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DEVELOPMENT OF RAINFED AGRICULTURE IN THE SAHEL

OVERVIEW AND PROSPECTS

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SUMMARY

The programme/overviews undertaken in the Sahel States in 1981 and 1982 by the Secretariats of the CILSS and the Club du Sahel analysed the development of rainfed agriculture in the Sahel.

Despite the poor reliability of data available on rainfed agriculture and the differences, and even contradictions, between data sources, the following picture can be given:

- Rainfed agriculture employs more than half of the active population in the Sahel and covers over 96% of the cultivated area. Providing 95% of the cereals produced and being one of the three pillars of the region's exports, along with livestock and mining, rainfed agriculture plays a capital role in the Sahel economy.

- Three major facts appear for cereal crops:

  . production does not follow the growth of needs, from either a quantitative or a qualitative point of view; cereal imports (commercial imports and food aid) are on a constant upward trend; towns are increasingly dependant on foreign sources for grain supplies;

  . Production remains very vulnerable to climatic conditions;

  . farm productivity and land yields are stagnating at a very low level; although progress has recently been observed in the use of modern production factors (animal traction, fertilizers), they are still used in very limited amounts.

- As regards export crops:

  . groundnuts reached a peak in 1975 and since then, production has been decreasing;

  . cotton has been developed to a large extent and has shown a spectacular increase in yields, but production has reached its ceiling, and may even have decreased in the last two or three years.

- With stagnating cereal production, population growth is making new lands scarce in certain regions and already overworked soil is degradating.

In sum, the overview of rainfed agriculture reveals a critical situation. Despite encouraging but often isolated progress, the main trends are disquieting: the region is not moving towards food self-sufficiency, and rainfed agriculture is playing a decreasing role in the Sahelian economy.

Turning to the future, and taking an average hypothesis of urban and rural population growth, it can be seen that each farmer who had 2.8 mouths to feed in 1980 will have 3.6 in the year 2000. The prospects are quite clear:

- should productivity and land yields remain stagnant there will be a four-fold increase in cereal imports over twenty years. The Sahel will become increasingly dependent and will largely have used up its land capital sources;

- should there be a significant increase in productivity and yields through improved methods (a roughly 1.4% increase in productivity per year) the cereals deficit will be at least stabilised and land deterioration checked.

The programme/overviews show that the Sahel has the necessary resources to achieve the second alternative. However, to do so, a new approach to the development of rainfed agriculture is needed.

The programme/overviews have set out some suggestions (many of which are very rich) for this new approach. The main suggestions can be summarized under two broad headings:

Rather than asking rural populations to participate in development projects which have been drawn up without them, development assistance should be considered as assistance to projects whose roots lie in the rural world.

This implies a thorough change in the structures of agricultural development, a new approach to drawing them up and implementing projects, etc. It necessitates a major effort to help the rural world to express its ideas, create and manage its own structures, and use them as a development tool.

The Sahel governments and aid sources must play an active part in this change.

Creating an environment favourable to the success of projects:

Past experience shows that the only projects that have a chance of success are those which generate farmers' interest. This has often been the case for export crops, almost never so for cereal crops. This dis-symmetry must be progressively reduced and the conditions created to promote the development of cereal crops.

This pre-supposes an overall policy, covering in particular:

- the search for more efficient production systems and their widespread introduction,

- the creation of efficient input distribution systems,

- the access of farmers to credit, and

- the guarantee that farmers can sell their cereal production at an attractive price that is compatible with the cost of inputs.

Food strategies must be directed at remodeling marketing systems and protecting national markets against low-cost cereal imports, etc. This will not always be easy and will necessitate substantial aid from the International Community. Nevertheless, the creation of an evnironment favourable to the success of projects originating to a large extent from the rural world itself is the sine qua non for moving forward towards food self-sufficiency.

Two key concepts emerge from the programme overviews: rehabilitation of the rural world and the development of cereal policies.

INTRODUCTION

A series of investigations undertaken in the Sahel in 1979 produced an overview of the development of irrigated agriculture in the region together with proposals for the future of these crops. Sahel leaders and donors alike recognised the value of the report in which the overview and prospects were set out.

The participants in the 4th Conference of the Club du Sahel (Kuwait, 1980) asked for a similar report covering rainfed agriculture.

In 1981 and 1982, the Secretariats of the CILSS and the Club du Sahel organised missions to upper Volta, Mali, Mauritania, Niger, Senegal and Cape Verde, and produced a set of country reports. The study on the Gambia was started only in early 1983, and this report will be published soon. It has not yet been possible to begin investigations in Chad.

The five published national documents provide an extremely rich fund of information. They describe the present position of rainfed agriculture and recent trends, and make a thorough examination of the obstacles to the development of these crops, the policies pursued, the structures developed and the projects implemented, with substantive proposals for future action. Analyses of this kind had never previously been published.

Given the constraints specific to each country, the national reports have generally not gone into specifics as regards the programming of future projects. However, the analyses and the recommendations drawn from them will no doubt prove invaluable to national executives in preparing future policies and projects.

In addition to the interest of the overviews at country level, the Secretariats of the CILSS and the Club du Sahel realized that they have considerable value at regional level. They give facts, analyses and recommendations for the Sahel as a whole, and therefore also concern the aid sources interested in the region.

The Club du Sahel, as a forum for the exchange and discussion of ideas, has taken the opportunity of the Brussels Conference to present this short synthesis of the overviews of rainfed agriculture, underlining the features that are common to the different countries rather than each State's specificities.

Although it has not yet been possible to undertake an overview of rainfed agriculture in Chad, available data on this country have been included.

I - THE POSITION OF RAINFED AGRICULTURE

1.1 - DATA UNCERTAINTIES

The overview of rainfed agriculture in the Sahel must allow for the fact that the data are not always completely reliable.

Almost all the data on cereal crops are estimates; some are practically guesstimates. The figures on acreage tilled, quantities produced, inputs used, number of agricultural workers, quantities marketed and actual prices are subject to a sometimes very high margin of uncertainty. Even foreign trade in cereals, in principle easier to determine, is far from precisely measured, especially the intra-trade of African countries, which is not recorded at all.

In a given Sahel State, different authorities use different agricultural statistics. In one instance the cereal production estimates for the same year used respectively by the Rural Development and Planning departments differed by no less than 35%. This indicates the degree of confidence to be placed in the figures.

The data on cash crops are rather better. For cotton for example, the data on areas planted and production marketed appear to be quite reliable; less so, however, the figures on the inputs actually used by farmers. As regards groundnuts, the quantities marketed are reasonably well known but on-farm consumption or areas under crops are shrouded by uncertainty.

Any overview of rainfed farming is thus hampered both by information gaps and contradictory information from national and international sources. For instance, the FAO attempts to adjust data to allow comparisons to be drawn between countries. As a result, the figures it publishes cannot always be cross-checked against the national data.

In drawing up this synthesis it was decided systematically to employ the data published by the agricultural development authorities. The aim of the present document is not to make comparisons between countries, but to study main trends, and one may hope that these estimates are at least fairly homogeneous over time. An attempt has been made to cross-check each of the main trends identified by more qualitative observations. Other, apparently plausible data have been used only when those published by the agricultural development authorities were patently out of line with the observed situation.

1.2 - THE ROLE OF RAINFED AGRICULTURE

Rainfed agriculture plays a basic role in the Sahel in terms of population employed, acreage farmed, food production and exports. Some orders of magnitude are presented below.

Rainfed agriculture and population employed:

There are no precise data on the population working in rainfed agriculture, but it can at least be said that, apart from Mauritania, at least 50% and probably more than 60% of the population is mainly occupied in this type of agriculture. Livestock, irrigated farming, artisans, industry and the government combined employ fewer people than rainfed agriculture alone.

Rainfed agriculture and acreage cultivated:

In Mali, the country in which irrigated agriculture is by far the most developed, 92% of the cultivated area is under rainfed crops. This percentage is even higher in the other Sahel countries. For instance, in Upper Volta and Niger 99.5% of the cultivated land is sown to rainfed crops.

In total, rainfed agriculture covers more than 96% of the cultivated area of the Sahel. This ratio has shown no tendency to decline. Irrigated areas have increased very slowly over the last few years, whereas the areas under rainfed crops have expanded at least as fast as population growth.

Rainfed agriculture and food production:

Over 85% of the cereals grown in Mali are rainfed. The share of rainfed cereal production in other Sahel countries is even higher: 90% in Mauritania, 95% in Senegal and 98% in Upper Volta and Niger.

In total, it can be said that rainfed cereal crops represent approximately 95% of the cereals grown in the Sahel. Since cereals are the source of approximately two thirds of the calories consumed on average by the Sahelians, the importance of rainfed crop production in the food supply of the population of the region is clear.

The share of rainfed cereal production in total has not declined over the last few years.

Rainfed agriculture and exports:

Almost all the vegetable products exported by the Sahel are the product of rainfed agriculture. In particular, cotton and groundnuts are strictly rainfed crops (attempts to irrigate cotton plantations were abandoned fifteen years ago).

The exports of The Gambia consist almost entirely of rainfed crops, as does half of the exports of Upper Volta, Mali and Senegal (allowing for the value added by industrial processing for this last country). By contrast, the share of rainfed agriculture in Niger's foreign trade has declined substantially since the development of the uranium mines and rainfed exports play a small role in Mauritania's foreign trade.

In total, the three pillars of the Sahel countries' exports are rainfed agriculture products, livestock and minerals.

The above facts show the importance of rainfed agriculture for the Sahel: it plays a basic role in the region's food supply and its economy.

1.3 - CEREALS AND CASH CROPS

Rainfed agriculture can be categorised as follows:

- cereal crops: millet, sorghum, corn, rainfed rice, fonio;
- other foodcrops: niebe, voandzou;
- so-called cash or export crops: groundnuts and cotton.

However, it should be noted that groundnuts are both a foodcrop and a cash crop, and that they have become a foodcrop in many Sahel countries.

As regards the distribution of land between foodcrops and marketable crops, two main areas can be distinguished in the Sahel:

- Senegal and The Gambia where export crops and especially groundnuts account for a major share of agricultural activity. Groundnuts cover 40% of the cultivated area in Senegal and 60% in The Gambia. Although the cotton and groundnut growing areas are declining in both countries, their agricultural economies remain essentially directed towards exports. Cereal production has been too low for too long to cover the population's needs and the position is what it would have been had a conscious decision been taken to grow and export groundnuts in order to import rice.

- The other continental Sahel countries are in a very different position: export crops are a marginal activity, and one which moreover, has tended to decline over the last few years. In Upper Volta, 90% of the cultivated area is under cereals, and if one assumes that roughly 5% of the land is used to grow groundnuts, practically all for internal consumption, some 95% of the land is used to grow cereals and groundnuts for domestic consumption, while cotton only occupies 3%.

  In Niger, 98% of the cultivated land is under cereals.

  These countries' agricultural production systems are mainly oriented towards the satisfaction of national food needs. Export crops only play a secondary role in the economy at large, although they account for a far from negligible share of their exports.

  (It is recalled that Cape Verde is not included in the present synthesis; its position is rather similar to that of Senegal and The Gambia. It often must use a substantial share of its agricultural potential to produce bananas for export, such as Senegal does groundnuts, instead of growing cereals).

  Table 1 gives a rough picture of the areas under different types of crops in an average recent year:

TABLE 1: AREAS UNDER DIFFERENT TYPES OF CROPS

	Millet Sorghum	Rainfed rice	Corn	Niebe	Groundnuts	Cotton
THE GAMBIA	35 400	21 000	9 500	-	101 000	1 000
UPPER VOLTA	1 950 000	43 000	129 000	-	154 000	73 000
MALI	1 400 000	-	88 000	-	152 000	118 000
MAURITANIA	156 000	-	-	18 000	18 000	-
NIGER	3 840 000+	-	13 000	1 095 000+	184 000	3 000
SENEGAL	1 100 000	63 000	70 000	50 000	1 050 000	30 000
CHAD++	1 285 000	19 000	-	-	190 000	180 000
T O T A L	8 800 000	150 000	310 000	1 160 000	1 850 000	400 000

(+) Niebe is grown together with cereals so that the two figures should not be added as they are partly overlapping: In Niger, approximately 70% of Niebe is grown with millet and sorghum.

(++) 1975 data on millet, sorghum, rice and groundnuts in Chad.

Over 13.3 million hectares are devoted to rainfed agriculture in the Sahel as a whole (including the data available on Chad). Approximately three quarters of the total is in cereal production (of which over 70% under millet and sorghum alone). Some 23% is used to grow Niebe and Groundnuts which are partly foodcrops and partly export crops. Less than 3% of the arable land is under cotton.

1.4 - TRENDS IN CEREAL CROPS

The Sahel countries are virtually in the same position as regards the development of cereal crops over the last ten years.

- production has risen more slowly than population,
- production remains very vulnerable to climatic hazards, and
- farmers' productivity and land yields are stagnating.

Production growth:

This is the field in which the information gaps are greatest. The programme-overviews could not provide a clear view of cereal production and its trends in the past. This stems from a basic problem. No one really knows how much Sahelian farmers actually produce: the national authorities use certain data, aid sources other data and international organisations still others, each according to the needs or its purpose. This makes for flights of fancy rather than analytical rigour.

Table 2 sets out the trend of millet and sorghum production, the main types of cereals grown, on the basis of the data supplied by rural development authorities to the teams responsible for the programme overviews.

The average production of the six countries covered since the end of the great drought of 1972-1973 is a little under four million tons per year with an upward trend of 3% a year over the following six years.

The following should be added to millet and sorghum production:

- corn, on which data are incomplete, but whose average volume can be estimated at 200 000 tons per year;
- rainfed rice whose volume is difficult to estimate as it is often combined with irrigated rice in the statistics. The average of 150 000 tons per year is shown with much hesitation.

TABLE 2: TREND OF THE MILLET AND SORGHUM CROPS

(in thousand tons)

	THE GAMBIA	UPPER VOLTA	MALI	MAURITANIA	NIGER	SENEGAL	TOTAL
1970-71		954	756		1 100	401	
1971-72		772	691	50	1 225	583	3 350
1972-73		778	624	37	1 127	323	2 950
1973-74		734	660	25	753	510	2 750
1974-75	56	1 045+	800	40	1 102	800	3 800
1975-76	49	1 205+	800	32	835	616	3 500
1976-77	38	881	900	21	1 306	507	3 650
1977-78	44	889	800	30	1 472	420	3 650
1978-79	69	1 024	1 000	43	1 593	802	4 500
1979-80	32	1 152+	943	21	1 606	521	4 200
1980-81	41	889	654	31	1 731	531	3 900
1981-82		1 114			1 574	736	

It can be observed that the data are patently not comparable. On the basis of the official figures of the rural development authorities, average annual production over the last three years has been:

- 123 Kg per inhabitant in Mali,
- 172 Kg per inhabitant in Upper Volta,
- 308 Kg per inhabitant in Niger,

which does not match very well with the observed position in these countries. The total gives, at best, an order of magnitude.

These aggregate statistics cannot be used for purposes of long-term analysis. In an attempt to determine the trend, we have taken two countries, Upper Volta and Senega., with continuous and apparently not overly heterogeneous statistical series as an illustration. Their positions differ markedly: export crops are marginal in Upper Volta and the country has already or should achieve self-sufficiency, whereas Senegal, a more outward-oriented country, has been affected by a structural cereal deficit for several decades.

(+) including maize

TABLE 3: TREND OF CEREAL PRODUCTION IN UPPER VOLTA

	Average production over the period	Production necessary to match population growth	Excess or Shortfall
1960-65	950	950	
1965-70	945	1 030	- 85
1970-75	950	1 125	-175
1975-80	1 150	1 245	- 95

It can be seen that cereal production has not followed population growth. The deficit increased during the drought but did not disappear in the following years. Even in 1981, a record year, Upper Volta produced less cereals per mouth to be fed than at the beginning of the 1960's.

TABLE 4: TREND OF CEREAL PRODUCTION IN SENEGAL

	Average production over the period	Production necessary to match population growth	Excess or Shortfall
1961-65	563	563	
1966-70	705	652	+ 50
1971-75	620	756	-135
1976-80	732	877	-145

Cereal production has not followed population growth.

All the Sahel countries are in the same position to a varying extent. The increase in cereal imports (see 1.7 below) confirms this, if confirmation is needed.

Vulnerability to climatic factors:

Table 2 shows that, even after the severe drought of 1972-73, rainfed cereal crops remain very vulnerable to climatic factors:

- at the regional level, local variations in output are to a certain degree offset from one year to the next as drought does not strike everywhere at the same time. Annual variations have not exceeded 20% of total production since 1975;

- by contrast, at the country level, the harvest can double or halve from one year to the next, as it has in Mauritania and in a Sahelian zone of low and random rainfall; however, it is more surprising in Senegal, some of which consists of Sudanese zones which, in principle, are less exposed to random climatic changes, but where it seems that climatic conditions have been worse than elsewhere in the last few years;

- rainfed rice is more sensitive than other types of cereal to climatic factors. There can be a three-fold difference in production from one year to another;

- as a practical matter, drought seems to have a complex impact on both yields and the areas cultivated by farmers. This impact has not yet been fully analysed.

It should further be noted that Sahelian farmers do not produce any of the short-cycle cereal varieties, which are less vulnerable to drought.

Productivity and yields:

Cereal yields per hectare remain very low. The figures given below are averages for recent years:

TABLE 5: CEREAL YIELDS

(kg per hectare)

	Rainfed rice	Corn	Millet-sorghum
THE GAMBIA.....	920	1 300	930
UPPER VOLTA	800	850	500
MALI		727	618
MAURITANIA			300 - 400
NIGER		660	425
SENEGAL	1 140	1 150	550

Millet-sorghum yields vary from 300 kg/hectare in the Sahelian zones which are at the edge of the area in which rainfed agriculture is possible to 700 or 800 kg/hectare in the better watered Sudan zones. The average for the whole region is 500 kg/hectare. Yields have not increased over the last two decades.

Yields have actually declined considerably in some areas, as shown in the example below:

Millet-sorghum in NIGER: average yield per hectare 1960-67: 525 kg

average yield per hectare 1979-81: 425 kg

Corn yields are higher: a little over 700 kg per hectare on average, but have not increased on average and have even declined in certain regions:

Corn in MALI: average yield per hectare 1964-66: 855 kg

average yield per hectare 1978-80: 727 kg

It can be taken that farmers' productivity has remained almost level over the last two decades, as production has increased roughly in line with numbers occupied in agriculture.

1.5 - TREND OF OTHER TYPES OF RAINFED CROPS

The trend of rainfed agriculture other than cereals is quite different.

Groundnuts:

Groundnut production reached a peak in 1975, as shown in Table 6.

TABLE 6: TREND OF GROUNDNUT PRODUCTION

(in thousand tons)

	1961	1971	1975	1978	1979	1980	1981
THE GAMBIA	94	125	151	167	112	42	
UPPER VOLTA	50	66	90	70	75	53	77
MALI	110	152	205	146	179		
NIGER	152	256	42	74	90	126	96
SENEGAL	995	997	1 476	1 021	850	490	883
TOTAL	1 400	1 600	1 960	1 480	1 300		

Exports have followed a similar trend. From a little less than one million tons of unshelled groundnuts or the equivalent at the beginning of the 1960's, exports increased to 1, 280 000 tons in 1975 and slumped to less than 400 000 tons in 1981, an exceptionally bad year. They have recovered since but are still far below the levels of the early 1960's.

Niger which had become a major exporter at the end of the 1970's has practically ceased to export. In Upper Volta, where groundnut production and exports have never been substantial, this product has become strictly a foodcrop. Mali's exports have dropped markedly. Groundnuts still play a substantial economic role only in Senegal and The Gambia, and even in these countries have been losing ground since 1978, as the price of groundnuts has declined continuously on world markets.

Yields have remained poor: 500 kg per hectare in Upper Volta, 700 to 800 kg per hectare in Senegal and Mali. Yields are decreasing in certain zones, in particular in the old groundnut basin in Senegal where the fertility of the soil has been declining.

Cotton:

The situation of cotton is very different. There has been a spectacular increase over the last two decades, as shown in the table below (which includes Chad):

TABLE 7: COTTON FIBRE PRODUCTION

(in thousand tons)

	1961/62	1971/72	1977/78	1978/79	1979/80	1980/81	1981/82
UPPER-VOLTA	0,8	10,4	13,9	22,3	28,7	24,7	22,7
MALI	3,9	25,3	42,4	48,1	56,1	41,8	35,2
NIGER	0,8	3,1	1,3	1,5	1,3	1,1	0,7
SENEGAL	-	7,7	13,3	12,6	9,7	8,4	13,3
CHAD	17,2	41	45,4	50,1	33,2	30,7	25
TOTAL:	22,7	87,5	116,1	134,6	128,9	106,7	96,9

This increase is attributable to an increase in the area cultivated and better yields, as shown in Table 8.

TABLE 8: CULTIVATED AREA AND COTTON YIELDS

	1961/62	1971/72	1978/79	1979/80	1980/81	1981/82
Cultivated area (thousand hectares)	371	506	514	424	378	308
Yields (kg of cotton fibre	61	173	262	303	282	314

There has been a five-fold increase in yields over the last 20 years.

However, in the last few years the acreage sown to cotton may have peaked. It has actually declined in Niger and Senegal. (+) Similarly, yields are tending to decline, not only because of climatic conditions. In some regions, in particular in Senegal, parasites have reappeared affecting yields and the methods used to combat them are considered as over-burdensome by producers, who skimp in their efforts.

Other crops:

Other rainfed crops (sesame, niebe, voandzou, vegetable growing, etc.) help to diversify diets, but only account for a minor share of food intake and are extremely marginal in exports.

Nevertheless niebe production has expanded substantially in Niger where it is both a foodcrop and an export crop to Nigeria. Niebe is grown together with millet and sorghum in Niger. It is sown after these crops, which replace it partially in meeting food needs if the cereal grains have not grown sufficiently by reason of delayed rains. The areas with which niebe is cultivated with millet and sorghum has risen from approximately 400 000 hectares in the early 1960's to roughly 1.1 million hectares at the start of the 1980's. The introduction of new varieties has increased yields on average from 100 kg per hectare to 250 kg per hectare (between 220 and 320 kg per hectare depending on climatic conditions).

Niebe has replaced groundnuts to a large extent in the agricultural economy of Niger.

(+) and in Chad, but the political situation has obviously had an influence.

1.6 - TRENDS IN PRODUCTION SYSTEMS

Trends in the different rainfed crops have been very diverse over the past twenty years.

Cotton is at one end of the range: the use of selected seeds, fertilizers and pesticides has been generalized, animal traction farming expanded and the recommendations made by extension officers are relatively well followed. There has been an almost five-fold increase in yields over the last twenty years.

At the other end of the range are the traditional cereals, millet and sorghum. The use of selected seeds, pesticides and fertilizers is still exceptional, the use of animal power not very widespread and farming techniques have basically not evolved. Yields have been stagnant or are declining.

Groundnuts and maize fall in an intermediate position which is however generally closer to that of millet and sorghum: a few modern techniques have been introduced, but average yields are low and are rising little if at all.

Aside from cotton, the intensification of rainfed agriculture has not made much progress. Although, as will be seen, signs of change have appeared over the last few years, there has not yet been a significant impact on the agricultural production system.

Selected seeds:

The use of selected varieties is generalised for cotton and also a large share of groundnut production. By contrast it is exceptional for cereals:

- selected seeds are used in less than 1% of the cereal-growing areas in Upper Volta.
- this ratio is 3% for the millet grown in Niger; however, only 0.3% of sorghum is grown using selected seeds.

The other countries are further advanced. It cannot be stated that the overall trend is favourable: the use of selected cereal seeds has tended to decline in Senegal and production has collapsed in Upper Volta.

Fertilizers:

The situation as regards the use of chemical fertilizer is basically the same as just described for selected seed varieties. Fertilizers are invariably used for growing cotton but are used much less regularly for groundnuts where the volume of inputs is subject to changes in economic conditions. Their use is exceptional for rainfed cereal agriculture. However, the general trend is more encouraging than for selected seeds.

The recent trend (or at least an estimate of it) in two countries of fertilizer use for cereal production is indicated in Table 9.

TABLE 9: FERTILIZER USE FOR CEREAL CROPS

(thousand tons)

	UPPER VOLTA (millet, sorghum, rice)	SENEGAL (millet, sorghum)
1972	0,3	16,4
1973	0,6	10,8
1974	1,1	17,4
1975	1,4	28,2
1976	1,8	30,6
1977	3,4	19,3
1978	5,5	33,1
1979	7,2	37,7
1980		28,2

The use of fertilizers for growing cereals started to develop in Senegal in the 1960's. Currently it is very sensitive to economic conditions, i.e., farmers' incomes and the price of fertilizers. It started late in Upper Volta, and despite the progress achieved over recent years, marginally over 3% of the country's cereal growing areas were treated with fertilizer in 1980.

Fertilizer use is even lower in Niger: 2300 tons in 1980, covering 0.8% of the cereal growing areas. It is almost nil in Mauritania.

Despite this modest performance, it must be underlined that whereas fertilizers were exclusively used for cotton, groundnuts and irrigated rice a few years ago, they have begun also to be used for rainfed cereals.

Pesticides and plant protection:

Each of the Sahel countries has created a national plant protection department which generally follows three lines of action:

- the struggle against pests and rodents,
- the treatment of seeds using fungicides,
- crop treatment.

There is a major contrast between cotton and the other types of crops in this field: for instance, in Upper Volta, two-thirds of the cotton growing area has been treated at least three times, whereas the other crops are not treated at all; 3% to 4% of areas are treated in Senegal, etc.

Use of Animal Traction

The use of animal traction for cultivation is unevenly distributed in the Sahel. At the beginning of the 1960's only in Mali, to a lesser extent, in the Senegal groundnut basin, was the use of animal traction at all frequent. It has made substantial progress over the last twenty years, but its geographical distribution, like its distribution between the different types of crops, remains very uneven.

It has become dominant in cotton growing: in 1961/62, 4% of cotton growing areas were farmed using animal traction; by 1981/82, 73% of these areas were being farmed using animal traction. It has thus become widespread in the large cotton growing areas: Western Volta and Southern Mali. This does not mean that farmers living in these zones who have yokes use them systematically for growing cereals.

The use of animal traction has made substantial advances in the groundnut zones: in the old Senegal groundnut basin, in the Maradi district in Niger, etc; however, it is not possible to give an estimate of its prevalence.

By contrast, recourse to animal traction is increasing slowly (and has sometimes even decreased in certain provinces in very recent years) in zones in which cotton and groundnut growing are a marginal activity. In Niger and Upper Volta, it is estimated that not more than 5% of the land used to grow cereal is cultivated using animal traction.

Over the last twenty years, cereal production has increased by the extension of land surface under cultivation and hardly at all through a rise in yields or productivity.

Further, the development of more land surface has generally caused no problem, although this may not be true everywhere, as will be shown in the next section.

At all events, preference has been shown for it over intensification, although (and the national overviews lay emphasis on this point) major potential for intensification exists in all the countries, i.e., manual farming and a fortiori, animal traction cultivation.

Cotton farming has been intensified, but not cereal growing, for which it has just barely started. There are obviously one or more barriers to the development of the cereal production system. This point will be returned to.

1.7 - THE PROBLEM OF LAND

The question of land availability has a dual aspect: difficulty of access, and the quantity of arable land.

Customary law governs property rights and land use almost everywhere in the Sahel, including those countries which have promulgated special legislation. The national overviews generally do not flag major difficulties as regards farmers' accessibility to the land. However, it has been observed that in some areas, large farmers, merchants or religious leaders have taken over the land. The share-cropping system under which this land is worked is believed to be an impediment to soil improvement.

As to the quantity of arable land, the actual area of the Sahel that is suitable for cultivation is subject to controversy, but the 13 to 14 million hectares presently cultivated without doubt only represents a part (perhaps one fourth) of potentially workable land.

The uneven distribution of the population explains why substantial land development potential exists in some areas, while in others the extension of land surface under cultivation is undertaken at the cost of reducing fallowland. Since in the present agricultural system, soil fertility is reconstituted by fallow crops, the land is deteriorating and yields are decreasing, causing further extension of land under cultivation, and in turn, further loss of fallow land.

1.8 - CEREAL MARKETING AND IMPORTS

Most of the rainfed cereals produced are consumed locally. However, it is difficult to indicate the magnitude of the share of on-farm consumption and marketed crops. Official cereal marketing agencies market a limited part of the crops, most of which are disposed of through many different channels: sales to wholesalers or small dealers, direct supply of rural and urban markets, deliveries to distant relations, sales to occasional transporters, etc. None of the studies made has been able to determine the shares of produce flowing through these channels. To give an order of magnitude, it can be said that 10% to 20% of the produced cereal is marketed, varying by country and by year.

The volume of marketed cereals is not sufficient for town supply and must increasingly be supplemented by imported cereals (commercial imports and food aid.)

The main imported cereals are basically wheat and rice. The two tables on the following page show the recent trend of imports:

TABLE 10: TREND OF RICE IMPORTS

(thousand tons)

	1965	1975	1976	1977	1978	1979	1980	1981
THE GAMBIA.....	7	13	24	38	30	32	40	25
UPPER VOLTA.....	3	10	12	18	10	26	30	15
MALI	-	20	-	-	72	25	49	
MAURITANIA.....	1	14	24	26	51	60	64	70
NIGER.....	2	14	2	12	20	19	28	
SENEGAL	179	177	103	200	219	250	323	200
T O T A L	192	248	155	294	402	412	534	

TABLE 11: TREND OF WHEAT IMPORTS

(thousand tons)

	1965	1975	1976	1977	1978	1979	1980	1981
THE GAMBIA.....	2	1	4	3	9	1	2	4
UPPER VOLTA	11	13	16	30	21	31	30	
MALI	20	49	49	45	28	16	34	
MAURITANIA.....	1	14	24	26	63	45	66	50
NIGER.....	2	8	11	17	14	8	17	30
SENEGAL.....	61	101	117	119	158	128	110	130
T O T A L	97	186	221	240	293	229	259	

This trend confirms, if need be, that the growth of cereal production has fallen behind the increase in needs. The position is what one would expect if towns were relying increasingly on foreign cereals, while the rural world is unable to provide the quantity or type of cereals required by town-dwellers.

II - DEVELOPMENT POLICIES

This chapter reviews the rainfed agriculture development policies effectively pursued in the Sahel countries over the last few years as identified in the course of the various national investigations.

2.1 - THE ORGANISATION OF DEVELOPMENT

Each of the Sahel countries, apart from Mauritania where rainfed agriculture is far less developed, has created regional structures to promote rural development in their sphere of action: ORD in Upper Volta, Operations in Mali, a more complex system in Senegal with regional development organisations and operational entities, etc.

These regional structures are, in principle, in contact with village level farmer cooperatives, having different names, depending on countries.

One of the chacteristics brought out in all the national reports is the extremely centralised structure of the system. Development is designed "from the top down". Rural development is formulated and programmed at national level by the central authorities. Projects are likewise mostly prepared and accepted at national level or in some instances by the regional development structures.

However, the central authorities and regional structures are mostly technocratic organisations which are ill-equipped to understand a rural world, which is neither organised to make itself heard nor ready to do so.

The cooperatives are often initiated by government authorities; some are the heritage of the old provident societies of colonial times. They are often more considered as an emanation of the authorities at village level than as true village producer associations, and are cooperatives in name only. The most extreme example in Senegal where the cooperative movement is virtually under full government control, and has consequently been discredited.

However, farmers have begun to react in recent years. True producer associations of strictly voluntary partipants and accepting only co-opted members have begun to emerge spontaneously, in particular in Upper Volta and Senegal.

This is a major step forward as it will provide the official development, marketing and credit structures with true opposite numbers and partners.

2.2 - THE MARKETING OF INPUTS

Production and distribution of selected seeds:

All of the cotton and most groundnuts produced in the Sahel today are grown using selected seeds. Chapter one has shown how far this position fails to obtain in the case of cereals.

This is despite the fact that most of the Sahel countries have designed more or less complex seed production and distribution systems which generally involve the participation of national agronomic research organisations, regional development organisations, often a coordinating "national seed department" and "multiplier" farmers specialising in seed production.

Notwithstanding, quantities of selected seeds remain very small for millet and sorghum, slightly greater for corn and rainfed rice. In addition, it can be observed that supply frequently exceeds demand and that an often non-negligible share of the seeds delivered to regional development organisations is not effectively sown.

The limited use of selected cereal seeds cannot be explained by lack of production capacity, or by the poor organisation of distribution or processing. There are obviously more fundamental reasons. The national reports have given at least two:

- Producers are wary of new varieties. They believe they run a risk by using them, and that these new varieties are more subject to attack by insects and diseases, whereas in practice they have not mastered the techniques necessary to combat them and thus guarantee good yields. Above all, they believe that the yield of the superior varieties is not markedly greater, and is offset by such drawbacks as different taste, short stems, etc.

- Producers consider that the cost of selected seeds is too high, especially when they are doubtful that their quality is in fact superior. Cotton producers have been accustomed to receiving free seeds. This practice can of course not be generalised to cereal seeds. It was promoted (and proved to be effective) without taking account of the difficulties it would engender when the intensification of cereal crops would be promoted.

To the factors listed above as hampering the introduction of selected seeds should be added the fact that their promotion by demonstrators is generally poorly performed.

Production and distribution of fertilizers:

There is for the time being only one chemical fertilizer factory (at Dakar). It imports some of the ingredients needed for production. Outside the radius of this factory, the Sahel countries import their fertilizers from abroad.

Some countries have started to exploit natural phosphates, abundant in Western Africa, for their own needs, using them after crushing as phosphate bases. However, this is still marginal.

Two problems arise as regards the distribution of fertilizers:

- The degree of complexity of the distribution systems set up by the States to provide farmers with fertilizers. The systems operate quite well for cash crops but less well for cereal crops.

- Prices and subsidies. Fertilizers for export crops are generally subsidized, the subsidy being recovered from the profit margin on the product. The effect is as if part of the cost of fertilizers was advanced to the farmer and recovered when the crop is harvested. However, this is not possible with cereals; only a limited part of the crop is marketed, an even smaller part of it through official channels at a low rate of profit. In practice, much of the fertilizer used for cereal cultivation is subsidized by the State, which has no way to recover the subsidy. The system can operate because only small quantities of fertilizer are used. However, should these quantities increase, the budget will not be able to finance the cost. Considering the price of cereal, there is no real incentive for cereal farmers to purchase unsubsidized fertilizers; and considering the burden on government budgets, the enthusiasm of States for promoting the use of subsidized fertilizers by cereal farmers is limited. There is a contradiction in the present system, and it operates against the more extensive use of fertilizers.

Production and distribution of equipment for animal traction:

Most of the Sahel States have created workshops to manufacture agricultural machinery, with distribution systems that are either specialized or also cover fertilizer marketing.

The problems set out in the section on fertilizers basically recur in the case of animal traction.

On the one hand, the distribution system is far from satisfactory. In several countries farmers would like to have equipment and the system cannot supply enough of it. This is true in Upper Volta where the production-distribution system needs to be reorganised. It is also true in Senegal, where, since the dissolution of the ONCAD in 1980, the distribution of agricultural equipment has stopped in some areas.

On the other hand, there is also the problem of prices and subsidies, although perhaps to a lesser extent, since farmers seem willing to purchase unsubsidized equipment, at least in some countries.

For seeds, fertilizers, equipment - and pesticides could also be added to the list - there is a major dissymmetry between cereal

and export crops. For export crops farmers dispose of an integrated set of production factors : cost-free and effective seeds, subsidized fertilizers, animal traction equipment, pesticides, etc. Cereal farmers, by contrast, do not receive the same assistance: the seeds available are not obviously superior, and they are expensive. The States give farmers no incentive to use costly fertilizers; the desired animal traction equipment is not always available, etc.

This dissymetry is intensified by the marketing and credit systems.

2.3 - MARKETING OF PRODUCTS

Rainfed crops are marketing through various channels:

- for cotton, there are specialised marketing agencies which also provide inputs and collect production;
- for groundnuts there are likewise official marketing agencies which collect most of the crops which are not locally consumed;
- marketing of cereals is divided between the official cereal agencies, many of which have a legal monopoly, and a private trading system.

As the aggregate volume of cereals marketed is not well quantified, it is difficult to say how much of it is channelled via official organisations and how much via the private system. What is certain is that the official sector has failed to establish a monopoly of the purchase of cereals. In no country does it purchase as much as half the crops, and it is estimated that no organisation purchased as much as one fourth of the total harvest until 1974. The official agencies have somewhat improved on this figure in recent years, but none of them have purchased even half of the cereals marketed, and some much less. For instance, during the crop year 1980-81, 95% of the cereals marketed in Upper Volta were sold through private channels.

Two main reasons explain the dissymmetry between the role played by the export marketing and the cereal departments:

- First, the limited resources available to the cereal departments to collect scattered production. A farmer wishing to sell cotton always finds a representative of the official agency nearby, but for cereals, this is far from true.
- The second, more fundamental reason concerns the farmer's reaction to the public authorities' policies. On the one hand, he knows the official price of cotton before the season begins, has seen that it has been profitable over the last few years, and also knows that agency guarantees to purchase his whole crop

at that price. For cereals, on the other hand, the official price is announced late, sometimes after the harvest. It is too low to be considered as an incentive to raise production, let alone to cover the costs of possible intensification; the farmer also knows that he has no guarantee that he can sell his crop at the announced official price (for example, in Upper Volta, farmers still remember vividly the excellent 1975 harvest which they had to offload to private traders because they could neither store it all nor sell it to the OFNACER).

The farmers' reaction is therefore to sell surpluses to official cereal agencies only when the price offered is higher than on the private market, or to sell them as little as possible to avoid trouble with authorities.

Although private buyers offer a solid guarantee of purchase, they do not guarantee prices, which can suddenly soar, and then collapse in the event of over-abundant supply or speculation. It is also quite common for crops to be sold before the harvest: to repay the money he has received as an advance, the farmer is then compelled to sell his crop on the private market at well below the official price. This is of course no incentive for a producer to expand his cereal crop, and even less to intensify.

The agencies created to balance supply and demand over time and to secure financial resources for farmers when they need them (e.g. the "cereal banks" in Upper Volta) have so far only partly succeeded in changing this situation.

Probably through absence of a favourable environment and the non-motivation of members, cooperatives have only played a small role so far in the primary marketing of cereals. They could certainly become stronger to the extent that real producer associations were developed and promoted favourable conditions for the increase of cereal production.

By tending to focus too closely on the interests of urban consumers (or rather a priveleged segment of them), the cereal marketing system has obviously failed to create the right conditions for the expansion and intensification of cereal crops.

The efforts of the last few years to improve the operation of the system by making it more flexible, and offering higher prices have not yet produced really significant results, probably because they are not part of a consistent whole nor components of an overall policy.

2.4 - AGRICULTURAL CREDIT

Special schemes have been introduced to offer equipment and seasonal credits to cotton farmers, and in some countries to groundnut producers. The system operates satisfactorily to the

extent that the supply of inputs, the distribution of credit and marketing of products are generally handled by a single organisation which consequently, has no difficulty in controlling credit and recovering its claims.

This is not true of cereals because of the limited marketing of the product and the even more limited amounts moving through official channels. Credit to producers is thus still very low, and the operation of the credit system is impaired because of the high rate of non-repayment, and the quite frequently lax attitude towards recalcitrant debtors.

These difficulties are so overwhelming in some countries (Niger, Senegal) that credit to producers has virtually been suspended pending the development and introduction of new more adequate procedures.

A specialised structure, the National Agricultural Credit Fund (NACF) was created very recently (1980) in Upper Volta. It is supported by the ORD's and village cooperatives which play a key-role both in the decision to allocate credit and in later recovering the claim. This experiment is still at the teething stage, but to the extent that the NACF is seeking to develop a mass credit, it warrants attention.

A major problem remains: satisfactory access to credit, which cereal producers can obtain neither from official organisations nor on the private market. It appears that this problem will only be solved by the development of independently managed producer associations, which will make it their business to recover debts and guarantee that the system operates well. It is this aspect which makes the experiment in Upper Volta of interest.

2.5 - TRAINING

All the Sahel States have training facilities for:

- higher level executives,

- middle level staff: technical assistants, work supervisors,

- monitors, farmers and artisans.

Some general remarks can be made on the present training systems as regards rural development.

A large number of specialists have been trained or are undergoing training. Many of them have received a high level education, but it is not always certain that it is adapted to needs. Conventional approaches are often of very little use in the difficult situation prevailing in the Sahel, or in determining new and more efficient production systems adapted to local conditions. What really matters is an observant and critical mind, and the ability to gather scattered data to solve a new problem,

somewhat the qualities of a jack-of-all-trades. However, it seems that a large number of executives have a narrow conception of their role, expecting too much from the hierarchy or specialists, and take very few initiatives. This is doubtless not only due to their initial training but also to the structure of the authorities or State corporations and to their view of the hierarchy. It would be desirable to modify the initial training to foster the development of the qualities listed earlier.

The insufficient link between higher level education and research and development was noted in the country reports, and leads to the same finding: if students had more contact with research this would promote the quest for original solutions rather than the strict application of existing methods.

Most studies concerning middle level staff underline that there are not enough of them, and suggest the need for reform, or the creation of training centres.

However, the greatest gap is certainly the training of extension agents, the farmers themselves and the skilled workers in charge of the maintenance and repair of agricultural equipment.

Several states have created original training schemes for farmers, which they have sometimes then modified to take the experience gained into account. However, these schemes only cover a small number of people and do not have a mass effect. Much of the training effort goes to top level executives, and a smaller share to middle level staff and the remainder, which is often vestigial, to mass training.

Several national reports underline the most obvious problems:

- inappropriate training of monitors who are only taught the techniques to be disseminated, but not how to impart their knowledge nor the environment into which these techniques are supposed to be introduced;

- too limited training of farmers who are taught a specific technique: e.g., animal traction, but not the operations carried out before and after: making manure, or tending to traction animals;

- still embryonic training of producer associations in financial management and accountancy, whereas these largely govern their future;

- insufficient training of rural craftsmen.

2.6 - RESEARCH

After a long spell during which virtually all agronomical research was undertaken by specialised teams of foreign institutes, most

Sahel States have taken their research problems into their own hands. Most of them have now created a national research structure whose existence is admittedly sometimes somewhat more formal than real, with departments specialised in the different types of crops.

Several remarks are called for:

First, less attention has in general been paid to cereals than to export crops. The selected groundnut and cotton varieties have replaced less productive local varieties almost everywhere. This is not true of cereals. Selected local varieties are made available to producers in several countries, but, as stated above, are not always a success. Foreign varieties are still not very popular. A major effort is needed in the field of suitable cereal varieties.

An increased research effort will not be enough. The national reports stress the need for presenting models adapted to local conditions of cereal farmers: varieties and farming techniques that are really more efficient and resistant, methods of preserving soil fertility, etc. It is not enough to develop a few isolated techniques; what is required is a consistent set of technical factors ensuring intensification and that are adaptable by farmers, i.e., within their grasp given their technical capacity, the cultural context, and the profitability requirement.

It should also be observed that the Sahel research organisations are still staffed with foreign research workers. There is no question of contesting their competence. However, it would be desirable for the Sahel's own best scientific minds to focus on agronomic research, which is essential for the future of the region. In several countries, the status of research work is not such as to tempt many researchers into this direction.

Several national reports state the need for a definition of a veritable research policy, designed in relation to the needs identified in the country, and the necessity for better coordination between extension services and research.

III - PROSPECTS

3.1 - THE PRESENT SYSTEM ENTERING A DEAD END

Productivity per agricultural worker has not improved over the last two decades, whereas, because of population growth and urban migration, each farmer has more mouths to feed every year.

Should this situation persist, i.e., should the present cereal production system not change, the cereal deficit will grow exponentially.

Several hypotheses have been put forward as regards the distribution of urban and rural population over the next two decades. Taking an average, hypothesis (similar to that used by the FAO in "Horizon 2000"), the trend over the next twenty years would be as indicated in the table below:

TABLE 12: NUMBER OF CONSUMERS PER AGRICULTURAL PRODUCER

	1980	2000	Yearly rate of growth
Total population (millions)	31,1	54,5	2,8 %
Agricultural working population (millions)	11	15	1,4 %
Number of consumers per agricultural producer	2,8	3,6	1,4 %

This means that if productivity does not increase, the cereal deficit, roughly 800,000 tons in an average year at the beginning of the 1980's will easily exceed three million tons a year by 2000. Approximately one third of the cereals consumed in the Sahel will be imports or food aid. This means that to keep the cereal deficit at its present level, each worker will have to improve his productivity by 1,4 % a year on average over the next twenty years, which is a substantial figure.

This effort is impossible under the present production system in which human labour is the only production factor. The system needs to change.

Will the land needed to extend the present system be available? Taking the average scenario of the trend of rural population set out above and the hypothesis of constant productivity, approximately three million additional hectares would have to be put under cereals by the year 2000. There is enough arable land in the Sahel to find these three million hectares, but because of the uneven distribution of population, the land in a growing number of regions will be over-worked and yields will decline.

The present cereal production system is reaching its limits from two points of view. On the one hand, it will supply increasingly less food for the Sahelian populations, and the region's dependence will rise to a disquieting level. And this poor result will be attained at the cost of land deterioration in a growing number of areas.

3.2 - THE SAHEL'S RESOURCES ARE GREATER THAN ITS NEEDS

To escape from this dual impasse, one can initially envisage promoting internal migration and new land development in regions where land is plentiful.

Much potential "new land" is located in the most rainfed regions of the Sahel, especially in Mali and Chad, but also in Senegal (Upper Casamance and Eastern Senegal) and Upper Volta (West, South-West and East).

This measure will reduce the pressure on today's over-worked zones and halt land deterioration; however, to the extent that farmers' productivity does not improve, it will not solve the problem of providing cereals for the rapidly growing urban population.

The solution to this problem is first to intensify the rainfed cereal production system. This intensification is possible.

It is estimated that millet and sorghum production could increase by 75 % in Niger by introducing improved manual agricultural techniques, and by 150 % by recourse to animal traction Niebe output could be tripled.

In Upper Volta, where millet and sorghum yields are currently below 600 kg per hectare in the country's most rainfed regions, yields could be raised over 1500 kg per hectare by using the most efficient techniques: treatment of seeds, in-line sowing, manuring, use of animal traction for soil preparation. In a less well endowed region, such as the Yatenga where yields are roughly 440 kg per hectare, they could be doubled.

Of course, these increases in yields are theoretical and depend on the farmers' acceptance of the appropriate techniques. They will not be possible everywhere.

However, it is worthwhile noting that a 25 % to 30 % increase in yields would be enough tc stop the growth of food dependence over the next two decades and feed the rising urban population. It can be taken that the potential rainfed agriculture alone in the Sahel, in the light of the possible increase in yields mentioned above, is greater than present and forseeable needs for some decades.

However, it will also be noted that the potential is very unevenly distributed from one region to the next. In the least rainfed regions, intensification will be harder to undertake, less attractive and the results less exciting, and it will probably not be enough to avoid a certain amount of internal migration from the least endowed to the better watered zones.

Finally, intensification will not necessarily solve the problem of vulnerability to climatic conditions. Inter-annual storage, the development of irrigated agriculture whose potential is considerable in the Sahel (see the overview of irrigated agriculture drawn up by the CILSS and the Club du Sahel in 1980) will have to be envisaged to face up to the irregularity of rainfed cereal crops.

IV - PROPOSALS FOR THE FUTURE

The programme-overviews include a certain number of proposals for the future, some of which are specific to the countries studied while others have a regional coverage. The latter proposals are listed below.

4.1 - A NEW APPROACH

If intensification is possible, what is effectively needed for it actually to occur? The approach followed by the Sahel governments and aid donors over the last two decades has obviously not yielded satisfactory results. It is thus proposed to revise it and several suggestions follow:

- Better understanding of the rural world

  Everyone knows that development projects cannot have mechanical effects and that their success is subject to the participation of the population in meeting objectives and adopting the methods proposed. However, although progress has been achieved in better understanding the needs of the rural world, too many projects are still designed, as stated above, "from the top downward"; they are devised without a real dialogue with rural dwellers and are proposed to farmers who can accept or refuse the model presented, but have little opportunity to alter it.

  It would be more effective to conceive development aid as aid to a project which originates from the rural world. It would certainly be more beneficial to require national agencies and project structures to participate in the technological, economic and social progress of the rural population rather than ask the population to participate in development projects on whose design it has no influence.

  Nevertheless, local initiatives are not enough. The rural population of the Sahel has to face up to difficult problems: the shrinkage of the available space, land deterioration, the need to increase workers' productivity at a sustained pace to meet the rise in urban needs, etc. Village communities cannot be expected to solve all these problems. They need outside help, proposals, advice, etc.

  In the future, the key factors of development projects will be those translating the needs and wishes of the rural world and those operations which foster and support local initiative.

  A real rehabilitation of the rural world is necessary.

- To create favourable conditions for projects

Despite the declarations on priority for food self-sufficiency, agricultural policies have concentrated on export crops. The contrast between what has been done for cereal crops compared with export crops has been underlined in the earlier chapters.

To guarantee the success of future projects, it is necessary for cereal crops to enjoy the same favourable conditions which have been responsible for the success of cotton projects.

A complete set of consistent measures must therefore be taken to create these conditions. These measures are:

- the extension of techniques, training of farmers;
- the supply of inputs;
- marketing and the price of products;
- access to credit;
- management and training;
- etc.

Improving the conditions for cultivation of cereals should not be to the detriment of export crops which are basic in most Sahelian economies. It will thus be necessary to adopt an overall view of agricultural activity which takes both cereal and export crops into account.

4.2 - THE ORGANISATION OF DEVELOPMENT

The role and limits of action of each institution warrant clear definition.

- At national level:

Most regional development structures are encumbered by serious operating problems which limit their capacity to a large extent. Improvement is necessary. It can be obtained through:

- less top-heavy structures, and
- the gradual transfer of certain tasks and responsibilities to farmers themselves via associations or cooperatives.

It is indispensable to put an end to inflation of supervisory staff, whose costs are too heavy for the State to bear, by revising projects, and to focus the action of regional organisations on extension and the follow-up and implementation of projects.

- At local level:

Since the farm-level structures must be considered as the basic cells of development, groups and other associations should be made to evolve into dynamic structures with a legal

capable of developing without the permanent assistance of monitors.

This approach, proclaimed on many occasions by the Sahel countries' decision-takers for the promotion of the rural world, implies awareness and a change in mentality of both the farmers and supervisory organisations. Producers should cease being dependent, assisted persons and take their future fully into their hands: by contrast, the development organisations should progressively limit their role to provide groupings with the assistance and services they require, while granting them more decision-taking power. The week management capacity of producer groups is presently a common handicap. The functional literacy programmes undertaken to facilitate training their members in management have not yielded the expected results. There are several reasons for this: a shortage of candidate teachers, the limited contents of programmes, post-literacy problems, etc.

The future of rural producer associations will nevertheless only be secure when a sufficient number of rural dwellers have become literate and national languages can be used to communicate, a precondition in particular for adequate management training.

The best support for producer groupings is therefore in systematic development of functional literacy in the frame of projects so as to adapt programmes to the specific needs of farmers who will then be able to put their newly acquired knowledge in practice.

4.3 - LAND POLICY

The traditional land system, a basic element of the social heritage, is in the throes of changes affecting tenure rights, and the parcelling of holdings. Speculation (buying and renting) has developed.

In the light of this new situation, legislation on land tenure rights and a land management programme must be established.

- Land tenure

  The rural population's desires should be taken into account in drawing up (or improving) this legislation which should be flexible enough to adapt to different local situations.

  It can be assigned the following objectives:

  . to eliminate the risk of concentration of property and the use of land in the hands of a minority (which hampers rural development to a considerable extent in other parts of the world);

. to promote investment in the preservation and improvement of the soil by guaranteeing a permanent and transferable right of use;

. to specify relations between farmers and herders.

- Land development

It is necessary to encourage internal migration to reduce the pressure on land in over-populated zones and make better use of the space available for agriculture.

The States should clearly define a new land development policy and establish guidelines on settlement. In addition, experiments in directing voluntary migrants should be undertaken in coordination with and the participation of local residents.

- Protection and improvement of land

All rural development programmes which include new land development projects should make specific provision for water conservation, soil protection, rehabilitation and reforestation.

These programmes should avoid using sophisticated techniques, involve participation by the local populations and be designed so as to increase local incomes in the short-term.

As regards plots, the actions could basically cover:

. anti-erosion measures, which should respect the boundaries of plots which as far as possible should be lined with local varieties (nere, karite, gao, etc.);

. improved fallow practices, organic manuring and diversification of crops by introduction of leguminous plants (niebe);

. optimum use of water-points (construction of ponds) which will allow the working season to be extended while providing appreciable incomes.

4.4 - AGRICULTURAL RESEARCH

We have discussed the limited research effort devoted up to now to rainfed cereal agriculture and the asymmetry between cereal and export crops. A certain number of suggestions can be put forward for increasing and better directing future efforts.

Good coordination both at national and regional scale is indispensable in designing research and testing programmes to avoid duplication and superimposition of activities, although some major sectors may not be concerned.

The specialised organisations of the CILSS (Sahel Institute and Agrhymet Centre) should play a key role in coordination at regional level.

As regards the new directions to be taken, greater priority should be given to research into:

- foodcrops, including secondary crops (fonio, tubers, etc.) and fodder plants.

- farming techniques and socio-economic characteristics, placed in the frame of the existing production systems.

The advantage of this approach would be to consider simultaneously all agricultural production factors in situ and so better to meet development needs.

Priority in research on the improvement of varieties should be given aiming at improving local vegetable varieties in the light of their adaptation to climatic conditions and the nature of the soil in different areas.

It is recalled that it has already been recommended to establish a suitable status of the research worker as an incentive for a larger proportion of scientists to focus on an area of research which is absolutely essential for the region's future.

4.5 - TRAINING

Several suggestions have already been set out as regards initial training for specialists (better contact of students with research activities), the development of executive training, and the gaps in training farmers, craftsmen, supervisory staff have been underlined.

Several recommendations can be made to bridge these gaps:

- extension officers and supervisory staff should not only undergo training in the dissemination of agricultural techniques but also be trained in the socio-economic and commercial aspects of agricultural activity;

- producers should be trained in the management and accounting techniques pertaining to their land holdings and their associations, and it is imperative that they be aware of their rights and duties as members of an organisation.

  Functional literacy in its new form should open up an opportunity to extend training in different languages while allowing for differences in socio-economic conditions;

- the entry of young farmers into agricultural production activities in villages whould be facilitated by all available means, in particular:

  . by forming young farmers' associations and flexible post-training structures;

  . by training rural craftsmen (blacksmiths, carpenters, etc.) and enabling them to set up in trade.

Considering the States' limited resources, each development project should systematically include funds for training, equitably distributed between executive and staff training and the training of farmers and for their associations (which as noted, are often reduced to a residual amount).

4.6 - SUPPLY OF INPUTS

Cereal crops cannot be intensified without adopting new production systems and, therefore, supplying farmers with new inputs. The supply of inputs must not be allowed to be a bottleneck in the process of altering the production system.

Several general remarks can be made:

- the development of export crops has been promoted by high input subsidies (sometimes even in the form of outright grants); this policy can of course not be extended to cereal crops and policy as regards the price of inputs should reflect market levels.

- this does not necessarily preclude the grant of temporary subsidies for some inputs as an initial boost for intensification; modern production factors have started to be employed for cereal crops and these beginnings must not be throttled;

- the International Community could help the Sahel States, which lack the resources to implement a temporary input subsidy policy for cereal crops, to implement this policy;

- the new models proposed to farmers should, as far as possible, promote technical approaches providing for foreign currency savings through enhanced use of local resources, so that the national economy can, in the long run support the costs without foreign aid (natural phosphates, organic manuring, etc.)

Eliminating the input supply bottleneck also pre-supposes:

- the development of a distribution system which currently is far from omnipresent,

- the development of agricultural credit, and

- consistency between input costs and product prices.

Selected seeds:

The choice of varieties which can fulfil local agricultural requirements, is of capital importance, but not sufficient on its own. Farmers must also have enough high-grade seeds and plants at the right time, at reasonable prices and in adequate quantity.

The extension of selected seeds and their more widespread use (reduction of the price) necessitates the development of a seed policy at national level which fosters the development of selected seed production to be marketed through a re-organised distribution system.

Research into seed production should be limited to obtaining so-called "basic" seeds. Seed-growing farms and the rural world itself (see growers on contracts, preferential groups in seed-growing villages) should be assigned the job of taking care of the other stages of the seed multiplication process.

Fertilizers:

The use of mineral manures in the North (350 to 400 mm of rain) is limited by a restrictive factor: water. However, it can be used further South, the main constraints being economic. The composition of the fertilizers used at present is basically suited to cash crop production.

New mineral and organic fertilization methods should be designed to meet the following dual criteria: economic acceptability to farmers and the preservation of soil fertility.

The problem of input subsidies is most acute in the field of mineral fertilizers: it warrants thorough consideration in each individual case.

Two points in particular can be underlined:

- there are major natural phosphate deposits in the Sahel which should be drawn on more for the development of the region, either after chemical processing, or even without processing when the phosphates are soluble enough;

- the development by farmers themselves of organic manuring is of key importance for maintaining soil fertility and promoting intensification, although this point has so far not received the attention it deserves.

Agricultural and related equipment

Although still very recent, the use of agricultural and related equipment (e.g. carts for haulage) is developing rapidly.

The needs of animal traction farming, a dynamic factor for the modernisation of farm holdings, are very great. In this regard, efforts should first be made to develop the association between agriculture and livestock.

Actions should also be undertaken to:

- secure greater flexibility in purchasing terms (possibility of buying for cash, sale of equipment in individual elements and not as whole units, etc.);

- diversify the range of choice proposed to farmers.

Farmers should be granted assistance:

- to use equipment better and keep it in good condition;

- in the choice and husbandry of cattle.

The presence of competent craftsmen able to understand farmers' real needs is of major consequence for the promotion of the rural world. Their training and installation should thus be facilitated.

Motorisation is appearing in certain zones in intermediate or small-scale form. It will no doubt be generalised at a later stage of agricultural development. It is nertheless never too early to think about the conditions of future success: e.g., the size of farm holdings, training of technicians, choice of agricultural techniques, creation of an after-sales service.

4.7 - AGRICULTURAL CREDIT

A certain concentration of credit in the better-endowed regions has been observed in the past. Priority has been given to production factors for export crops and for exclusively agricultural activities.

In the future, it would be desirable to take agricultural-related activities into account, to extend credit to all geographical zones and to diminish the discrimination between foodcrops and cash crops.

The difficulties met regarding agricultural credit in almost all the countries studied make it necessary and sometimes urgent to carry out a fundamental reform of the institutions, criteria and mechanisms governing the extension and recovery of credit. The policy in this field should be integrated into sector policies, given their interdependence, in particular as regards:

- input subsidies and supply,

- prices and marketing of agricultural products, and

- organisation of farmer associations.

The following general recommendations can be made here:

- greater flexibility in the criteria and conditions of allocation of credit better to adapt them to different realities;

- decentralisation to foster direct contacts between credit institutions and borrowers;

- a simplification of procedures to allow farmers to participate directly in the management of credit;

- increasing the responsibility of credit users in the recovery of debt through the provision of meaningful personal guarantees and joint and several guarantees by groupings and other associations of farmers;

- dissociation of the tasks performed by extension officials and credit recovery personnel.

4.8 - PRICE, MARKETING AND STORAGE POLICIES

Farmers must enjoy effective and profitable sale outlets for their cereal crops if they are to agree to increase production beyond the threshold of their own needs, the pre-requisite for the region to achieve its goal of food self-sufficiency.

The only way a price will be both profitable and incentive is if:

- on the one hand, it is consistent with the input costs required for production; and,

- on the other, it is consistent with the price of other cash crops. To become a cash crop, cereals must provide farmers with similar advantages to existing cash crops.

This can be achieved only in the framework of consistent cereal policies and food strategies, by acting on the organisation of markets to secure the setting of incentive prices for cereals. The measures here include protection of national markets against low cost imports, the active use of food aid for the development of food crops, etc.

The price incentive is nevertheless not sufficient on its own to attain food self-sufficiency. The farmer further must be certain that he can sell his surplus at this price.

This pre-supposes remodelling the marketing system in such a way that each economic actor can play his role in his proper field: National cereal departments, private traders, and village groupings which have a leading role to play in primary marketing and local processing. These all deserve more help from the States and International donors.

The design of appropriate technology (arts and crafts or industrial) can make local products more attractive and easier to use by urban residents.

Food self-sufficiency should be easier to achieve for the Sahel as a whole through regional complementarity. However, this will necessitate the progressive implementation of a common cereal policy which, by harmonising prices and promoting free trade among the Sahel States would promote the development of internal production.

By regulating supply, the development of a storage policy at the local, national and regional level, adapted to the constraints of the environment in the Sahel, should greatly facilitate progress toward achieving the objective of regional food self-sufficiency.

4.9 - THE DESIGN, EXECUTION AND FINANCING OF DEVELOPMENT OPERATIONS

Although the expression used is "integrated development", most of the projects completed or under way limit their field of action to credit, extension services and the operation of management structures.

In these projects, stress is generally laid on the technical characteristics, under-estimating the complexity of the existing socio-economic relationships and the conditions required for the insertion of the project into its socio-economic context, as if the environment had to adapt to the project and not the opposite.

In addition, general economic policy and the sectoral actions undertaken are far from always promoting the intensification of cereal crops. Through the absence of a meaningful dialogue between donors and national authorities, projects and actions tend to be in competition instead of being complementary.

It seems that the project approach adopted up to now is too restrictive and limiting to have a real and lasting impact on the development process.

Following substantial joint efforts made by the International Community and the Sahel States after the great drought of 1968 to 1973 and given the relatively limited results of the

development actions taken as a whole, it is now necessary to re-examine the basic principles of the design, creation and execution of projects as well as those governing financing criteria and procedures.

The debate, open for some time on these problems, is far from being exhausted. A whole range of recommendations could be put forward on the basis of the analysis of the various development actions in hand at the time the programme/overview of rainfed agriculture was drawn up.

The conception and design of operations:

- design development actions, not as one-time individual and limited actions but as broader programmes, with good supporting measures upstream and downstream from production proper, and provision for economic and social infrastructures;

- extend the duration of operations because it is impossible in such a complex and slowly changing environment to obtain results within the three to five year period which is the average duration of traditional projects;

- improve knowledge of the human, social and economic context into which programmes must be integrated;

- systematically analyse the development actions undertaken in neighboring zones;

- avoid too rigid action programmes to be able to respond to needs perceived in the course of execution, and to correct possible errors in design.

- estimate the recurrent costs engendered by a programme and the ability of States and other economic actors to fund them;

- secure the closer participation of farmers and other economic actors as well as the technical and administrative agency in the design of projects.

Execution of operations

It is necessary:

- to avoid creating new structures, and to make existing ones more operational;

- to limit the numbers and the role of foreign technical assistants and to confer more responsibilities on national executives by given them more decisional-making power;

- to begin the execution of projects only when the participation of farmers and their associations has been secured;

- to facilitate and provide support for the insertion of private economic agents in development activities;

- to generalise follow-up and evaluation cells so as to gain clearer understanding of the impact of different actions;

- to avoid sporadic interference with operations, whatever the difficulties met, so as to avoid a negative impact on farmers' willingness to participate.

Financing criteria and procedures

- when the conditions for success are present, to increase substantially the volume of funds allocated to rural development programmes, in view of the low volume of investment up to the recent past;

- to take the rate of economic return as a parameter among others, with due regard to the difficulties involved and the "subjective" nature of such calculations.