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EASTERN EUROPE'S LIVESTOCK ECONOMIES

PART I

by

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Agriculture has long been a problem sector in centrally-planned economies. Agriculture's difficulties in the Soviet Union and eastern Europe have been especially well-publicized. While grain production has received the most attention, the condition of the livestock economy may represent the greatest obstacle to future agricultural growth. Problems in the livestock economy are closely related to those in grain production since a high proportion of the grain produced in the region is fed to animals. So livestock can be considered the pivotal sector within agriculture. The livestock economy is also important because meat and milk consumption is crucial to economic well-being and political stability in European cultures. Studying animal production then provides insight into the politics and economics of the East European countries.

This study examines the role of the livestock sector in East Europe. The region is defined to include the European members of the CMEA, or Council for Mutual Economic Assistance; these are Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland and Romania. These countries share similarities in their systems of animal production, have a common ideology and are linked by trade and monetary relationships.

We first identify some general problems of the livestock economies in these countries. Briefly, these are that the increased purchasing power of consumers in eastern Europe has been channeled largely into an increased demand for animal products, demand that has often exceeded the available supply. Secondly, the East European countries need hard currency earnings from animal product exports. The region as a whole also lacks an adequate fodder basis; high-protein feed concentrates are in especially short supply. Finally, the large-scale socialist livestock farms are often inefficient producers. They don't use their feed and labor resources to best advantage.

Expenditures on Food and Meat

Agriculture plays a much more important role in eastern Europe from a consumption perspective than it does in other developed countries. Table I shows that expenditures on food and beverages as a percentage of households' total

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Table I
Expenditures on Food and Beverages as Percentage of Household
Total Disposable Income

Country and type of employment	1971	1975	1980	Country and type of employment	1971	1975	1980
<u>Bulgaria</u> ¹ :				<u>Hungary</u> ² :			
Industrial workers	47	43	48	Industrial workers	NA	41	43
Professionals	42	39	45	Professionals	NA	33	35
Collective farmers	49	45	52	Collective farmers	NA	43	46
<u>Czechoslovakia</u> :				<u>Poland</u> :			
Industrial workers	32	30	27	Industrial workers and professionals, total	45	40	39
Professionals	29	27	24	Peasants	NA	49	43
Collective farmers	28	28	26	<u>Romania</u> :			
<u>GDR</u> ² :				Non-agricultural workers			
Industrial workers and professionals, total	36	37	36	Collective farmers	NA	NA	63
Collective farmers	39	37	37				

Table is from Eastern Europe: Agricultural Production and Trade Prospects through 1990, United States Department of Agriculture, Economic Research Service, Foreign Agriculture Economic Report No. 195, Washington, D.C., February, 1984, p.34

Sources: Statistical Year Books of the respective countries

¹ Includes tobacco for 1971

² Includes tobacco

disposable income are very high in East Europe. Consumers spend at least 35 percent of their income on food in all the countries except Czechoslovakia. Some, such as farmers in Bulgaria and Romania, spend more than half of their income on food. By contrast, consumers in the United States in 1980 spent less than 20 percent of their disposable income on food and beverages.¹

It is remarkable that in eastern Europe, the proportion of income spent on food over time has more often increased than decreased, as the data in Table I show. In Bulgaria and Hungary, consumers were spending a higher proportion of their income on food in 1980 than they were in 1975. This is not what one would expect, since the income-food consumption relationships that have been found to prevail in market economies show that as income increases over time, the proportion of income spent on food decreases.

Why haven't expenditures on food declined with the substantial increases in incomes in the East European countries? One of the main reasons is that there is a lack of other consumer goods to absorb these increases in purchasing power. Economic policy in East Europe was strongly directed towards heavy industry in the early post-war period. Capital and labor resources were allocated more to the production of steel, chemicals, machinery, and the like than to the production of light industrial or consumer goods. Services were also neglected. These policies continue to dominate today, although in somewhat muted form. As a consequence, there are relatively few consumer goods and services of high-quality on which workers can spend their money. "... The supply of non-food, especially industrially produced consumer commodities, is not adequate in quantity and/or quality. It cannot absorb the rising cash incomes of the population, and therefore the purchasing power is often diverted to higher-quality or semi-luxury food."²

Among these high-quality foods on which consumers prefer to spend their incomes, meat and milk are two of the most important. About one-third of the total amount spent on food goes just for meat and milk. Manual workers in Czechoslovakia in 1980 spent 32.2 percent of their food budgets on meat and milk products.³ In Hungary manual workers spent 33 percent of their food budget on meat and milk, while collective farm workers spent 35 percent.⁴ In the German Democratic Republic, meat alone made up one-third of average food expenditures.⁵

East Europeans closely identify increases in meat and milk consumption with economic progress. "Especially in the absence of a sufficient quantity of desirable and affordable consumer durables, the population of the CMEA countries tend to judge their well-being in terms of meat-consumption."⁶ When housing, automobiles, tourism and the like are chronically in short supply as they have been in countries such as Poland in recent years, meat consumption becomes the main measure of one's standard of living.⁷

With meat and milk making up such a large proportion of consumer food expenditures, the availability and affordability of meat and milk also affect political stability. The political upheavals during 1970, 1976, and 1980 in Poland were all related to attempts by the authorities to raise meat prices and bring the meat market into balance, so that demand would not be continually

out-stripping supply.⁸ The Soviet leadership, in recognition of political consequences, have kept meat and other food prices stable since 1962, when price increases initiated by Khrushchev led to widespread dissatisfaction and local riots.⁹ Meat is the political agricultural product in the CMEA countries these days. Consequently, one of the major policy goals for agriculture in eastern European countries is to increase meat output and consumption.¹⁰

Meat Consumption and Production

The countries of eastern Europe have achieved some success in increasing the amounts of meat consumed by their populations. Increases in per capita meat consumption from 1971 to 1980 are shown in Table II. Particularly in Romania,¹¹ Bulgaria and Poland, increases in meat consumption, of 84, 40 and 32 percent, respectively, have been very substantial.

Despite substantial growth in per capita meat consumption, levels of meat consumption in eastern Europe are not that high when compared with western Europe. Table III compares levels of meat and fish consumption for eleven West European and six East European countries. All the East European countries, except the German Democratic Republic and Czechoslovakia, rank at or near the bottom. However, per capita consumption levels in the German Democratic Republic are still considerably lower than those in the Federal Republic of Germany. Comparing other East and West European countries that have similar levels of per capita income, for example Italy, Spain and Hungary,¹² significantly higher levels of per capita consumption are found in the West.

Per capita meat consumption statistics do not reflect quality differences. There are substantial quality differences between East and West European meat products because consumption data for the CMEA countries include edible offals and meat by-products that are not as highly-valued by consumers. For this reason, the gap between East and West European meat consumption may be even greater. Data showing an increase in the quantity of meat consumed may conceal a decline in quality. This happened in Poland between 1974 and 1977. Per capita meat consumption increased by 3.5 kilograms, but the consumption of "other meats," including edible offals, increased by 4 kilograms.¹³ Thus, the increase in the overall level of meat consumption was associated with a drop in quality. If the data in Table III were adjusted for quality therefore, consumption of meat in eastern Europe would be much lower than in western Europe.

The progress achieved by the East European countries in improving meat consumption has not been very consistent, either. As Table IV shows, in the early half of the decade of the 1970's the increases in per capita meat consumption kept pace with the increases in real per capita incomes. This is what one would have expected given the importance of meat as a consumer good that absorbs increases in incomes. But in the second half of the decade, when real incomes grew almost as rapidly as in the first half, meat consumption failed to keep pace. The supply of meat available to consumers in eastern Europe is thus highly variable. When supplies are short and must be rationed, consumer purchases of meat are constrained, despite any increases in disposable income. The next section explores this variability in supply with particular reference to government export policies that are designed to earn foreign exchange and the impact of those policies on domestic meat supply.

Table II
Consumption of Meat /kilograms /capita / - Eastern Europe

Country	1971	1975	1980
Bulgaria	43.6	58.0	61.2
Czechoslovakia	73.7	81.1	85.6
GDR	68.5	77.8	89.4
Hungary	59.5	68.4	71.7
Poland	56.1	70.3	74.0
Romania	32.6 ¹	45.7	60.0
Average for all countries	55.66	66.88	73.65

Table is from Eastern Europe: Agricultural Production and Trade Prospects through 1990, USDA, Foreign Agriculture Economic Report No. 195, Washington, D.C., February, 1984 p. 33. Data include meat and meat products consumption.

¹Approximated figure from COMECON DATA, 1981, edited by the Vienna Institute for Comparative Economic Studies, The Mac Millan Press, Ltd., London, 1982.

Table III
Per Capita Meat and Fish Consumption -
Comparison between West and East Europe

Country	Meat and Fish ¹ consumption /kilograms/capita/	Rank in consumption
<u>Western Europe</u> ²		
Austria	89.1	9
Belgium/Luxembourg	110.0	2
Denmark	109.4	3
France	128.5	1
Greece	70.0	15
Holland	94.0	6
Federal Republic of Germany	104.7	4
Norway	80.0	13
Italy	85.1	10
Spain	93.5	7
United Kingdom	82.3	11
<u>Eastern Europe</u> ³		
Bulgaria	69.1	16
Czechoslovakia	90.4	8
German Democratic Republic	96.9	5
Hungary	73.8	14
Poland	82.1	12
Romania	60.0 ⁴	17

¹Data from Statisztikai Évkönyv, 1981, published by Központi Statisztikai Hivatal, Budapest, 1982, p. 395

²Data for the western European countries refer to 1979.

³Data for the eastern European countries refer to 1980.

⁴Romania's consumption approximated using its 1979 consumption figures

Table IV
 Changes in Per Capita Meat Consumption
 Compared to
 Real National Income Per Capita Changes

Country	Percentage Change in Per Capita Meat Consumption		Percentage Change in Real National Income Per Capita	
	From 1971 to 1975	From 1975 to 1980	From 1971 to 1975	From 1976 to 1980
Bulgaria	33.0 %	5.5 %	23.2 %	13.0 %
Czechoslovakia	10.0 %	5.5 %	18.7 %	15.0 ³ %
GDR	13.6 %	14.9 %	22.4 %	21.5 %
Hungary	15.0 %	4.8 %	18.4 %	9.0 %
Romania	38.5 %	30.4 %	27.2 %	25.5 %

¹Sources for changes in per capita meat consumption the same as in Table II.

²Sources for changes in per capita GNP: from Statisztikai Évkönyv, 1983, Table 338, published by Központi Statisztikai Hivatal, Budapest, 1984. Rates of growth in population from COMBICON DATA 1981, edited by the Vienna Institute for Comparative Economic Studies, The Mac Millan Press Ltd., London, 1982

³National income data for Czechoslovakia are from Statisztikai Évkönyv, 1983, Table 35.6, and are in nominal rather than real terms.

Domestic Supply and Exports of Animal Products

To improve the quality of their populations' diets, the countries in eastern Europe have tried to increase production of animal products, that is of meat, milk and eggs.¹⁴ As a result, the output of animal products grew faster than the output of crops from 1965 to 1980. However, the rate of increase in meat production has been slowing down. From 1965-70 to 1971-75, meat production increased by 27 percent. But from 1971-75, it increased by only 19 percent.¹⁵

Even though the rate of growth in output was slowing down, eastern Europe remained a net exporter of livestock and animal products. During the 1970's each country in the region except Poland increased its net exports of meat. This is shown in Table V. It's particularly important to note that net exports as a percentage of production increased everywhere as well, except in Poland. Bulgaria, Hungary and Romania all realized large increases in net exports as a percentage of production. Hungary expanded from exporting only 12.8 percent of its meat production to exporting a fifth of its output during this period. East Germany also became a significant net exporter, for the first time, during this period.

Expanding meat exports in the face of a slowing rate of growth in production helps explain why meat consumption failed to grow as rapidly during the second half of the 1970's as it had during the first half. Particularly in Bulgaria and Hungary, and also in Romania, an expanding export role for meat and meat products meant substantially lower rates of growth in meat consumption. If net exports had been held constant or reduced, the rates of growth in meat consumption could have been closer to those achieved in the earlier part of the decade.

The governments of eastern Europe, however, had little choice but to expand meat exports during the 1970's. During this period, hard currency was badly needed to service the debt incurred by massive borrowing from western banks, and to finance imports of crucial intermediate goods for industrialization plans. Meat and livestock products, including canned hams, bacon and live animals could be sold to western markets, the Middle East and the Soviet Union for dollars and therefore became an important source of hard currency.¹⁶

The countries of eastern Europe often find it easier to export agricultural products, like meat and livestock, than industrial products. They have the same problem with the demand for their export goods as they do with domestic demand. That is, there is a much stronger demand for their relatively high-quality agricultural products, particularly meat, than there is for their relative low-quality industrial and consumer goods.

Thus while governments recognize the political prudence of using increases in meat production to satisfy domestic demand, their financial problems may force them to divert meat supplies to export markets. Recently, some countries, especially Poland, have used their hard currency from high-quality meat exports to finance a larger amount of lower-quality meat imports as a means to solve both the domestic meat consumption and hard-currency problems simultaneously.¹⁷

Table V
Production and Net Exports of Meat

Country	Annual Averages 1971-75			Annual Averages 1976-80		
	Production (1,000 tons)	Net Exports (1,000 tons)	Net Exports as a Percentage of Production	Production (1,000 tons)	Net Exports (1,000 tons)	Net Exports as a Percentage of Production
Bulgaria	571	53	9.3 %	739	99	13.4 %
Czechoslovakia	1218	-17	-1.4 %	1392	6	.4 %
GDR	1506	22	1.5 %	1798	109	6.1 %
Hungary	1286	164	12.8 %	1463	272	18.6 %
Poland	2656	138	5.2 %	2998	108	3.6 %
Romania	1189	85	7.2 %	1621	148	9.1 %
Country Total	8426	445	5.3 %	10,010	742	7.4 %

Sources: Production and 1971-75 export data are from Eastern Europe: Agricultural Production and Trade Prospects through 1990, Foreign Agriculture Economic Report, No. 195, United States Department of Agriculture, Washington, D.C., February, 1984, p. 44, 51 and 53
1976-80 export data are from Eastern Europe, Outlook and Situation Report, RS-84-7, Economic Research Service, United States Department of Agriculture, Washington, D.C., June 1984, p.25

Dependence on Imported Feed

Production of livestock in eastern Europe has come to depend more and more on imported feed, so to export more meat, these countries must first import more feed. The feed imports consist of grain fed to livestock and high-protein concentrates, especially oil-seed meal. East Germany is a case in point. Both production and per-capita consumption of meat increased steadily until 1981. But even during the 1967-1971 period, approximately 17 percent of animal production was based on imported feed, and by 1974-78 this had increased to 21 percent.¹⁸ Thus, even while it was increasing its meat exports, the German Democratic Republic was also becoming more dependent on imports of feed. Czechoslovakia too, which shifted from being a net importer to a net exporter of meat in the 1970's, incurred a substantial trade deficit in animal feeds. Because most of these feeds come from the West, importing animal feeds has had a negative effect on the availability of scarce hard currency.¹⁹

Countries do differ in the extent to which they depend on importing feed-grain for livestock versus importing the high-protein concentrates. We can get a good picture of the deficits in feed-grains by looking at data on total grain imports, since 68 percent of total grain utilized in the region is fed to livestock.²⁰ As Table VI shows, the region has become more dependent on imports. By the latter half of the 1970's, the region as a whole was importing almost 13 percent of the grain it used. By far the largest grain deficits were in Czechoslovakia, East Germany and Poland, where net grain imports, as a percentage of total grain used, amounted to 14 percent, 28 percent and 26 percent respectively. Hungary is the only country in the region that has consistently been a net exporter, rather than importer of grain.

The shortage of high-protein concentrates throughout the region, which is the second aspect of the dependence on feed imports, is perhaps the most critical one in the long run. High-protein concentrates have become essential to modern intensive livestock production, because they make it possible to achieve rapid weight gain in monogastric animals, such as pigs and poultry, by providing low fiber feeds that are high in protein.²¹ High-protein concentrates are derived mainly from soybeans, other oilseeds and fish meal, which are in short supply in eastern Europe. This so-called protein gap emerged in the early 1960's. Since then all the countries in East Europe have increased their imports of soybean and fish meal.²² Table VII shows that the region increased its imports of oilseed meal alone from 2,8 million metric tons in 1971-75 to 4,2 million metric tons in 1980. However, the value of oilseed meal imported by the region increased even faster than the quantity, i.e., from \$ 229 million dollars in 1971 to \$ 1.131 million in 1980, almost a 500 percent increase.²³

Romania and Poland more than doubled their imports of oilseed meals. By 1980, Poland had become by far the largest importer of oil-seed meals in eastern Europe. In the 1960's, when Poland relied primarily on hay and pastures to provide protein for livestock, grain and high-protein meals were much less important. But the situation changed in the 1970's and Poland began to feed more grain and high-protein meals. These now supply more than 70 percent of the protein requirements for livestock. Because Poland imports more than a quarter

Table VI
Net Grain Imports - Eastern Europe

	<u>Total, 1971-75</u>	<u>Total, 1976-80</u>
Grain Production /1,000 tons/	72,470	78,375
Net Grain Imports /1,000 tons/	6,811	11,496
Total Grain Use ¹ /1,000 tons/	79,281	89,871
Net Imports as a Percentage of Total Grain Use	8.6 %	12.8 %

Source : Eastern Europe, Agricultural Production and Trade Prospects, through 1980, Foreign Agriculture Economic Report, No. 195, Economic Research Service, United States Department of Agriculture, Washington D.C., February, 1984, p.50

¹ Includes feed, food, industrial use, seed and waste

Table VII
Imports of Oilseed Meal by Eastern Europe, 1971-1980
/1,000 tons/

Country	<u>1971-75</u> <u>Annual Average</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
Bulgaria	201	256	214	181	136	184
Czechoslovakia	527	671	592	606	593	753
GDR	789	875	998	941	986	943
Hungary	441	541	594	692	622	620
Poland	665	1,024	1,051	1,088	1,274	1,361
Romania	177	320	240	270	270	385
Total	2,800	3,687	3,689	3,778	3,881	4,246

Source: Eastern Europe, Agricultural Production and Trade Prospects, Foreign Agriculture Economic Report, No. 195, Economic Research Service, United States Department of Agriculture, Washington D.C., February, 1984, p.50

of its grain and 73 percent of the high-protein meals it feeds to livestock, Poland has become heavily dependent on foreign feed supplies.²⁴

Solving the "protein gap" problem is crucial to improving levels of meat production and consumption in eastern Europe, because when high-protein imports fall, meat production also falls. The experience of the past few years, since 1980, illustrates this. Table VIII shows that meat production began to decline in 1980. Production of meat in the region decreased by 735,000 tons, or by 7 percent. During this time, financial crises and hard currency shortages in eastern Europe were forcing these countries to reduce their imports of oilseed meal and grain. It is to this reduction in imports that the decline in meat production can largely be attributed. Even though domestic grain production increased, so that total grain availability in 1982 remained about the same as in 1980, oilseed meal imports were down by 454,000 tons, or 11 percent. This 11 percent reduction in oilseed meal imports thus explains most of the fall in meat production.

Productive Efficiency in the Livestock Sector

East European countries can scarcely afford to reduce their imports of high-protein concentrates. It's generally acknowledged that a major weakness of animal production in eastern Europe is feed conversion ratios, that is, the amount of feed consumed per unit of meat or milk produced.²⁵ When feed rations are correctly balanced with adequate nutrients, especially protein, animals gain weight more rapidly and require less total feed per unit of weight gain. But even with sizable feed imports, feed rations in eastern Europe are too low in protein. In Hungary, for example, animal feed rations contain only 100 grams of digestible protein, as compared to the 107-110 grams recommended.²⁶ As a result, livestock consume more feed than necessary.

To evaluate the relative efficiency of livestock feeding, it's useful to compare feed conversion ratios in eastern and western Europe. Estimates of feed conversion ratios for fattening pigs for seven West European countries²⁷ indicated that, on average, 3.48 kilos of feed were required to produce one kilo of weight gain. In contrast, pig fattening required 4.2 kilos of feed, in grain units, per kilo of weight gain in Hungary, 5-6 kilos in East Germany, and more than 7 kilos in Poland. Although exact figures aren't available for Bulgaria, feed conversion ratios there are reported to be about 50 percent over the world average.²⁸

Similar discrepancies in feeding efficiency may be found in poultry production. Hungary uses 2.6 kilos of feed concentrate to produce one kilo of chicken meat, and Czechoslovakia uses 2.73 kilos.²⁹ Western Europe uses, on average, 2.05 kilos. The limited data that are available on feeding efficiency of slaughter cattle in eastern Europe indicate poor feed conversion ratios in this aspect of livestock production as well.

Protein shortages are only one cause of poor feeding efficiency. Minimizing feed use depends on selection of breeds, and methods of animal husbandry. This includes good veterinary services, a sufficiently well-trained labor force that can evaluate the health and dietary needs of animals, and

Table VIII

East European Meat Production and Feed Imports
1980-1982

Year	Meat Production /1,000 tons/	Oilseed Meal Imports /1,000 tons/	Total Grain Available		
			Net Imports + 1,000 tons	Production = 1,000 tons	
1980	10,654	4,246	13,593	80,284	93,877
1981	10,206	4,583	11,707	78,977	90,684
1982	9,919	3,792	6,028	88,372	94,400

Sources : Meat production, same as in Table V

Oilmeal imports, Eastern Europe, Outlook and Situation Report, RS84-7,

Economic Research Service, United States Department of Agriculture,

Washington, D.C., June, 1984, p.25

Grain imports and production, Ibid., p.20 and 22

good management practices in animal feeding. Eastern European livestock farms are deficient in many of these areas. For example, some observers suggest that in Bulgaria feed rations could be better managed so as to increase the rate of weight gain during the fattening period and reduce total feed use.³⁰

Poor management and labor practices also raise the costs of production of livestock and contribute to the chronic unprofitability of animal production in eastern Europe.³¹

Many of these problems are most severe in the large-scale socialist farms rather than in the small-scale household plots. Is the socialist organization of agriculture itself a contributing factor to inefficiencies in livestock production? Analyzing this issue and evaluating the causes of high costs and unprofitability of animal production requires an in-depth country study. For this reason, Part II of this report concentrates on Hungary's livestock sector. It reviews the structure and organization of the main branches of animal production and analyzes the productive efficiency of Hungary's large- and small-scale farms.

Notes to Part I

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2. Wadekin, K.E., Agrarian Policies in Communist Europe, Allanheld, Osmun and Co., Totowa, New Jersey, 1982, p. 102.
3. OECD, Organization for Economic Cooperation and Development, Prospects for Agricultural Production and Trade in Eastern Europe, Paris, 1981, Vol. 2, p. 16.
4. Kozponti Statisztikai Hivatal, Statisztikai Evkonyv, 1981, Budapest, 1982.
5. OECD, op. cit., Vol. 1, p. 119.
6. Jacobs, E.M., "Agricultural Development in Communist Europe" in Current Trends in the Soviet and East European Food Economy, edited by K.E. Wadekin, Duncker and Humblot, Berlin, 1982, p. 37.
7. OECD, op. cit., Vol. 1, p. 19.
8. Ibid., p. 19.
9. Wadekin, K.E., "Agrarian Structures and Policies in the U.S.S.R., China and Hungary, A Comparative View," paper presented the Seventh International Conference on Soviet and East European Agriculture, Grignon, France, July 9-13, 1984, p. 6.
10. Jacobs, loc. cit.
11. It should be noted however that Romanian statistics are believed to be rather unreliable, so this growth in meat consumption may be exaggerated.
12. Recent calculations by the International Comparison Project of the World Bank have estimated Hungary's per capita GNP at 53 percent of Austria's. Using these calculations Spain, Italy and Hungary have roughly the same levels of per capita GNP.
13. OECD, op. cit., Vol. 1, p. 21.
14. Lazarcik, G., "Comparative Performance of Agricultural Output, Inputs, and Productivity in Eastern Europe, 1965-1983," paper presented to the Seventh International Conference on Soviet and East European Agriculture, Grignon, France, July 9-13, 1984, p. 5.
15. USDA, Economic Research Service, Eastern Europe: Agricultural Production and Trade Prospects through 1990, Foreign Agricultural Economic Report No. 195. Washington, D.C., February 1984, p. 9.
16. USDA, Economic Research Service, Eastern Europe: Outlook and situation Report, RS-84-7. Washington, D.C., June 1984, p. 7.

17. Ibid., p. 7.
18. OECD, op. cit., Vol. 1, p. 126.
19. OECD, op. cit., Vol. 2, p. 54-56.
20. USDA, Agricultural Production and Trade Prospects through 1990, op. cit., p. 51.
21. See Organization for Economic Cooperation and Development, Animal Feeding and Production: New Technical and Economic Developments, Paris, 1981, for a discussion of the relationship between protein and feeding efficiency.
22. Wadekin, K.E., Agrarian Policies, op. cit., p. 128.
23. USDA, Agricultural Production ..., op. cit., p. 48
24. OECD, op. cit., Vol. 1, pp. 44-46.
25. Wadekin, K.E., Agrarian Policies ..., op. cit., p. 136.
26. OECD, op. cit., Vol. 1, p. 209.
27. Estimates are for West Germany France, Netherlands, Belgium/Luxemburg, United Kingdom, Ireland, and Denmark, for the year 1977. Figures provided by OECD, Animal Production, op. cit., p. 216.
28. OECD, op. cit., Vol. 2, p. 186.
29. OECD, op. cit., Vol. 1, p. 210, and Vol. 2, p. 47.
30. Ibid., Vol. 2, p. 187.
31. USDA, Outlook ..., op. cit., p. 6.