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A Program for Food Grain Self-Sufficiency in the Sahel

SUMMARY

By

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A PROGRAM FOR FOODGRAIN SELF-SUFFICIENCY IN THE SAHEL BY THE YEAR 2000

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I. SUMMARY

1.1 Foodgrain self-sufficiency is a primary goal of the Sahelian nations which are members of the CILSS -- Cape Verde, Mauritania, Senegal, the Gambia, Mali, Upper Volta, Niger, and Chad. Foodgrain self-sufficiency generally implies national foodgrain production to meet national foodgrain needs. No country in the Sahel is currently self-sufficient by this definition, although Niger is very close. Four countries (Cape Verde, Mauritania, Senegal, and the Gambia) experience chronic foodgrain deficits; all countries import nearly the totality of their wheat supplies. In general, the overall degree of grain self-sufficiency in the Sahel today is less than it was in the 1965-67 period and, in many countries, lower than it was during the great drought of 1968-73.

1.2 This paper employs a simple simulation model to examine the likely magintude and incidence of future foodgrain deficits in the region. The base case describes the "normal year" foodgrain production and consumption situation in the early 1980's. Projection of population growth and production trends results in a estimated regional deficit of just over three million tons of cereals (not including wheat) by the year 2000.

1.3 Major development efforts to increase grain production have been and are being undertaken by the Sahelian countries with the assistance of donors. The model, therefore, permits examination of the likely impact which four approaches to increasing food production could have upon this deficit:

a. the intensification of rainfed production could result in a reduction of the projected deficit by 63 percent at an estimated cost of $1.9 billion;
b. the additional development of 273,900 hectares of irrigated land at a cost of $2.7 billion would result in a 100 percent reduction of the remaining deficit under "normal" rainfall conditions;
c. a drought-proof strategy involving the development of 841,000 additional hectares at a cost of $8.2 billion

would result in grain production levels at 142 percent of normal requirements, estimated to be enouggh to permit stockpiling of amounts adequate to cover occasional deficits; and

d. a regional trade-based strategy would shift investments from countries with high irrigation development costs toward those with lower costs and more irrigation potential. Potential cost savings (over the drought-proof strategy) are on the order of $5 billion; trade from surplus to deficit producers would, however, absorb some of these savings.

1.4 The utilization of this model as a planning tool, given the current data base, suggests that:

a. national foodgrain self-sufficiency is probably not attainable in all countries of the Sahel except at extremely high cost or under assumptions of extremely high yield levels;
b. regional foodgrain self-sufficeincy is attainable at more moderate costs under more realistic yield assumptions; and
c. investment resources on the order of approximately $300 million per year from now to the year 2000 will be rquired to achieve such regional self-sufficiency, an amount roughly equivalent to present official development assistance flows for agriculture.

1.5 Chapter II of this paper describes the base case and the assumptions which are incorporated into this model. Present levels of deficits are estimated. The impacts of recent development efforts on overcoming these deficits are assessed. Chapter III presents each of the scenarios for achieving foodgrain self-sufficiency on a national basis by the year 2000. Chapter IV summarizes the costs of these efforts. In Chapter V, one approach to regional food self-sufficiency is developed. Chapter VI concludes with recommendations for steps which are essential to effective use of such a planning model.

II. THE FOODGRAIN SITUATION IN THE SAHEL

2.1 The Importance of Foodgrains

Cereals are the most significant component of caloric intake in each Sahelian country. Per capita consumption of millet, sorghum, maize, and rice ranges from 120 kilograms per year in Cape Verde and Mauritania to a high of 227 kilograms in Niger (see Table II-1). These amounts are generally estimated to account for 50 to 80 percent of average daily energy intakes. Thus, an important element

TABLE II - 1 The FOODGRAIN SITUATION IN THE SAHEL
PER CAPITA PRODUCTION, CONSUMPTION, SELF-SUFFICIENCY

COUNTRY	MILLET/SORGHUM			MAIZE			RICE			WHEAT			ALL GRAINS		
	PROD	CONS	SELF-	PROD	CONS	SELF-SUFF	PROD	CONS	SELF-SUFF	PROD	CONS	SELF-SUFF	CONS	SELF-SUFFICIENCY W/WHEAT	SELF-SUFFICIENCY WO/WHEAT
CAPE VERDE	0.00	0.00	0.00	18.00	112.00	0.16	0.00	8.00	0.00	0.00	14.00	0.00	134.00	0.13	0.15
CHAD	117.70	137.00	0.86	1.20	3.00	0.40	5.20	6.00	0.87	0.00	4.00	0.00	150.00	0.83	0.85
THE GAMBIA	61.50	75.00	0.82	15.80	10.00	1.58	33.70	85.00	0.40	0.00	8.00	0.00	178.00	0.62	0.65
MALI	123.80	140.00	0.88	13.90	16.00	0.87	20.30	25.00	0.81	0.00	9.00	0.00	190.00	0.83	0.87
MAURITANIA	21.70	84.00	0.26	1.30	6.00	0.22	1.50	30.00	0.05	0.00	15.00	0.00	135.00	0.18	0.20
NIGER	229.10	220.00	1.04	1.60	2.00	0.80	3.50	5.00	0.70	0.00	13.00	0.00	240.00	0.98	1.03
SENEGAL	102.60	110.00	0.93	9.20	12.00	0.77	10.50	47.00	0.22	0.00	28.00	0.00	197.00	0.62	0.82
UPPER VOLTA	150.00	182.00	0.82	13.70	11.00	1.25	4.10	6.00	0.68	0.00	4.00	0.00	203.00	0.83	0.84
THE SAHEL	134.80	151.00	0.89	8.50	10.00	0.85	9.30	20.00	0.47	0.00	12.00	0.00	193.00	0.79	0.84

SOURCE: ROSS, TABLE II-1

of food self-sufficiency is grain self-sufficiency. Wheat consumption, ranging from an average per capita level of four kilos per year in Upper Volta and Chad to an average 28 kilos per capita annually in Senegal, provides a special complication. Wheat imports are growing to satisfy demand for bread; this trend will continue with population growth, income gains, and increased urbanization. Given the agricultural potential of the Sahel, however, little can be done to offset these wheat imports. Wheat will undoubtedly remain a major import for the foreseeable future. Foodgrain self-sufficiency in this paper, therefore, implies only the production of sufficient amounts of sorghum, millet, rice, and maize to meet consumption requirements.

2.2 Food Self-Sufficiency

Both the grain consumption patterns and the present degree of self-sufficiency vary within the region and within the countries. While variations between rural and urbran consumption may be significant, for the sake of simplicity, the base case presented here encompasses only national variability. As Table II-1 indicates, the present degree of grain self-sufficiency, excluding wheat, ranges from a low of 15 percent for Cape Verde to a high of 103 percent in Niger, with an average level for the region of 84 percent. This is lower than the 93.6 percent estimated for the pre-drought, 1965-67 period and even lower than the 88 percent of the immediate post-drought years (Hirsch, 1979:25-103). In fact, the current rate of food self-sufficiency appears not to have improved greatly since the minimum 80 percent experienced during the drought.

2.3 Foodgrain Production:

In all countries, estimated yields per hectare have been constant or declining. Since 1965, production declines have been particularly noted in Cape Verde, Chad, and Mauritania. Upper Volta, The Gambia, and Senegal might, on the other hand, have had modest production increases, achieved largely by bring new lands into cultivation. Production in the Sahel has not kept pace with population growth, however, and the trend of production per capita is downward in all countries. Climatic factors, disincentive production and pricing policies, and inappropriate and inadequate donor responses are among the elements which have contributed to this declining pattern of production and food self-sufficienty.

The influence of the each of these elements can be briefly summarized:

1. Climatic factors: Variable rainfall is a major factor in the variability of Sahelian grain production. Drought years have recurred frequently since the "end" of the drought in 1974. Both Mauritania and Cape Verde have continued to experience lower-than-normal rainfall consistently since 1974.

2. Policies: There has been evident contradiction between the countries' professed goal of grain self-sufficiency and their development efforts. Export income earning cash crops have been favored over domestic grain crops as far as marketing arrangements, input deliveries, etc. are concerned. Not one CILSS country has succeeded in defining and implementing an efficient program for intensification of rainfed production and only a small portion of development funds have been specifically directed towards rainfed agriculture. Little attention and remedial action have been devoted to the problem of soil degradation. Price policies which have favored export crops and/or the maintenance of low consumer prices for grain have been followed. Government marketing, storage, and extension programs which could have had a positive impact on grain production have been undercut by lack of effective management, adequate funds, and local participation. The amount of irrigated land developed in the 1970's has barely equalled the amount of irrigated land which has been abandoned (CILSS, 1980).

3. Donors' responses: Donor assistance since 1975 has been concentrated in food aid, technical assistance, and project support. While some of this assistance has been directly targeted toward rainfed grain production, the major portion has not. Food aid has permitted countries to practice price policies detrimental

to grain production and to favor development of non-food crops. Donor groups have generally not been effective in discouraging inappropriate policies, but have, rather, actually enouraged countries to pursue them. Poor donor coordination has also limited the effectiveness of the development aid offered. Further, donor financial planning, premised on the assumption that the Sahelian countries would assume future costs of projects, has been inadequate. This has led to the recurrent cost problem and to the abondonment of project efforts before their completion.

III. FOODGRAIN SELF-SUFFICIENCY ON A NATIONAL BASIS

3.1 The Base-Case Scenario:

Given the situation for a "typical year" of the early 1980's, the base case lays out the conditions the region is likely to experience with respect to foodgrain production and consumption, or the state of foodgrain self-sufficiency, by the year 2000 (Table III-1).

3.1.1 The Consumption of Grain:

Per capita grain consumption levels are assumed constant at the national average levels of the early 1980's. It is recognized that this approach ignores (a) the likely impact of increased urbanization and incomes on the demand for wheat and rice, (b) the effect that inreased incomes might have on overall grain demand as better-off consumers diversify from the present grain-based diet and, in addition, (c) the alterations which price changes, either market-induced or the result of country policies, could make in per capita demands. No credible a priori assumptions concerning such grain demand changes can be advanced, however, and the estimated per capita reference consumption level is used through the year 2000.

3.1.2 The Production of Grain:

Three assumptions are made to project the base-case scenario of production:

1. Yields per hectare remain the same.

2. The number of hectares cultivated inreases at one percent per year due to inreasing population in Chad, Mali, Niger, Senegal, and Upper Volta. Land and/or labor constraints are assumed to limit rainfed cultivation in Cape Verde, The Gambia, and Mauritania to base-case levels.

TABLE III-1 BASE CASE SCENARIO
FOODGRAIN PRODUCTION, CONSUMPTION, AND BALANCE
SAHEL REGION

	BASE YEAR	1985	1990	1995	2000
POPULATION (MILLIONS)	33.27	34.88	39.27	44.22	49.82
SURFACE CULTIVATED (IN THOUSAND HAS.):					
RAINFED	9953.70	10149.70	10657.00	11192.70	11750.50
IRRIGATED	131.50	131.50	131.50	131.50	131.50
FOODGRAIN (THOUSAND TONS):					
CONSUMPTION	6033.18	6326.95	7126.86	8031.35	9054.43
PRODUCTION	5005.60	5101.00	5347.80	5607.30	5880.00
BALANCE	-1027.58	-1225.95	-1779.06	-2424.05	-3174.43
SELF-SUFFICIENCY RATIO	0.83	0.81	0.75	0.70	0.65

SOURCE: ROSS, TABLES 1 AND 3, ANNEX 9. BASE YEAR IS 1983

3. The distribution of land among crops remains the same.

Gross production (hectares times yield) is converted into edible production -- or "net production" -- by allowing for storage loss, seed use, and milling loss through the use of a transformation factor. This transformation factor is unique to each crop and is assumed not to vary by country.

3.1.3 The Cost of Production:

In the base case, the growth in production is assumed to require no additional external investment costs.

3.1.4 The Food Grain Balance:

Table III-1 summarizes the consumption, production, and grain balance projected for the Sahel as a whole for the base case, that is, assuming that there is no change in current production patterns and consumption increases only due to population growth. By this calculation, regional self-sufficiency will decline from the present 84 percent to 65 percent in the year 2000. The food grain deficit will grow from an estimated level of one million tons to just over three million tons.

3.2 <u>The Intensified Rainfed Production Scenario</u>

3.2.1 The Consumption of Grain:

The growth in consumption is assumed to be exactly as in the base case.

3.2.2 The Production of Grain:

In this scenario, it is assumed that the first step to eliminate the regional deficit projected in the base case is to intensify rainfed agriculture. The premise is that farmers, using improved technology, will succeed in improving yields per hectare. This specific yield increase assumed here is 75 percent.

It is further assumed that only a portion of the farmers will be able to intensify their production each year. For this analysis, it is assumed that each year two percent of land currently being farmed using to traditional (base case) technologies will be brought under more intensive cultivation.

It is further assumed that total rainfed surface cultivated expands at a rate faster than the one percent assumed in the base

TABLE III-2. RAINFED INTENSIFICATION SCENARIO
FOODGRAIN PRODUCTION, CONSUMPTION, AND BALANCE
SAHEL REGION

	BASE YEAR	1985	1990	1995	2000
POPULATION (MILLIONS)	33.27	34.88	39.27	44.22	49.82
SURFACE CULTIVATED (IN THOUSAND HAS.):					
RAINFED (UNIMPROV)	9803.90	9698.70	9443.70	9199.70	8966.10
RAINFED (INTENSIF)	197.10	596.90	1603.30	2716.90	3862.90
IRRIGATED	131.50	131.50	131.50	131.50	131.50
FOODGRAIN (THOUSAND TONS):					
CONSUMPTION	6033.18	6326.95	7126.86	8031.35	9054.43
PRODUCTION	5102.30	5395.30	6162.70	6983.70	7863.90
BALANCE	-930.88	-931.65	-964.16	-1047.65	-1190.53
SELF-SUFFICIENCY RATIO	0.85	0.85	0.86	0.87	0.87

SOURCE: ROSS, TABLES 1, 5A, AND 6 IN ANNEX 9.

case in certain countries -- Niger, Senegal, Mali, and Upper Volta. The factors applied in this scenario are 1.5 percent in Niger and two percent in the others.

3.2.3 The Cost of Development:

For an intensification of rainfed production, it is assumed that some level of additional external investment will be required. Rough estimates based on project experience indicate that administrative, research, extension and investment costs per hectare range from $200 to $1000. A figure of $500 is used there, charged against all hectares transferred from lower to higher technologies, i.e., "intensified." Such development of rainfed production is, therefore, estimated to require just under two billion dollars investment by the year 2000.

3.2.4. The Food Grain Balance:

Table III-2 summarizes the results which could be expected by achieving the foregoing rainfed intensification strategy, assuming continued "normal" rainfall. While the regional rate of grain self-sufficiency will not yet reach 100 percent, the projected 86.9 percent in the year 2000 represents a considerable improvement over the 64.9 percent rate projected in the "no change" base case. However, a deficit of 13.1 percent or just over one million tons still remains in years of normal rains.

3.3 <u>The Irrigation Scenario</u>

3.3.1 The Consumption of Grain:

Again, the base case projection of grain consumption is used.

3.3.2 The Production of Grain:

This scenario assumes that the grain deficit remaining after a program or rainfed intensification has been adopted will be eliminated by the development of irrigated agriculture. For this analysis the assumption is that the irrigated crop produced will be rice, except in Cape Verde, where maize will be grown.

While there is substantial variability in base case irrigated surface and in yields, for reasons of simplicity a very conservative increase in yields of five percent per year is assumed for all countries. Thus, not only does the irrigated surface increase to meet the food deficit, but the increasing average yields also make a contribution.

TABLE III-3. IRRIGATION SCENARIO
FOODGRAIN PRODUCTION, CONSUMPTION, AND BALANCE
SAHEL REGION

	BASE YEAR	1985	1990	1995	2000
POPULATION (MILLIONS)	33.27	34.88	39.27	44.22	49.82
SURFACE CULTIVATED (IN THOUSAND HAS.):					
RAINFED (UNIMPROV)	9803.90	9698.70	9443.70	9199.70	8966.10
RAINFED (INTENSIF)	197.10	596.90	1603.30	2716.90	3862.90
IRRIGATED	135.20	144.10	179.60	251.00	405.40
FOODGRAIN (THOUSAND TONS):					
CONSUMPTION	6033.18	6326.95	7126.86	8031.35	9054.43
PRODUCTION	5115.88	5442.45	6345.96	7461.95	9054.43
BALANCE	-917.30	-884.50	-780.90	-569.40	0.00
SELF-SUFFICIENCY RATIO	0.85	0.86	0.89	0.93	1.00

SOURCE: ROSS, TABLES 6 AND 8, ANNEX 9.

3.3.3 The Cost of Development:

Estimating a per hectare cost for developing irrigated land is, perhaps, the most difficult and controversial aspect of this paper. First, costs are site- and technique-specific. Second, donor experience with irrigated projects in the Sahel is limited; from a small sample of projects, one has a very broad range of cost estimates. The base price used here is that estimated for small-scale perimeters -- $3500 per hectare developed. The cost for medium-scale (100 to 800 ha.) perimeters is estimated here to be 2.5 times that for small-scale (defined as less than 100 ha.) perimeters. Large-scale perimeters, that is, those with more than 800 contiguous hectares, are estimated to cost five times more than small-scale. In principle, these costs include pre-investment, capital, land and other development costs. In order to arrive at the mean cost per hectare for each country, then, some assumptions had to be made about the relative importance of each scale of development (see Annex Table A for details). The percentages actually chosen are somewhat arbitrary at this stage but provide a weighted mean per hectare cost for each country. Senegal is expected to experience the lowest development costs per hectare on average -- at $7950 per hectare; development of irrigation in Cape Verde, Mauritania, and Niger is estimated to be more expensive -- at $11,200 per hectare. The average cost for the Sahel is projected to be $9,889 per hectare. Total irrigation development in this scenario is estimated to require $2.7 billion over the 18-year period.

3.3.4 The Food Grain Balance:

In order to achieve food self-sufficiency in years of normal rains in each country within the region, an additional 273,900 hectares of irrigated land would have to be developed by the year 2000 (Table III-3). This implies an annual increase in excess of 15,000 hectares or a 6.6 percent rate of growth per year.

3.4 <u>The Drought-Proof Case</u>

Even with the irrigated development outlined in the previous scenario, a serious drought could result in a significant grain deficit. In order to provide reasonable assurance against a serious decrease in rainfed producton, it is proposed in this scenario to develop enough irrigation capacity to offset a possible 25 percent shortfall in rainfed production each year (equivalent to crop failure one year in four). In principle, the surplus irrigated production in good years could be purchased and stored for consumption during drought years or it could be exported.

TABLE III-4. DROUGHT-PROOF SCENARIO
FOODGRAIN PRODUCTION, CONSUMPTION, AND BALANCE
SAHEL REGION

	BASE YEAR	1985	1990	1995	2000
POPULATION (MILLIONS	33.27	34.88	39.27	44.22	49.82
SURFACE CULTIVATED (IN THOUSAND HAS.):					
RAINFED (INIMPROV)	9803.90	9698.70	9443.70	9199.70	8966.10
RAINFED (INTENSIF)	197.10	596.90	1603.30	2716.90	3862.90
IRRIGATED (INTENS)	142.90	170.00	276.50	492.80	972.40
FOODGRAIN (THOUSAND TONS):					
CONSUMPTION	6033.18	6326.95	7126.86	8031.35	9054.43
PRODUCTION	3890.08	4170.75	5031.56	6375.95	9054.43
BALANCE	-2143.10	-2156.20	-2095.30	-1655.40	0.00
SELF-SUFFICIENCY RATIO	0.64	0.66	0.71	0.79	1.00

SOURCE: ROSS, TABLE 9, ANNEX 9

3.4.1 The Consumption of Grain:

The base case level of consumption is again projected to the year 2000.

3.4.2 The Production of Grain:

Rainfed production is estimated to be 25 percent lower each year than it is in the base case. Irrigated production in the year 2000 is targeted to be adequate to cover consumption needs; the model calculates the numer of irrigated hectares which would need to be cultivated, assuming yield levels as in the previous scenario, in order to meet this target. Irrigated hectarage in the drought-proof case is more than double the amount developed in the minimum irrigation case. Over 840,000 hectares of new irrigated development would be rquired to provide the level of drought protection desired compared to the 274,000 hectares needed simply to cover consumption requirements which could not be met with "normal" rainfed production.

3.4.3 The Cost of Development:

The additional cost of drought-proofing is highest for those countries with the largest proportion of rainfed agriculture -- Chad, Mali, Niger, and Upper Volta. For countries like Cape Verde and Mauritania, which would be heavily dependent on irrigated agriculture in any case, the additional cost of drought-proofing is relatively low. Overall, the drought-proofing strategy would cost the region about $5.5 billion dollars additional.

3.4.4 The Food Grain Balance:

Under the conditions assumed in this scenario, drought would have the effect of reducing foodgrain self-sufficiency below base case levels until almost 1995 (Table III-4). Only after 1995 would enough irrigated production capacity be developed to permit 79 percent of foodgrain consumption needs to be covered, with the degree of self-sufficiency attained then rising rapidly to 100 percent in the year 2000.

IV. THE COST OF NATIONAL GRAIN SELF-SUFFICIENCY

Combining the projected rainfed and irrigated development program costs and the estimated costs per hectare, it is possible to estimate on a national basis the costs of attaining foodgrain self-sufficiency under the three scenarios for production improvement (Table IV-1). Under the base ase scenario, of course, costs are not increased but self-sufficiency is not attained.

TABLE IV-1.

COST COMPARISON: FOUR DEVELOPMENT SCENARIOS
THE YEAR 2000 BASE CASE, RAINFED INTENSIFICATION,
IRRIGATION, DROUGHT-PROOF BY COUNTRY, SAHEL

COUNTRY	BASE CASE-YR 2000		RAINFED SCENARIO			IRRIGATED SCENARIO			DROUGHT-PROOF SCENARIO		
	RAINFED HAS. ('000)	IRRIGA-TED HAS. ('000)	TOTAL HAS. INTENSIFIED ('000)	$COST PER HA.	TOTAL COST ($ MILLS)	TOTAL HAS. DEVELOPED ('000)	$COST PER HA.	TOTAL COST ($ MILLS)	TOTAL IRR HAS. DEVL ('000)	$ COST PER HA.	TOTAL COST ($MILLS)
CAPE VERDE	20.00	0.50	8.60	500.00	4.30	14.90	11200.00	166.88	15.20	11200.00	170.24
CHAD	1383.00	2.00	418.20	500.00	209.10	41.80	9275.00	387.70	112.70	9275.00	1045.29
THE GAMBIA	90.00	3.00	32.50	500.00	16.25	12.10	8775.00	106.18	16.80	8775.00	147.42
MALI	2079.20	100.00	744.40	500.00	372.20	9.00	9275.00	83.48	188.80	9275.00	1751.12
MAURITANIA	95.00	2.00	29.00	500.00	14.50	88.10	11200.00	986.72	92.10	11200.00	1031.52
NIGER	3866.90	4.00	1272.50	500.00	636.25	0.00	11200.00	0.00	117.00	11200.00	1310.40
SENEGAL	1492.00	12.00	534.20	500.00	267.10	63.50	7950.00	504.83	120.20	7950.00	955.59
UPPER VOLTA	2724.20	8.00	823.60	500.00	411.80	47.90	10238.00	490.40	178.00	10238.00	1822.36
TOTAL SAHEL	11750.50	131.50	3863.00	500.00	1931.50	277.30	9831.13	2726.17	840.80	9788.00	8229.75

TABLE IV-2. COMPARISON OF PROJECTED RESOURCE NEEDS WITH AVAILABILITY

($ MILLIONS)

	1981 LEVEL OF ODA	AV ANNUAL ODA 1975-1981		ESTIMATED ANNUAL RESOURCE NEEDS		
		TOTAL	AGRIC*	RAINFED SCENARIO	IRRIGATION SCENARIO**	DROUGHT-PROOF SCENARIO***
CAPE VERDE	60	49	6.60	0.30	9.60	9.80
CHAD	69	90	17.90	11.60	33.10	69.70
GAMBIA	64	50	7.70	0.90	6.80	9.10
MALI	248	200	51.10	0.90	25.30	118.00
MAURITANIA	189	148	24.70	0.80	55.60	58.10
NIGER	272	182	35.97	35.40	35.40	108.20
SENEGAL	354	241	37.34	14.90	43.00	68.90
UPPER VOLTA	326	198	44.70	22.80	50.10	124.10
REGIONAL	389	127	75.34			
TOTAL SAHEL	1972	1347	301.44	107.40	258.90	565.90

SOURCES:OECD, OFFICIAL DEVELOPMENT ASSISTANCE TO CILSS MEMBER COUNTRIES, VOL. 1 TABLE 19, PARIS, 1983 AND ROSS, C. JULY, 1983 DRAFT, TABLE IV-2.

*OECD CATEGORIES: MULTISECTORAL RURAL DEVELOPMENT: RIVER BASIN DEVELOPMENT: CROP PROTECTION; DRYLAND FARMING; IRIGATED AGRICULTURE; MARKETING AND STORAGE

** THAT IS, COSTS OF RAINFED DEVELOPMENT PLUS IRRIGATED DEVELOPMENT ASSUMING "NORMAL" RAIN.

***THAT IS, COSTS OF RAINFED PLUS IRRIGATED DEVELOPMENT ASSUMING 25% DROP IN RAINFED YIELDS.

With intensification of rainfed production, no country is able to meet its entire consumption requirement from domestic production although Mali, Niger, and Upper Volta are fairly close -- all over 90 percent. Under the rainfed intensification scenario, roughly $2 billion are required simply to maintain the present rate of self-sufficiency until the year 2000.

Improving the degree of self-sufficiency through the development of new irrigation infrastructure would be least costly for Niger (where yield increases on presently cultivated irrigated hectarage would cover production needs) and for Mali where only 9,000 new hectares would have to be developed. For Mauritania, however, the price for attaining domestic foodgrain self-sufficiency would be almost a billion dollars invested in irrigation infrastructure. Insuring against drought is costly everywhere except Cape Verde and The Gambia.

As Table IV-2 illustrates, however, the levels of investment implied in all three scenarios are not likely to be beyond the capacity of donors and Sahelian governments to fund -- if an appropriate portion of current levels of assistance were targeted to such foodgrain development programs. Total net disbursements of official development assistance to the Sahel were, on average, approximately $1.3 billion each year in the 1975-81 period. The combined GNP of the Sahelian states was just over $8 billion. These annual levels already greatly exceed the amounts needed to support a rainfed improvement scenario. Only 19 percent of such ODA levels and 3 percent of such GNP levels would cover the irrigation development costs projected in the no drought irrigation scenario. Targeting of 42 percent of all assistance or 7 percent of GNP levels would meet the drought-proof scenario investment levels.

V. A PROGRAM FOR REGIONAL SELF-SUFFICIENCY

This chapter examines the possibility of achieving <u>regional</u> self-sufficiency by permitting certain countries with greater comparative advantages in grain production, such as Mali and Niger, to produce grain surpluses adequate to offset deficits in other countries.

5.1 A Rationale for a Regional Self-Sufficiency Strategy

For some countries, simply achieving national self-sufficiency would result in the underdevelopment of irrigation potential. Niger, for example, would actually have slightly less land in irrigated production in the year 2000 than at present and still achieve grain self-sufficiency by theturn of the century. In the case of Mali,

TABLE V-1. A TRADE-BASED SCENARIO: REGIONAL SELF-SUFFICIENCY IN THE YEAR 2000

COUNTRY	BASE CASE			DROUGHT-PROOF CASE			TRADE-BASED CASE			REL COSTS ($MIL)		DIFFERENCES IN RATE OF IRRIGATION	
	RAINFED AREA ('000 HA.)	IRRIGATED AREA ('000 HA.)	SELF-SUFF RATIO	RAINFED AREA ('000 HA.)	IRRIGATED AREA ('000 HA.)	SELF-SUFF RATIO	RAINFED AREA ('000 HA.)	IRRIGATED AREA ('000 HA.)	SELF-SUFF RATIO	TOTAL DROUGHT-PROOF	TOTAL TRADE-BASED	DROUGHT PR-CASE	TRADE-CASE
CAPE VERDE	20.00	0.50	10.50	28.60	15.70	100.00	28.60	6.00	50.00	174.50	65.90	0.21	0.15
CHAD	1383.20	2.00	70.90	1383.20	114.70	100.00	1383.20	25.00	95.00	1254.40	422.40	0.25	0.15
THE GAMBIA	90.00	3.00	41.60	90.00	19.80	100.00	90.00	17.00	93.00	163.70	139.13	0.11	0.10
MALI	2079.20	100.00	64.40	2483.00	288.80	100.00	2483.00	203.00	113.00	2123.30	1327.50	0.07	0.04
MAURITANIA	95.00	2.00	13.00	95.00	94.10	100.00	95.00	11.00	26.00	1046.00	115.30	0.24	0.10
NIGER	3866.90	4.00	74.50	4226.00	121.00	100.00	4226.00	107.00	116.00	1946.70	1789.90	0.21	0.20
SENEGAL	1492.00	12.00	53.90	1781.40	132.20	100.00	1781.40	67.00	90.00	1238.60	720.30	0.15	0.10
UPPER VOLTA	2724.20	8.00	74.20	2724.00	186.00	100.00	2724.00	45.00	98.00	2234.20	790.60	0.19	0.10
THE SAHEL	11750.50	131.50	64.90	12811.20	972.40	100.00	12811.20	481.00	101.00	10181.40	5371.10	N/A	0.08

only a modest increase in irrigated surface is needed for grain self-sufficiency. By contrast, the increase in irrigated hectarage needed to cover Mauritania's and Cape Verde's needs are so large they are, perhaps, infeasible. It seems reasonable, then, to look at the question of self-sufficiency on a regional basis with exports from some countries covering requirements in others.

5.2 An Illustration of a Regional, Trade-Based Strategy

Table V-1 gives an example of such a trade-based self-sufficiency scenario. Mali and Niger become exporters of grain and all the others become importers. In this example, rainfed intensification is assumed to be possible in all countries at roughly the rate applied in the rainfed scenario discussed in Chapter III. Irrigation yield increases, however, are reduced to more realistic levels in this regional scenario and potential rates of expansion for irrigated surface are similarly adjusted downward. Cape Verde, Chad, and Mauritania in this scenario have considerably lower expansion growth rates than those assumed in Chapter III. It should be emphasized that the growth rates derived here are illustrative and may need additional evaluation. Nevertheless, given these assumptions, it is clear that if regional self-sufficiency instead of national self-sufficiency were to be specified as the objective, national targets for production would be considerably altered.

5.3 An Evaluation of the Regional Trade Scenario/Strategy

In comparison to the national self-sufficiency scenarios, this scenario provides two related advantages: (a) irrigation potential in the region as a whole will be more fully utilized than in the irrigated development (no drought) scenario; and (b) for those countries where national food self-sufficiency through irrigation development at either the no-dought or drought-proof levels appears to be excessively costly or practically unattainable, more realistic targets with regard to domestic food grain production can be set and scarce development resources can be directed toward other activities where they might have greater comparative advantage. Cost savings of nearly $5 billino could be gained, although some of the savings would no doubt be used to accomplish the needed trade (storage, transportation, etc.). Finally, this trade-based scenario implies considerable differences in allocation of development assistance for irrigation infrastructure investments among countries. Chad, Mauritania, and Upper Volta would receive relatively less; Niger and Mali proportionally more.

VI. RECOMMENDATIONS

This analysis suggests that the following steps must be taken immediately in order to reverse the declining trend of domestic foodgrain production and to move toward the achievement of foodgrain self-sufficiency:

1. It must be recognized that the food grain situation in the Sahel has, in fact, deteriorated. Further, a recognition of the causes for that deterioration is vital.

2. Both national experts and donors should jointly design a strategy for reaching foodgrain self-sufficiency. The possibility of a regional self-sufficiency strategy may be more cost-effective should be examined. The detailed strategy must include remedial action for particular national constraints.

3. The program of grain self-sufficiency decided upon requires joint national and donor monitoring. Continued donor assistance to the self-sufficiency effort would be contingent upon satisfactory progress in implementing the jointly-designed program. It may be useful to establish a timeframe within which the individual country would take the requisite policy actions to achieve increased grain production. This approach is, however, best characterized as convenant, not as a simple quid pro quo. The covenant should be viewed as a joint, cooperative venture to achieve a desired end.

It should be noted that none of these steps is novel. In fact, such procedures have been begun, with success, in several countries. The experiences in Mali and Senegal are particularly encouraging. The progress which will be observed in such cases may help to convince countries reluctant to undertake such joint programs that such efforts may be useful in moving toward foodgrain self-sufficiency.

ANNEX TABLE A. IRRIGATION DEVELOPMENT COSTS++

COUNTRY	DISTRIBUTION OF DEVELOPMENT IN TERMS OF SCALE (IN %)			AVERAGE COST/HA. (IN $)
	SMALL	MEDIUM	LARGE	
CAPE VERDE	0.20	0.40	0.40	11200.00
CHAD	0.40	0.30	0.30	9275.00
THE GAMBIA	0.30	0.35	0.35	8775.00
MALI	0.40	0.30	0.30	9275.00
MAURITANIA	0.20	0.40	0.40	11200.00
NIGER	0.20	0.40	0.40	11200.00
SENEGAL	0.40	0.30	0.30	11200.00
UPPER VOLTA	0.30	0.35	0.35	7950.00
SAHEL MEAN	0.30	0.35	0.35	9889.00

++ AVERAGE DEVELOPMENT COSTS: SMALL-SCALE = $3,500 EVERYWHERE BUT SENEGAL AND GAMBIA WHERE IT IS $3000; MEDIUM-SCALE = $8,750 EXCEPT IN SENEGAL AND GAMBIA WHERE $7,500 IS USED; LARGE-SCALE = $17,500 ($15,000 IN SENEGAL AND GAMBIA).