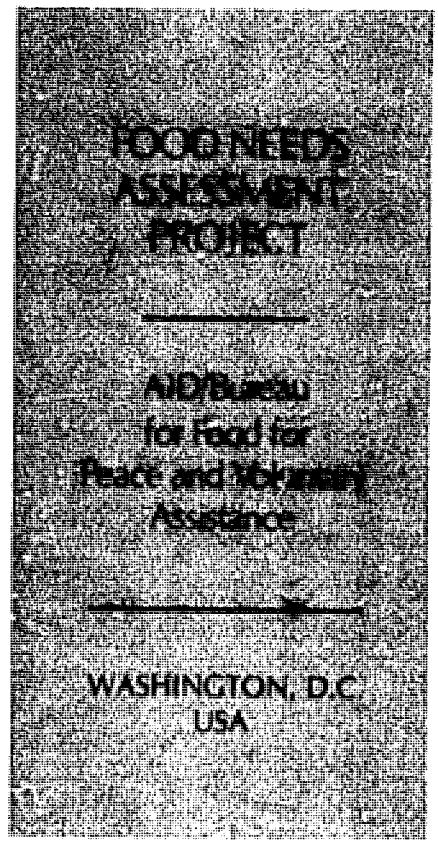
FNIA

FOOD AND FEED NEEDS ASSESSMENT: ECUADOR

November 1988



ECUADOR FOOD AND FEED NEEDS ASSESSMENT

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November 14, 1988

A food and feed needs assessment was carried out in Quito from July 18-29, at the request of USAID/Ecuador. The food needs assessment covered rice, wheat, soft corn, milk, soybeans and palm oil, while the feed needs assessment included hard corn, sorghum, wheat flour, soybean meal and milk.

For the food needs assessment, historic food balances were compiled for five years (1982 and 1984-87; 1983 was eliminated due to unusual El Niño) in order to establish trends for calculating food requirements and availabilities for the current year, CY 1988. The final results were commodity-by-commodity surpluses or deficits for 1988. (See Appendix A for historical year balance sheets.) The same basic methodology was used for the feed needs assessment, except that the feed consumption requirement was based on a standard composition of feed rather than historic trends.

I. SUMMARY OF RESULTS - FOOD NEEDS ASSESSMENT

The 1988 food needs assessment showed slight surpluses for all commodities with the exception of wheat, which recorded a deficit - after commercial imports - of 45,000 unmilled metric tons (see Table 1). This means that the per capita availability of rice, soft corn, milk, soy beans and palm oil will be slightly greater than the average per capita availability during the five historic years, while slightly less wheat will be available. (See Appendix B for per capita consumption graphs.)

It must be recognized that this analysis was not based on nutritional requirements, but on historic consumption levels. While the analysis concluded that there is enough rice, soft corn, milk, soy and palm oil in the country to feed the population at historic levels of consumption and that additional amounts of wheat would be needed to maintain these levels, it does not attempt to address two critical issues: 1) the adequacy of historic levels of consumption, and 2) the equity of distribution within the country. This analysis provides a framework for further study of these and other issues.

A. Wheat

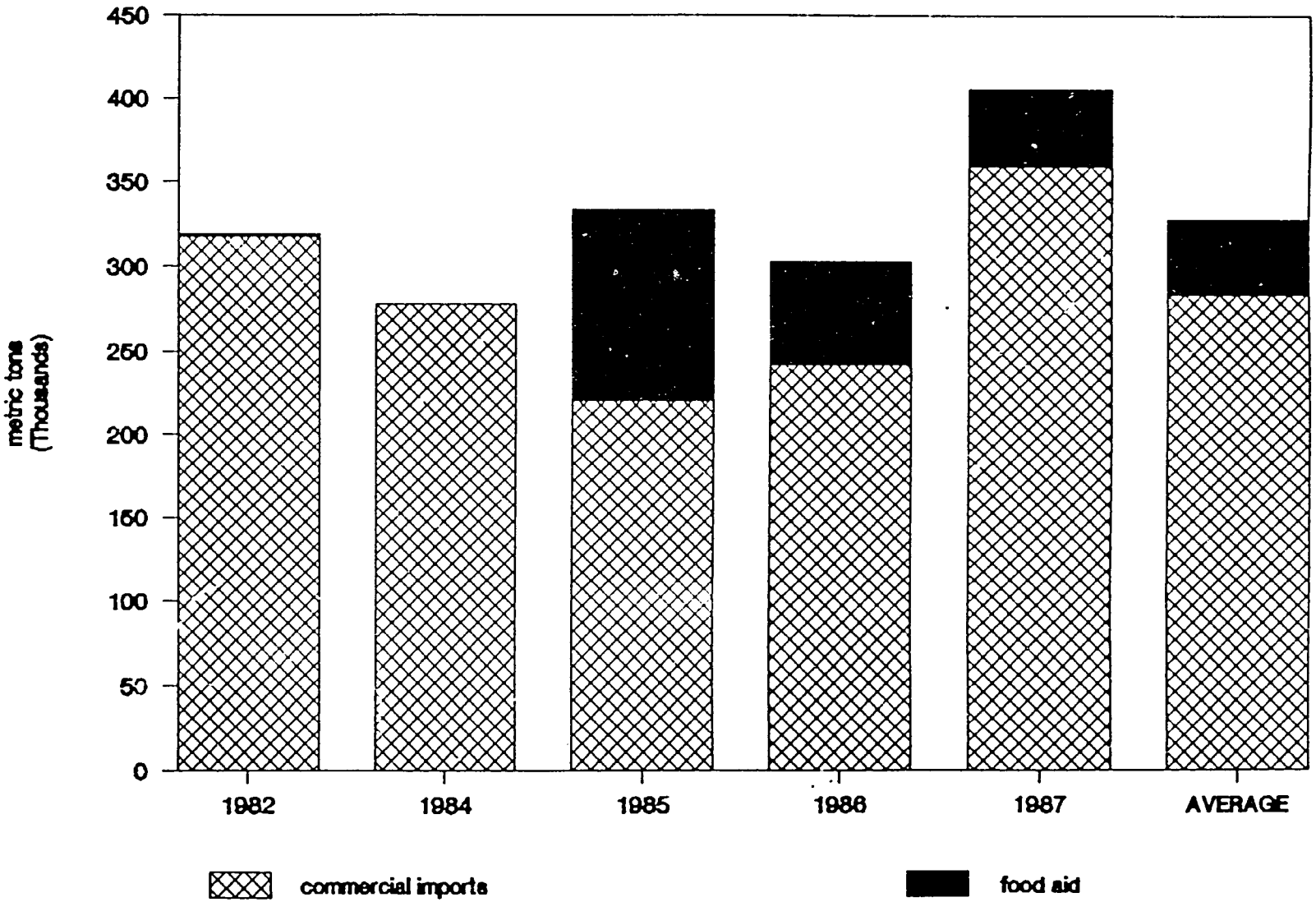
The wheat situation in Ecuador during the past five years has been characterized by declining domestic production and increasing imports, both commercial and food aid (see Graphs 1 and 2). While both of these factors remain central in 1988, the most notable development is the enormous increase in the use of wheat for the shrimp industry. In fact, the 45,000 wheat deficit for 1988 is almost the same amount as is expected to be used for shrimp feed during the year. Table 2 shows the five-year historic summary of the wheat situation.

CURRENT YEAR FOOD BALANCE -- CY 1988

Commodity	Arroz	Trigo	Maiz Suave	Leche	Soya	Oilpalm
PER CAPITA CONSUMPTION (kg/year)	43.2	35.5	7.3	84.0	25.1	55.0
x Population (thousands)	10,204	10,204	10,204	10,204	10,204	10,204
= Total Consumption Requirement	440,421	362,672	74,955	857,604	255,953	561,205
Gross domestic food production	439,114	18,940	104,170	1,402,162	124,321	646,750
- Total non-food uses	44,790	52,977	14,688	491,113	43,566	64,675
= Net domestic food production	394,324	(34,037)	89,482	911,049	80,755	582,075
- Net change in stocks	(24,000)	0	0	0	0	0
- Total food exports	0	8,684	0	0	0	0
= Domestic food supply	418,324	(42,721)	89,482	911,049	80,755	582,075
Total Consumption Requirement (from above)	440,421	362,672	74,955	857,604	255,953	561,205
- Domestic food supply (from above)	418,324	(42,721)	89,482	911,049	80,755	582,075
= Import Requirement	22,097	405,393	(14,527)	(53,445)	175,198	(20,870)
- Total Commercial Food Imports	24,306	360,000	0	9,691	183,333	0
= FOOD DEFICIT (UNMILLED)	(2,209)	45,393	(14,527)	(63,136)	(8,135)	(20,870)
x Milling Extraction Rate (M.E.R.)	0.63	0.76	0.90	0.72	0.18	0.18
= FOOD DEFICIT (MILLED)	(1,380)	34,499	(13,074)	(45,458)	(1,464)	(3,757)

WHEAT – COMMERCIAL IMPORTS AND FOOD AID

Graph 1



Food Needs Assessment

Table 2

Historical Commodities Table

Commodity Trigo

	1982	1984	1985	1986	1987	AVERAGE
Gross domestic food production	38,546	31,050	18,460	23,320	13,329	24,941
- Total non-food uses	7,516	5,229	11,183	25,538	30,716	16,036
= Net domestic food production	31,029	25,821	7,278	(2,218)	(17,387)	8,905
- Net change in stocks	0	0	(9,437)	0	0	(1,887)
- Total food exports	6,579	10,526	13,158	6,579	6,579	8,684
= Domestic food supply	24,450	15,295	3,557	(8,797)	(23,966)	2,108
+ Total commercial food imports	317,894	278,621	221,057	242,506	360,000	284,016
+ Food Aid	1,600	96	113,000	61,060	46,210	44,393
= Total food supply	343,944	294,012	337,614	294,769	382,244	330,517
/ Population (thousands)	8,606	9,089	9,349	9,617	9,892	9,311
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	40	32	36	31	39	36
= PER CAPITA CONSUMPTION (MILLED kg/year)	30	25	27	23	29	27

(all values are in UNMILLED terms, unless noted)

1. Domestic Production

Domestic wheat production levels is expected to recover slightly in 1988, although the historic levels seen in Graph 3 show a clear downward trend. While the decline in domestic production might have serious policy implications, the role of local production in the total wheat supply is extremely limited, as Table 3 shows.

TABLE 3

Gross Domestic Production as a Percentage of Total Wheat Consumption

1982	1984	1985	1986	1987	1988
11%	10.6%	5%	7.9%	3.5%	5.2%

Even the picture presented in Table 3 is overly optimistic. When gross domestic production is adjusted for non-food uses of wheat (seed saved for planting in the subsequent year, losses occurring between the farm and the mill and, most importantly, animal feed use), Ecuador has had a negative domestic availability of wheat since 1986 (see Graph 4). In other words, domestic production does not cover even the non-food uses of wheat, not to mention the 300,000+ tons needed for human consumption.

2. Non-Food Uses

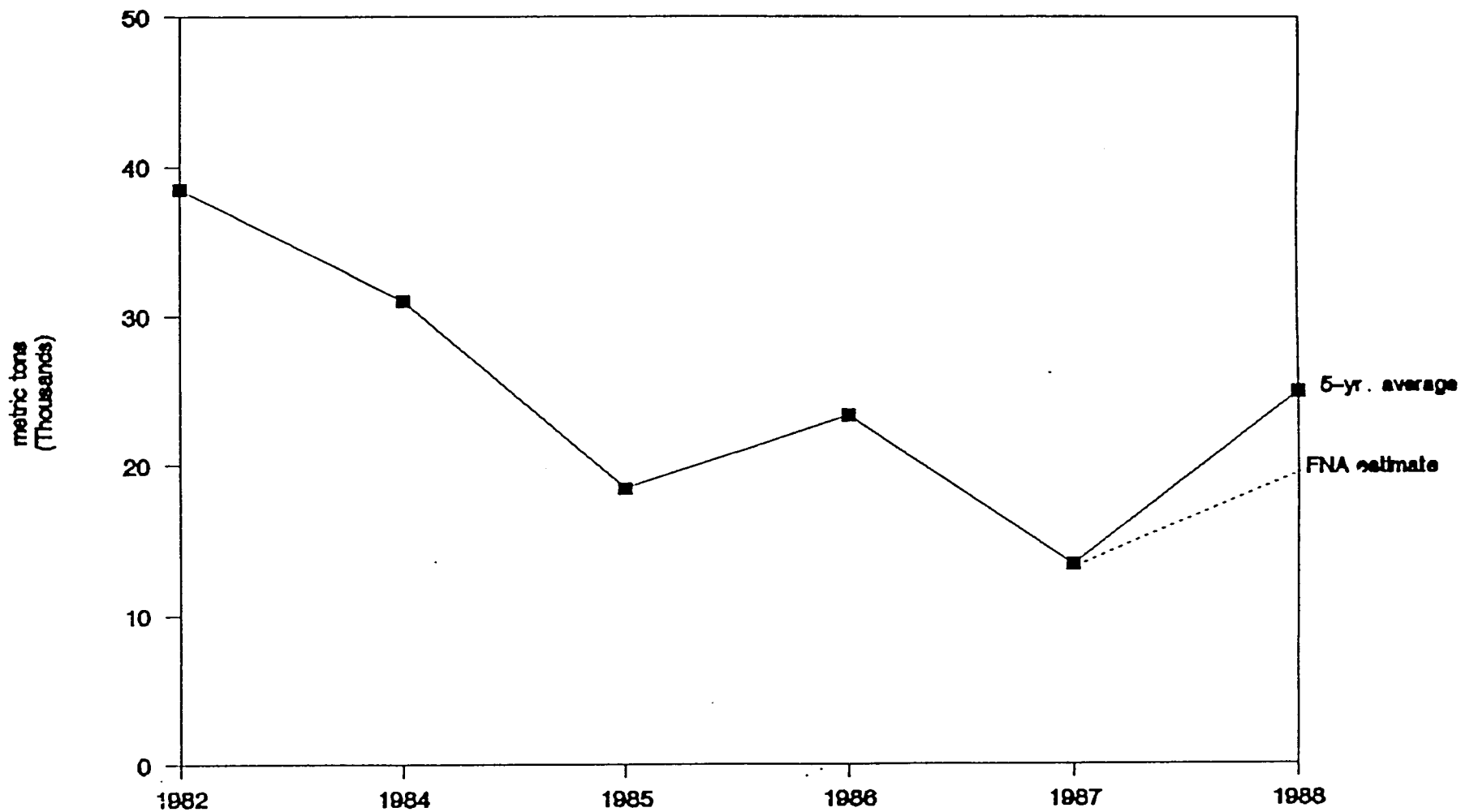
The use of domestic wheat supplies for seed and post-harvest losses have been held constant as share of production throughout the historical period. Therefore, the enormous increase in non-food uses seen in Table 2 can be attributed solely to the use of wheat flour in shrimp feed. (Also see the Feed Needs Assessment, Section II.)

The use of wheat flour in shrimp feed has increased commensurately with growth in the shrimp industry and the low price of wheat flour relative to other commodities. According to feed industry sources, wheat flour is lowest priced and most widely available product for use as a gluten and for buoyancy.

However, wheat flour is not an indispensable component of shrimp feed. If relative prices increased or if supplies became constrained, a replacement could be found. A new chemical binder which could replace wheat flour is expected to be available soon, although high prices may limit its market.

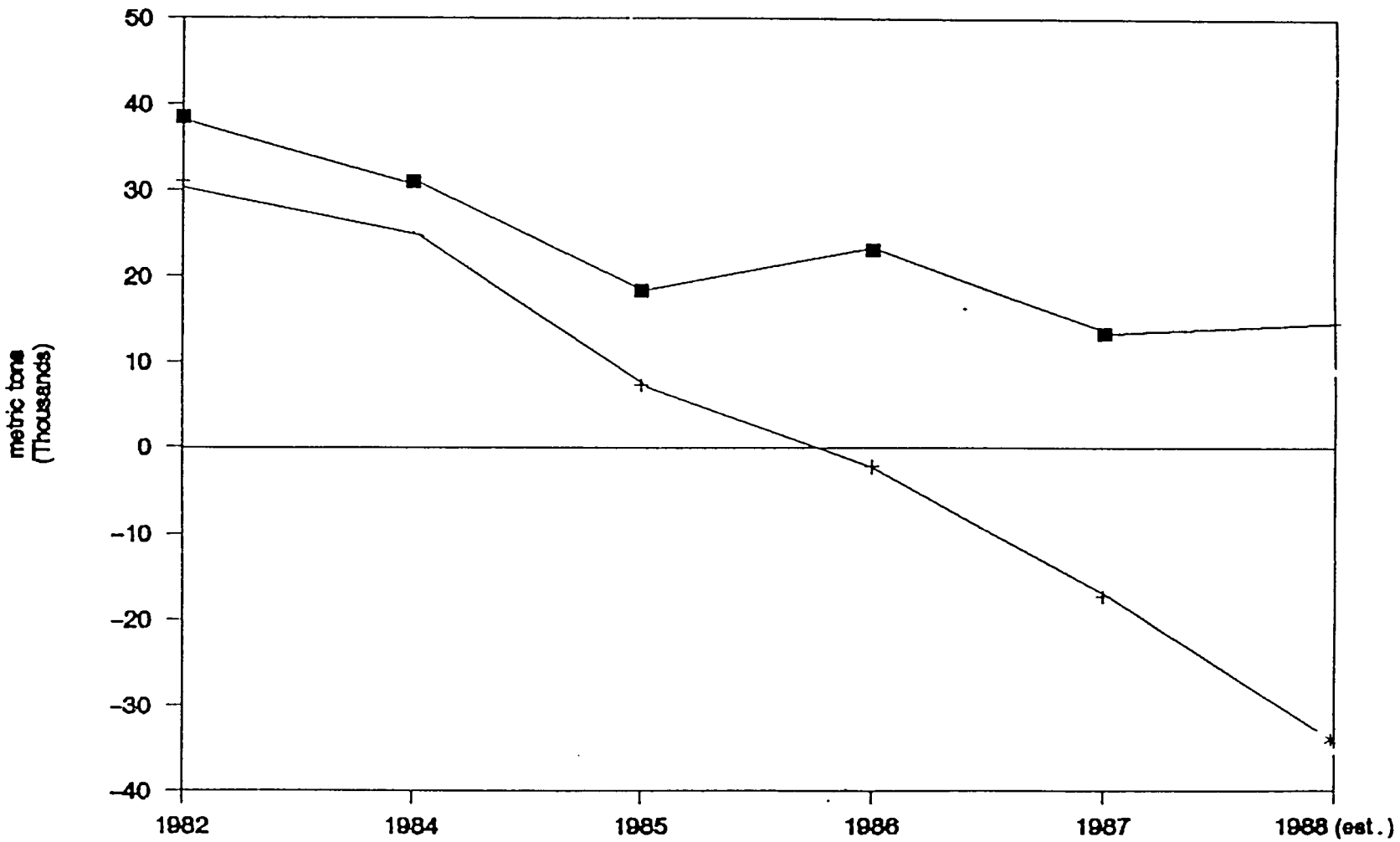
GROSS DOMESTIC WHEAT PRODUCTION

Graph 3



WHEAT - GROSS VS. NET PRODUCTION

Graph 4



Net production = gross production - seed use - feed use -post-harvest losses - industrial uses

Yuca (cassava) flour, which could be produced locally, is commonly mentioned as a potential substitute. Shrimp feed with 5-10% cassava flour content reportedly would have the same binding qualities as feed with 30% wheat flour. Cassava flour is slightly more expensive than wheat flour, although it is competitive because of the smaller quantity required. Cassava flour production has increased significantly in the past several years, although it still remains relatively low. This year, 3000 tons are expected to be produced, most of which will be used by shrimp feed compounders (small amounts are used in as industrial binders, for human food use and for exports). Further increases in production will be constrained by a lack of processing facilities.

3. Exports

Contraband exports of wheat flour to Colombia reportedly have decreased due to the government's control efforts, although a small volume continues to cross the border. Estimates of illegal trade for wheat and other commodities are extremely difficult to find and must be viewed with caution. Overall, the contraband estimates included in the Food Needs Assessment are probably conservative, based on data provided by the Foreign Agriculture Service of USDA, the World Bank and the Junta del Acuerdo de Cartegena food security project.

4. Imports

Estimates of historical commercial imports vacillate widely among sources. The reasons for the large disparities are unclear, although it may be that some sources include food aid in estimates of commercial imports, while others do not; or that some sources estimate the amount that arrives at the ports, others estimate the amount that arrives at the mill, etc.

The amount of wheat food aid has declined annually since 1985, when 113,000 tons arrived. While declines in food aid levels have been met in part by increased commercial imports, it may not be feasible to continue this trend given the economic problems of the country.

According to the U.S. Department of Agriculture's Economic Research Service, Ecuador can "afford" to spend $39 million dollars on commercial food imports in 1988/89[1]. This total would allow the country to purchase approximately 216,000 tons of food. (The conversion from dollars to tons used USDA's calculation of projected U.S. wheat export prices multiplied by the historical ratio of Ecuador's import unit value and the U.S. export unit value. This assumes that the price of imported wheat will be $180/ton, which might be low given the effects of U.S. drought. As of September 22, 1988, U.S. export prices were just over $160/ton compared to $112/ton in September 1987, see Appendix C for FAO pricing data. If a CIF wheat price can be obtained in Quito, it could be applied to the $39 million for a more accurate conversion.)

[1] World Food Needs and Availabilities, 1987/88, USDA Economic Research Service, July 1987.

USDA's methodology for calculating commercial import capacity estimates historical levels of foreign exchange available and calculates how much of this total foreign exchange has been allocated to food imports in the past (See Appendix C for USDA's tables and methodological statement). A three-year average (in this case, 1983-86) of the ratio of food imports to total foreign exchange is applied to the current year financial indicators.

It virtually impossible to judge the accuracy of USDA's projected commercial food import levels for an upcoming year. Import levels can be dependent on a number of factors - from domestic agricultural production to world commodity prices to debt rescheduling arrangements, etc. USDA's methodology for calculating food needs is unavoidably rigid in that it must use the same algorithm for projecting commercial imports in every country. Because of this constraint, they have decided calculate commercial import capacity based entirely on financial data.

In many cases, the Food Needs Assessment project considers variables other than financial indicators when projecting upcoming commercial imports. For example, past commercial food import levels are often a more useful indicator for projecting current year food imports than financial data. A five-year average (or the Usual Marketing Requirement), or a linear or non-linear trend extrapolation, can be indicative. In cases of significant declines in agricultural production or a cycle of continuing economic problems, the highest level of food imports recorded in the past might be a useful indicator.

Because of declining oil prices, the residual effects of the earthquake and the overall economic problems facing Ecuador, a case can be made for depending heavily on financial indicators to predict 1988/89 commercial imports. However, USDA's estimate of 216,000 tons of commercial import capacity is significantly lower than historical commercial import levels (see Table 2.) The five year average of commercial wheat imports, as calculated in the Food Needs Assessment, is 284,016 tons.

In summary, USDA estimates that Ecuador can import 216,000 tons of food commercially (or less - depending on the assumption of wheat prices used for the conversion.) While it is realistic to assume that the country may not be able to import record levels given the overall economic situation, USDA's projected amount is much lower than historical levels of commercial food imports.

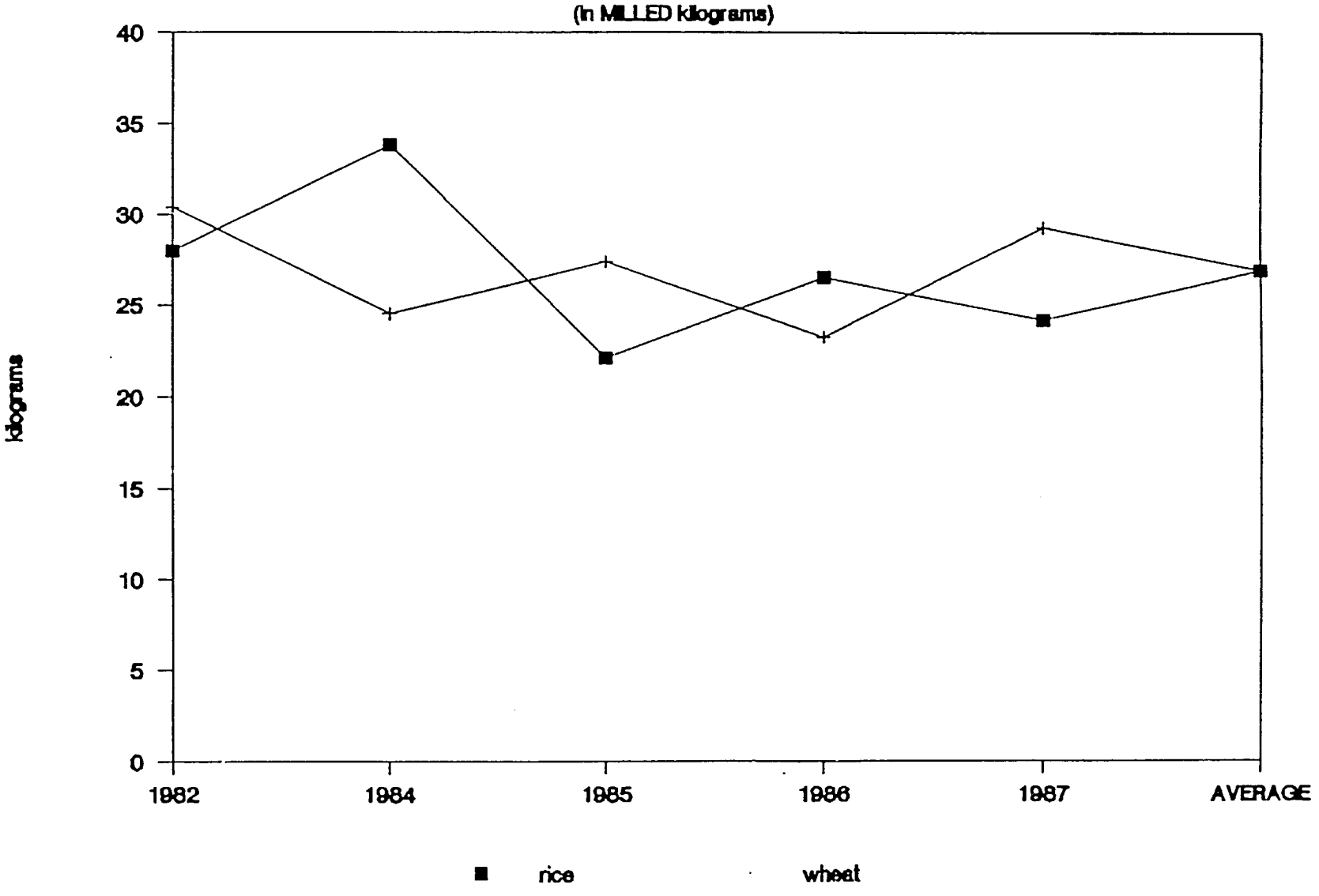
5. Per Capita Consumption

The per capita consumption of wheat has remained relatively stable, increasing or decreasing by several kilograms per person per year depending mainly on commercial import and food aid levels. There is no clear trend toward yearly increases in wheat consumption as might be expected.

Graph 5 shows an interesting occurrence: in each year that wheat consumption increased, rice consumption decreased and conversely, when wheat consumption was down, rice consumption was up. This seems to suggest a high degree of substitutability between the two commodities, although additional analysis would be required.

Graph 5

PER CAPITA CONSUMPTION - RICE & WHEAT



One hypothesis is that people consume more rice in years when less wheat is available; in other words, that the supply of wheat is the constraining factor and rice is used "to fill in" for wheat. This could have extremely important ramifications, given the potential for large increases in domestic rice production and the rising costs of imported wheat.

B. RICE

Rice production appears to have decreased in both 1987 and 1988, after a bumper harvest in 1986 resulted in large surpluses and eventual subsidized exports by the government. Although the Ministry of Agriculture still maintains that 1987 gross domestic production will be 780,000 tons (compared to the record 1986 harvest of 515,480), most other sources estimate production at around 400,000 tons. Given the trends seen in Graph 5 and the high level of wheat imports recording in 1987, the 400,000 ton figure seems more credible. Similar levels are estimated for 1988. Table 4 shows the historical summary of the rice situation.

C. SOFT CORN

Soft corn production has been erratic, decreasing to 35,000 tons in 1985 but expected to increase to 134,000 tons for 1987 (see Table 5). Although it is an important commodity for certain portions of the population, on a national scale, it is relatively minor. The 1988 Food Balance Sheet (Table 1) shows a surplus in soft corn, which reflects the use of a historical average for per capita consumption.

D. MILK

The most interesting feature of the food needs assessment for milk was the virtually constant per capita consumption level during the base period (see Graph 6). In other words, production increases have kept pace almost exactly with population growth. The milk surplus recorded for 1988 (Table 1) is due to milk industry projections of production increases above population growth levels. Table 6 shows the five-year summary for milk.

Although the 1988 Food Balance Sheet shows a surplus for milk, it is important to remember that this is based on historical levels of consumption rather than nutritional requirements. According to the National Institute of Nutrition, the recommended consumption of milk is 117 kilograms per person. For CY1988, this would translate into a 275,000 ton milk deficit based on nutritional norms.

Milk was also included in the feed needs assessment (see Section II).

Historical Commodities Table

Base Commodity Arroz

	1982	1984	1985	1986	1987	AVERAGE
Gross domestic food production	384,359	459,875	397,377	515,480	434,116	438,241
- Total non-food uses	32,671	36,974	34,731	47,830	51,609	40,763
= Net domestic food production	351,688	422,901	362,646	467,650	382,506	397,478
- Net change in stocks	(31,942)	1,877	16,442	44,202	(35,200)	(924)
- Total food exports	0	24,000	40,000	16,000	40,000	24,000
= Domestic food supply	383,631	397,024	306,205	407,449	377,706	374,403
+ Total commercial food imports	0	96,019	22,400	109	3,000	24,306
+ Food Aid	1,600	0	2,976	1,670	3,000	1,849
= Total food supply	385,231	493,043	331,581	409,227	383,706	400,558
/ Population (thousands)	8,606	9,089	9,349	9,617	9,892	9,311
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	45	54	35	43	39	43
= PER CAPITA CONSUMPTION (MILLED kg/year)	28	34	22	27	24	27

(all values are in UNMILLED terms, unless noted)

Historical Commodities Table

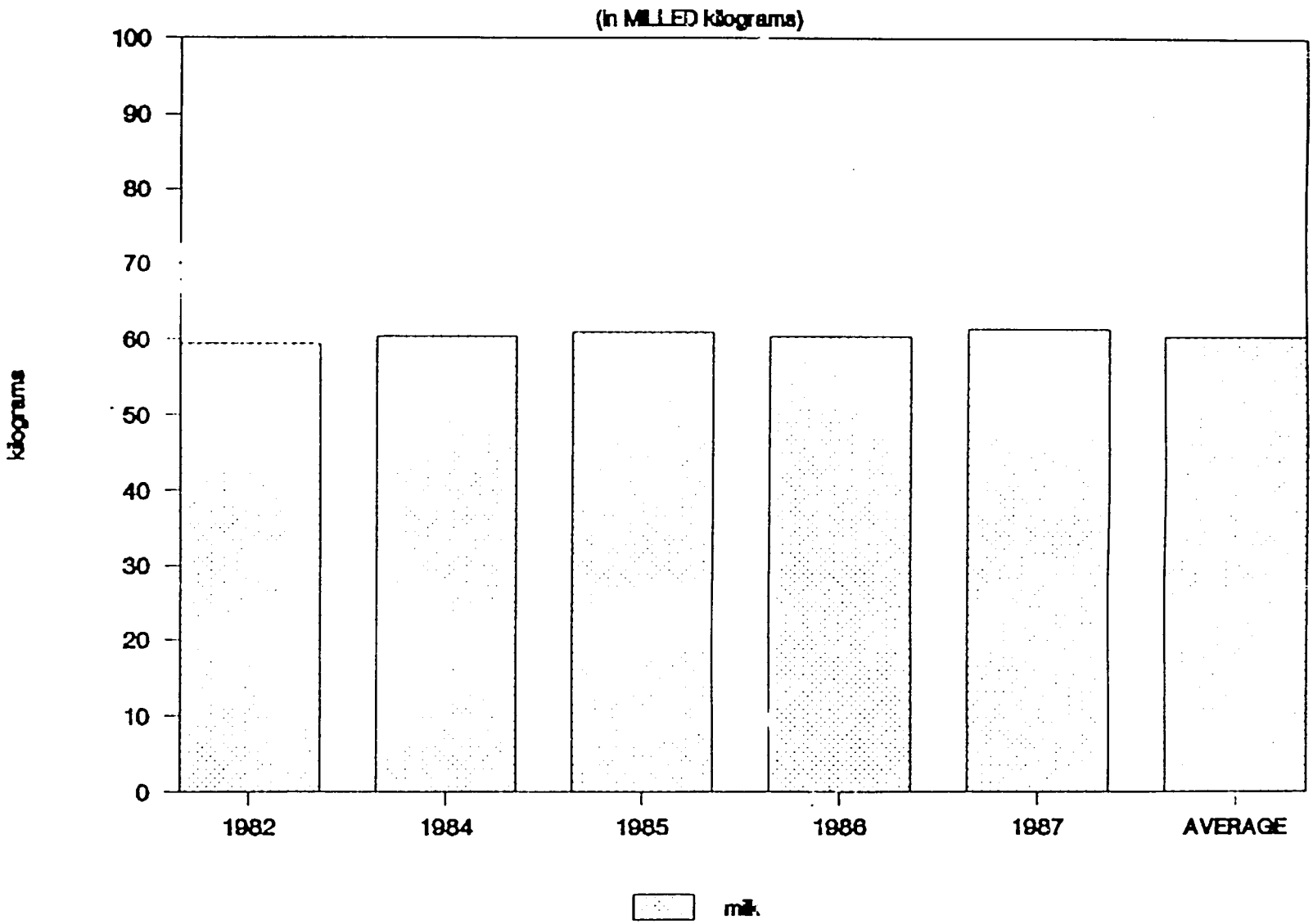
Commodity Maiz Suave

	1982	1984	1985	1986	1987	AVERAGE
Gross domestic food production	54,673	58,500	35,414	88,200	134,424	74,242
- Total non-food uses	6,287	6,353	3,956	11,603	13,805	8,401
= Net domestic food production	48,385	52,147	31,458	76,597	120,619	65,841
- Net change in stocks	0	0	(18,889)	0	0	(3,778)
- Total food exports	500	0	1,056	0	556	422
= Domestic food supply	47,885	52,147	49,292	76,597	120,063	69,197
+ Total commercial food imports	0	0	500	0	0	100
+ Food Aid	0	0	0	0	0	0
= Total food supply	47,885	52,147	49,792	76,597	120,063	69,297
/ Population (thousands)	8,606	9,089	9,349	9,617	9,892	9,311
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	6	6	5	8	12	7
= PER CAPITA CONSUMPTION (MILLED kg/year)	5	5	5	7	11	7

(all values are in UNMILLED terms, unless noted)

PER CAPITA CONSUMPTION - MILK

Graph 6



Historical Commodities Table

Commodity Leche

	1982	1984	1985	1986	1987	AVERAGE
Gross domestic food production	1,075,951	1,155,126	1,198,736	1,228,459	1,259,519	1,183,558
- Total non-food uses	376,583	404,294	419,557	429,960	428,237	411,726
= Net domestic food production	699,368	750,832	779,179	798,499	831,283	771,832
- Net change in stocks	0	0	0	0	0	0
- Total food exports	0	0	0	0	0	0
= Domestic food supply	699,368	750,832	779,179	798,499	831,283	771,832
+ Total commercial food imports	9,974	10,510	12,146	6,801	9,025	9,691
+ Food Aid	944	790	0	1,140	4,111	1,397
= Total food supply	710,287	762,132	791,325	806,440	844,418	782,920
/ Population (thousands)	8,606	9,089	9,349	9,617	9,892	9,311
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	83	84	85	84	85	84
= PER CAPITA CONSUMPTION (MILLED kg/year)	59	60	61	60	61	61

(all values are in UNMILLED terms, unless noted)

E. SOYBEANS AND AFRICAN PALM OIL

Tables 7 and 8 show the historical summaries for the two major edible oils - soybean and palm. The tables show both commodities in the UNMILLED form and the deficit/surplus is converted to oil equivalent in the last line. Both commodities are produced domestically, although large volumes of soybeans (in oil form) are imported.

Palm oil and soybean production has increased annually as Graph 7 shows. As a result of these large increases, imports of soybean oil have decreased. Despite the fact that both commodities are used as edible oils, they are not considered perfect substitutes. Soybeans generally produce a higher quality and preferred type of oil.

Contraband trade in oils is widely acknowledged, although no available source would hazard a guess at even the order of magnitude of the trade. Because estimates were unavailable, unregistered exports of oil are not included in any of the historical or current tables. Although this biases the consumption levels upward, the same bias is consistent throughout the base period. The high average per capita consumption of the two oils - 14 kilograms per person per year - probably confirms the existence of unregistered exports.

Some reports claim that a large percentage of the soybean oil is exported illegally to Colombia where prices for oils are much higher. Palm oil is not exported in large volumes because of its relatively low quality and tendency to cloud.

Historical Commodities Table

Commodity Soya

	1982	1984	1985	1986	1987	AVERAGE
Gross domestic food production	37,406	55,001	62,875	76,260	118,813	70,071
- Total non-food uses	2,206	3,282	3,708	4,045	3,596	3,367
= Net domestic food production	35,200	51,719	59,167	72,215	115,217	66,703
- Net change in stocks	0	0	0	0	0	0
- Total food exports	0	0	0	0	0	0
= Domestic food supply	35,200	51,719	59,167	72,215	115,217	66,703
+ Total commercial food imports	185,000	279,444	193,744	58,267	53,270	153,945
+ Food Aid	1,167	444	1,280	460	53,222	11,315
= Total food supply	221,367	331,607	254,191	130,942	221,709	231,963
/ Population (thousands)	8,606	9,089	9,349	9,617	9,892	9,311
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	26	36	27	14	22	25
= PER CAPITA CONSUMPTION (MILLED kg/year)	5	7	5	2	4	5

(all values are in UNMILLED terms, unless noted)

Historical Commodities Table

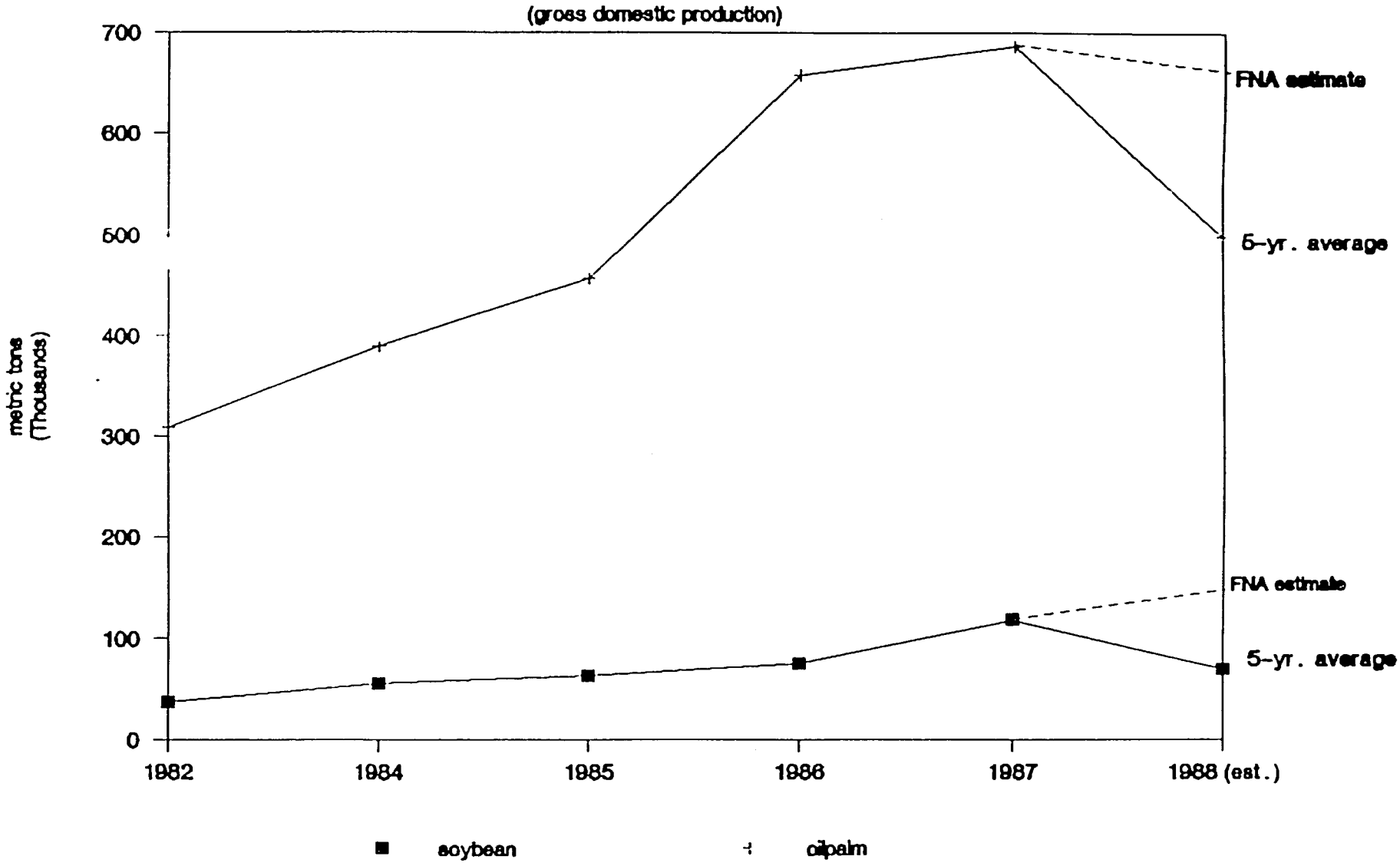
Commodity Oilpalm

	1982	1984	1985	1986	1987	AVERAGE
Gross domestic food production	309,287	389,984	457,911	657,740	686,400	500,264
- Total non-food uses	61,857	3,900	45,789	65,774	68,640	49,192
= Net domestic food production	247,430	386,084	412,122	591,966	617,760	451,072
- Net change in stocks	0	0	0	0	0	0
- Total food exports	0	0	0	0	0	0
= Domestic food supply	247,430	386,084	412,122	591,966	617,760	451,072
+ Total commercial food imports	0	0	0	0	0	0
+ Food Aid	556	0	435	0	0	198
= Total food supply	247,985	386,084	412,557	591,966	617,760	451,270
/ Population (thousands)	8,606	9,009	9,349	9,617	9,892	9,311
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	29	42	44	62	62	48
= PER CAPITA CONSUMPTION (MILLED kg/year)	5	8	8	11	11	9

(all values are in UNMILLED terms, unless noted)

SOYBEAN AND OILPALM PRODUCTION

Graph 7



II. THE FEED NEEDS ASSESSMENT

The feed needs assessment included five commodities: hard corn, sorghum and soybean meal for poultry; wheat flour for shrimp; and milk for calves. Table 9 shows the final feed balance.

A. POULTRY FEED

Graph 8 shows the standard formula used by feed compounders. The calculations above the graph translate this commodity mix into the metric tons required for 1988. Hard corn and sorghum are basically interchangeable (there is slightly less nutritional value in sorghum) and the feed compounders say that the percentages allocated to each can vary as long as the two commodities combined comprise 40-60% of the feed mix.

There are large discrepancies among various 1988 production estimates for the three commodities used in poultry feed. For example, the Ministry of Agriculture and Livestock (MAG) is projecting that 1988 hard corn production will be 346,000, while the feed producers association (AFABA) claims hard corn production will be only 139,000 tons. Similarly, MAG projects sorghum production at 23,450 tons, while AFABA expects only 4000 tons.

In the past, MAG estimates often have been overly optimistic, so it is safe to assume actual production levels will be somewhere below the official government figures. Also, the feed producers industry could have a vested interest in underestimating domestic production, in order to increase the apparent need for imports, depressing the local prices and lowering the cost of inputs for feed producers. Therefore, it is also possible that the production estimates provided by AFABA are too low. Even when using the MAG estimates as the upper limit and the AFABA estimates as the lower limit, the range is enormous. Graph 9 shows MAG, AFABA and five-year averages for hard corn and sorghum production.

In order to move ahead with the assessment, one set of production estimates were selected, although they should be viewed with extreme caution. For hard corn, 240,000 tons was used, a number which is slightly lower than the five-year average and not coincidentally, approximately the mid-point between MAG and AFABA estimates. For sorghum, the five-year historical average of 7700 tons was selected. In this case, the MAG estimate appeared way out of line and was not considered. Because all other variables remain constant, the balance can be recalculated easily when more reliable production estimates are available.

(Sensitivity analyses were run using each estimate - Table 10 with MAG production data, Table 11 with historical averages and Table 12 with AFABA data. As can be seen in the tables, the implications of the different estimates are diametrically opposite: with MAG data, there is a 95,000 ton surplus of hard corn, while with AFABA data, a 100,000 ton deficit exists.)

The exports shown on the feed balance (Table 9) for hard corn and sorghum are

FEED BALANCE - 1988

COMMODITY:	MAIZ DURO	SORGO	PASTA DE SOYA	HARINA DE TRIGO	LECHE
Requirement per animal (kg/yr)	3.6	1.1	0.8	--	590.8
x Number of animals (thousands)	46,890	46,890	46,890	--	712
= Total feed requirement (mt)	169,200	51,606	36,801	35,280	491,113
Gross domestic production (UNMILLED)	240,000	7,656	70,071	18,940	1,402,162
- Seed saved	3,600	612	2,452	3,087	0
- Post-harvest losses	12,000	1,531	1,401	947	0
- Industrial uses	45,000	0	28,028	0	0
- Milling losses	0	0	12,613	4,174	0
= Net domestic production	179,400	5,512	38,189	10,732	1,402,162
- Food use	*	0	0	261,124	857,604
- Net change in stocks		0			
- Total exports	15,000	12,000			
= Domestic feed supply	164,400	(6,488)	38,189	(250,392)	544,558
Total feed requirement (above)	169,200	51,606	36,801	35,280	491,113
- Domestic feed supply	164,400	(6,488)	38,189	(250,392)	544,558
= Feed import requirement	4,800	58,094	(1,388)	285,672	(53,445)
- Total commercial imports	0	60,000	0	259,200	9,691
= Feed deficit	4,800	(1,906)	(1,388)	26,472	(63,136)

* Food and industrial uses combined.

FEED NEEDS ASSESSMENT - 1988

======= POULTRY =======

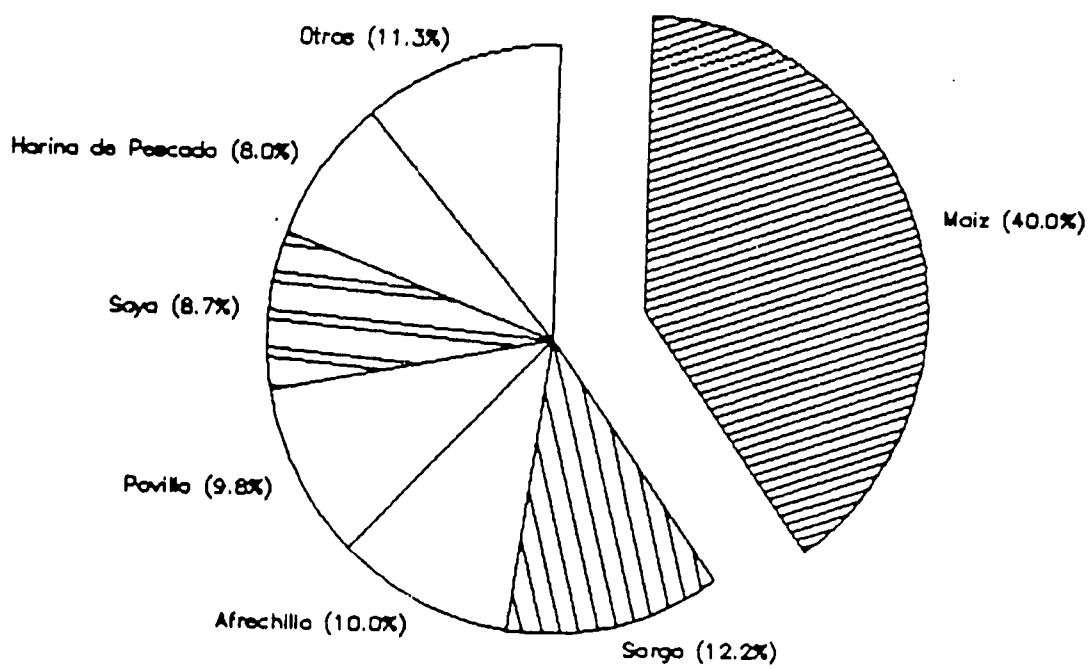
Number of animales/year	46,890,000
x Average feed requirement - kg/yr	9.02
= Total feed requirement - mt/year	423,000

Composition of poultry feed needs - 1988

	mt/year
Maiz	169,200
Sorgo	51,606
Afrechillo	42,300
Povillo	41,454
Soya	36,801
Harina de Pescado	33,840
Otros	47,799
	423,000

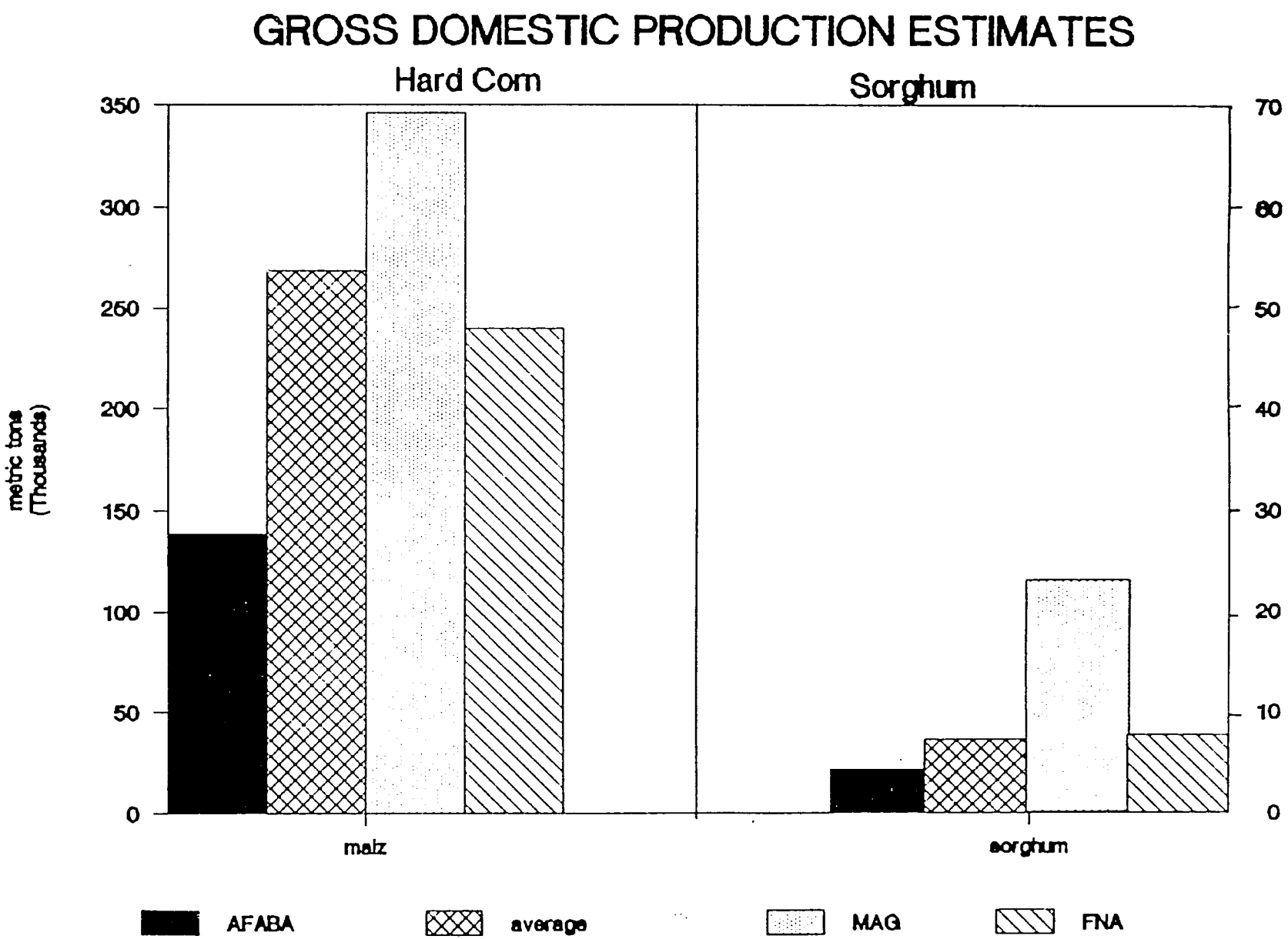
Graph 8

FORMULA BASICA POR ALIMENTOS DE AVES



Source: "Industria de Alimentos Balanceados: Componente Vital de la Cadena Agroalimentaria del Ecuador," 3 Marzo 1988.

Graph 9


GROSS DOMESTIC PRODUCTION ESTIMATES
Hard Corn
Sorghum
metric tons (Thousands)
350
300
250
200
150
100
50
0
70
60
50
40
30
20
10
0
maiz
sorghum
AFABA
average
MAG
FNA

Scenario 1, Worst Case Production Estimates

FEED BALANCE - 1988

COMMODITY:	MAIZ DURO	SORGO	PASTA DE SOYA	HARINA DE TRIGO	LECHE
Requirement per animal (kg/yr)	3.6	1.1	0.8	--	590.8
x Number of animals (thousands)	46,890	46,890	46,890	--	712
= Total feed requirement (mt)	169,200	51,606	36,801	35,280	491,113
Gross domestic production (UNMILLED)	139,000	4,000	70,071	18,940	1,183,558
- Seed saved	2,085	320	2,452	3,087	0
- Post-harvest losses	6,950	800	1,401	947	0
- Industrial uses	45,000	0	28,028	0	0
- Milling losses	0	0	12,613	4,174	0
= Net domestic production	84,965	2,880	38,189	10,732	1,183,558
- Food use	*	0	0	261,124	857,604
- Net change in stocks		0			
- Total exports	15,000	12,000			
= Domestic feed supply	69,965	(9,120)	38,189	(250,392)	325,954
Total feed requirement (above)	169,200	51,606	36,801	35,280	491,113
- Domestic feed supply	69,965	(9,120)	38,189	(250,392)	325,954
= Feed import requirement	99,235	60,726	(1,388)	285,672	165,159
- Total commercial imports	0	60,000	0	259,200	9,691
= Feed deficit	99,235	726	(1,388)	26,472	155,468

* Food and industrial uses combined.

** AFABA production estimates for maiz and sorgo; three-year average for trigo; five-year averages for soya and leche.

Scenario 2, Historical Averages

FEED BALANCE - 1988 - AVERAGES**

COMMODITY:	MAIZ DURO	SORGO	PASTA DE SOYA	HARINA DE TRIGO	LECHE
Requirement per animal (kg/yr)	3.6	1.1	0.8	--	590.8
x Number of animals (thousands)	46,890	46,890	46,890	--	712
= Total feed requirement (mt)	169,200	51,606	36,801	35,280	491,113
Gross domestic production (UNMILLED)	268,435	7,656	70,071	24,941	1,183,558
- Seed saved	4,027	612	2,452	4,065	0
- Post-harvest losses	13,422	1,531	1,401	1,247	0
- Industrial uses	45,000	0	28,028	0	0
- Milling losses	0	0	12,613	5,496	0
= Net domestic feed production	205,987	5,512	38,189	14,133	1,183,558
- Food use	*	0	0	261,124	782,920
- Net change in stocks		0			
- Total exports	15,000	12,000			
= Domestic feed supply	190,987	(6,488)	38,189	(246,991)	400,638
Total feed requirement (above)	169,200	51,606	36,801	35,280	491,113
- Domestic feed supply	190,987	(6,488)	38,189	(246,991)	400,638
= Feed import requirement	(21,787)	58,094	(1,388)	282,271	90,475
- Total commercial imports	0	60,000	0	259,200	9,691
= Feed deficit	(21,787)	(1,906)	(1,388)	23,071	80,784

* Food and industrial uses combined.

** Scenario uses five-year averages, as estimated by the FNA, for production estimates.

Scenario 3, Optimistic Production Estimates

FEED BALANCE - 1988 - MINISTRY OF AGRICULTURE AND LIVESTOCK ESTIMATES

COMMODITY:	MAIZ DURO	SORGO	PASTA DE SOYA	HARINA DE TRIGO	LECHE
Requirement per animal (kg/yr)	3.6	1.1	0.8	--	590.8
x Number of animals (thousands)	46,890	46,890	46,890	--	712
= Total feed requirement (mt)	169,200	51,606	36,801	35,280	491,113
Gross domestic production (UNMILLED)	346,200	23,450	70,071	18,940	1,402,162
- Seed saved	5,193	1,876	2,452	3,087	0
- Post-harvest losses	17,310	4,690	1,401	947	0
- Industrial uses	45,000	0	28,028	0	0
- Milling losses	0	0	12,613	4,174	0
= Net domestic production	278,697	16,884	38,189	10,732	1,402,162
- Food use	*	0	0	261,124	857,604
- Net change in stocks		0			
- Total exports	15,000	12,000			
= Domestic feed supply	263,697	4,884	38,189	(250,392)	544,558
Total feed requirement (above)	169,200	51,606	36,801	35,280	491,113
- Domestic feed supply	263,697	4,884	38,189	(250,392)	544,558
= Feed import requirement	(94,497)	46,722	(1,388)	285,672	(53,445)
- Total commercial imports	0	60,000	0	259,200	9,691
= Feed deficit	(94,497)	(13,278)	(1,388)	26,472	(63,136)

* Food and industrial uses combined.

contraband trade. The estimate of 15,000 tons of illegal hard corn exports is based on data from the Junta del Acuerdo de Cartagena food security project, which estimated contraband levels at 25,000-30,000 tons annually between 1982 and 1985, and on reports that the volume of illegal trade has diminished but not disappeared. The estimate of 12,000 tons of illegal sorghum exports is based on reports from the Foreign Agriculture Service and AFABA. Reportedly, a significant percentage of the 60,000 tons of sorghum imported in 1988 was re-exported to Colombia.

B. SHRIMP FEED

Graph 10 shows the basic formula for shrimp feed currently being used. This mix has changed recently; before 1985, wheat flour was not used in significant quantities. As discussed in the Food Needs Assessment section, a large amount of wheat flour is being used for buoyancy and as a gluten, although viable substitutes are available or could be produced.

It is difficult to assess whether competition currently exists between wheat flour for human consumption and for shrimp feed. If wheat flour continues to be used for the ever-expanding shrimp industry and economic difficulties limit commercial imports, such competition seems inevitable, at least until the price of wheat flour is increased to the level where feed compounders switch to one of the substitutes. As the shrimp industry is highly-profitable and export-oriented, an economic argument can be made that wheat flour for feed is a high valued use of the commodity, although this position would be politically untenable if competition between human and animal use grows.

C. CATTLE FEED

The livestock industry consumes very little grain in Ecuador. The Cattlemen's Association claims that all of the available hard corn and sorghum goes to the poultry industry and import quotas are very difficult to obtain. For 1988, the Association requested 10,000 tons of sorghum, but received none because import quotas were allocated to poultry feed producers.

Milk was included in the feed needs assessment because of the high rate of use as food for calves, combined with the reported nutritional deficit in milk consumption for humans. According to industry sources, 35% of the total milk produced is used for animal feed.

While both the food and feed needs assessment show a milk surplus, these surpluses only indicate that a slight production increase is expected this year. As mentioned in the Food Needs Assessment section, when per capita requirements are calculated using levels recommended by the National Institute of Nutrition instead of historical averages, a 275,000 ton deficit exists.

There is potential significant reductions in the animal consumption of milk, according

FEED NEEDS ASSESSMENT - 1988

======= SHRIMP =======

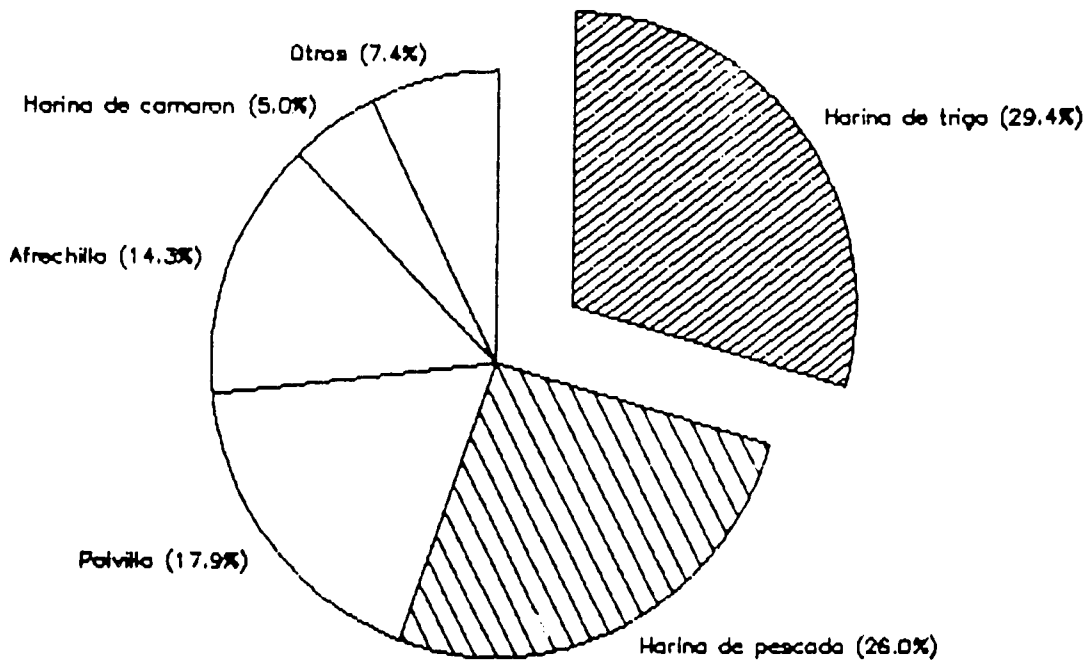
Hectares in cultivation	80,000
Rotations/year	1.5
Total hectares in production/yr	120,000
Estimated feed requirement - mt/ha/yr	1
Total feed requirement	120,000

Composition of shrimp feed needs

	mt/year
Harina de trigo	35,280
Harina de pescado	31,200
Polvillo	21,480
Afrechillo	17,160
Harina de camaron	6,000
Otros	8,880

Graph 10

FORMULA BASICA ALIMENTARIA DE CAMARONES



Source: "Industria de Alimentos Balanceados: Componente Vital de la Cadena Agromentaria del Ecuador," 3 Marzo 1989.

to industry reports. A 1985 report, which claimed animal consumption was "excessive" at 25-30% of total production, included a plan to reduce this level to 20% by 1990. If a reduction in animal consumption from 35% to 20% took place, more than 200,000 additional tons would be available for human use. Of course, such a change would not take place immediately, but the potential exists and it could have a significant impact on the nutritional situation in the country.

RECOMMENDED AREAS FOR FURTHER STUDY

1. Commercial import capacity for wheat

Hypothesis: Ecuador is currently allocating a much larger percentage of its available foreign exchange to wheat imports than in the past. The country may not be able to sustain this trend.

2. Substitutibility of rice for wheat

Hypothesis: If prices of wheat increased, and/or available supplies decreased, rice demand would rise. Providing rice price levels were adequate, rice demand could be met through increased domestic production.

3. The effects of potential wheat flour price increases on shrimp feed manufacturers

Hypothesis: Wheat flour is used in shrimp feed only because it is seen as the least-cost, most-widely available product. If prices increased substantially, industry consumption would quickly drop to zero as substitutes were found.

4. The feasibility of increased yuca production as a substitute for wheat flour in shrimp feed

Hypothesis: Increased domestic production of yuca (and yuca flour) would be a viable alternative to wheat flour in shrimp feed.

5. Options for increasing human consumption of milk and milk products through a reduction in calf milk consumption

Hypothesis: Current milk consumption levels by calves are excessive and could be reduced, providing a means to close the nutritional gap in human milk consumption.

PERSONS CONTACTED

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Asocicion de Ganaderos:

Galo Izurieta

Programa Mundial de Alimentos (WFP):

Bodo Henze

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Others:

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Steve Romanoff, IDEA

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APPENDIX A
HISTORICAL BALANCE SHEETS

Food Needs Assessment

08-Aug-88

Historical Year Food Balance Sheet
Year of Analysis: 1982

Commodity	Arroz	Trigo	Maiz Suave	Leche	Soya	Oilpalm
Gross domestic food production	384,359	38,546	54,673	1,075,951	37,406	309,287
- Total non-food uses	32,671	7,516	6,287	376,583	2,206	61,857
= Net domestic food production	351,688	31,029	48,385	699,368	35,200	247,430
- Net change in stocks	(31,942)	0	0	0	0	0
- Total food exports	0	6,579	500	0	0	0
= Domestic food supply	383,631	24,450	47,885	699,368	35,200	247,430
+ Total commercial food imports	0	317,894	0	9,974	185,000	0
+ Food Aid	1,600	1,600	0	944	1,167	556
= Total food supply	385,231	343,944	47,885	710,287	221,367	247,985
/ Population (thousands)	8,606	8,606	8,606	8,606	8,606	8,606
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	45	40	6	83	26	29
= PER CAPITA CONSUMPTION (MILLED kg/year)	28	30	5	59	5	5

Historical Year Food Balance Sheet
Year of Analysis: 1984

Commodity	Arroz	Trigo	Maiz Suave	Leche	Soya	Oilpalm
Gross domestic food production	459,875	31,050	58,500	1,155,126	55,001	389,984
- Total non-food uses	36,974	5,229	6,353	404,294	3,282	3,900
= Net domestic food production	422,901	25,821	52,147	750,832	51,719	386,084
- Net change in stocks	1,877	0	0	0	0	0
- Total food exports	24,000	10,526	0	0	0	0
= Domestic food supply	397,024	15,295	52,147	750,832	51,719	386,084
+ Total commercial food imports	96,019	278,621	0	10,510	279,444	0
+ Food Aid	0	96	0	790	444	0
= Total food supply	493,043	294,012	52,147	762,132	331,607	386,084
/ Population (thousands)	9,089	9,089	9,089	9,089	9,089	9,089
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	54	32	6	84	36	42
= PER CAPITA CONSUMPTION (MILLED kg/year)	34	25	5	60	7	8

Historical Year Food Balance Sheet
Year of Analysis: 1985

Commodity	Arroz	Trigo	Maiz Suave	Leche	Soya	Oilpalm
Gross domestic food production	397,377	18,460	35,414	1,198,736	62,875	457,911
- Total non-food uses	34,731	11,183	3,956	419,557	3,708	45,789
= Net domestic food production	362,646	7,278	31,458	779,179	59,167	412,122
- Net change in stocks	16,442	(9,437)	(18,889)	0	0	0
- Total food exports	40,000	13,158	1,056	0	0	0
= Domestic food supply	306,205	3,557	49,292	779,179	59,167	412,122
+ Total commercial food imports	22,400	221,057	500	12,146	193,744	0
+ Food Aid	2,976	113,000	0	0	1,280	435
= Total food supply	331,581	337,614	49,792	791,325	254,191	412,557
/ Population (thousands)	9,349	9,349	9,349	9,349	9,349	9,349
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	35	36	5	85	27	44
= PER CAPITA CONSUMPTION (MILLED kg/year)	22	27	5	61	5	8

(All data in UNMILLED terms, unless noted)

Historical Year Food Balance Sheet
Year of Analysis: 1986

Commodity	Arroz	Trigo	Maiz	SuaveLeche	Soya	Oilpalm
Gross domestic food production	515,480	23,320	88,200	1,228,459	76,260	657,740
- Total non-food uses	47,830	25,538	11,603	429,960	4,045	65,774
= Net domestic food production	467,650	(2,218)	76,597	798,499	72,215	591,966
- Net change in stocks	44,202	0	0	0	0	0
- Total food exports	16,000	6,579	0	0	0	0
= Domestic food supply	407,449	(8,797)	76,597	798,499	72,215	591,966
+ Total commercial food imports	109	242,506	0	6,801	58,267	0
+ Food Aid	1,670	61,060	0	1,140	460	0
= Total food supply	409,227	294,769	76,597	806,440	130,942	591,966
/ Population (thousands)	9,617	9,617	9,617	9,617	9,617	9,617
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	43	31	8	84	14	62
= PER CAPITA CONSUMPTION (MILLED kg/year)	27	23	6	60	2	11

(All data in UNMILLED terms, unless noted)

Historical Year Food Balance Sheet
Year of Analysis: 1987

Commodity	Arroz	Trigo	Maiz Suave	Leche	Soya	Oilpalm
Gross domestic food production	434,116	13,329	134,424	1,259,519	118,813	686,400
- Total non-food uses	51,609	30,716	13,805	428,237	3,596	0
= Net domestic food production	382,506	(17,387)	120,619	831,283	115,217	686,400
- Net change in stocks	(35,200)	0	0	0	0	0
- Total food exports	40,000	6,579	556	0	0	0
= Domestic food supply	377,706	(23,966)	120,063	831,283	115,217	686,400
+ Total commercial food imports	3,000	360,000	0	9,025	53,270	0
+ Food Aid	3,000	46,210	0	4,111	53,222	0
= Total food supply	383,706	382,244	120,063	844,418	221,709	686,400
/ Population (thousands)	9,892	9,892	9,892	9,892	9,892	9,892
= PER CAPITA CONSUMPTION (UNMILLED kg/year)	39	39	12	85	22	69
= PER CAPITA CONSUMPTION (MILLED kg/year)	24	29	11	61	4	12

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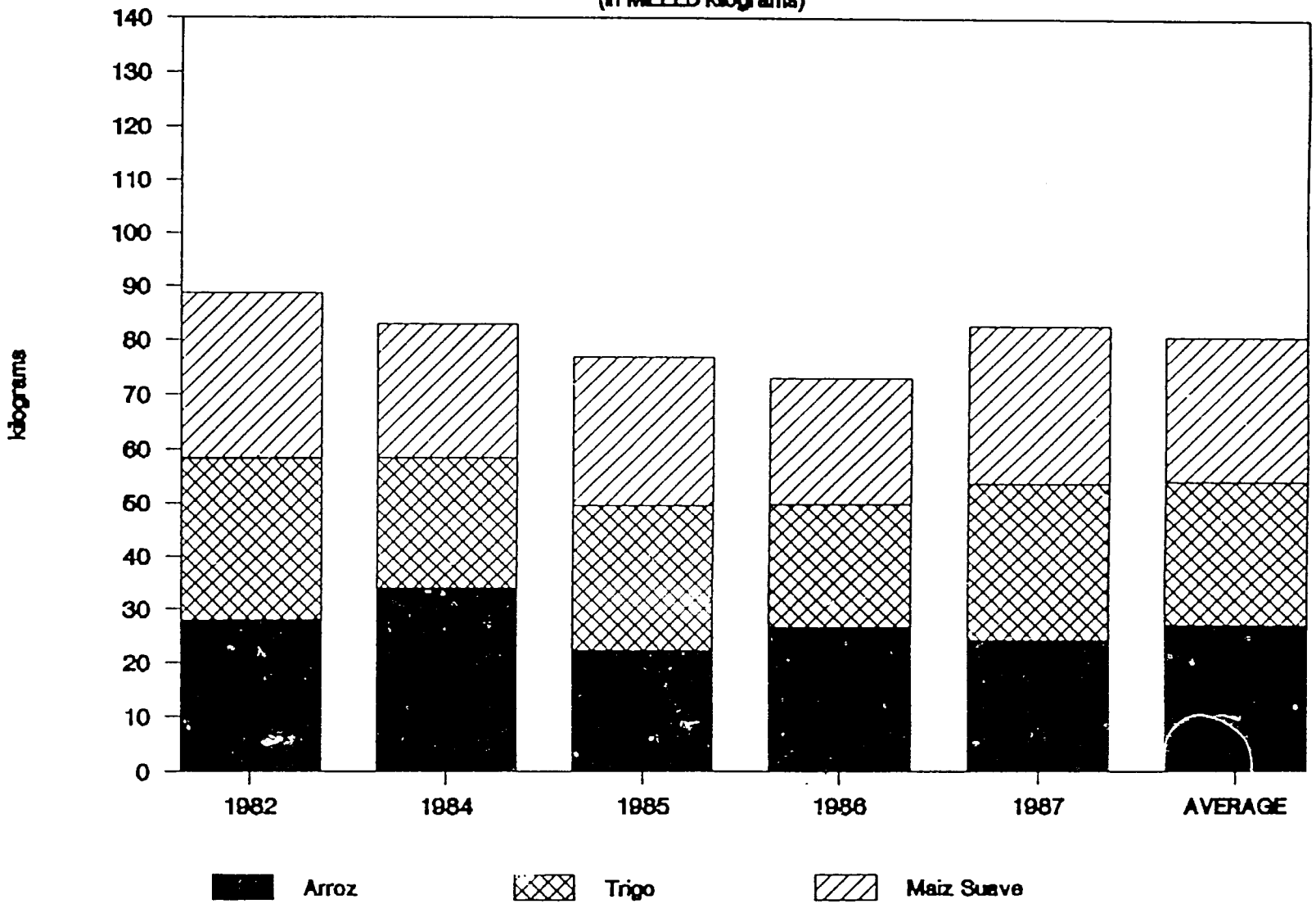
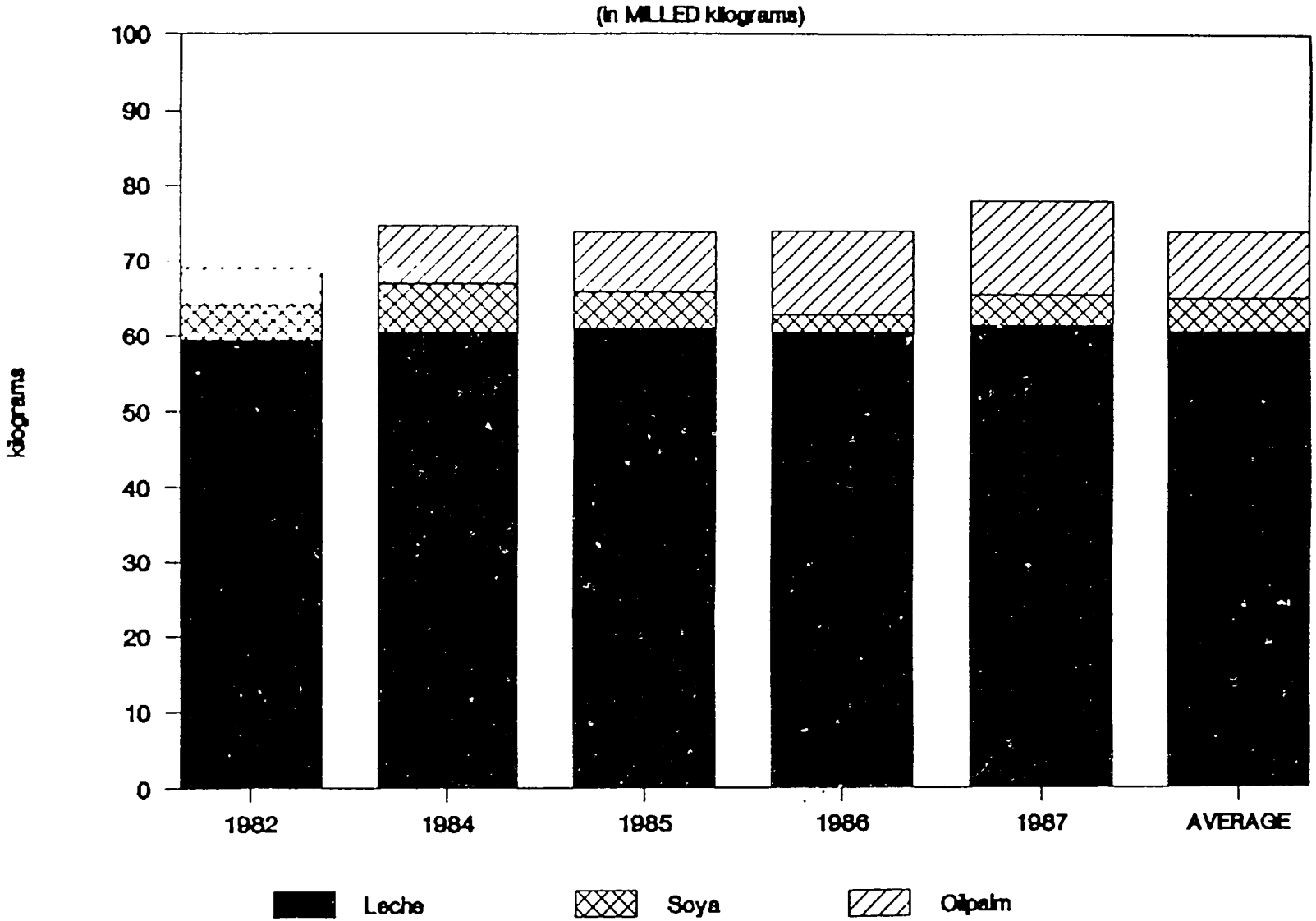
PER CAPITA CEREAL CONSUMPTION

(In MILLED kilograms)



PER CAPITA NON-CEREAL CONSUMPTION



APPENDIX C
COMMERCIAL IMPORT CAPACITY CALCULATIONS

From Food Outlook, UN Food and Agricultural Organization, October 1988

Table A. 9 - **Export Prices of Cereals and Soybeans**

	U.S. WHEAT		MAIZE	SORGHUM	RICE	SOYBEANS
	No. 2 1/ Hard Winter Ord. Prot.	No. 1 2/ Hard Winter Ord. Prot.	U.S. No. 2 Yellow 2/	U.S. No. 2 2/	Thailand 3/	U.S. No. 2 Yellow 2/
	(U.S. $/ton)					
July/June						
1984/85	148	148	123	111	236	229
1985/86	129	128	105	95	226	200
1986/87	110	109	73	71	222	195
1987/88	124	122	86	81	287	237
1987 - September	114	112	73	70	263	202
1988 - March	125	125	90	86	313	240
April	127	126	90	82	314	255
May	130	129	89	82	308	273
June	152	148	120	116	311	344
July	152	149	126	118	315	323
August	151	150	121	110	315	325
September 1	157	157	125	114	315	330
8	161	160	124	113	315	337
15	162	161	121	111	315	328
22	163	162	121	111	315	317

SOURCES: Wheat U.S. No. 2 - International Wheat Council; wheat U.S. No.1, maize, sorghum and soybeans - USDA; rice - Board of Trade of Thailand, posted prices. 1/ Export price f.o.b. U.S. Gulf ports. 2/ Export prices delivered U.S. Gulf ports. 3/ White rice 100% second grade, f.o.b. Bangkok.

From World Food Needs and Availabilities, USDA/ERS, July 1987.

Financial indicators for Ecuador, actual and projected

Year	Exports and other credits	Imports and other debits	Debt service	International reserves	Foreign exchange available	
					Total	Share to major food imports
	Million dollars					Percent
1980	2,975	3,647	559	1,013	2,416	5
1981	3,000	4,027	922	632	2,078	6
1982	2,734	3,949	1,107	304	1,627	7
1983	2,688	2,816	529	645	2,159	6
1984	2,972	3,240	991	611	1,981	6
1985	3,260	3,370	939	718	2,321	5
1986	2,575	3,290	1,000	644	1,575	
1987	2,375	3,494	726	400	1,329	6
1988	2,850	3,450	1,500	450	1,090	6

Additional food needs to support consumption for Ecuador, with stock adjustment

Commodity/year	Commercial import capacity		Status quo		Nutrition-based	
	Quantity	Value	Quantity	Value	Quantity	Value
	1,000 tons	Million $	1,000 tons	Million $	1,000 tons	Million $
Cereal equivalent Consumption						
1987/88	252	48	99	19	132	25
1988/89	216	39	185	33	216	39
Stock adjustment						
1987/88			(0)	(0)	(0)	(0)
1988/89			6	1	6	1
Total						
1987/88			99	19	132	25
1988/89			191	34	222	40
Milk						
1987/88	3	4	0	0	0	0
1988/89	3	4	0	0	0	0
Total						
1987/88		52		19		25
1988/89		43		34		40
Maximum absorbable						
Cereal equivalent						
1987/88			99	19	110	21
1988/89			191	34	206	37
Milk						
1987/88			0	0	0	0
1988/89			0	0	0	0
Total						
1987/88				19		21
1988/89				34		37

Commercial import capacity surplus to additional food needs in individual commodity groups offsets some additional cereal needs.

Calculating Import Unit Values

Import unit value (IUV) estimates are used in this report to convert tonnage import requirements (IRCQ) to value estimates (IRCV), and to convert estimated commercial import capacities in dollars (CICV) to tonnage terms (CICQ). Import unit values are computed for each country, year, and commodity group j as follows:

(20) $$IUV_j = (IUV_{jB}/USXUV_{jB})*FUSXUV$$

where:

IUV_{jB} = a country's average import unit value for commodity j during base period B (1983-85 in this report). In some cases, lack of current data has necessitated the estimation of country import unit values from those of nearby countries (sources: FAO and ERS).

$USXUV_{jB}$ = the average U.S. export unit value for commodities in group j during a base period B. The average U.S. export unit values used for each commodity group in the report are as follows: cereal equivalent = wheat; vegetable oils = soybean oil, pulses = dry beans, milk = nonfat dry milk converted to fluid equivalent.

$FUSXUV_j$ = the forecast U.S. export unit value for commodities in group j for the appropriate year (source: ERS).

Estimated import unit values are, therefore, dependent on a base-period ratio between a country's import unit value and the U.S. export unit value for a particular commodity, and on the forecast U.S. export unit value of that commodity. The use of the base-period ratio is intended to compensate for differences in transportation costs to various countries from both U.S. and non-U.S. ports, depending on who the base period suppliers were, as well as quality differences between what a country normally purchases and the U.S. average quality.

Calculating Commercial Import Capacity

A country's capacity to pay for imports of food staples is calculated in two steps. The first formula measures the country's available foreign exchange and is as follows: (all values are in million US $):

(1) $$FEA = MEE - [(IR_B/MI_B * MI) - IR] - DS;$$

where:

FEA = estimated foreign exchange availability;

MEE = projected merchandise export earnings (sources: World Bank and ERS);

IR_B = international reserves during the base period (sources: IMF and World Bank);

MI_B = merchandise imports during the base period (sources: IMF and World Bank);

MI = projected merchandise imports (sources: World Bank and ERS);

IR = projected international reserves (sources: World Bank and ERS);

DS = projected debt service (sources: World Bank and ERS); and

B = the base period over which IR and MI are averaged, (in this report, 1983-86).

Simply put, this formula states that the foreign exchange available for commercial food imports depends on export earnings, less any allowance for the accumulation or drawdown of reserves and debt service payments. The allowance for reserves is based on the notion that during the projection period a country be permitted to maintain a ratio of reserves to imports equal to the ratio in the base period. The term within the brack . determines the allowance for the accretion of reserves.

To illustrate, take the case of Ethiopia, where, for 1987:

MEE = 675

IR_B = 140

MI_B = 1169

MI = 1300

$$IR = 250.5$$

$$DS = 88.9$$

(2) $$FEA = 675 - [(140/1169 * 1300) - 250.5] - 88.8$$

(3) $$FEA = 675 - [(.1198 * 1300) - 250.5] - 88.8$$

(4) $$FEA = 675 - [155.7 - 250.5] - 88.8$$

(5) $$FEA = 675 + [94.8] - 88.8$$

(6) $$FEA = 681$$

Equation (3) indicates that, from 1983 to 1986, Ethiopia held reserves equal to about 12 percent of imports. After multiplication of this figure by the 1987 import projection, equation (4) shows that $156 million of reserves are needed to maintain the same reserves/imports ratio. Equation (5) shows the amount of reserves that Ethiopia will accumulate--the difference between reserves needed to maintain the base-period ratio and projected reserves. Equation (6) indicates the available foreign exchange for Ethiopia in 1987.

The next step in the formula determines the amount of available foreign exchange to be applied toward commercial imports of foods in a particular group of substitutable foods (cereals, roots and tubers, pulses, vegetable oils, etc.) designated by the subscript j. This step is specified as follows:

(7) $$CICV_j = FEA * (CFI_j/MEE)_B$$

where:

$CICV_j$ = Estimated commercial import capacity for food commodities in group j;

FEA = estimated foreign exchange available as derived from part 1 of the formula;

CFI_{jB} = commercial food imports of commodities in group j during the base period (sources: FAO and ERS);

MEE_B = merchandise export earnings during the base period (sources: IMF and World Bank); and

B = the base period over which CFI and MEE are averaged (in this report, 1983-86)

This method projects the ability of a country to purchase food imports, based on the percentage of export earnings spent on food imports during the base period.

To continue the illustration with Ethiopia for the food group consisting of cereals, where:

$$FEA = 681$$

$$CFI_{jB} = 16.9$$

$$MEE_B = 509$$

(8) $$CICV_j = 681 * (16.9/509)$$

(9) $$CICV_j = 681 * (.033)$$

(10) $$CICV_j = 22.9$$

Equation (9) indicates that Ethiopia spent roughly 3 percent of its export earnings on imports of cereals during the base period. For the purpose of additional food needs assessment, it is expected that the same percentage, or $22.9 million, of its available foreign exchange will be committed to import food staples in 1987/88.

A few shortcomings of this method should be noted. Countries that historically have spent a greater share of export earnings on food imports will be expected, for the purpose of this assessment, to spend the same share in forecast years. In contrast, countries that spend relatively little on food will be expected to continue spending that lower ratio.

Furthermore, countries whose base-period reserves-to-imports ratio is high may be permitted to accumulate reserves at a faster rate than countries with a lower ratio. Finally, because debt service projections, in many cases, are based on historical levels of actual payment in relation to export earnings and not on actual debt service obligations, forecasts of debt service may be understated.