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REPUBLIC OF NIGER

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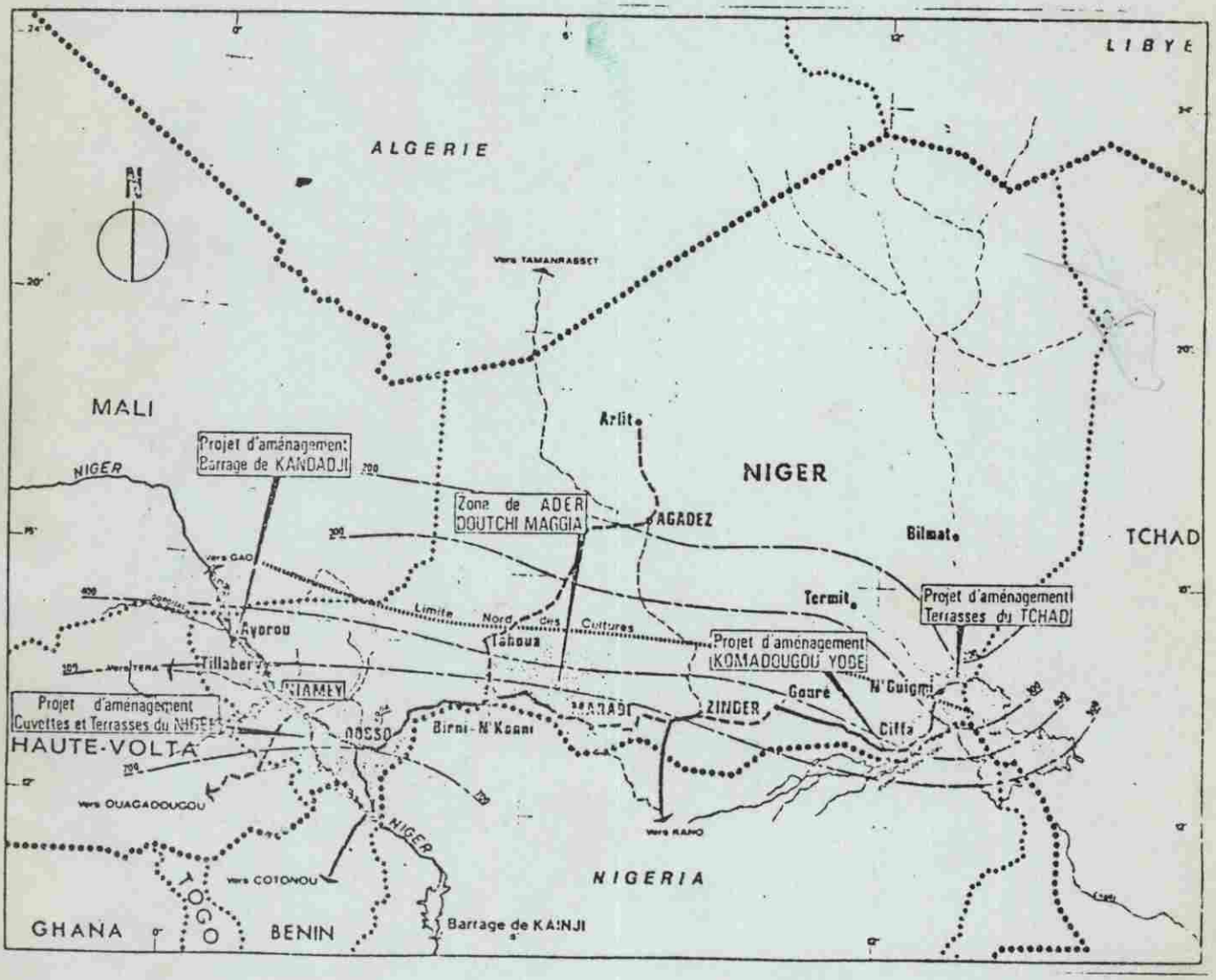
DEVELOPMENT OF IRRIGATED AGRICULTURE IN NIGER

GENERAL OVERVIEW AND PROSPECTS,

- PROPOSALS FOR A SECOND PROGRAMME 1980-1985 -



October 1979

THE DEVELOPMENT OF IRRIGATED AGRICULTURE IN NIGER

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PREFACE

Two years after having submitted to the CILSS the so-called first generation projects contemplated in the field of irrigated farming, it seemed desirable in the course of the last meeting of the specialised irrigation group of the Club du Sahel and the CILSS to take stock of the operations undertaken, to examine the difficulties encountered for the expansion of irrigation and to develop, in the light of the information supplied by the Sahel States, a second programme of projects to be put forward for consideration to the international community.

A study Mission organised by the Club du Sahel and the CILSS went to Niger from the 15th to 31st August, 1979 in order to examine conditions in the irrigated farming sector with the competent authorities, review the status of programmes and their implementation, and discuss operations contemplated for the coming years.

This report was prepared by Mr. Pierre PONSY, Engineer in Rural Engineering, Waterworks and Forestry, Consultant to the Club du Sahel. It is essentially composed of information supplied by Nigerien officials he met during the Mission.

The conclusions and recommendations are intended for the irrigation team of the Club du Sahel and the CILSS for their consideration and discussion.

SUMMARY AND CONCLUSIONS

1. The trend of developing areas for irrigation remains slow both for meeting the population's food needs and in view of overall development possibilities which are of the order of 220,000 hectares. The total irrigated area is presently estimated at 5,800 hectares of which 4,800 are modern perimeters with total water control.

They are located mostly along the Niger River Valley (3,500 developed hectares) including 3,200 levelled rice farming perimeters on the river banks (double cropping is carried out on approximately 2,500 hectares) and 300 hectares on benched terraces suitable for farming various crops.

The MAGGIA and BIRNI N'KONNI projects (the latter is being implemented) in the TAHOUA Department currently total 1,750 developed hectares.

Lastly, at KOUMADOUGOU 500 hectares are developed mostly for perimeters with controlled flooding.

2. Rice farming is expanding under modern irrigation reaching 18,000 tons per year with average yields of 7 to 8 tons in two annual harvests.

To cover the food deficit in 1990 - due to increasing rice consumption as compared to a decrease for millet and sorghum - would require farming a new area of 10,000 hectares.

Other irrigated crops remain marginal and concern mainly truck farming, cereals and cotton on the MAGGIA perimeter and the benched terraces of the Niger River Valley.

3. The major types of development carried out concern:

- rice farming on river banks: cover approximately 3,000 hectares. On recent perimeters total water control is achieved through ground levelling (the water level is maintained through a system of bunds with profiles between 0.10 and 0.20 meters) and a full irrigation and drainage network. These developments obtain high yields (10 tons of paddy/hectare/year) but their increasing complexity leads to high investment costs (over 3 million FCFA a hectare).

- terraces along the river: represent only 300 developed hectares. However, this is potential farmland irrigable by pumping and its agro-economic development modalities remain to be defined.

Irrigation in the Niger River Valley during the dry season is limited to about 12,000 hectares upstream from SAY at low stream flow. The KANDADJI dam, whose purpose is both hydro-electric and hydro-agricultural, will regulate the river's flow in 1982.

Outside of the Niger River Valley, the potential is small and not well defined:

- the MAGGIA area with a semi-arid climate but densely populated where small reservoirs were created (eight dams covering about 1,500 hectares) at very high cost (around 5 million FCFA/hectare) - BIRNI N'KONNI project; and

- the development of groundwater resources for irrigation can be envisaged in certain cases under acceptable socio-economic conditions (GOULBI at MARADI, Dry Valleys, AIR, ...).

4. Besides the lack of technical manpower requiring specific training activities, particularly directors of irrigated perimeters, the expansion of irrigated farming faces various problems which have been grouped into two categories:

(a) Project design and implementation:

- particularly high development costs in the River Valley reaching 4 million FCFA/hectare; the creation of the National Office for Hydro-Agricultural Developments (ONAHA) which will take over the activities of the UNCC and the GR in the field of execution and should stress the rationalisation of development costs by:

  . increasing competition through wider publicity (the potential market amounts to a yearly development of 1,000 to 2,000 hectares and should attract new companies);

  . Develop, particularly within ONAHA, activities under state supervision;

  . seek technical solutions to lower costs at the design stage of hydraulic infrastructure ("prefabricated portable canals" seems to be a solution requiring further study);

  . support also guidance and supervision activities which are currently insufficient and tend to foster cost overruns.

(b) Developments are presently managed by the UNCC, whose responsibilities should be transferred soon to the ONAHA. The management of the system needs:

- better supporting extension activities at various stages;

- greater ability to recover costs and maintain developments.

The status of debt collection varies from one perimeter to another. It is relatively good in the Department of TAHOUA and more problematic on certain perimeters in the TILLABERY area. The average debt collection rate is 70 per cent. At the end of 1978 the total of unpaid debts amounted to 250 million FCFA.

An improvement in the debt collection system is essential to carry out effective project maintenance. Presently this is not carried out satisfactorily. The deterioration of infrastructure reaches an alarming level on certain perimeters and the renewal of pumping equipment is not always ensured.

- The importance of efficient farmer organisation on every perimeter.

The farmers organisation tends to have farmers participate in the extension of technical subjects (heads of farmer groups) and in management (management and development committee). This excellent principle which tends to reduce the direct intervention of the authorities, implies a more intensive training programme, particularly at project start-up, and technical assistance to co-operative bodies existing in each perimeter.

- Insufficient contacts between the UNCC and agronomic research organisations.

5. Status of development committed since 1977 indicates:

- the slow development trend

Only three developments totalling less than 400 hectares have been completed.

- the size of activities abandoned for reasons of cost overrun or technical constraints is very important.

Of ten activities begun, seven covering a total area of 2,300 hectares are presently halted. Additional financing of over a billion and a half FCFA is required for carrying them out and has been requested from the National Investment Fund.

Most additional activities to be carried out are the responsibility of the administration (terminal activities). However, the Agricultural Engineering Directorate does not have the necessary equipment or extension agents for this.

This situation is of concern and indicates the extent of the rehabilitation activities to be carried out in organising activities such as the maintenance of existing perimeters where important lags exist requiring major repairs costing around 1 billion FCFA.

These are the problems facing the creation of ONAHA. It is clear that considerable assistance will have to be rapidly mobilised (equipment, personnel, operating expenses) for this purpose otherwise the goal of this reorganisation, indispensable to the development of irrigated farming, will remain an illusion.

6. Future programmes (1979-1983):

The Planning Ministry's five-year plan anticipates:

- carrying out different studies both to prepare project identification documents and to improve the general knowledge of hydro-agricultural implementation in certain areas;

- the implementation of different projects totalling 4,750 hectares in the Niger Valley (this excludes the Tillabery sugar project) and 2,800 hectares in other areas (Maggia, Birni N'Konni and Maradi).

This programme is sizeable compared to the present administrative capacities. Its implementation depends on the ability of management to master various implementation problems implied by the projects.

7. Therefore the creation of ONAHA appears to be of prime importance and should be carried out as soon as possible. It should also be provided with all resources necessary for carrying out its task.

The creation of ONAHA is the occasion to get the irrigation sector under control and provide a new impetus. To ensure this start-up in satisfactory conditions, both the National Investment Fund and the international community must provide aid.

This assistance should meet the following three objectives, the first two being the most urgent:

- provide material support (equipment for the Agricultural Engineering Directorate and corresponding infrastructure), personnel (support extension activities with temporary expatriate assistance) and organise ONAHA's activities;

- rehabilitate deteriorated perimeters, terminate unfinished ones, provide the required management personnel, and support development operations on existing perimeters;

- programme and pursue new developments in the light of available financings.

This is the framework within which ONAHA should prepare a priority action programme that should be the basis in the next few months for concerted donor action.

REPUBLIC OF NIGER

CLUB DU SAHEL
CILSS

DEVELOPMENT OF IRRIGATED AGRICULTURE IN NIGER

INTRODUCTION

Agriculture provides the livelihood for 90 per cent of the 5 million inhabitants of Niger and contributes nearly 50 per cent of GDP(1).

However, productivity in agriculture remains low given the present state of techniques and production which, depending largely on rainfall, in certain years falls to catastrophic levels.

Because of the continuous growth of food demand (2.7 per cent per year), the food balance in Niger remains very precarious. In 1978, a good year in rainfall, the cereals deficit was estimated at over 30,000 tons.

NATIONAL CEREAL PRODUCTION (estimate 10/78)

	Area (hectares)	Yield (Kg/ha)	Production (T)
Millet	2 676 000	407	1 090 501
Sorghum	799 995	451	361 031
Rice	26 600	1 260	33 500
	3 502 595		1 485 032

(Data Agricultural Board)

Therefore in the sector of rainfed farming the Government is implementing or is going to start projects to improve productivity such as:

- MARADI Project;
- DOSSO Project;
- Integrated development project of DIFFA;
- ZINDER Project;

where it is expected to generalise the utilisation of inputs (fertilizers, seeds, etc.) by extending agricultural loans and reinforcing extension services.

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(1) The accelerated production of uranium and its price having quadrupled, has allowed the State to devote more resources to productive investments. Thus, the funds of the National Investment Fund rose from 4.5 billion FCFA in 1975/76 to 28 billion in 78/79.

These projects, in present conditions, would allow for a production growth of about 10 per cent by 1985, and an increase in farmers' income of about 50 per cent. The farmers, however, will remain poor and the staple food of the country (millet and sorghum) will depend largely on an uncertain climate. The high demographic growth (2.7 per cent/year) will undoubtedly widen the gap between production and national food needs in the coming years.

Nigerien authorities therefore consider the expansion of irrigated farming as a top priority in order to ensure a part of the national food production against the risks of drought and also to help reduce the chronic food deficit.

The purpose of this report is to describe the current situation of the irrigated farming sector, to underline the major difficulties facing the expansion of irrigation and, on the basis of the elements supplied by the Nigerien authorities, to present a programme which could be undertaken in the course of the next five years.

I. CURRENT STATUS OF IRRIGATED AGRICULTURE - EXISTING OPERATIONS

Irrigated areas are insufficiently developed in comparison with the food needs of the country and the development potential of about 220,000 hectares(1). In fact, the total irrigated area is estimated at 5,800 hectares of which 4,800 are modern irrigation perimeters (total water control).

The main areas are situated along the valley of the Niger River (3,500 developed hectares) of which 3,200 hectares of rice perimeters on the banks of the river (annual double cropping is practised on about 2,500 hectares) and 300 hectares on the "terraces" of the river suitable for mixed farming.

The water reservoirs at the bottom of the hills of MAGGIA and of BIRNI N'KONNI (project under way) in the Department of TAHOUA provide a total of 1,750 hectares of irrigated areas.

Finally, there is Koumadougou where 500 hectares are developed (mainly in perimeters of controlled flooding). The main features of the existing developments are summarised in Table I below.

1.1 Irrigated productions

1.1.1 Rice production

- On the developments of the valley of the Niger (see Annex 1):

The 1978 paddy yield (dry season and rainy season) is estimated at 17,250 T according to the UNCC(2) which is in charge of the development of that area. The average output/cultivated hectare/per year would be over 8.1 T (3.6 + 4.5) a remarkable average result on the 2,520 developed hectares controlled by the UNCC.

In fact, the average result conceals important variations among the developments where progress is subordinated to three factors which are rarely found together:

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(1) The 220,000 hectares of potential are distributed as follows:

- Valley of the NIGER 140,000 (40,000 ha of basins and 100,000 of terraces);
- Valleys of the MAGGIA 10,000, Dry Valleys, Goulbis and Dallols: 30,000 to 50,000;
- Valley of the KOUMADOUGOU: 5,000, Lake Chad: 15,000 to 25,000 ha.

(2) UNCC - Union Nigérienne de Crédit et de Coopération (Nigerien Loan and Assistance Union).

TABLE I - STATUS OF HYDRO-AGRICULTURAL DEVELOPMENTS

as of January 1979

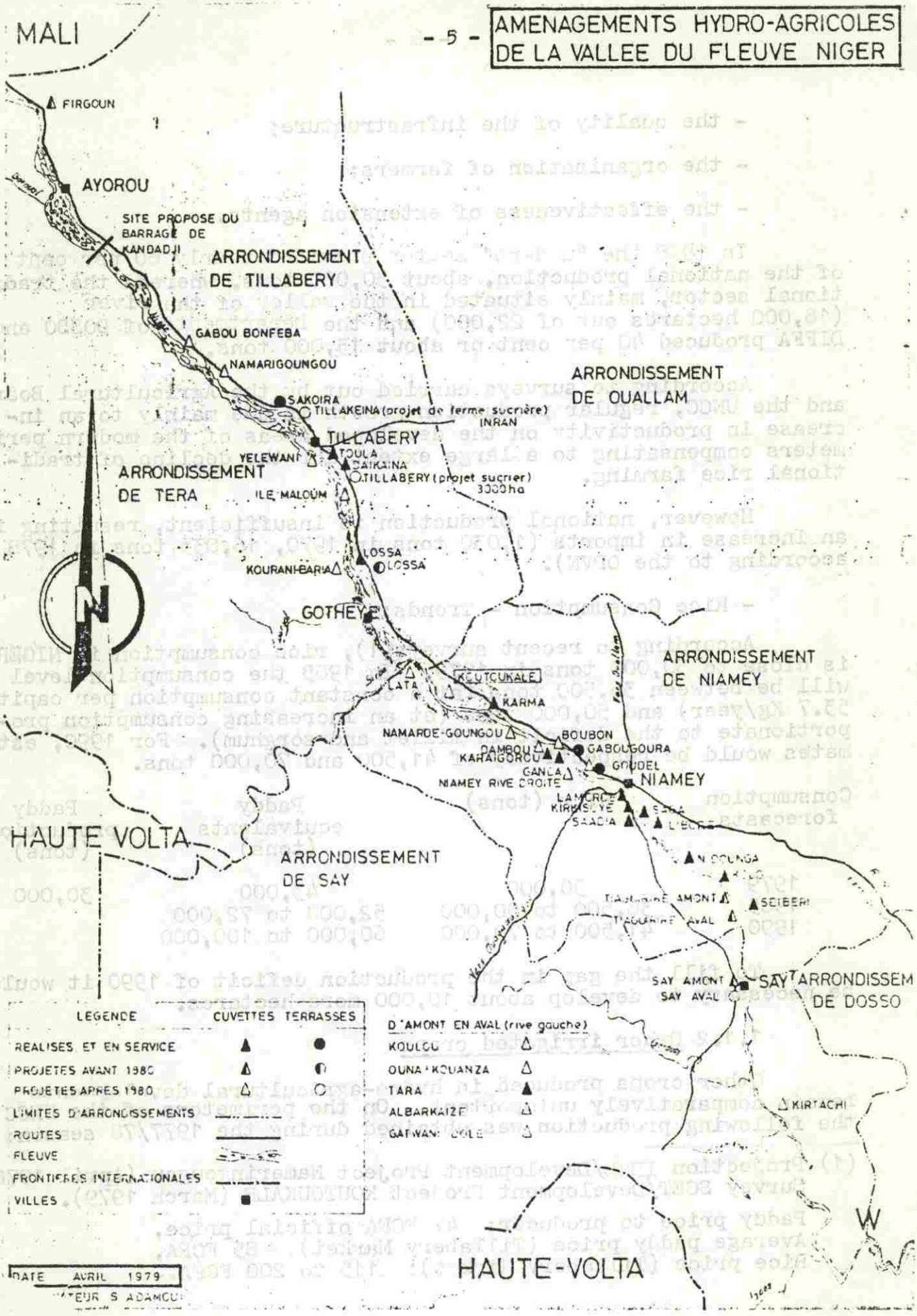
Location of Developments	Type	Area developed (hectares)	Year of implementation	Cultivated area(3) in 1978		Average yield (ha/year)
				Rainy season	Dry season	
I. DEPARTMENT OF NIAMEY (Valley of the NIGER River)						
FIRGOUN	C1	300	1953	200	-	?
KOUTOUKALE	C1	410	1966	210		2.24
DAIKENA	C	120	1964	120	120	(seeds)
TOULA	C	260	1974/1975	240	240	9.723
SONA AND KOKOMANI	C	212	1974/1975	154	152	7.900
LOSSA	C	190	1974/1976	137	106	7.330
KARMA	C	150	1972/1978	126	123	8.900
KAREGOUROU	C	145	1970/1976	133	82	7.74
KOURTERE	C	10	1970	10	10	7.17
KIRKISSOYE	C	100	1965+1977	90	80	6.500
SAADIA	C	115	1973	93	85	8.355
SAGA	C	385	1966+1976	385	346	8.77
LIBORNE	C	259	1966+1976	192	216	9.92
N'DOUNGA I	C	280	1966	221	210	7.50
N'DOUNGA II	C	290	1966+1978	271	260	9.90
SABOIRA	T	42	1966	29	44	onions and
TILLABEINA(1)	T	100(1)	1967	45	60	melons
SONA II(2)	T	71	1975+1976			
LOSSA II(2)	T	91	1975/1976			
				I N R A N		
TOTAL I		3530				
II. TAHOUA						
IBOHAMANE	R.C.	750	1966-1969	dam under repair		
GUIDANMAGAGI	R.C.	132				
MOULELA +		65	-d°-	cotton + food farming		
KAWARA + TOUFFANI		80				
+ 3 reservoirs to rehabilitate		132				
TOTAL II		1159				

(1) One part 24 ha to the INRAN.

(2) INRAN perimeters (cereal project and GERDAT) III BIRNI NIKONNI RC 600 + DOGGO (+MARA) = 130 + DIFFA + 90.

(3) UNCC Data.

AMENAGEMENTS HYDRO-AGRICOLES DE LA VALLEE DU FLEUVE NIGER



- the quality of the infrastructure;

- the organisation of farmers;

- the effectiveness of extension agents.

In 1978 the "modern" sector provided nearly 60 per cent of the national production, about 30,000 tons, whereas the traditional sector, mainly situated in the valley of the river (18,000 hectares out of 22,000) and the Departments of DOSSO and DIFFA produced 40 per cent or about 13,000 tons.

According to surveys carried out by the Agricultural Board and the UNCC, regular production growth is due mainly to an increase in productivity on the developed areas of the modern perimeters compensating to a large extent for the decline of traditional rice farming.

However, national production is insufficient, resulting in an increase in imports (1,030 tons in 1970, 16,835 tons in 1978 according to the OPVN).

- Rice Consumption - Trends:

According to recent surveys(1), rice consumption in NIGER is close to 30,000 tons in 1979. In 1985 the consumption level will be between 36,500 tons (at a constant consumption per capita = 53.7 Kg/year) and 50,000 tons (at an increasing consumption proportionate to the deficit in millet and sorghum). For 1990, estimates would be respectively of 41,500 and 70,000 tons.

Consumption forecasts	Rice (tons)	Paddy equivalents (tons)	Paddy production (tons)
1979	30,000	43,000	30,000
1985	36,500 to 50,000	52,000 to 72,000	
1990	41,500 to 70,000	60,000 to 100,000	

To fill the gap in the production deficit of 1990 it would be necessary to develop about 10,000 more hectares.

1.1.2 Other irrigated crops

Other crops produced in hydro-agricultural developments remain comparatively unimportant. On the perimeters of the UNCC the following production was obtained during the 1977/78 season:

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(1) Projection IBRD/Development Project Namaringougou (April 1978), Survey SCET/Development Project KOUTOUKALE (March 1979).

Paddy price to producer: 47 FCFA official price,
Average paddy price (Tillabery Market): 85 FCFA,
Rice price (Tillabery Market): 115 to 200 FCFA.

- terraces in the river valley (76 hectares)

  . groundnuts (rainy season farming): 6,150 tons (1,200 T/ha)

  . onions (dry season farming): 410 tons (10 T/ha)

- perimeters downstream of a dam (region of Tahoua):

  Rainy season

  . cotton (665 hectares): 1,450 tons (2,200 T/ha)

  . millet, sorghum, corn (357 ha): 750 tons (2,000 T/ha)

  Dry season (230 ha)

  . potatoes: 900 tons (6 T/ha)

  . onions: 2,200 tons (25 to 30 T/ha)

  . tobacco, tomatoes and others.

- finally, the following specific production should be pointed out:

  . truck farming perimeter of SODEPRIM near NIAMEY which supplies the capital;

  . fodder perimeter upstream of Tiaguirire (240 ha) to supply a feedlot (7,500 heads);

  . irrigated forest perimeter (400 ha of eucalyptus) underway (IBRD project) also near NIAMEY, intended to provide the capital with firewood.

1.2 Existing operations

- NIGER RIVER

  . Development of rice-farming basins (see Annex 1)

The first developments (1954-1960) were essentially concerned with building dikes in the basins of the major river bed; gates slowed down and controlled the rise of floods. This system does not permit double-cropping nor the introduction of high yield varieties. Most of these developments have been taken up again and renovated through the introduction of pumping to ensure a better control of irrigation and drainage.

The only type of development carried out already or under consideration, involves those ensuring total water control by levelling (perimeters where water level is maintained through a system of small contour bunds between 0.10 and 0.20 m) and a complete network of irrigation and drainage. These developments make high yields possible (about 10 tons/ha/year). However, this increasing complexity involves high investment costs (about 3 million FCFA/ha).

. Development of terraces

The terraces on the river are in general unsuited for rice farming but suitable for mixed farming (cereals, groundnut, niébé, fruits, truck produce). Those insufficiently developed (300 hectares for four developments) require the installation of a pumping station (discharge of 5 to 25 metres), of an irrigation and drainage network mainly for the peripheral protection of the perimeters. According to the farming and types of soil, terrace irrigation may involve several systems (sprinkler, drip irrigation) more efficient than irrigation by canals.

- OTHER REGIONS

. Water reservoirs at the bottom of hills

In the region of Ader Doutchi Maggia, small earth dams have been built to store flood waters from backwaters to provide irrigation for rainy season farming and, if water is available, some counter season farming.

This kind of development, justified in areas of high demographic density with uncertain water resources, presents several problems: very high investment costs (about 5 million FCFA/ha), irregular water supply, high evaporation and high erosion, the latter contributing to a fast filling up of reservoirs. Three dams have been damaged in this way (among these that of Ibohamane which controls 760 hectares) by the floods in 1978.

. Groundwater irrigation

The existence of groundwater aquifers at no great depth in certain areas (goulbis and dry valleys) make the implementation of borehole irrigation possible. This type of irrigation, still rarely practised, should be developed as part of the Maradi project where the development of 1,000 hectares of food and truck farming is contemplated.

II. CURRENT ORGANISATION OF IRRIGATED PERIMETERS

2.1 National level

The setting-up and management of irrigated perimeters is the responsibility of the Ministry of Rural Development but they have been carried out so far by two different organisations: the Service of Rural Engineering (Service du Génie Rural), in charge of preparing and building projects and the Nigerien Loan and Assistance Union (Union Nigérienne de Crédit et de Coopération, UNCC), in charge of the various tasks concerning the management and organisation of the perimeters.

The lack of co-ordination between these two organisations, the bureaucratic constraints and the lack of equipment in the Rural Engineering Service and of extension staff both in the perimeters and in the UNCC, result not only in management difficulties but also in the absence of a coherent policy in the programming and implementation of projects.

It is this situation which prompted the authorities to create the National Office of Hydro-agricultural Development (Office National des aménagements hydro-agricoles, ONAHA) which will combine the duties of the UNCC and the Service of Rural Engineering. The Statutes were approved on 31st December, 1978 and although the Director General had not been appointed as of 1st September, 1979, the first meeting of the Board of Directors was to take place in early October 1979. For almost two years since this project has been under consideration by the Government, the hydro-agricultural development sector has been going through a transition phase resulting in a slowdown of implementations and in a perceptible deterioration of management conditions in the perimeters. It is desirable, therefore, that the actual setting-up of the ONAHA and the transfer of the responsibilities from the UNCC and Rural Engineering Service take place as soon as possible.

2.2 Farmers organisation

Even if for various reasons they are not always successful, the methods of organisation and co-management for farmers that the UNCC has been trying to implement on the perimeters, seem worthy of interest.

On each perimeter a development committee and an administrative committee are set up, elected by farmer units (one unit per hectare). These bodies make decisions about running the perimeter. Relations with local authorities and the UNCC are maintained through the Development Committees, the latter also defining the policies in matters of agricultural production and general organisation of the perimeter.

III. MAIN DIFFICULTIES AND CONSTRAINTS TO THE DEVELOPMENT OF IRRIGATED FARMING

The government's purpose in hydro-agricultural development is to achieve 2,000 irrigated hectares per year.

This average rate of development is definitely above that of previous years which has remained from 1972 to 1978 below an average of 400 hectares per year.

A certain number of factors, however, oppose a rapid expansion of irrigation.

It has often been stressed that irrigated perimeters are in general costly investments (particularly in Niger where they reach record levels) requiring, therefore, a very high productivity per hectare. This high productivity is indispensable to ensure two necessary conditions for the success of perimeters:

- to clear an adequate farming revenue allowing the farmer to cover farming and maintenance expenses of the areas developed;
- to implement a rigorous organisation and administration on the perimeters to ensure the supply of services (water, agricultural inputs, collecting the produce, etc.) and the technical and economic training of the farmers.

These conditions imply mastering a complex set of problems both at the level of implementations, the maintenance and the development of irrigated lands. To solve this would require the mobilisation of adequate resources, especially a sufficient number of trained staff.

NIGER, like all other countries in the Sahel must therefore promote a definite training programme in order to have irrigated perimeter directors who can perform the duties of actual managers of a modern farming enterprise. From this training operation depends in fact the development and the success of irrigated farming.

An estimate of the staff necessary to ensure the management of 2,000 hectares of irrigated farming is given in Annex 4. A comparison with the Nigerien staff under training shows the extent of this constraint which can be provisionally compensated only through foreign technical assistance.

Besides these general considerations, current difficulties in the hydro-agricultural development sector in Niger have been broken down into two main categories:

- the problems related to implementation
- the problems related to management

3.1 Elaboration and implementation of hydro-agricultural developments

After an examination of existing implementation, the following can be pointed out:

- the dispersion of developments shows the intention of the government to extend irrigated production to all areas of the country.

This purpose to establish an interregional balance must, however, rest on an adequate knowledge of development conditions. Only the river Valley is until now fairly well understood thanks to previous studies, especially the feasibility survey on the KANDADJI dam. Thus, it is known that the expansion of irrigation in the river Valley (North of SAY) cannot exceed an area of 12,000 hectares in double cropping under the present conditions of low water level (15 cubic metres average in June). The government has therefore decided to carry out the implementation of the multi-purpose KANDADJI dam which would allow an interannual regularisation of water supply as well as the production of electric energy. The first phase of the development (dam at gradient 228) would permit the irrigation of 140,000 hectares and an energy production between 100 and 125 Megawatts. The investment cost (besides farming developments) is estimated at 80 billion CFA (1978 prices). Works are planned to start in 1982. The dam could be operational for irrigation from 1985.

In the other areas (Valleys of ADERDOUTCHIMAGGIA, dry valleys, terraces on Lake Chad) the surveys for the Master Plan for Water Development are still to be undertaken. They should specify the middle and long term development programmes which could be undertaken in these regions although their potentialities are more restricted and more difficult to develop than in the valley of the River Niger.

- The average size of developments remains modest (about 200 hectares).

This small area per unit which increases the cost of development per hectare, is mainly due to the restricted financial aid supplied by outside bilateral assistance.

A development policy intended for the equipment of a more important project, such as the IBRD, associated with KFW of the Federal Republic of Germany has carried out for the project of NAMARINGOUNGOU of 1,500 hectares, allows spreading out the implementation over several years and therefore improves the conditions of amortization of the equipments and results in a cost price reduction. The expenses for exploitation and functioning would equally benefit from considerable savings.

- The search for better water control on developments is to be recommended to ensure the reliability of irrigation and farming yields. This is a necessary condition both for income and motivation of farmers. However, it does not justify the high cost prices of irrigated development projects until now.

- The cost of development works appears in fact excessively high.

In addition to the growing complexity of irrigation systems there is also a considerable increase in unitary prices given by firms.

The comparison of cost prices in different recent rice-farming projects shows the following results (costs updated to 1979 without taxes).

	TOULA(1)	NAMARINGOUNGOU(2)	TIAGUIRIRE(1) Upstream
Net surface (hectare)	260	1,500	220
Cost per irrigated ha.	3,140,000 FCFA	2,920,000 FCFA	3,850,000 FCFA
Dykes	700,000	230,000	
Pumping station & electromechanics	240,000	280,000	1,500,000
Irrigation network	1,680,000	1,970,000	
Internal developments (levelling tertiary networks, roads, etc.)	520,000	440,000	2,350,000

This comparison shows:

- the very high level of costs and their constant rise above the increase in the cost of living,

- the importance of items such as "internal networks and developments".

This situation can be explained by the scarce competition among local firms and the fact that they are not accustomed to carry out hydro-agricultural developments (networks and terminal developments).

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(1) Results of bids of firms updated in 1979.

(2) Original estimate of the Consulting Engineer in 1977.

It is necessary therefore to seek:

(a) to increase competition by a wide publicity campaign (the potential market involving the implementation of 1,000 to 3,000 hectares per year should interest new firms);

(b) to develop, especially through the ONAHA, the means to implement works under State management;

(c) to look for, when planning works involving hydraulic infrastructures, technical solutions capable of lowering costs (prefabricated canal linings could be at least a solution worthy of consideration);

(d) to strengthen the control and management of projects lacking at the moment and which contribute to increasing the costs.

The creation of the ONAHA should achieve these objectives.

3.2 The management of projects - the problems of exploitation

Most developments once completed are taken over by the Hydro-Agricultural Developments Division of the UNCC which ensures their technical and financial management. Only some perimeters devoted to seed production or agronomic research are managed by the Agricultural Service or the INRAN.

The organisation of perimeters comprises the following:

- the Management Division at the UNCC in NIAMEY, with a Head of the Division, an expatriate engineer, and a secretarial and accounting section (one part-time accountant).

- departmental delegations:

  . in NIAMEY for projects concerning the Niger valley

  . in TAHOUA for ADM developments; including a total of three engineers (one expatriate) and exploitation staff.

- perimeter staff which for the 22 existing developments include:

  . 21 technical agents, heads of perimeters

  . 33 extension agents

These staff members are attached to the Ministry of Agriculture.

It is therefore important to stress the need to increase the number of extension agents at the different levels of operations:

- Management level where management staff are insufficient to ensure the follow up of perimeters and even more so, the preparation for taking over projects planned.

This lack is especially felt in such aspects as regular book-keeping and financing of projects, and for tasks involving the regular supply of perimeters.

- Perimeter level where the inadequate training of the heads of perimeters should be deplored /especially relative to the management of irrigated perimeters. The School of Agronomy in Kolo does not provide, so far(1), specific training in hydraulics and the UNCC does not offer training in this field/.

Extension work for farmers is definitely inferior to the expected norms (one extension agent per 50 farmers is needed, but there is only on the average one per 150). This shortage and the lack of an extension programme for farmers has led to serious delays by Extension Services on numerous irrigated perimeters.

However, some achievements are to be noted. They show that farmers can be perfectly integrated and play an important role in the collective management of their development and reach at the same time high levels of production. It is the case of TOULA (FED project, implemented in 1974/75), where the organisation, despite certain difficulties of a sociological kind, must be considered as an example for new projects.

The farmers organisation, based on considerations invoked in Annex 2, tends to have farmers participate in the extension of technical subjects (heads of farmers groups) and in management (management and development committee). This excellent principle which tends to reduce the direct intervention of the Authorities, implies a more intensive extension programme, especially with respect to the starting of projects and technical assistance by the co-operative bodies set up in each perimeter.

These activities should be systematically taken in charge by outside assistance for the first five years from the setting up of the perimeters.

Finally, it would be useful to make an on-going analysis not only of agricultural results but also of the sociological evolution of the farmers' structures which risk to be co-opted as can be noted on certain perimeters, to the profit of the traditional dignitaries. This is nevertheless an indication of the success of the projects.

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(1) The extension project of the IPDR at KOLO (see Annex 3) could, however, fill this gap. It renders obsolete the CILSS project of instructors training at MARADI.

The problems concerning collecting debts and the maintenance of developments:

The average expenses per hectare under exploitation amount in 1978 to 37,000 F/hectare/season. That is, once State subsidies are deducted, about 70,000 F/hectare/year have to be covered by farmers' rents.

The debt payment situation varies from one perimeter to another. Relatively good in the department of TAHOUA, it is more problematic in certain perimeters of the TILLABERY area. On average, the debt collection rate is about 70 per cent, the total of unpaid debts reaching 250 million FCFA by the end of 1978.

The debt per season is fixed at a ceiling of 40,000 FCFA/hectare in total (farming and hydraulic costs) to be compared to the gross product per crop of 180,000 F/hectare (see estimate of the average exploitation income in Annex 2) and a net income of 100,000 F/hectare.

An improvement in the debt collecting system is essential to perform an effective maintenance of projects. At the moment, maintenance work is not carried out satisfactorily. The deterioration of infrastructure reaches an alarming level on certain perimeters, and the renewal of pumping equipment is not always ensured.

This improvement involves the following:

- a greater discipline on the perimeters to respect the contracts established between the UNCC and the farmers basic units;

- the handling by the UNCC of a greater part of the crop. For each 0.25 hectare the farmer must at the moment deliver 350 kg of paddy at the price of 47 FCFA/kg. This official price is low, lower than the price the farmer can get on a private market (from 55 to 80 F/kg in 1978). This irregular situation can be explained by the constraints in exploitation of the rice fields (which suffer from a lack of supply resulting in a high cost price);

- establishing provision for maintenance and replacement, and the effective application of corresponding budgets;

- an increase in rents and the pegging of paddy and fuel prices could also be contemplated.

Applied research:

Development operations should integrate more effectively the results of applied agronomic research:

- the problem of ageing rice fields;

- the problem of the exploitation of terraces (the rotation of crops and the working out of adapted and profitable production systems);

- complementing rainfed and integrated farming on land under exploitation.

These are subjects, among others, which must be essential concerns for the UNCC. Such experimentation should be developed within the projects themselves.

The whole department of hydro-agricultural development of the UNCC must without delay be transferred to the ONAHA. To be effective, this organisation should follow the recommendations stated so far.

IV. PROGRAMMES UNDER WAY

They concern operations undertaken since 1st January, 1977 and which are built or under way on 1st September, 1979.

(a) RIVER VALLEY

KARMA:

Resumption of rice-farming (modern perimeters) on 150 hectares.

- Dam repair, drainage network, levelling out parcels, etc.
- Financing by FED. Execution under State management (Rural Engineering Service).

A solar pump was installed in KARMA (ONERSOL Project) for the irrigation of 20 hectares.

- Management handed over to the UNCC.

FIRGOUN:

Redevelopment of perimeters with total water control on an old development of 220 hectares (located in the KANDADJI dam basin).

- Pumping stations.
- Internal development under State management (Rural Engineering Service) about to be completed (complementary financial aid requested from the FNI)(1).
- Management handed over to the Department of Agriculture.

LOSSA III:

- "Terrace" type development of 160 hectares.
- Financed by the FAC.
- Exploitation is rather incomplete [Research station of GERDAT (INRAN) - Cereal Project] due to inadequate management and to the non-completion of infrastructure.
- Management provided by the Department of Agriculture.
- Need for additional financial aid estimated at 50 million FCFA.

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(1) FNI = National Investment Fund (Fonds National d'Investissement).

KIRKISSOYE:

(100 hectares) basin taken over by Rural Engineering (renewal pumping station) through FNI financing - expansion towards the South of 10 hectares.

- Management handed over to the UNCC.

TARA:

(140 hectares) basin with implementation of rice-farming perimeter, financing by the FNI and AFRICARE (USAID) (surveys and implementation carried out by Rural Engineering).

(50 hectares) are completed - development not yet handed over to the UNCC.

- Tiaguirire upstream (project financed by the Federal Republic of Germany)

Perimeter intended for the production of irrigated fodder and pasture land for intensive cattle raising (7,500 heads/year of 240 hectares.

Delays could be ascribed to slow progress in the construction of the electric line. Complementary financial aid is under consideration (600 million FCFA).

- Tiaguirire downstream (project financed by the FAC)

Rice-farming perimeter with total water control (only the peripheral damming and the pumping station exist). Complementary financial aid is being requested (about 300 million CFA) to complete the equipment.

- Goudel (project financed by the CEAO)

Basin of 85 hectares - the dam is about to be completed. Financial aid for internal development is being sought (150 million CFA).

(b) OTHER REGIONS

BIRNI N'KONNI PROJECT

Brief description:

- Development for the irrigation of a plain of 2,600 hectares (3,300 ha/gross) by two water reservoirs:

ZANGO (15 Hm^3) and MOZAGUE (30 Hm^3) dams.

The first phase of the project is under way. Three hundred hectares have been brought into cultivation (2/3 sorghum + 1/3 cotton and wheat and niébé farming in counter season). This first phase comprises the implementation of:

- the main infrastructures:

  . ZANGO dam (432 million F)
  . TAMPON reserve (350 million F)
  } 1982 million FCFA
  . Canal 14 km (1200 million F)

- a perimeter of 1,700 hectares (gross) (1,360 irrigated hectares) comprising:

  . the building of a protection embankment of 10 km.

  . secondary embankments and canals for surplus irrigation water for 2,300 million.

These developments have been realised for a total cost of 4,283 billion CFA (financing by: FNI, BCEA, UNDP).

The Rural Engineering Service has realised under State management (financing by the FNI for 227 million FCFA):

- the lining of the principal canals;

- the clearing and preparation of soils on 600 hectares;

- the internal development (levelling) of 300 hectares.

An additional investment to complete the first part (clearing and preparation of soils on 1,100 hectares - development of parcels on 1,760 hectares) is estimated at about 400 million.

The management of the development is ensured directly by the project. Handing it over to the UNCC has not been contemplated yet.

DIFFA (CDA of DIFFA):

The small perimeter of TAM (food farming on 20 hectares) and the CDA project of 120 hectares of rice-farming with total water control on the KOUMADOUGOU have been implemented as part of the operations of the DBLT (financing by WAEC)(1).

Finally, several small food farming or experimental projects have been carried out in the areas of Agades and Tabalak.

The status of the operations programme undertaken at the beginning of 1977 shows:

- the slow rhythm of implementation:

Only three developments have been completed adding up to less than 400 hectares.

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(1) WAEC = West African Economic Community.

- The great number of non-completed works either because of exceeding credit limits or because of technical contingencies.

Of the ten sites involved, seven representing a total area of 2,300 hectares are in this situation. Their completion necessitates an additional financial assistance of over a billion and a half FCFA, requested from the National Investment Fund (FNI).

Most of the additional works to be implemented fall within the competence of State management (terminal developments). However, the Rural Engineering Department does not have the appropriate resources in equipment or trained personnel.

This situation is of great concern. It shows the extent of the improvement needed to be made in the organisation, as well as in the maintenance of the existing perimeters where long delays are noted and where the major repairs required are estimated at about one billion FCFA.

It is this difficult situation which accounts for the creation of ONAHA. It is evident that new and substantial resources (equipment, staff and resources) must be made available as soon as possible in order to make this organisation, unanimously considered indispensable for the development of irrigation, a reality.

V. FUTURE PROGRAMMES

5.1 Operations being financed

VALLEY OF THE NIGER

Namaringougou: 1,500 hectares financing by IBRD/KFW

This project is getting off the ground. It concerns a number of rice-farming perimeters with total water control. Its implementation will be carried out between 1979 and 1983 (cost of the project: F.CFA.4.85 billion). This project has been implemented under State management supervised by ONAHA and donors contemplate the appointment of management staff to carry out construction. This project will make the implementation of ONAHA at the regional level in TILLABERY possible.

- Koutoukale:

Rice-farming perimeter with total water control (400 hectares) - cost of the project F.CFA.1.5 billion (financing by FED under consideration). Its implementation should be carried out between 1980 and 1981.

OTHER REGIONS

- Galmi:

Development through upland water reservoirs - equipment of 500 hectares (financial assistance being negotiated for F.CFA.3.9 billion with the Federal Republic of Germany) for food crops (onions).

- Maradi:

Irrigation project forming part of the development programme of MARADI. This project concerns the development of 1,000 irrigated hectares through boreholes and upland water reservoirs. The feasibility study is complete, and the IBRD and the CCCE have reached a general agreement for the setting up of the project.

These four projects make a total of 3,500 new hectares.

5.2 Projects contemplated within the Five Year Plan

For these projects in different stages of preparation financial assistance is needed.

They consist of the following nine operations:

1.1 DAYBERI: rice-farming perimeter of 400 hectares

1.2 YALEWANI: rice-farming perimeter of 150 hectares

1.3 KOURANI-BAHIA: rice-farming perimeter of 750 hectares

1.4 LATA: rice-farming perimeter of 190 hectares

1.5 KOUANZA-OUANZA: rice-farming perimeter of 410 hectares.

The surveys for these five developments were tendered for bid in 1975-76 (AGRAR for the first two and 1977-78 SOGREAH for the other three).

These projects must still be completed at the socio-economic and financial levels.

The updating of costs and preparation of PID are estimated at 10 million CFA/project.

1.6 SAY (under discussion with Belgium) - 300 hectares

The technical dossier for the project was made in 1977. Belgian financial aid, which seemed firm, appears to be under reconsideration.

1.7 KOLO: 500 hectares

Feasibility study and PID to be made (F.CFA.25 million).

1.8 NAMARDEGOUGOU (feasibility study made in 1979) 150 hectares.

1.9 TILLABERY (Sugar perimeter) of 3,500 hectares supplying a sugar-refinery of 20,000 tons (feasibility studies are completed - financing of the project is being set up). Given the nature of this project it is mentioned here only as a reminder.

TOTAL: 2,850 hectares (+ 3,500 hectares)

OTHER REGIONS

- Birni Nikonni II:

This project concerns the continuation of the project under way. The second phase of the 1,300 hectares project involves an investment cost of F.CFA.3.53 billion (1978 prices), comprising the building of the MOZAGUE Dam (820) + Canal improvement (210) + Perimeter (2,500) - Partial financing needs to be obtained.

5.3 Programme of Studies to be undertaken

The implementation of the above-mentioned projects in the valley of the Niger, as well as the indispensable additional information to determine development conditions in other areas, presuppose carrying out certain studies.

According to information provided by the Rural Engineering Service, the following programme is contemplated for the five-year period of 1980-84.

5.3.1 Valley of the NIGER:

- Projects concerned with rice-farming developments:

  . Setting up project identification documents of

    DAYBERI - YALEWANI - KOURANI - LATA and KOUANZA-OUANZA:

  . updating project costs on the basis of existing technical surveys. Evaluation of costs/benefits of the projects;

  . study of the organisation for implementation;

  . estimate cost of the surveys per project:

    F.CFA.12 million, that is for the five projects: F.CFA.60 million

    KOLO: feasibility study of project (500 hectares): F.CFA.50 million.

- Detailed preliminary engineering for KANDADJI dam mentioned as a reminder, financing would be ensured through French assistance.

5.3.2 Valley of the MAGGIA:

Several studies have been made on this region, especially during the years 1960-70.

It is necessary to take up these studies again, to update them, to complete their data and to identify these projects as part of a development plan for the area.

The cost of this programme is estimated at F.CFA.100 million.

5.3.3 Valley of the KOUMADOUGOU and terraces on Lake Chad:

The UNDP, as part of the LCBC, has just completed an important study on future prospects of the Lake Chad basin.

Only the irrigation possibilities of the valley of the KOUMADOUGOU have been estimated; they would be relatively low and restricted to 2,300 hectares. The survey does not mention the Nigerien areas running along the lake where important subsistence farming is developed (sorghum and wheat).

The development plan of this area - where the conditions for a more intensive development remain still to be analysed - should be studied.

A first estimate considers that the cost of the studies (topography, agropedology, identification of development projects) would be about F.CFA.85 million.

5.3.4 Dry Valleys - utilisation of groundwater:

A number of studies are to be undertaken on certain dallols where only groundwater resources can be tapped for irrigation and to provide food for human and animal consumption.

Although no definite programmes have been submitted, one can mention the plains of TARKA (survey under agreement with the CCCE), of KAROFANE, of TALAK, of the West and East fringes of the AIR, etc., where water resources are more or less known and where a feasibility study on their utilisation should be carried out.

A survey of three to four projects is estimated roughly at F.CFA.200 million.

VI. SETTING UP THE NATIONAL OFFICE OF HYDRO-AGRICULTURAL DEVELOPMENTS (ONAHA)

We have pointed out earlier the reasons behind the creation of this new body which will assume the functions performed at present by the Rural Engineering Service and the UNCC.

However, a number of difficulties seem to hinder the setting up of this new body, officially created on 31st December, 1978, and which since March 1979 benefits from the assistance of three expatriate engineers stationed in the country through French assistance. Not only has the General Director not been appointed yet but his attributions have not been clearly defined.

This ambiguous situation and the progressive deterioration of the resources at the disposal of the Rural Engineering Service (equipment) and the UNCC, results as it has been pointed out earlier, in a serious delay in the execution of projects, which is incompatible with the scope of the new intended programmes. Therefore it is necessary to improve as soon as possible:

(a) The transfer, once the respective responsibilities of the Rural Engineering Service and the ONAHA have been defined and as soon as material conditions will allow it, of the corresponding resources in staff and equipment from the UNCC and the Rural Engineering Service, to the ONAHA.

We think it is important to stress the necessity to look for a complementary exercise of functions between the Rural Engineering Service and the ONAHA. It seems clear that the ONAHA will ensure the implementations to be carried out under State management and under contract. It does not seem practical to contemplate a division of responsibilities from these two types of works for self-evident reasons of technical co-ordination and sound personnel management. Such a solution would entail a costly duplication of equipment (topography, work supervision, etc.) hardly practicable in the present state of financial constraints.

Furthermore, the need to ensure a more coherent equipment policy (search for a reduction of costs in implementation, better maintenance and management, etc.), seems to justify that the ONAHA should be in a position to ensure the technical preparation of projects and should be therefore endowed with a capacity for making design studies directly.

The Rural Engineering Service should moreover be concerned with the other aspects of rural equipment, that is, with the general study of hydro-agricultural development such as: basic technical and economic surveys, Master Plans, programming studies, research and experimentation, etc., and to the technical control of implementation. This twofold function is at the

moment performed unsatisfactorily and, in the future, should be the basis for the study of the policy to be applied in the field of irrigation.

(b) The number of works carried out under state management (about 1,000 hectares/year), the delays accumulated in developments and in the heavy maintenance of the perimeters, mean that the ONAHA should be given the necessary resources both in equipment and staff for these tasks. A priority investment of about F.CFA.2 to 2.5 billion is required within the next two years, in addition to the cost of new developments.

(c) Finally, in order to carry out its other assignments, especially in the field of exploitation, ONAHA must have at its disposal additional staff, both at the level of the Office management and regional posts (TAHOUA, TILLABERY and NIAMEY), as well as at the level of the perimeters themselves.

In 1978, the Ministry of Rural Development was considering for the Rural Engineering Services and the ONAHA the following estimates concerning the needs for the period 1978-1983:

- Engineer G.R. or I.E.R.: 20 that is 3/year
- Engineer Rural Works: 30 that is 5/year
- Senior Technicians and Agricultural Technicians: 43 that is 7/year.

The measures taken, although reflecting a considerable effort on the part of the Government to fill the gaps in training (see Annex III concerning the IPDR extension project at KOLO) remain nevertheless well below these estimates(1). It seems in short that the creation of the ONAHA must be the occasion for taking back in hand the irrigation sector. To ensure this organisation a good start, considerable aid must be granted both by the National Investment Fund and the international community.

This aid should serve the following three objectives, the first two being the most urgent:

- To provide the resources in equipment (Civil Engineering equipment and the corresponding infrastructures) and in staff (reinforcement of the extension service by resorting provisionally to technical assistance) and in the organisation of the functions of the Office.

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(1) The School of Rural Engineering of OUAGADOUGOU expects to receive only 5 Nigerien students for the period 1980-1982.

- To rehabilitate developments in a state of deterioration, to complete sites discontinued, to appoint the corresponding management staff and to reinforce development operations on existing perimeters.

- To programme and pursue new implementations according to the resources available.

It is in this sense that the ONAHA must prepare a priority action programme which in the coming months should serve as a framework for the co-ordinated interventions of external assistance.

HYDRO-AGRICULTURAL DEVELOPMENTS IN NIGER - Five year period 1979-83

SURVEYS	Type	Status of Financing	Estimate in F.CFA millions
Dam of KANDADJI	Detailed preliminary survey & D.C.E. (under way)	FAC	As reminder
Development Valley of the NIGER:			
Setting up 5 feasibility projects	Updating & Agro-eco. complement	To be obtained	60
Feasibility survey of KOLO	Project identification document	To be obtained	50
Valley of the A.D.M.			
Master Plan Development	Identification survey & programme project	To be obtained	Terms of reference to be defined
Terraces on Lake CHAD:			
Master Plan Development	ditto	To be obtained	ditto
Dry Valleys:			
TARKA	Feasibility survey	CCCE agreement	60
Other projects (KAROFANE, TALAK, AIR ...)	ditto	To be obtained	Terms of reference to be defined
SUPPORTING ACTIVITIES			
Assistance for starting up the ONAHA . Equipment (for 1,000 developed hectares/year) . Infrastructures (Workshops, construction) . Rehabilitation works . Additional technical assistance	Priority programme to be defined by the ONAHA	To be obtained (multi-donor programme)	F.CFA.2 to 3 million

IMPLEMENTATIONS	Type and area	Status	Estimate in F.CFA.Million	Remarks
Valley of the NIGER:				
. NAMARINGOUNGOU	Basin 1,500 ha	Confirmed agreement IBRD/KFW	4.85	Start-up end 19[illegible]
. SAY	Basin 300 ha	Under discussion with BELGIUM		
. KOUTOUKALE	Basin 400 ha	Under discussion with FED	1.4	
. TILLABERY	Sugar project 3,500 ha	(Under way)	As reminder	
. Seven other projects in the Valley of the NIGER: DAYBERI, YALEWANI, KOURANI, LATA, KOUANZA, KOLO and NAMARDEGOUNGOU	Basins totalling 2,550 ha	In search of financing	9.0	
Other regions:				
. GALMI	Reservoir at bottom of hills 500 ha	Under discussion with Germany	3.9	
. MARADI	Groundwater 1,000 ha	Under discussion with IBRD	-	
. BIRNI KONNI II	Dam 1,300 ha	Partial preliminary interest (Arab Fund)	4.2	

ANNEX I

PERIMETER DEVELOPMENT ON THE NIGER RIVER

ANNEX I

PERIMETER DEVELOPMENT ON THE NIGER RIVER

The NIGER valley, stretching for 550 kms between AYOROU in the North and DOLE in the South, is one of the most densely populated areas in the Republic of NIGER, because of the agricultural potential of the river basin.

If the average demographic density of NIGER taken as a whole is about 3.5 inhabitants per square km, the river area has a density ten to twelve times above the average. The stretch of the territory between TILLABERY and SAY (40 to 70 inhabitants per square km) is more densely populated than that between SAY and DOLE (15 to 40 inhabitants per square km).

The annual rate of demographic growth is 27 per cent making it possible to expect a doubling of the population in 25 years.

The valley also offers the greatest hydro-agricultural potentialities of the country (140,000 hectares in the valley and on the bordering terraces) which are only partially developed (3,500 hectares in total).

This area will very likely become the site of the largest irrigation developments from now to the year 2,000, not only in rice and eventually fodder production, but also in the production of cereals, fruit and truck farming on the light soils of the terraces.

I. GENERAL DATA

Rainfall varies from 370 mm in the North to 870 mm (GAYA) in the South. There are great interannual disparities around the average and distribution is very irregular during the year. It is therefore essential:

- to be able to palliate a possible deficit through irrigation,
- to have a sufficient control of the waterflow in order to avoid flood risks in the developed areas.

Evaporation is superior to 2,200 mm in NIAMEY and about 3,000 mm in TILLABERY.

The hydrology of the NIGER river is relatively well known thanks to the observations and surveys done in the past (see the ORSTOM publication). The general hydraulic conditions of the NIGER river are sketched out in the diagram below. These are characterized by a shift between the rise of the river (low water level in June and July, higher water level in February) and the rainy season (June to October) which allow for two farming seasons.

Recent observations show however, certain anomalies (now being studied) in the regime of the river, these consisting in an early and more abundant flow and in an early low water level flow (up to 1962 in NIAMEY the average flood flow was of 1850 m^3/s and the average low level water flow was of 43 m^3/s. In 1976, year of normal rainfall, it was of 16 m^3/s).

If this phenomenon is maintained or worse still is intensified, its consequences would be greatly damaging for agriculture:

- developments would not be sufficiently protected against floods.

It has already been pointed out that the low water level of the river must be retained in perimeter developments which cover more than certain areas (about 12 to 1,500 hectares). The water supplies drawn in May and June are insufficient to meet the water requirements of farming beyond this time.

The KANDADJI dam, situated North of the NIGER - feasibility studies are still being pursued - would allow the regulation of the river flow (400 to 800 m^3/s in regulated flow) and would meet the water needs of the various activities contemplated in the valley. This project, depending on the results of the studies, could be operational by 1985.

The water requirements for rice farming, the essential production on the river, are estimated as follows by the Rural Engineering Service (Middle Valley):

- rainy season: 6,900 m^3/hectare at the station;

- dry season: 16,800 m^3/hectare.

The water requirements in June are:

- $\frac{2,360}{0.8}$ = 2,950 m^3/hectare that is for 15 hours: 2.81/s/ha.

2. BASIN DEVELOPMENT

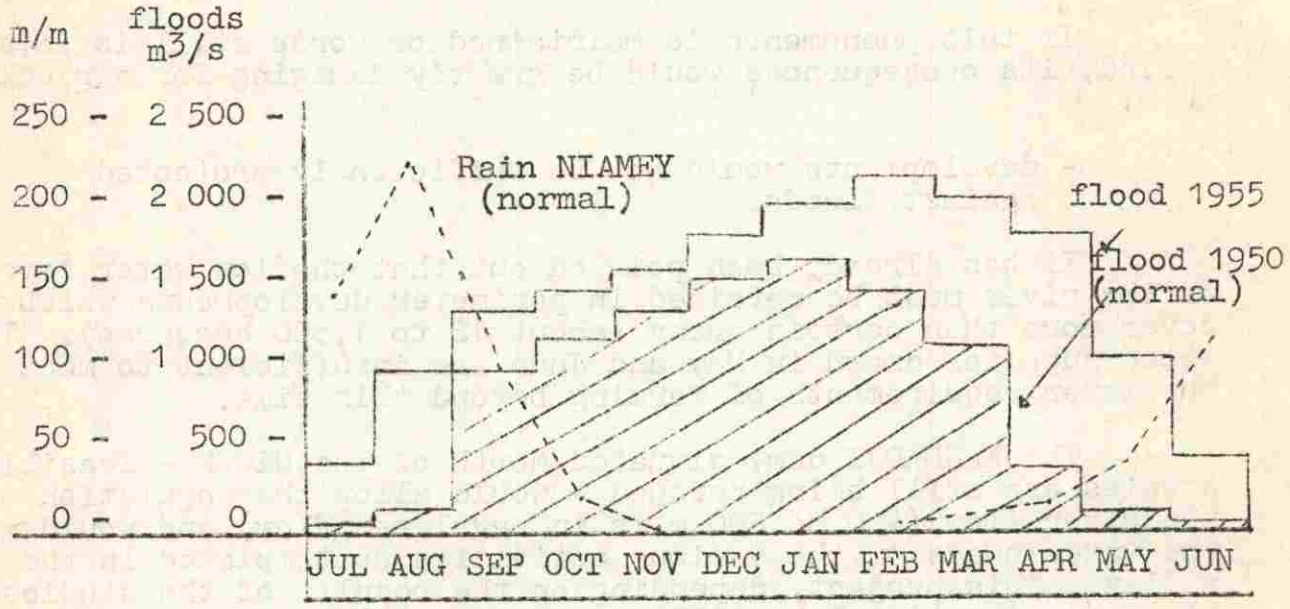
Development principles

In order to make use of the waters of the river during the dry season, certain infrastructure is necessary for the protection of the basins suitable for farming.

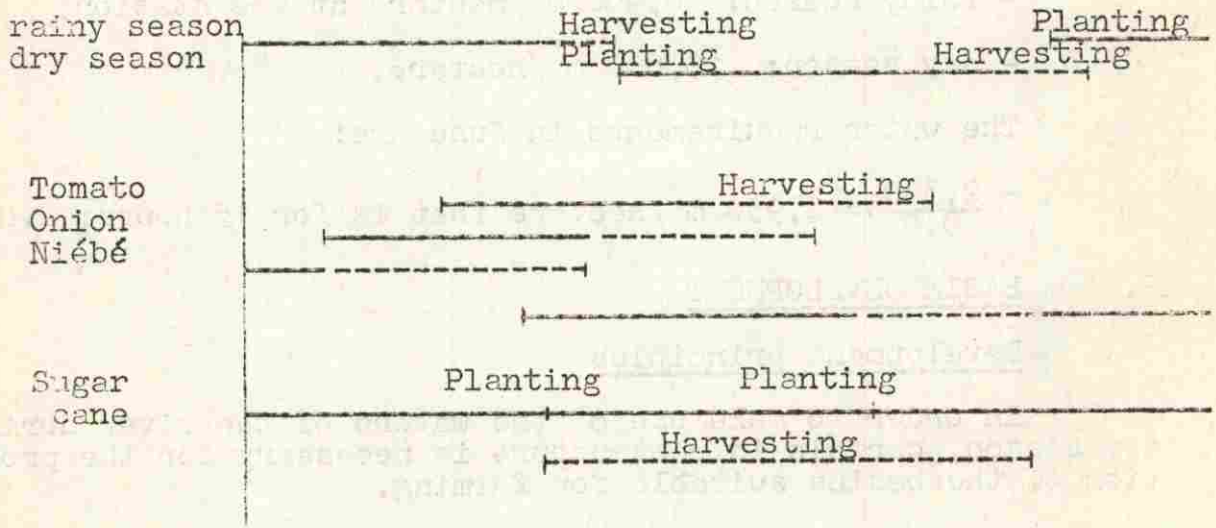
Complementary irrigation necessary during the rainy season, considering the low level of the waters, are restricted by a very low water flow.

The basins, given their location on the major bed of the river, are in general rather small - 200 hectares on average - and elongated in shape with a rather marked micro-relief. The development principle consists in surrounding the basin with

AGRO HYDROCLIMATIC DIAGRAM



Rice D 52/37



protection dikes against floods and rizophagous fish. The perimeter provided with intake and discharge water works can then be developed with a more or less complete control of water supply.

The first developments were implemented in 1953. There are at the moment about 25 projects representing a total of 3,500 hectares developed.

Besides natural flooding basins with or without anti-rizophagous wire-netting, which remain subjected to the contingency of rains and floods, three other types of developments are to be found:

A. SIMPLE FLOODING

- Flood-proof embankment with intake and discharge water works (water level from 0 to 0.70m) and internal development in terraces formed by small embankments or BUNDS restricting the water level to 0.20 - 0.70m.

- Gravity and drainage irrigation canals.

B. CONTROLLED FLOODING

- Same type of development as above with supporting pumping equipment.

C. ARTIFICIAL FLOODING

- Same type as above.

- Perimeters are levelled to restrict water level to 0.10 - 0.20m.

A complete network of irrigation and drainage canals (water supplied through low pressure canals or pipe serving very small basins only).

By the end of 1979, about 3,800 hectares had been developed. The latest developments belong to type C, which according to the UNCC, reduces exploitation costs and allows for better economic results at the farmer level.

It is acknowledged by now that only this last type of development will be implemented in the future. In fact, despite its high implementation cost (about 3 million F.CFA per hectare), this type of development makes high yields possible, about 10 tons of paddy/hectare/year.

ANNEX II

UNCC DOCUMENTS CONCERNING THE MANAGEMENT OF HYDRO-AGRICULTURAL DEVELOPMENTS (1978)

II.1 STRUCTURE OF A GENERAL PERIMETER EXPLOITATION ACCOUNT

(updated).

1. OUTLINE

COSTS	SOURCES
- Farming costs (prefinanced by CNCA)	- Costs charged to farmers. (Depending on the size of cultivated areas)
- Development costs paid by the farmers	
- Development costs (subsidised by the State)	- Withdrawn from solidarity fund (if necessary) - Exploitation subsidies - Subsidies

2. EXPENSES

The main expenses accounts used to work out development charges are the following.

2.1 MAINTENANCE OF PERIMETER

Various supplies and, above all, manpower.

This item varies greatly from one season to another.

2.2 MAINTENANCE OF PUMPING STATIONS

Repairs, purchase of parts and maintenance of works connected with pumping stations (main canal, pumps, etc.) which vary from one season to another.

2.3 FUEL AND/OR ELECTRICITY

Includes lubricants.

2.4 WAGES

Permanent staff assigned to perimeters (pump assistants, water foreman).

2.5 MANAGEMENT EXPENSES

Office supplies for the development.

2.6 GENERAL EXPENSES

Expenses which cannot be charged to any specific perimeter. Sharing is carried out at the end of season according to area size.

These expenses essentially concern the ones related to preparing costs of vehicles.

2.7 FUNDS FOR CIVIL ENGINEERING WORKS

In order to meet the substantial expenses in network maintenance that might be caused by heavy repairs (collapse of a canal, deteriorated gate, etc.). Each year a fund is set up, fixed at 2,500 F/ha/Season. This way maintenance expenses can be regularised from year to year and they may constitute a reserve.

2.8 AMORTIZATION OF HYDRAULIC EQUIPMENT

These expenses correspond to the replacement cost of pumping equipment (engines, pumps, pipes, etc.). Amortization depends on the type of equipment:

Heat engines: 5 years

Electrical engines: 8 years

Centrifugal or ram pumps: 10 years(1)

Obviously this item is subject to variations.

2.9 FUNDS FOR REPLACEMENT OF HYDRAULIC EQUIPMENT

They help compensate price increases which are not contemplated by the type of amortization in use. This supplementary reserve allows to pay for the price differences when buying new equipment.

These funds are calculated on the basis of a 5 per cent annual price increase for supplies.

This item will be revised for next year's charges, that is the 1979 dry season.

2.10 FUNDS FOR REPAIRS ON HYDRAULIC EQUIPMENT

Funds are set up every year in order to meet the considerable expenses that might be required for heavy repairs.

This reserve is estimated according to the type of engine and the number of working hours.

For a heat engine with pump we multiply 5 per cent by the number of working hours per year on 1,000 hours.

For an electric engine we calculate on the basis of 1.5 per cent. Example: 5 per cent x $\frac{1,500}{1,000}$ h x Value of equipment

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(1) For each new installation, amortization will be fixed at eight years.

2.11 OTHER AMORTIZATION

They refer to the amortization expenses concerning the developments division as well as topographical equipment. This reserve is divided up among all developments according to their area.

This item will be revised for the next year's charges, that is the dry season 1979.

2.12 RESERVE FOR SOLIDARITY FUNDS

Subsidised entirely by the State.

In certain cases these funds are given back to the farmers unable to pay for their developments. They are supplied by an annual endowment, calculated on the base of 10 per cent of development costs.

2.13 RESERVE FOR THE MANAGEMENT ORGANISATION

Subsidised entirely by the State.

The UNCC bears certain development expenses such as (working conditions of vehicles, travel expenses, allowances to extension workers, etc.).

Funds amount to Frs.4,000/paying ha./year. In fact an amount of Frs.6,000 would be more adequate.

2.14 FARMING EXPENSES

They include: seeds, fertilizers, insecticides, soil preparation (other than those carried out by the DARMA) prefinanced by the CNCA.

2.15 LOAN INTEREST

Expenses are prefinanced by the CNCA.

The farmer pays interest which is 6.5 per cent but reached 8 per cent for fiscal year 1977-78 and will be of 9.5 per cent for fiscal year 1978-79.

3. YIELDS

3.1 MISCELLANEOUS YIELDS

Some developments sell gas-oil, rice seeds, fertilizers, etc., to other developments. This constitutes an income for the development.

3.2 SEASON CHARGES

Charges are collected from the farmers after the season. They cover development and farming expenses.

That is total expenses (less final stock and products) divided by the number of hectares per development.

They are calculated then according to the actual exploitation expenses.

Besides these expenses, rents cover an endowment into the different funds accounts (amortization motor-pumps, funds for heavy works and heavy repairs, etc.).

The expense items to be taken into account for the calculation of charges are:

Account No.	Expenses items	base of calculation
608	purchase of fuel and lubricant	actual expenses
610	perimeter staff	actual expenses
612	perimeter maintenance	actual expenses
613	maintenance and small repair of motor pumps	actual expenses
6.813	amortization of motor pumps	actual expenses
157	funds for heavy works	Frs.2,500/ha/ season
158	funds for heavy repairs motor pumps	5 per cent price new/year for 1,000

Charges are to be paid entirely by the farmers and normally are not subsidised at all.

In any case the ceiling is fixed at Frs.40,000/ha/season, on the river, with the exception of SAKOIRA and TILLAKEINA (farming onions and melons).

3.3 EXPLOITATION SUBSIDY

It covers the expenses which are not taken into account by the farmer's charges:

- participation in the expenses of the management organisation, calculated on the base of an amount of Frs.4,000/ha/year;

- solidarity funds 1/10 of the global amount of annual expenses.

3.4 EXPENSES COVERED BY FUNDS

Amount recuperated from the reserves already accumulated. Expenses may be motor pumps or canal repairs.

3.5 WITHDRAWAL FROM SOLIDARITY FUNDS

It helps to balance costs and yields, if necessary a partial or total amount of the solidarity fund can be withdrawn.

II.2 GENERAL EXPLOITATION ACCOUNT (RAINY SEASON 1978)

EXPENSES		YIELDS	
Initial stock	1,191,256	Final stock	5,298,881
Maintenance perimeter & management expenses	11,940,804	Miscellaneous yields	32,749,934
Station maintenance	4,239,468	Rainy season rents	66,400,319
Fuel & Electricity	62,862,032	Dry season rents	76,923,998
Wages	6,718,835	Exploitation rents	7,929,132
General Expenses	1,300,155	Farming expenses fees C.N.C.A.	11,422,451
Funds Civil Engineering Works	15,943,970	Charges covered by funds	10,229,360
Funds heavy repairs	11,559,800	Exploitation subsidy	24,914,172
Funds renewal hydraulic equipment	5,873,690	Subsidy LOSSA central	4,000,000
Reserve amort. Veh. Topi. Mat.	2,221,484	Withdrawal solidarity fund	12,782,152
Reserve solidarity fund	10,128,212		
Reserve management body	13,885,960		
Expenses nurseries	3,041,661		
Farming expenses	65,872,394		
Loan interests	4,974,221		
Other expenses	3,767,273		
TOTAL	251,750,399	TOTAL	251,750,399

Each perimeter is divided up in basic units of about 50 hectares each: the Mutual Farming Units MFU (Groupements Mutualistes de Production-GMP) grouping together 100 to 120 farmers. Each extension agent is, in principle, responsible for a MFU.

11.3 FARMER STRUCTURES IN RIVER DEVELOPMENTS

DEVELOPMENT COMMITTEE (DC)

DC Office:	President, Secretary, Treasurer + Director of perimeter
Mutual Farming Unit Office:	President, Secretary, Extension Agent + 5 delegates per Mutual Farming Unit Office (MFU)
Administration Representative:	(Sub-Prefect, Head of Service)

MANAGEMENT COMMITTEE (MC)

DC Office
MFU Office
UNCC Extension Service

MFU1 MFU2 MFU3

Office: President, Secretary + Extension Agent
5 Delegates
Water foremen
Extension farmers

The farmers problems are discussed in a General Assembly of MFUs. In this assembly a committee is also elected which deals with most other matters.

The Union of these MFUs with the five delegates supporting it headed by a President (helped by a Secretary and a Treasurer) and the Director of the perimeter, constitute the Development Committee, holding the power of decision for the management of the perimeter.

This obviously constitutes a rather large assembly, especially for large size perimeters, therefore an executive body, the management committee, deals with current management affairs on the perimeter.

It is this Management Committee which calls for a meeting of the Development Committee when it considers that the decisions to be taken are important enough.

ROLE OF UNCC'S AGENTS

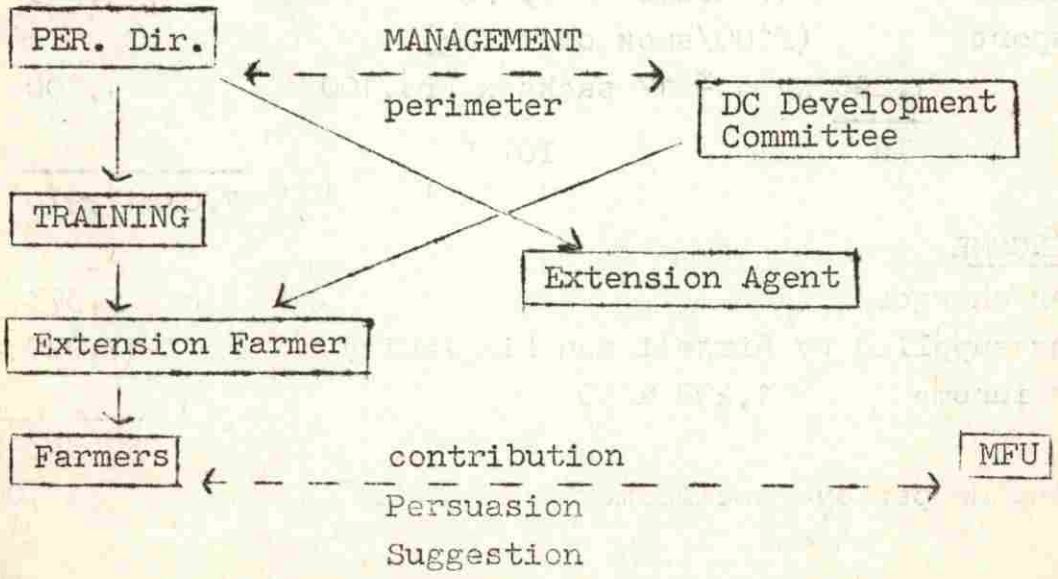
The Director of a perimeter plays a fundamental role: he is in charge of setting up the Development Committee so that the latter can be involved in every activity and assume its responsibilities i.e. enforce regulations and apply sanctions if necessary.

In fact, UNCC agents are at the moment capable of following the policy applied on the perimeter since they are present at every assembly.

Every month, perimeter Directors meet among themselves to analyse the problems arising on their perimeters and it is on this basis that they determine the policies to follow.

EXTENSION WORK

It is carried out primarily by the extension farmers (three per each MFU). At the moment, it is one of the fundamental roles of the UNCC extension agents to ensure this training and to control its impact.



Extension method in service at the moment as part of the campaign's plan.

TRENDS

Although there is a development committee on each development, not all of them play an active role. It is therefore the UNCC extension agent's aim to involve these committees in all the decisions to be taken concerning the policies to be chosen. On the other hand, Mutual Benefit Funds have been created in perimeter on the river and these constitute a powerful tool of intervention for the Development Committees.

These Mutual Benefit Funds receive the surplus funds that the co-operative gets from marketing agricultural products. They can eventually be tapped to contribute to finance certain specific operations. They can help farmers fight against the speculation of dealers, in time interval between harvests, for personal loans, and they can also constitute a means to foster new investments (agricultural equipment).

Mutual Benefit Funds can also be contemplated as an effective means for a co-operative to direct the course of its development. For the aim of the structure of co-operative development is not only to prevent these to concentrate themselves exclusively on development but also make a regional co-operative assist, through Mutual Benefit Funds, certain specialised units (marketing, craftsmen groups, irrigated perimeters, etc.) by means of additional development programmes.

II.4 AVERAGE INCOME PER FARMER - TYPE/SEASON

A typical farmer is a farmer cultivating an average of 28 ares (28/1000 of a hectare).

Work supplied by himself and his family

Ploughing (Frs.6,000/ha, price asked by the UNCC for the hiring of a motor-cultivator).

Planting	44 Hours x 75,6/h	F.CFA.1,680
		3,326
Maintenance	98 Hours x 75,6/h	7,409
Harvesting	34 Hours x 75,6/h	2,570
Threshing	17 Hours x 75,6/h	1,285
Transport	(F100/sack of 75 Kg)	
$\frac{1,298}{75}$	Kg = ± 17 sacks x Frs.100	1,700
	TOTAL	F.CFA17,970

NET INCOME

Farmer charges		9,373	
Labour supplied by himself and his family		17,970	
Gross income	1,298 x 45		58,410
		27,343	58,410
Net income per average farmer		31,067	

ANNEX III

EXPANSION OF THE I.P.D.R. IN KOLO-STATUS OF THE PROJECT

(Document from the Ministry of Rural Development)

1972

Republic of Niger
Ministry of Rural Development
Institut Pratique de Développement Rural
at Kolo

STATUS OF THE REFORM AND EXPANSION OF THE IPDR AT KOLO

1. Review of objectives
2. Financing of the Project
3. Current Status
4. Estimate of manpower requirements and graduating staff

Republic of Niger
Ministry of Rural Development
Institut Pratique de Développement Rural
at KOLO

Status of the reform and the IPDR (Kolo) project

1. Review of objectives

1.1 An increase in the level of agricultural productivity presupposes a sufficient number of technical staff adapted and quickly operational. The IPDR at Kolo is in charge of training these cadres for the Agricultural, Forestry, Rural Engineering, Assistance, Rural and Extension Services. To carry out this training, the Government has requested the cooperation of both international and bilateral donors. The main objective is to supply 150 extension agents yearly in agriculture adapted to the present demands of rural development and especially to the large projects of production and hydro-agricultural development.

1.2 The immediate objectives of this project are the following:

1.2.1 To carry out the reform of the training given at the IPDR and to take part in the expansion of this Institute by:

- setting up an adapted training system
- setting up a teaching unit which will ensure the application of the training system chosen
- appointing expatriate instructors needed for the reform and expansion of the IPDR
- preparation of a replacement plan of the expatriate staff by Nigerien cadres
- carrying out extension activities concerning technical progress and rural development
- setting up an information and documentation centre on rural development.

1.2.2 To carry out the expansion of the Institute both in planning the new buildings and those existing already and to supervise the execution of contracts.

2. Financing the Project

2.1 Cost of the project in Million US dollars

	Phase I 1977-81	Phase II 1982-84	Phase III 1984-87	Total 1977-87
Expatriate staff	4.2	0.8	-	5
Instructors training	0.4	0.3	-	0.7
Equipment	0.8	0.4	0.9	2.1
Construction	4.5	1.6	-	6.1
Operating costs	0.1	0.1	0.1	0.3
Total	10.0	3.2	1.0	14.2

2.2 Participants in the Project

The financial needs of the project to implement the reform and expansion of the IPDR presented by the Government of Niger are beyond the scope of a single donor. Therefore, the Government has requested the UNDP and the FAO to help them find a partner. The FAO, as responsible for the execution, will coordinate this project as part of UNDP/FAO NER 77/003. Financial aid is granted in US dollars.

UNDP 2,011,310

TCP - FAC 135,000 (construction 1st phase)

T.F. Switzerland 160,000 (construction 1st phase)

USAID 2.300,000 of which Construction (2nd phase) 2,000,000

Socio-economic Block 800,000

Operation Village 300,000

FRANCE (FAC) six financed expatriate posts

BELGIUM three expatriate posts - equipment and grants

FED two expatriate posts

The World Bank has made known its intent to participate in the project and will take over the third construction phase.

2.3 Contribution UNDP/FAO

The UNDP financial contribution is broken down as follows into expenses elements for the period 1976/1981.

	Preparatory phase 1976/77		Phase I 1977/81		Total 1976/81	
	month work	U.S. dollars	month work	U.S. dollars	month work	U.S. dollars
Exports	83	372,674	202	1,366,990	285	1,739,664
Training		12,750		315,290		328,040
Equipment		64,364		235,830		300,194
Miscellaneous		18,094		93,200		111,294
Total		467,832		2,011,310		2,479,192

FAO will supply primarily the experts who will implement the reform, grants for instructors training and will also contribute to the equipment necessary for the Institute.

3. Current Status

3.1 Structures

The implementation of the reform is entrusted to the teaching unit created with the help of the UNDP/FAO Project, and is charged with the coordination of activities of the Teaching Departments taken care of by various bilateral donors. The importance given to practical training has led to a reinforcement and adaptation of this structure by setting up:

- a farm
- practical workshops and laboratories for each specialised field
- a village operational unit
- a reception network for traineeships

Finally, teaching staff and students have already at their disposal

- a unit for the production of teaching materials
- an information and documentation centre on rural environment and farming development.

3.2 The training system

The IPDR must train middle level extension agents and execution agents in rural development corresponding to the categories C and B in public administration, in two years and four years respectively, by means of a direct and professional recruitment for each one of these categories.

3.3 The main focus of the IPDR reform

The Republic of Niger has an urgent need for middle level cadres in agriculture well-adapted to the current trends of the rural development policy. (Production projects - hydro-agricultural developments - co-operative extension), and quickly operational.

3.3.1 Adaptation of the Institute to the policy of rural development

In order to respond adequately to the priorities of this policy, it is necessary:

- to coordinate the flow of graduates in each specialised field with the priorities of this policy, i.e. :
  - . the field concerned with farming production should correspond to the priority given to the pursuit of food self-sufficiency
  - . the field concerned with developments should correspond to the priority given to the mobilisation of resources
- to plan beforehand, each year, the assignment of future cadres by setting up an employment plan in the Ministry of Rural Development before the start of the school year in each period.

3.3.2 Adaptation of the training intended for the students

It is necessary to integrate the IPDR in Kolo into the whole of the institutions concerned with agricultural development. In concrete terms this insertion should be carried out as follows:

- through a definition of the cadres' profile they require
- through the communication and integration of the information they possess in education
- through the assignment of teaching staff for these Departments and Institutions to the IPDR
- through a participation in the planning of traineeships in their institutions
- through a participation of users in the final examination
- through periodical conferences between users and teaching staff

Finally, it is also necessary to adapt teaching to the demands of true professional training:

- To lighten and adapt technical education programmes according to the aims of development (improvement of productivity in dune farming and expansion and diversification of irrigated farming, generalisation of animal traction farming and introduction of mechanised farming at certain points, etc.), in accordance with precise training objectives.

- To supply expatriate teaching staff and even Nigeriens who have studied or practiced elsewhere, with a solid information and documentation well-adapted to the Nigerien environment and Western Africa (creation of a documentation unit).

- To supply students and teaching staff with a production unit of teaching materials adapted to Niger.

- Finally, and above all, to provide the students with a solid practical training putting at their disposal a diversified range of resources:

  . a farm comprising an irrigated and rainfed perimeter and

  . a village operational unit where development activities will be performed

  . a reception network for traineeships

3.3.3 Getting operational cadres

(a) In order to obtain operational cadres meeting the requirements in demand, it is necessary to include in their training practical traineeships preparing them for their eventual assignment

(b) For the organisation of these traineeships, the teaching unit must consider the location of these traineeships according to the requirements in demand and their extension possibilities

(c) The traineeships forming an integral part of the education period, must respond to pedagogical principles:

- in their elaboration

- in their development

- in their control by the teaching staff

4. Forecast in class sizes and graduation of cadres

4.1 Courses anticipated for the start of the school year 1979

Subject to the approval of the documents being elaborated at present, training provided at the IPDR would comprise two levels:

4.1.1 A short two year course for technical agents training. It corresponds to the current course adapted to new requirements in the programmes as well as in the methods.

4.1.2 A long four year course for advisers training. This course would be carried out in stages and could be completed by 1982-1983.

During the 1979-1983 period the current training of B2 cadres would be maintained, extended if possible to the training of B1 cadres in special transitory courses.

4.2 Trends in class sizes at the IPDR

Taking into consideration the courses set up in 4.1., class sizes would follow the trend indicated below:

School year	Size	Classes
1973-1974	67	4
1974-1975	160	4
1975-1976	154	5
1976-1977	198	6
1977-1978	203	6
1978-1979	222	6
1979-1980	270	8
1980-1981	320	10
1981-1982	355	11
1982-1983	390	12

As of 1984-85 the number of 450 anticipated in the IPDR expansion plan, would be achieved and correspond to 14 classes.

4.3 Graduation flow - Agents available to users

(indicative)

Categories	1977	78	79	80	81	82	83	84	Total 8 years
Technical agents	56	58	64	80	80	95	95	95	623
Leaders	35	40	40	35	35	10	10	10	240
Advisers					18	18	43	43	122
	91	98	104	115	134	148	148	148	985

ANNEX IV

ESTIMATE IN EXTENSION STAFF FOR THE DEVELOPMENT OF A 2,000 IRRIGATED HECTARES SECTOR

(5 UNITS OF 400 HA)

Category	Function	Number	
		Starting period	Operating period
Engineer "A_1"	General Management	1) 2 1)	1) 1 -)
Engineer "A_2"	Exploitation Service	2) 7	1) 6
	Director of perimeters	5)	5)
Technical assistants B	Network maintenance	5) 10	2) 4
	Management perimeter	5)	2)
Technical Agents B_2 and instructors		12	8
Extension workers		25	12
	Total	56	31