	0.	331.8	331.8	1771.5	1.23	1130.
rubb	0.	599.0	0.	0.	0.	0.3	599.3	599.3	0.	-599.3	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	9193.5	0.	0.	0.	21.5	-23.9	9191.1	0.	3155.6	3155.6	12346.8	1.34	1200.
mutt	1131.4	0.	0.	0.	1.3	-5.2	1127.5	0.	543.9	543.9	1671.4	1.48	1108.
pigm	8566.9	0.	0.	0.	93.7	-56.6	8604.1	0.	4956.3	4956.3	13560.4	1.58	1626.
poul	2802.0	0.	0.	0.	21.8	6.4	2830.2	0.	905.7	905.7	3735.9	1.32	1144.
milk	77998.4	2217.2	82965.6	0.	6343.1	113.6	169638.0	0.	15367.6	15367.6	185005.6	1.09	209.
eggs	4789.5	0.	0.	239.4	259.5	2.5	5290.9	0.	1303.5	1303.5	6594.4	1.25	902.
cgrn	19939.1	4663.0	157810.5	19197.5	18341.9	633.7	220585.7	20699.6	0.	-20699.6	199886.1	0.91	
cere	79143.5	5447.0	219086.7	33238.2	32302.1	997.6	370215.2	31864.5	0.	-31864.5	338350.7	0.91	
meat	21693.9	0.	0.	0.	138.4	-79.3	21753.0	0.	9561.5	9561.5	31314.5	1.44	
cer$	12271.1	731.1	30258.3	4737.3	4611.3	146.4	52755.5	4605.1	0.	-4605.1	48150.4	0.91	
fod$	24347.8	950.4	11106.3	3261.2	3129.0	70.3	42865.0	3782.6	1421.6	-2361.0	40504.0	0.94	
nfd$	0.	5688.2	0.	0.	0.	6.5	5694.6	393.1	1976.2	1583.0	7277.6	1.28	
liv$	50042.9	463.4	17339.8	216.0	1764.4	-93.2	69733.4	0.	17872.1	17872.1	87605.5	1.26	
tfo$	86661.8	2144.9	58704.4	8214.5	9504.8	123.6	165353.9	8387.7	19293.7	10906.0	176259.9	1.07	
gvp$	86661.8	7833.1	58704.4	8214.5	9504.8	130.0	171048.5	8780.8	21269.8	12489.0	183537.5	1.07	
gdp	938663.1			tot pop	393096.0			lab for	199843.0	ag lab	34368.0		

notes

TABLE D.2 *Continued.*

IIASA - FAP agriculture programming system - basic data set

Normative Medium Scenario

sua for CMEA 1990

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	55146.4	887.1	68891.4	15114.8	15063.5	150.3	155253.4	7284.2	0.	-7284.2	147969.3	0.95	159.
rice	4473.8	4.7	0.	105.0	120.6	14.9	4719.0	2996.8	0.	-2996.8	1722.2	0.36	230.
c.gr	19650.7	5269.1	177917.5	22062.1	21098.9	400.1	246398.4	17349.7	0.	-17349.7	229048.8	0.93	130.
suga	18214.2	0.	23.4	0.	19.9	24.1	18281.6	3571.5	0.	-3571.5	14710.1	0.80	208.
vege	11041.1	0.	8531.7	2345.8	1969.2	27.5	23915.3	1502.4	0.	-1502.4	22412.8	0.94	1420.
bana	564.8	0.	0.	0.	53.1	0.2	618.2	618.2	0.	-618.2	0.	0.	120.
citr	1539.4	0.	0.	0.	112.5	1.5	1653.5	1518.8	0.	-1518.8	134.7	0.08	218.
frui	29520.5	0.	142.7	0.	3129.2	25.2	32817.6	0.	7256.6	7256.6	40074.2	1.22	210.
vego	3958.0	1384.9	204.9	345.0	6.8	11.0	5910.6	76.8	0.	-76.8	5833.8	0.99	760.
coco	386.8	0.	0.	0.	0.8	1.0	388.5	388.5	0.	-388.5	0.	0.	1421.
coff	306.7	0.	0.	0.	0.	1.1	307.8	307.8	0.	-307.8	0.	0.	1586.
teas	190.6	0.	0.	0.	0.	0.4	191.0	44.9	0.	-44.9	146.1	0.76	1200.
cott	0.	9164.1	0.	0.	0.	8.9	9173.0	0.	6264.1	6264.1	15437.1	1.68	420.
o.nf	0.	1524.2	0.	0.	0.	1.8	1526.0	0.	720.7	720.7	2246.7	1.47	1130.
rubb	0.	639.0	0.	0.	0.	0.2	639.2	639.2	0.	-639.2	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	10030.1	0.	0.	0.	24.6	16.1	10070.8	0.	3930.8	3930.8	14001.6	1.39	1200.
mutt	1234.7	0.	0.	0.	1.5	2.0	1238.2	0.	656.5	656.5	1894.8	1.53	1108.
pigm	9561.6	0.	0.	0.	107.1	19.6	9688.3	0.	5285.9	5285.9	14974.1	1.55	1626.
poul	3560.5	0.	0.	0.	24.5	15.2	3600.3	0.	572.7	572.7	4173.0	1.16	1144.
milk	81895.1	2592.9	91519.2	0.	7190.7	79.5	183277.5	0.	26608.4	26608.4	209885.9	1.15	209.
eggs	5416.0	0.	0.	267.4	288.6	3.8	5975.9	0.	1377.0	1377.0	7352.9	1.23	902.
cgrn	19650.7	5269.1	177917.5	22062.1	21098.9	400.1	246398.4	17349.7	0.	-17349.7	229048.8	0.93	
cere	79270.8	6160.9	246808.9	37281.9	36283.0	565.3	406370.8	27630.6	0.	-27630.6	378740.2	0.93	
meal	24386.9	0.	0.	0.	157.7	53.0	24597.6	0.	10446.0	10446.0	35043.5	1.42	
cer$	12351.8	827.1	34083.0	5295.5	5165.7	79.3	57802.5	4102.9	0.	-4102.9	53699.5	0.93	
fod$	26553.9	1052.5	12300.7	3593.3	3490.5	56.7	47047.7	3691.3	1523.9	-2167.5	44880.2	0.95	
nfd$	0.	5990.5	0.	0.	0.	5.9	5996.4	419.3	3445.3	3026.0	9022.3	1.50	
liv$	55025.8	541.9	19127.5	241.2	1996.5	91.0	77024.0	0.	21497.7	21497.7	98521.7	1.28	
tfo$	93931.6	2421.6	65511.2	9130.0	10652.7	227.0	181874.1	7794.2	23021.6	15227.3	197101.5	1.08	
gvp$	93931.6	8412.0	65511.2	9130.0	10652.7	233.0	187870.5	8213.6	26466.9	18253.3	206123.8	1.10	
gdp	1202590.6			tot pop	408116.0			lab for	205573.0	ag lab	29746.0		

notes

IIASA - FAP agriculture programming system - basic data set

Normative Medium Scenario

sua for CMEA 1995

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	55125.1	961.5	75343.2	15831.2	15782.0	114.9	163157.9	8297.4	0.	-8297.4	154860.4	0.95	159.
rice	5202.6	5.1	0.	81.0	139.4	14.7	5442.8	4110.6	0.	-4110.6	1332.2	0.24	230.
c.gr	19389.9	5853.1	194966.8	23895.9	22826.0	299.7	267231.5	18537.9	0.	-18537.9	248693.6	0.93	130.
suga	19227.5	0.	26.2	0.	22.3	19.6	19295.5	3375.0	0.	-3375.0	15920.5	0.83	208.
vege	11529.3	0.	9217.7	2441.0	2090.1	21.3	25299.4	1962.6	0.	-1962.6	23336.8	0.92	1420.
bana	599.1	0.	0.	0.	56.3	0.2	655.6	655.6	0.	-655.6	0.	0.	120.
citr	1774.6	0.	0.	0.	129.0	1.3	1905.0	1770.3	0.	-1770.3	134.7	0.07	218.
frui	33221.1	0.	159.6	0.	3410.7	22.6	36814.0	0.	6859.4	6859.4	43673.4	1.19	210.
vego	4300.2	1501.8	229.9	374.5	7.2	9.9	6423.5	163.5	0.	-163.5	6260.0	0.97	760.
coco	433.5	0.	0.	0.	0.8	0.9	435.3	435.3	0.	-435.3	0.	0.	1421.
coff	359.3	0.	0.	0.	0.	1.0	360.3	360.3	0.	-360.3	0.	0.	1586.
teas	210.1	0.	0.	0.	0.	0.4	210.4	50.0	0.	-50.0	160.5	0.76	1200.
cott	0.	9606.9	0.	0.	0.	9.2	9616.1	0.	8539.2	8539.2	18155.3	1.89	420.
o.nf	0.	1651.7	0.	0.	0.	2.7	1654.4	0.	1120.5	1120.5	2774.9	1.68	1130.
rubb	0.	693.5	0.	0.	0.	0.3	693.8	693.8	0.	-693.8	0.	0.	656.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	10659.4	0.	0.	0.	27.5	12.0	10698.9	0.	4480.2	4480.2	15179.1	1.42	1200.
mutt	1317.0	0.	0.	0.	1.7	1.6	1320.3	0.	730.2	730.2	2050.5	1.55	1108.
pigm	10379.3	0.	0.	0.	119.8	15.8	10515.0	0.	5666.7	5666.7	16181.6	1.54	1626.
poul	4227.2	0.	0.	0.	26.5	13.2	4266.9	0.	465.3	465.3	4732.2	1.11	1144.
milk	85096.3	2850.3	97932.7	0.	7781.5	52.0	193712.8	0.	34285.2	34285.2	227998.0	1.18	209.
eggs	5979.2	0.	0.	303.5	335.9	3.4	6622.1	0.	1806.6	1806.6	8428.7	1.27	902.
cgrn	19389.9	5853.1	194966.8	23895.9	22826.0	299.7	267231.5	18537.9	0.	-18537.9	248693.6	0.93	
cere	79717.5	6819.7	270310.0	39808.2	38747.4	429.3	435832.1	30945.9	0.	-30945.9	404886.2	0.93	
meat	26582.9	0.	0.	0.	175.5	42.7	26801.1	0.	11342.4	11342.4	38143.4	1.42	
cer$	12482.2	915.0	37325.2	5642.3	5508.8	60.6	61934.0	4674.7	0.	-4674.7	57259.4	0.92	
fod$	28512.8	1141.4	13297.3	3750.9	3725.8	46.3	50474.5	4625.7	1440.5	-3185.2	47289.3	0.94	
nfd$	0.	6356.3	0.	0.	0.	7.1	6363.4	455.2	4852.6	4397.5	10760.8	1.69	
liv$	59141.5	595.7	20467.9	273.8	2189.4	71.1	82739.3	0.	24726.8	24726.8	107466.1	1.30	
tfo$	100136.5	2652.0	71090.5	9666.9	11423.9	177.9	195147.8	9300.3	26167.3	16866.9	212014.8	1.09	
gvp$	100136.5	9008.3	71090.5	9666.9	11423.9	185.0	201511.2	9755.5	31019.9	21264.4	222775.6	1.11	
gdp	1492642.3			tot pop	420890.0			lab for	210623.0	ag lab	25225.0		

notes

TABLE D.2 *Continued.*

IIASA - FAP agriculture programming system - basic data set

Normative Medium Scenario

sua for CMEA 2000

	food	industry	feed	seed	waste	stocks	demand	import	export	trade	output	ssr	price
whea	55541.9	1036.0	79101.5	16228.5	16267.0	63.7	168238.6	9799.9	0.	-9799.9	158438.7	0.94	159.
rice	5947.3	5.5	0.	58.0	158.7	15.0	6184.5	5229.4	0.	-5229.4	955.1	0.15	230.
c.gr	19252.6	6437.2	205337.9	24997.1	23818.6	159.1	280002.5	18686.5	0.	-18686.5	261316.0	0.93	130.
suga	20136.1	0.	28.5	0.	24.3	17.8	20206.6	3238.3	0.	-3238.3	16968.3	0.84	205.
vege	12365.8	0.	9657.8	2461.6	2180.7	16.3	26322.2	2867.5	0.	-2867.5	23454.7	0.89	1420.
bana	629.6	0.	0.	0.	59.2	0.2	689.0	689.0	0.	-689.0	0.	0.	120.
citr	1984.7	0.	0.	0.	143.5	1.2	2129.4	1994.7	0.	-1994.7	134.7	0.06	218.
frui	36633.2	0.	174.0	0.	3505.9	20.5	40333.6	0.	4643.9	4643.9	44977.6	1.12	210.
vego	4620.8	1618.8	255.4	402.2	7.7	9.5	6914.3	278.0	0.	-278.0	6636.3	0.96	760.
coco	476.7	0.	0.	0.	0.9	0.8	478.5	478.5	0.	-478.5	0.	0.	1421.
coff	407.8	0.	0.	0.	0.	0.9	408.8	408.8	0.	-408.8	0.	0.	1596.
teas	228.1	0.	0.	0.	0.	0.4	228.5	63.6	0.	-63.6	164.9	0.72	1200.
cott	0.	10049.7	0.	0.	0.	9.2	10058.9	0.	10620.6	10620.6	20679.6	2.06	420.
o.af	0.	1779.2	0.	0.	0.	2.7	1781.9	0.	1591.9	1591.9	3373.8	1.89	1130.
rubb	0.	748.0	0.	0.	0.	0.3	748.3	748.3	0.	-748.3	0.	0.	655.
fodd	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	91.
beef	11163.6	0.	0.	0.	30.0	9.7	11203.3	0.	4378.0	4378.0	15581.3	1.39	1200.
mutt	1386.9	0.	0.	0.	1.8	1.4	1390.1	0.	707.2	707.2	2097.3	1.51	1108.
pigm	11055.9	0.	0.	0.	130.6	13.2	11199.7	0.	5824.4	5824.4	17024.1	1.52	1626.
poul	4815.7	0.	0.	0.	27.7	11.8	4855.2	0.	439.9	439.9	5295.1	1.09	1144.
milk	88125.9	3107.6	100923.1	0.	7958.5	31.0	200146.0	0.	34860.6	34860.6	235006.7	1.17	208.
eggs	6501.5	0.	0.	340.0	389.2	3.2	7233.9	0.	2335.7	2335.7	9569.6	1.32	902.
cgra	19252.6	6437.2	205337.9	24997.1	23818.6	159.1	280002.5	18686.5	0.	-18686.5	261316.0	0.93	
cere	80741.8	7478.7	284439.3	41283.5	40244.3	237.9	454425.6	33715.7	0.	-33715.7	420709.8	0.93	
meat	28422.0	0.	0.	0.	190.1	36.1	28648.2	0.	11349.6	11349.6	39997.8	1.40	
cer$	12701.9	1002.8	39271.1	5943.3	5719.4	34.3	64572.7	5190.2	0.	-5190.2	59382.5	0.92	
fod$	30359.2	1230.3	13944.7	3801.1	3878.4	38.1	53251.8	6265.2	975.2	-5230.0	48021.9	0.90	
nf$$	0.	6722.1	0.	0.	0.	7.1	6729.2	490.9	6259.5	5768.6	12497.8	1.86	
liv$	62701.6	649.5	21092.9	306.7	2296.5	57.5	87104.6	0.	25403.6	25403.6	112508.3	1.29	
tfo$	105762.7	2882.6	74308.7	9951.1	11894.3	129.8	204929.1	11395.4	26378.9	14983.5	219912.6	1.07	
gvp$	105762.7	9364.7	74308.7	9951.1	11894.3	136.9	211658.3	11886.3	32538.4	20752.1	232410.4	1.10	
gdp	1807776.9			tot pop	433663.0			lab for	215672.0	ag lab	20614.0		

notes

APPENDIX E Commodity Projections for the Smaller CMEA Countries

TABLE E.1 Projections for wheat production in the smaller CMEA countries (10^3 t).

	Production				SSR			
Scenario	1975	1985	1990	2000	1975	1985	1990	2000
FAO/1	26,528	43,935	50,330	–	1.00	0.98	0.98	–
FAO/2	26,528	47,488	63,063	104,149	1.00	0.99	1.10	1.17
A/1	26,528	42,741	52,407	87,868	1.00	0.98	0.98	1.73
A/2	26,528	42,767	52,448	87,215	1.00	0.98	0.98	1.73
A/3	26,528	47,741	52,407	88,026	1.00	0.98	0.98	1.72
A/4	26,528	34,807	47,074	43,063	1.00	0.97	1.10	0.98
A/I	26,528	42,741	52,407	87,830	1.00	0.98	0.98	1.73
A/II	26,528	48,305	60,620	101,928	1.00	0.98	0.97	1.83
A/III	26,528	40,240	47,970	73,652	1.00	0.99	0.98	1.57
A/IV	26,528	38,284	44,637	64,492	1.00	0.99	0.98	1.37
A/a	26,528	42,596	51,969	85,196	1.00	0.98	0.98	1.77
A/b	26,528	42,354	51,549	84,699	1.00	0.98	0.98	1.77
A/c	26,528	42,078	52,606	86,118	1.00	0.98	0.98	1.77
A/d	26,528	42,838	52,332	85,680	1.00	0.98	0.98	1.77
A/A	26,528	42,837	52,332	85,680	1.00	0.98	0.98	1.77
A/T	26,528	42,995	52,688	86,762	1.00	0.99	0.98	1.42
B/1	26,528	45,343	59,375	94,450	1.00	0.98	1.06	1.09
B/2	26,528	41,738	50,713	81,541	1.00	0.98	0.98	1.50
C/1	26,528	42,542	53,677	91,361	1.00	0.98	1.00	1.76
C/2	26,528	40,998	49,507	77,913	1.00	0.98	0.98	1.53
C/3	26,528	40,898	49,041	76,432	1.00	0.98	0.98	1.46
C/4	26,528	40,997	49,507	75,538	1.00	0.98	0.98	1.16
C/M	26,528	42,209	48,488	74,158	1.00	0.99	0.98	1.12

TABLE E.2 Projections for coarse grain production in the smaller CMEA countries (10^3 t).

	Production				SSR			
Scenario	1975	1985	1990	2000	1975	1985	1990	2000
FAO/1	48,713	68,049	69,182	–	0.90	0.92	0.78	–
FAO/2	48,713	75,346	93,384	135,664	0.90	1.01	1.01	1.02
A/1	48,713	67,036	75,552	111,952	0.90	0.95	0.97	1.00
A/2	48,713	67,068	75,596	111,262	0.90	0.95	0.97	1.00
A/3	48,713	67,036	75,552	112,135	0.90	0.95	0.97	1.00
A/4	48,713	73,040	69,563	64,730	0.90	0.89	1.01	0.91
A/I	48,713	67,036	75,552	111,879	0.90	0.95	0.97	1.00
A/II	48,713	73,861	84,994	127,879	0.90	0.93	0.98	1.00
A/III	48,713	63,976	70,580	95,582	0.90	0.95	0.97	1.00
A/IV	48,713	61,483	66,763	84,527	0.90	0.95	0.97	1.00

TABLE E.2 *Continued.*

Scenario	Production				SSR			
	1975	1985	1990	2000	1975	1985	1990	2000
A/a	48,713	66,918	75,106	109,675	0.90	0.95	0.96	1.00
A/b	48,713	66,603	74,714	109,181	0.90	0.98	0.96	1.00
A/c	48,713	67,547	75,839	110,541	0.90	0.95	0.97	1.00
A/d	48,713	67,233	75,536	110,138	0.90	0.95	0.97	1.00
A/A	48,713	67,233	75,536	110,138	0.90	0.95	0.97	1.00
A/T	48,713	67,573	76,239	111,701	0.90	0.90	0.89	1.02
B/1	48,713	72,164	88,120	122,326	0.90	1.00	1.01	1.03
B/2	48,713	65,043	72,480	100,558	0.90	0.93	0.96	1.01
C/1	48,713	62,267	74,980	110,356	0.90	0.92	1.02	1.00
C/2	48,713	63,495	69,965	93,881	0.90	0.92	0.97	1.00
C/3	48,713	63,382	69,466	92,576	0.90	0.92	0.96	1.00
C/4	48,713	63,494	69,964	89,400	0.90	0.92	0.97	1.00
C/M	48,713	62,598	68,868	88,253	0.90	0.90	0.94	1.00

TABLE E.3 Projections for meat production in the smaller CMEA countries (10^3 t).

Scenario	Production				SSR			
	1975	1985	1990	2000	1975	1985	1990	2000
FAO/1	8984	14,257	18,743	–	1.47	1.85	2.23	–
FAO/2	8984	14,508	19,443	33,183	1.47	1.88	2.30	3.44
A/1	8984	13,330	16,384	16,020	1.47	1.76	2.04	1.77
A/2	8984	13,340	16,399	15,880	1.47	1.76	2.04	1.76
A/3	8984	13,330	16,384	16,053	1.47	1.76	2.01	1.78
A/4	8984	12,758	10,261	10,997	1.47	1.68	1.28	1.23
A/1	8984	13,330	16,384	16,018	1.47	1.76	2.04	1.77
A/II	8984	15,478	18,442	17,625	1.47	2.09	2.32	1.99
A/III	8984	12,364	14,886	14,306	1.47	1.67	1.89	1.63
A/IV	8984	11,636	13,682	13,715	1.47	1.57	1.74	1.57
A/a	8984	13,259	16,255	15,206	1.47	1.78	2.06	1.73
A/b	8984	13,170	16,141	15,086	1.47	1.76	2.05	1.71
A/c	8984	13,436	16,445	15,471	1.47	1.82	2.08	1.75
A/d	8984	13,347	16,355	15,339	1.47	1.80	2.07	1.74
A/A	8984	13,347	16,355	15,338	1.47	1.80	2.07	1.74
A/T	8984	13,318	16,266	15,359	1.47	1.80	2.06	1.74
B/1	8984	13,807	18,367	30,615	1.47	1.83	2.27	3.32
B/2	8984	13,058	15,618	15,408	1.47	1.73	1.94	1.71
C/1	8984	13,454	14,160	14,819	1.47	1.70	1.69	1.57
C/2	8984	12,828	14,571	13,499	1.47	1.69	1.81	1.50
C/3	8984	12,829	14,592	13,520	1.47	1.70	1.82	1.50
C/4	8984	12,828	14,571	14,902	1.47	1.69	1.81	1.66
C/M	8984	12,843	14,611	14,913	1.47	1.70	1.82	1.66

TABLE E.4 Projections for fruit production in the smaller CMEA countries (1972 US$ million).

	Production				SSR			
Scenario	1975	1985	1990	2000	1975	1985	1990	2000
FAO/1	9832	10,647	10,216	–	1.61	1.34	1.12	–
FAO/2	9832	11,255	11,984	13,255	1.61	1.41	1.29	1.14
A/1	9832	10,436	10,518	11,401	1.61	1.35	1.26	1.13
A/2	9832	10,439	10,521	11,358	1.61	1.35	1.26	1.12
A/3	9832	10,436	10,518	11,411	1.61	1.35	1.26	1.13
A/4	9832	8902	8084	8313	1.61	1.16	0.98	0.83
A/I	9832	10,436	10,518	11,399	1.61	1.35	1.26	1.13
A/II	9832	11,078	11,311	12,335	1.61	1.48	1.37	1.26
A/III	9832	10,137	10,077	10,374	1.61	1.36	1.25	1.09
A/IV	9832	9893	9733	9645	1.61	1.33	1.22	1.03
A/a	9832	10,422	10,477	11,250	1.61	1.39	1.29	1.17
A/b	9832	10,392	10,441	11,219	1.61	1.37	1.29	1.17
A/c	9832	10,480	10,540	11,306	1.61	1.41	1.30	1.17
A/d	9832	10,451	10,514	11,280	1.61	1.40	1.30	1.17
A/A	9832	10,451	10,514	11,280	1.61	1.40	1.30	1.17
A/T	9832	10,489	10,576	11,387	1.61	1.40	1.31	1.19
B/1	9832	10,836	11,374	11,856	1.61	1.40	1.34	1.14
B/2	9832	10,082	10,026	10,118	1.61	1.31	1.20	1.01
C/1	9832	9961	9938	9850	1.61	1.27	1.10	0.89
C/2	9832	9789	9529	8971	1.61	1.27	1.15	0.91
C/3	9832	9792	9539	8999	1.61	1.27	1.15	0.91
C/4	9832	9789	9529	8679	1.61	1.27	1.15	0.87
C/M	9832	9817	9550	8713	1.61	1.28	1.15	0.88

APPENDIX F Commodity Projections for the Soviet Union

TABLE F.1 Projections for wheat production in the Soviet Union (10^3 t).

	Production				SSR			
Scenario	1975	1985	1990	2000	1975	1985	1990	2000
FAO/1	82,340	103,712	108,082	108,545	0.97	0.98	0.99	1.00
FAO/2	82,340	101,636	105,137	109,403	0.97	0.98	0.99	1.12
FAO/3	82,340	100,424	103,306	103,105	0.97	0.98	0.99	1.01
A/1	82,340	107,558	116,164	125,716	0.97	0.98	0.98	0.99
A/2	82,340	103,410	110,612	117,385	0.97	0.98	0.98	0.99
A/3	82,340	99,767	105,700	111,295	0.97	0.98	0.98	0.99
A/4	82,340	97,821	102,935	107,758	0.97	0.98	0.99	0.99
A/5	82,340	110,233	119,173	126,747	0.97	0.98	0.98	0.99
A/6	82,340	111,924	121,379	129,015	0.97	0.98	0.98	0.99
A/I	82,340	107,687	115,669	122,942	0.97	0.98	0.98	0.99
A/II	82,340	98,338	103,515	109,169	0.97	0.98	0.98	0.99
A/III	82,340	105,586	112,147	117,290	0.97	0.98	0.98	0.99
A/IV	82,340	95,715	98,775	101,442	0.97	0.99	0.99	0.99
A/a	82,340	106,419	114,888	122,452	0.97	0.97	0.98	0.99
A/b	82,340	107,462	115,427	122,763	0.97	0.98	0.98	0.99
A/c	82,340	106,170	114,793	122,357	0.97	0.97	0.98	0.99
A/T	82,340	106,173	113,815	121,622	0.97	0.98	0.98	0.99

TABLE F.2 Projections for coarse grain production in the Soviet Union (10^3 t).

	Production				SSR			
Scenario	1975	1985	1990	2000	1975	1985	1990	2000
FAO/1	94,652	123,697	132,438	130,727	0.98	0.97	0.99	1.00
FAO/2	94,652	119,208	125,959	132,622	0.98	0.97	0.99	1.25
FAO/3	94,652	116,703	122,263	119,441	0.98	0.97	0.99	1.04
A/1	94,652	131,929	150,261	168,343	0.98	0.96	0.97	0.99
A/2	94,652	123,291	138,551	150,883	0.98	0.96	0.97	0.99
A/3	94,652	116,235	128,156	138,323	0.98	0.97	0.98	0.98
A/4	94,652	112,428	122,245	130,944	0.98	0.97	0.98	0.98
A/5	94,652	137,538	156,378	169,759	0.98	0.97	0.97	0.98
A/6	94,652	141,081	160,899	174,218	0.98	0.96	0.97	0.98
A/I	94,652	132,534	149,403	162,335	0.98	0.97	0.97	0.99
A/II	94,652	118,506	128,020	137,382	0.98	0.97	0.98	0.99
A/III	94,652	125,197	137,450	145,514	0.98	0.97	0.98	0.99
A/IV	94,652	115,506	121,171	123,849	0.98	0.98	0.98	0.99
A/a	94,652	129,344	147,319	161,087	0.98	0.96	0.97	0.99
A/b	94,652	132,009	148,875	161,972	0.98	0.97	0.97	0.98
A/c	94,652	129,017	147,023	160,837	0.98	0.96	0.97	0.98
A/T	94,652	129,083	145,446	160,020	0.98	0.97	0.97	0.99

TABLE F.3 Projections for meat production in the Soviet Union (10^3 t).

	Production				SSR			
Scenario	1975	1985	1990	2000	1975	1985	1990	2000
FAO/1	13,961	16,731	17,458	16,673	1.08	1.10	1.05	0.88
FAO/2	13,961	16,138	16,504	12,767	1.08	1.06	0.99	0.67
FAO/3	13,961	16,345	16,922	15,984	1.08	1.07	1.02	0.84
A/1	13,961	18,177	20,601	22,713	1.08	1.19	1.23	1.19
A/2	13,961	16,928	18,882	20,373	1.08	1.11	1.13	1.06
A/3	13,961	15,751	17,264	18,510	1.08	1.02	1.03	0.96
A/4	13,961	15,117	16,354	17,457	1.08	0.98	0.98	0.91
A/5	13,961	18,972	21,567	23,244	1.08	1.24	1.29	1.22
A/6	13,961	19,575	22,270	23,931	1.08	1.28	1.33	1.26
A/I	13,961	18,257	20,541	22,088	1.08	1.19	1.22	1.15
A/II	13,961	16,158	17,420	18,571	1.08	0.98	0.98	0.91
A/III	13,961	16,999	18,566	19,343	1.08	1.15	1.17	1.08
A/IV	13,961	15,683	16,422	16,822	1.08	0.91	0.87	0.77
A/a	13,961	17,939	20,246	21,889	1.08	1.18	1.21	1.15
A/b	13,961	18,129	20,448	22,039	1.08	1.18	1.22	1.15
A/c	13,961	17,884	20,176	21,852	1.08	1.57	1.21	1.14
A/T	13,961	18,405	21,063	23,802	1.08	1.21	1.26	1.24

TABLE F.4 Projections for fruit production in the Soviet Union (1972 US$ million).

	Production				SSR			
Scenario	1975	1985	1990	2000	1975	1985	1990	2000
FAO/1	16,921	25,220	31,137	43,448	1.23	1.62	1.73	1.93
FAO/2	16,921	24,474	29,696	33,050	1.23	1.58	1.66	1.53
FAO/3	16,921	24,555	30,001	41,005	1.23	1.58	1.67	1.83
A/1	16,921	26,860	35,146	54,195	1.23	1.71	1.90	2.28
A/2	16,921	27,791	37,283	61,298	1.23	1.76	1.99	2.51
A/3	16,921	26,245	34,236	54,405	1.23	1.65	1.86	2.28
A/4	16,921	25,421	32,606	50,668	1.23	1.59	1.78	2.15
A/5	16,921	30,601	42,705	73,445	1.23	1.91	2.23	2.90
A/6	16,921	31,585	44,285	76,585	1.23	1.96	2.30	3.01
A/I	16,921	29,823	40,608	68,306	1.23	1.86	2.12	2.73
A/II	16,921	26,733	34,362	54,149	1.23	1.48	1.66	2.03
A/III	16,921	28,037	36,915	58,223	1.23	1.87	2.16	2.71
A/IV	16,921	26,095	32,524	48,054	1.23	1.34	1.43	1.63
A/a	16,921	29,143	39,947	67,516	1.23	1.84	2.12	2.72
A/b	16,921	29,511	40,383	68,095	1.23	1.84	2.12	2.72
A/c	16,921	29,067	39,857	67,353	1.23	1.83	2.12	2.72
A/T	16,921	26,935	35,398	55,362	1.23	1.71	1.90	2.31

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