

AGRICULTURAL PRODUCTION AND RESEARCH

B U R U N D I

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March - May 1979

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SUMMARY

Agriculture in Burundi has come to a turning point where a drastic re-orientation of Government production and foreign assistance policies becomes essential.

Priority attention given to export crops and negligence of the food farms subsector in view of the fast growing population, has led to an alarming food supply and nutrition situation in rural areas.

Food crops other than rice are grown by the small subsistence farmers in all four ecological zones of the country. Where possible export crops such as coffee, tea or cotton, are produced in addition to ensure a cash income.

Under traditional cultivation methods which are still predominant, soils became impoverished and food crop yields declined to a critical level. Peasant farmers growing food crops for subsistence often have to search for seasonal off-farm employment to be able to cover minimum family expenses.

Production related administrative extension and research institutions are weak or conceptually disoriented. Half-hearted efforts to improve food crop production remained without tangible results and progress in the export crop sector was only possible through massive foreign project assistance. Shortage of academically trained personnel is one of the constraints which led to this unsatisfactory situation. Since 1975 the Faculty Agronomy of the University of Burundi does the best possible to educate young Burundians for leading agricultural administrative, extension and research positions.

Mission activities of the churches in Burundi are quite intensive and often include an agricultural education and production improvement element. Through their close relationship to farm families missions and missionaries have gained the confidence and respect of the peasant population, Mission

stations therefore could successfully support development efforts by stimulating farmers' receptiveness to innovative practices.

For the 1978-1982 planning period GOB has defined ambitious objectives. However, according to past experiences and in view of the still existing administrative, technological and supply constraints, the production targets look over-optimistic.

Foreign assistance projects have been successful in alleviating major constraints in the export crop sector which brought substantial increase in production. Development support for food crop improvement, however, is just beginning, and there is room for additional intervention in this field. In the last part of the report, specific needs for assistance in MOA administration, input supply, agricultural research and academic education are defined and recommendations made for USAID projects appropriate to meet these needs. Assistance interventions should focus on areas where farming and living conditions are especially difficult. Here GOB and foreign support in a concerted effort should implement an appropriate strategy to increase small farm food crop production. Suitable development measures should be aimed at an improvement of MOA operations, rural infrastructure and input supply and product marketing services as well as intensification of agricultural education, training, research and field extension activities.

Under this aspect the following projects are recommended for USAID execution:

1. Organization of a statistics Division in the MOA-Planning Department.
2. Establishment and operation of a special "Small Farm Research Center."
3. Improvement of fertilizer procurement and supply.
4. Assistance to the ISABU-On Farm Storage Research Program.
5. Support to the Agronomic Faculty - University of Burundi.

The findings presented in this report are based on data obtained through intensive study of the existing literature and documentation and on information gathered during interviews with government authorities, foreign assistance agencies, research staff, project personnel, missionaries and farmers in Bujumbura and in the field (Annex 1).

I. General

Burundi is one of the poorest of the developing countries with an economy based exclusively on agriculture. Production of food and export crops, except for a few large coffee and tea estates operated by parastatal organizations, is the domain of the small farm sector which employs 95% of the population. Food crop farm sizes vary from 0.4 - 0.8 ha. in the most densely populated zones of the Zaire-Nile Crest and Central Plateau to 2 - 4 ha. in the Lake Tanganyika/Ruzizi Plains and East/Southeastern border areas.

The vast majority of the approximately 700,000 family holdings with an average size of 1 ha are engaged in subsistence farming on mountain slopes producing an annual income of about US\$230.00 or below US\$40.00 per capita (1977). Traditional cultivation practices characterized by a backward technology and lack of modern inputs, especially in the food crop sector, have brought production to a critically low level. This and the increasing demand of a fast growing population (2.5% per year) for basic food products not only excluded the desirable reduction of food imports but also aggravated the already unsatisfactory nutrition status of rural families.

Sporadic famine and dietary imbalances are especially severe where localized crop failures cannot be off-set by supplies from surplus areas due to the absence of a functioning marketing and distribution system.

II. Agricultural Production

Burundi's agricultural potential is considerable but only part of it has been exploited during the last 20 years through intensification of export crop cultivation especially of coffee, tea and cotton.

Food crop production, although accounting for 50% of the domestic product, remained a consistently neglected sector hard pressed to cope with existing nutrition problems. Lately, however, indigenous food crops have been given higher priority in GOB production policy as is reflected in the third Five Year Plan 1978 - 1982.

Principal food crops are dry beans, bananas, cassava (manioc), maize, sweet potatoes and sorghum. These are the backbone of Burundi's rural subsistence economy and the single source of farm income where coffee, tea or cotton are not cultivated.

Rice, wheat and triticale have been introduced to reduce the dependence on food imports especially for the urban population, and irish potatoes and soya to improve the nutritive conditions of farm families in the High and Medium Altitude Zones. During the period 1970 - 1977 crop production developed as is shown in table 1.

Coffee, tea and cotton, thanks to the continuous attention and support from GOB, foreign assistance projects and marketing boards could maintain or slightly raise their production level. Output of major food crops (maize, beans, cassava, sweet potatoes) increased only insignificantly while the population grew by 17%. Therefore actual per capita production fell by 6%. GOB and outside donors alike, concerned about the noticeable deterioration of the domestic food supply situation are now determined to mobilize appropriate assistance to stem and reverse this detrimental development.

Table 1

Production de l'agriculture (en tonnes)*

	1970	1971	1972	1973	1974	1975	1976	1977
Café (mar.)	22.044	25.145	19.348	21.495	28.139	16.929	21.200	21.400
Thé (sec)	148	322	485	657	906	787	1.136	1.470
Coton (grain)	8.700	8.700	5.150	4.600	4.525	3.818	3.010	5.160
Haricots	278.700	284.831	256.348	291.097	232.078	294.008	300.478	307.000
Petits Pois	30.100	30.762	27.686	31.439	25.151	31.753	32.515	33.000
Bananes à légumes	440.507	450.198	405.178	460.102	462.000	464.703	474.926)	
Bananes à bière	756.522	773.166	695.850	790.176	780.000	798.078	815.636)	1.320.000
Manioc	370.300	378.446	340.601	386.772	389.418	390.640	393.374	396.000
Pommes de terre	34.000	34.748	31.273	35.512	28.410	35.867	36.584	37.000
Sorgho	20.040	20.481	18.433	20.931	16.745	21.140	21.457)	
Eleusine	8.800	8.994	8.095	9.192	7.354	9.284	9.423)	32.000
Colocase	96.200	98.316	88.484	100.479	80.383	101.484	103.412)	
Igname	5.750	5.876	5.288	6.005	4.804	6.065	6.180)	111.500
Patate douce	381.600	389.995	350.995	398.575	318.626	402.561	411.417	420.500
Mais	130.000	132.860	119.574	135.782	108.860	137.140	138.500	140.000
Froment	5.000	5.110	4.599	5.122	4.098	5.173	5.500	6.000
Riz	5.017	4.277	4.785	4.800	6.186	6.730	6.705	7.000
Fruits de palme	11.600	11.600	8.900	9.400	10.500	11.600	11.600	11.500
Arachides	6.200	7.000	7.200	7.800	8.400	9.000	9.225	9.500
Autres (fruits, légumes, courges, tabac, feuilles)	97.746	99.900	89.900	103.000	82.400	105.770	108.100	105.000
Production visée	2.678.082	2.736.560	2.463.189	2.796.184	2.565.413	2.830.996	2.885.032	2.936.000
Pertes 20%	535.661	547.312	492.638	559.236	513.082	565.200	577.006	587.200
Production disp.	2.142.421	2.189.248	1.970.551	2.236.948	2.052.331	2.265.796	2.308.026	2.348.800

* Ministry of Agriculture and Ministry of Planning - Annexes

.../...

Table 1 - Continued

- 2 -

	1970	1971	1972	1973	1974	1975	1976	1977
Indice de production	100,0	102,2	92,0	104,4	95,8	105,7	107,7	109,6
Population	3.350.000	3.417.000	3.424.000	3.575.000	3.655.400	3.735.900	3.817.200	3.901.200
Production par tête - en Kg	639,5	640,1	575,5	625,7	561,5	606,5	604,6	602,1
- en indice	100,0	100,2	89,8	97,7	87,7	94,6	94,5	94,1

Ecological Zones

Crop production in Burundi is influenced by three major environmental factors, topography, altitude and rainfall which determine features and limitations of natural and agricultural vegetation.

Four distinct ecological zones exist (Annex 2) which are subsequently described as they follow each other from West to East.

1. Lake Tanganyika and Ruzizi River Plains

Includes the lower western slopes of the Zaire-Nile Crest up to an altitude of 1000 m.

Annual Precipitation: 800 - 1.000 mm

Medium Temperature: 22.5 - 25.0 ° C

Growing Seasons: Major - September to December

Minor - January and February

Dry Season - June to September

Irrigated, semi-irrigated and rainfed cropping.

Production of rice, robusta coffee, cotton, maize, sorghum, cassava.

Millet and cowpeas are tested for possible introduction.

Robusta Coffee

Planted: 2.5 x 2.5 m

Fertilization: 400 g/tree of 45-10-10

Yield: 1200 kg/ha (parchment)

Cotton - semi-irrigated

Planting rate: 15 kg/ha

Fertilization: None

Yield: 550 kg/ha (seed cotton)

Rice - irrigated or semi-irrigated

Planted: 20 x 22 cm

Fertilization: 40 - 40 - 20 kg/ha

Yield: 2500 kg/ha

Maize - rainfed

Planted in pure stand

Fertilization: None

Yield: 800 kg/ha

Sorghum - rainfed

Plant population: 250.000/ha

Fertilization: None

Yield: 700 kg/ha

Cassava - dryland

Planted: 90 x 90 cm

Fertilization: None

Yield: 6000 - 8000 kg/ha

Cropping pattern example:

0,15 ha coffee - 0,30 ha rice - 0,50 ha maize/sorghum - 0,30 ha beans -
0,40 ha cassava - 0,30 ha bananas

2. Medium Altitude Western and Eastern Zone - 1.000 to 1.500 m

Annual precipitation : 900 - 1.200 mm

Medium temperature: 20.0 - 23.0 °C

Growing Seasons: Major - December to April

Minor - September to November

Dry Season - June to August

Production of beans, peanuts, maize, cassava, bananas. Introduction of sugar cane into the Mosso area.

Beans - pure stand

Planted approx. 15 x 15 cm

Fertilization: Small amounts of
compost/manure

Yield: 800 kg/ha

Peanuts

Mixed planting

Fertilization: None

Yield: 500 kg/ha (unshelled)

Maize

Mixed planting (12.000 plants/ha)

Fertilization: None

Yield: 450 kg/ha

Cassava

Mixed planting (6000 plants/ha)

Fertilization: None

Yield: 5.000 kg/ha

Bananas

Mixed stand (6.000 plants/ha)

Fertilization: Small amounts of manure or compost)

Yield: 7.000 kg/ha

Cropping pattern example:

0.35 ha bananas - 0.25 beans - 0.40 ha cassava/maize - 0.30 ha maize/peanuts -
1.70 ha natural pasture

3. High Altitude Zone - Zaire/Nile Crest - 1.900 - 2.500 m

Annual precipitation: 1.300 - 1.600 mm

Medium temperature: 17.0 - 19.0 C

Growing Seasons: Major: October to January

Minor: February to May

Dry Season: June to September

Principal crops are tea, maize, wheat, peas, sorghum, millet, sweet and irish potatoes.

Tea

Pure planting (12.000 plants/ha)
Fertilization: 400 kg/ha of 25-5-5
compound
Yield: 1.500 kg/ha (made tea)
Without fertilization: 900 kg/ha
(made tea)

Maize

Pure stand (35.000 plants/ha)
Fertilization: None
Yield: 650 kg/ha

Wheat - Pure stand

Seed rate: 60 kg/ha
Fertilization: None
Yield: 450 kg/ha

Peas

Mixed planting
Fertilization: None
Yield: 350 kg/ha

Sorghum/Millet

Mixed planting
Fertilization: None
Yield: 550 kg/ha

Sweet Potatoe

Mixed planting
Fertilization: None
Yield: 4.000 kg/ha

Irish Potatoes

Pure stand (30 x 60 cm)
Fertilization: Manure
Yield: 6.000 kg/ha

Cropping pattern example:

0.06 ha tea - 0.15 ha maize/peas - 0.20 ha wheat - 0.50 ha sweet potatoes/
peas - 0.20 ha sorghum/millet - 0.07 ha irish potatoes - 2.50 ha natural
pasture. In the marshy valleys well drained soils are cultivated during the
dry season.

4. Central Plateau - 1.500 to 1.900 m

Annual precipitation: 1.000 - 1.200 mm

Medium temperature: 19.0 - 20.0 C

Growing Seasons: Major - October to January

Minor - February to June

Dry season - June to September

Arabica coffee, bananas, beans, maize, sweet potatoes and cassava are
produced.

Arabica coffee

1.600 trees/ha

Fertilization: 120-40-40 kg/ha

Yield: 900 - 1.200 kg/ha (parch.)

Bananas

Mixed (4.000 plants/ha)

Fertilization: Manure

Yield: 6.500 kg/ha

Beans

Mixed planting

Fertilization: None

Yield: 450 kg/ha

Maize

Mixed planting (15.000 plants/ha)

Fertilization: None

Yield: 400 kg/ha

Sweet Potatoes

Mixed planting

Fertilization: None

Yield: 4.000 kg/ha

Cassava

Mixed planting (6.000 plants/ha)

Fertilization: None

Yield: 4.500 kg/ha

Cropping pattern example:

0.12 ha coffee - 0.25 ha bananas - 0.30 ha maize/beans - 0.20 ha cassava/sweet potatoes - 1.00 ha natural pasture.

Where possible crops are also grown on the marshy soils of the valleys during the dry season.

Throughout the four ecological zones traditional and more modern farming practices are divided as shown below.

<u>Crop</u>	<u>Traditional</u>	<u>Modern</u>	<u>Cultivation</u>
Coffee	40%	60%	
Tea	30%	70%	
Cotton	50%	50%	
Beans	90%	10%	
Maize	90%	10%	
Beans/Maize	100%	-	
Rice	40%	60%	
Wheat	90%	10%	
Banana	100%	-	
Cassava	100%	-	
Sweet Potatoes	100%	-	

<u>Crop</u>	<u>Traditional</u>	<u>Modern</u>	<u>Cultivation</u>
Irish Potatoes	90%	10%	

From the major food crops only a minute part is cultivated according to advanced methods. Haphazard mixed planting is still preponderant. The following are the most common crop associations:

Two Crop:

Beans-Maize

Beans-Sorghum

Beans- Cassava

Beans - Banana

Sorghum - Maize

Sorghum - Cassava

Cassava - Sweet Potatoes

Cassava - Peanut

Maize - Peanut

Three Crop:

Beans - Maize - Peas

Beans - Maize - Cassava

Beans - Maize - Peanut

Beans - Maize-Banana

Cassava - Sweet Potatoes - Banana

Cassava - Sweet Potatoes - Peanut

However, suitability and performance of the listed mixtures were never evaluated through field experiments and proportions of mixture components are arbitrarily chosen by farmers.

Experimental results obtained at ISABU-Stations over a number of years could prove that on Burundi soils food crops respond well to modern inputs. The magnitude of crop response expressed in kg/ha yields is illustrated in the subsequent tabulation.

CROP	Average traditional farming practice	Research Conditions	
		Mechanical cultivation Row Planting Conventional Seed	Mechanical cultivation Row Planting Improved Seed Fertilization
Beans	650 kg/ha (100%)	750 kg/ha (115%)	1.100 kg/ha (169%)
Maize	800 kg/ha (100%)	1.200 kg/ha (150%)	3.400 kg/ha (425%)
Rice	1.500 kg/ha (100%)	2.800 kg/ha (187%)	4.200 kg/ha (280%)
Wheat	500 kg/ha (100%)	900 kg/ha (180%)	2.200 kg/ha (440%)
Sorghum	550 kg/ha (100%)	1.000 kg/ha (182%)	3.500 kg/ha (636%)
Peas	350 kg/ha (100%)	600 kg/ha (171%)	1.100 kg/ha (314%)
Potatoes	5.500 kg/ha (100%)	7.000 kg/ha (127%)	12.000 kg/ha (218%)

These are impressive figures and even if one concedes that under practical farming conditions just 60 to 70% of the experimental yields would probably be obtained with equal inputs, only the bean yields would hardly justify the effort.

Fertilizer responses of a number of food crops have also been investigated by the FAO Fertilizer Promotion and Distribution Program since 1972. NPK proportions, quantities and benefit/cost ratios have been determined as given below.

Crop	NPK - kg/ha	Benefit/Cost Ratios*)					Average
		1973	1974	1975	1976	1977	
Maize	40 - 60 - 0	2.4	1.7	1.3	2.1	5.7	2.7
Wheat	30 - 55 - 30	2.5	1.4	1.6	2.5	2.6	2.3
Irish Potatoes	40 - 40 - 60	8.6	2.9	5.0	6.3	7.2	6.0
Beans	17 - 57 - 30	1.7	0.8	1.9	3.3	3.2	2.2
Peas	17 - 57 - 30	3.2	1.1	2.1	2.7	4.1	2.7
Rice	20 - 45 - 40	-	-	0.8	3.6	-	2.2
Sorghum	25 - 30 - 30	-	-	-	2.2	1.1	1.7

*) Yield increase divided by fertilizer cost

In these tests all crops except sorghum returned more than double the amount invested in fertilizer. Potatoes even produced an additional yield six times as high as the fertilizer cost. The data only reflect the effectiveness of fertilizer on crops planted in lines but without mechanized cultivation.

Despite these results and efforts fertilizer consumption in Burundi has remained stagnant as is reflected by the practically unchanged and lately declining import volume:

Fertilizer Imports in MT *)

1970-71	1.368
1971 -72	1.309
1972-73	1.412
1973-74	1.679
1974-75	2.809

1975-76	1.668
1976-77	798
1977-78	1.842
1978-79	463

*) Banque de la République du Burundi

Although fertilizers imported by the government enjoy a 50% price subsidy and food crop prices raised at an average of 23%, fertilizer acceptance by small farmers remained insignificant. This must be ascribed mainly to the lack of forceful field extension and the absence of an efficient fertilizer procurement and distribution system.

As one grave consequence the per ha yields have continued to decline to an alarmingly low level as is illustrated by the comparison below:

Yield Levels 1959*) and 1979 in kg/ha

	<u>1959</u>	<u>1979</u>	<u>% Decline</u>
Beans	750	650	15
Maize	1.000	800	20
Rice	3.500	2.500	28
Sorghum	1.200	550	54
Millet	600	450	25
Wheat	750	500	33
Peas	800	350	56
Peanuts	600	500	17
Cassava	13.000	7.500	43
Sweet Potatoes	7.500	4.000	47

	<u>1959</u>	<u>1979</u>	<u>€ Decline</u>
Irish Potatoes	7.000	5.000	29

*) P. Leurquin: Change in Ruanda-Urundi 1945 - 1960

Apart from the ongoing depletion and degradation of the formerly productive soils by traditional cultivation this dismal development also is the result of a progressive degeneration of the local seed material. Reduction or elimination of fallow periods, the reduction of the number of animals and additional cultivation of marginal land to feed the growing population have made their negative contribution as well.

To arrest and eventually reverse the deterioration of productivity and production will require sincere efforts in soil conservation, fertility restoration, and promotion and adoption of improved farming practices by the GOB-MOA and the peasant farmer alike.

In this connection the extreme post-harvest losses on small farms must specially be mentioned. Granaries are unknown and cereals and pulses are stored within family huts in small earthen containers, baskets and bags. No protective measures are applied and the storage losses caused by rodents, weevils (Bruchidae) and fungi are estimated as high as 20 - 30%. ISABU and the Faculty of Agronomy of the University of Burundi have just started a program to test different types of elevated granaries for their cost and effectiveness. If successful, this program will result in the development of improved storage methods the small farmer can afford which could reduce crop losses to a more tolerable 10% level.

Fruit and vegetable production up to now remained a rather neglected sector. Both types of products are not generally used in the traditional rural diet which is not only short of proteins and fats but also lacks vitamins and minerals.

Available data indicate that in 1977 hectareage and production were the following:

Fruit (415.000 trees and 2 million pineapple) 1.400 ha - 15.000 MT

Vegetables (Onions, leek, cauliflower, cabbage, carrots) 4.200 ha - 85.000 MT

With this output an annual per capita consumption of bare 4 kg fruit and 23 kg fresh vegetables could be ensured.

For 1982 GOB projections foresee production increases of 5.000 MT (33%) for fruit and 4.500 MT (53%) for vegetables. However, research and extension efforts to promote cultivation and consumption in rural areas are still half-hearted. They are restricted to the distribution of seed and planting material. Follow-up technical assistance is rarely provided.

Nonetheless vegetable supply and quality have reached a remarkable level especially around urban centers. In contrast, fruit production and quality are still below desirable standards.

III. Rural Productive Activities

The harsh conditions of traditional mountain agriculture require the concerted effort of adult and teenage family members of both sexes to secure their livelihood and existence. The magnitude of combined earnings from farm and off farm activities determines to what extent the most basic needs for food, clothing and other essential items (candles, kerosene, matches, spices, hand-tools etc.) can be met.

Farm Work

Women and teenage daughters are carrying the main burden of all food crop cultivation work. Soil preparation, planting, weeding, harvesting, threshing/shelling and storage are their responsibility while men and boys only take care of the cash crops and animals. Brewing of banana or sorghum beer and burning of charcoal are additional activities conducted by women and men respectively.

Apart from the marketing of their export or cash crops (coffee, tea, cotton, rice) farmers usually sell only small quantities (5 - 7%) of food crops.

Latest farm product prices were reported to be the following:

Coffee (parch.)	110 FBU/kg	Wheat	15 FBU/kg
Tea (dry)	16 FBU/kg	Rice	20 FBU/kg
Cotton (seed and Lint)	30 FBU/kg	Cassava	15 FBU/kg
Beans	30 FBU/kg	Sweet Potatoes	13 FBU/kg
Maize	20 FBU/kg	Banana	20-25 FBU/kg
Peanuts	35 FBU/kg	Beer	25 FBU/l
Sorghum	20 FBU/kg	Charcoal	300 FBU/30 kg
Peas	25 FBU/kg	Cow	25,000 FBU

Calf	10.000 FBU	Goat	1.200 FBU
Sheep.	1.000 FBU	Chicken	150 FBU

Off-Farm Engagements

Possibilities for off-farm employment are very limited and entirely restricted to male labor.

Small farmers are normally recruited on cash payment basis for agricultural work on Government estates, research stations, mission farms and development projects. Seasonal or part-time opportunities also exist with road construction, maintenance and reforestation programs.

Outside farm work is especially sought after by family heads with no or with not enough farm land and pure subsistence farmers which cultivate no marketable export or cash crops.

From the 600 work days available per family and year for the farming operation only about 320 days are utilized for this purpose. Therefore ample time can be devoted to off-farm jobs where employment possibilities exist. The following salaries are paid:

Government estates)	
Agricultural research stations)	
Agricultural development projects)	80 FBU/day (US\$ 0.89)
Road maintenance/construction)	
Reafforestation)	
Mission farms)	50 FBU/day (US\$ 0.56)

For the Gitega area in the Central Plateau the subsequent average net incomes from farm and off-farm activities had been reported for 1977:

Coffee and Food Crops and Animal Production -	20.600 FBU/year (US\$ 223.0)
Coffee and Food Crops, no Animal Production -	16.500 FBU/year (US\$ 184.0)
No Coffee, Food Crops and Animal Production -	14.500 FBU/year (US\$ 162.0)
No Coffee, Food Crops, no Animal Production -	11.500 FBU/year (US\$ 128.0)

Assuming that a coffee grower could work 2 1/2 and a food crop farmer 3 1/2 months off their holdings for about 65 FBU/day, their net incomes would be:

Coffee and Food Crops and Animal Production -	24.000 FBU/year (US\$ 268.0)
Coffee and Food Crops, no Animal Production -	20.600 FBU/year (US\$ 229.0)
No Coffee, Food Crops and Animal Production -	19.900 FBU/year (US\$ 222.0)
No Coffee, Food Crops, no Animal Production -	16.900 FBU/year (US\$ 188.0)

The economic advantage of the small group of farmers living in areas with employment possibilities is obvious.

IV. Production Related Agricultural Institutions

Government administration, research and academic education are extending their direct or indirect influences on crop production with differing intensities and results.

In addition, mission programs of the churches with their separate and localized activities also play a remarkable role especially in practical farmer education and production promotion.

Ministry of Agriculture

The Ministry of Agriculture is the central organization for the execution of Government policies and plans but it is a weak institution with frequent changes of the decision making personnel in higher positions. As a consequence, foreign development agencies and the GOB itself have entrusted production activities to a number in effect autonomous organizations*) reporting to the MOA.

In total the ministry employs over 2.000 people and this number is expected to grow further. There are 25 expatriate and 60 Burundian professionals working in the different departments of the ministerial headquarters in Bujumbura. 64 local professionals hold administrative/extension positions in the provinces and 51 expatriates and 145 Burundians occupy technical or management posts in agricultural development projects.

*) OCIBU - Coffee Board

COGERCO - Cotton Board

OTB - Tea Board

SRDS - Regional Development Societies

ISABU - Agronomic Research Institute

Except for its participation in specific development ventures, Government services to the farm sector through the MOA are quite modest despite substantial increases in recurrent and investment budget allocations.

	<u>1977</u>	<u>1978</u>	<u>1979</u>	(Millions FBu)
Recurrent	202	257	365	
Investment	455	471	870	

From these expenditures the near total is used for the supporting of the MOA infrastructure and for providing government contributions to foreign financed projects. Farmers living outside the project areas have hardly a chance of receiving any kind of support from the Ministry. Administrative and managerial shortcomings in the MOA must be attributed to the involved, unbalanced organization, the bad inter-sectorial communication and cooperation caused also by a dispersed location of offices, the absence of a statistics service and lack of transportation at all levels.

There are several organization charts in existence of which the most simple and most complicated ones are given in the Annexes 3 and 4. Straight lines of command as shown in Annex 3 in fact do not exist. Responsibilities and competences are not clearly defined or demarcated and overlappings, duplication of efforts and execution gaps are frequent. In one chart e.g. the aforementioned almost autonomous units (ISABU, OCIEU etc.) are placed under the Secretariat for Rural Development, in the other they fall under the Food Production Secretariat or the Minister's office. The Food Production Secretariat in comparison to Rural

Development seems highly overburdened.

Ministerial offices are located in 8 different buildings scattered all over Bujumbura which in view of the underdeveloped sense for communication makes cooperation really difficult.

The absence of statistics section must be considered a specific detriment for the definition of policies and agricultural planning. Without a reliable information base both activities have to rely on unsound guesswork which is often far apart from reality.

Transport difficulties are very grave at provincial, arrondissement and commune levels where they are severely curtailing administrative and especially field extension activities.

Victim of all these weaknesses is the peasant farmer.

Agronomic Research Institute - ISABU

ISABU is the only agricultural research institution in the country. In the decade after Burundi's independence in addition to doing research, it was also planning, preparing and implementing development projects. Nowadays all efforts concerning production and commercialization of coffee, tea, cotton and rice are entrusted to the aforementioned parastatal agencies or regional development societies which operate their own budgets, have their own extension services and can deal directly with foreign assistance agencies.

Since 1976 ISABU has been restricted to just doing pure research.

The organization is divided into five scientific departments which encompass

land utilization and management, crop production, crop protection, socio-economics, animal production. The head office is in Bujumbura where all management personnel of the department and research laboratories, engineering, surveying and cartographic services are located. Field experimentation is conducted on four main and four substations (Centres Agricoles). They are concentrated in the West - South Western part of the country, leaving the center and North East uncovered (annex 5).

There are 13 expatriate and 8 Burundian professionals working in the soil/plant department and three expatriate and two local experts in the socio-economic and animal production departments of the headquarters.

The four main research stations are manned with 4 foreign and 8 Burundian scientists, the four substations with five local technicians. One half of the total field and headquarters staff (20 expatriates, 23 Burundians) is dealing with food crops representing a remarkable research potential in this specialty. ISABU's annual budget amounts to 162 million Fbu (US\$ 1.8 million) of which 80% is covered by ATB and 20% by the GOB.

Despite this concentration of effort and expertise especially in the food crop sector ISABU's applied research had little effect on small farm food crop cultivation practices and production.

In part this must certainly be ascribed to the apparent lack of extension support. But it is also obvious that ISABU's basic research concept and

approach disregards the pressing need for special small farm research on slopy lands. Field experimental work puts major emphasis on variety testing, selection and seed multiplication with cultivation, fertility and rotation trials ranking second.

There is almost no research done on farmers' fields.

Mixed cropping vs. pure planting is not under test and there is no comparative evaluation of traditional and improved farming systems. Field research at stations is of the conventional type as it is done in countries with a developed agriculture. Experiments are mostly conducted on plain fields with mechanized soil preparation and use of costly inputs such as fertilizer and plant protection chemicals, everything the subsistence farmer in the mountains cannot afford.

Therefore it is not astonishing that simple, low cost food production packages have not been developed for the small farm sector.

According to the new five-year operational plan there will be no tangible changes in ISABU's research concept but newly added activities will include animal traction, hand tool and on-farm storage research.

University of Burundi - Faculty of Agronomy

In 1975 an agronomic faculty was established with Belgian (ATB) technical and financial assistance to meet the country's requirements for academically trained agriculturists. Official estimates for the next five years indicate a need for about 300 ingénieurs agronomes to fill existing and anticipated

professional positions in the MOA, SRD's, crop marketing boards, development projects and research. The faculty budget is funded with an annual amount of US\$ 650,000, eighty (80) percent of which is covered by ATE and 20% by GOB contributions. Faculty activities to a considerable extent have to be conducted on an improvised basis in one single building which GOB is renting for this purpose. Teaching laboratory and greenhouse facilities do not exist. Equipment supplied by the Belgian Government could not be unpacked due to lack of space. Practical field training for students had to be tailored to the limited funds available for this program. At present five Belgian professors provide academic agricultural training to 54 students in a three-years course. The curriculum (Annex 6) is very comprehensive and as to government request is determined to educate generalists for all kinds of positions rather than specialists. Under the present situation this is understandable and credit has to be given to the teaching staff for their efforts and the remarkable level of scientific knowledge provided under the prevailing conditions. It is to be expected, however, that with a gradual sophistication of Burundi's agriculture also the academic training of younger generations of students will become more specialised.

Church Missions

Intensive missionary activities of the christian churches are conducted all over the country. The catholic CARITAS organization and the ALLIANCE OF PROTESTANT CHURCHES with its 5 congregations maintain 130 mission stations in rural areas (Annex 7 - 8). All are engaged in evangelization, education and health care.

Most of the Caritas stations and two of the Protestant Missions also demonstrate and promote improved methods of crop cultivation and small animal production. These activities although not always based on latest technical knowledge are conducted with unselfishness and undiminished idealism. In contrast to the government extension service, missions and missionaries have gained unconditional respect and confidence among the peasant farm population. Such relationship combined with knowledge of native dialects represents a most valuable resource which could and should profitably be used by foreign development projects.

Based on a mutually acceptable modus of cooperation the combination of proven technology and mission instilled farmer motivation could prove highly beneficial to all parties involved. It appears as a most promising possibility for a successful stimulation of small farmer receptiveness to innovative agricultural practices promoted by projects. It is not advocated though to integrate missionary activities into AID projects.

V. Production Plans and Targets

Agricultural production planning with definition of concrete objectives began only with the second five year plan covering the period 1973-1977. Despite the disruption through the 1972 disturbances, increased production targets were set for export and food crops except for beans, cassava, sweet potatoes and rice (table 2). This was probably with the intention to obtain a better balanced general food offer.

The data of Part I of table 2 show the projected output increases in percent and metric tons compared to the actual achievements.

In the export crop sector tea production exceeded the target by 100% while coffee remained slightly and cotton far below expectations, since 1977 was not too good a coffee year and cotton production had suffered from low prices and marketing shortcomings.

The food crop sector in spite of the foreseen modest increases or even reductions showed remarkable increases of the bean, tuber crop, banana and especially millet and rice harvests. Other cereals and legumes failed to reach the respective goals by 6-7 or 28-38 percent.

Part II of table 2. reveals that also the anticipated alteration of production proportions could not be accomplished. Compared to 1972 at the end of the planning period (1977) the production positions of cereals dry legumes, tuber crops and bananas were still unchanged. In view of these trends one can assume a disparity between GOB production and price policy mainly in the case of potatoes and rice. One must also

Table 2

Second Five Year Plan - 1973-1977

Crop Production Projections *)

Part I

Type of Crop	Pred.MT 1972**)	% Proj.incr. 1973-1977	Proj.Prod.MT 1977	Actual% incr. 1973-1977	Actual Prod.MT 1977
Coffee	19,348	+ 22	23,605	11	21,400
Tea (dry)	485	+ 52	737	203	1,470
Cotton	5,150	+ 73	8,910	-	5,160
Beans	256,348	- 4	246,100	20	307,000
Peas	27,686	+ 25	34,608	19	33,000
Bananas	1,101,000	+ 10	1,210,000	20	1,320,000
Cassava	340,601	-45	187,300	16	396,000
Ir. Potatoes	31,237	+ 3	32,210	18	37,000
Sorghum	18,433	+ 27	23,410	20	22,200
Millet	8,095	-24	6,150	21	9,800
Taro/Yam	93,775	+ 51	141,600	18	111,000
Sw. Potatoes	350,995	-42	203,600	20	420,000
Maize	119,574	+ 55	185,300	17	140,000
Wheat	4,599	+ 58	7,260	30	6,000
Rice	4,785	-	4,785	46	7,000
Peanuts	7,200	+ 65	11,900	32	9,500

*) Ministry of Planning-Second Five Year Plan 1973-1977 } Estimates
 **) Ministry of Agriculture }

Table 2

Part II

Percent of Total Production

Crops	Actual 1972	Projected 1977	Actual 1977
Cereals	6.6	9.9	6.6
Dry Legumes	12.3	12.8	12.4
Tuber Crops	34.5	24.6	34.2
Bananas	46.5	52.7	45.4

conclude that traditional production habits do not comply with largely theoretic planning projections.

The third five year-plan (1978-1982) while still much concentrated on cash crops puts greater emphasis on food crops. In this context it lists as primary objectives: food self-sufficiency, production of exportable/marketable surpluses and the replacement of imports.

These ambitious conceptions are supplemented by equally ambitious quantitative targets as is illustrated below.

Third Five Year Plan Production Targets

Type of Crop	Prod. 1977 MT	Projected % increase 1977-1982	Projected Prod. MT 1982
Coffee (made)	21,400	38	29,530
Tea (dry)	1,470	144	3,600
Cotton	5,160	100	10,320
Cereals	185,000	50	278,000
Dry Legumes	349,500	20	419,400
Tuber Crops	964,000	10	1,061,000
Bananas	1,320,000	10	1,452,000

To reach the projected targets the third plan also foresees an extension of the food and export crop surface by 5% to 1,280,000 ha, an increase of the manured land from 47,000 to 106,000 ha (125%) based on improved livestock and manure (120%) production and the provision of 13,000 tons of chemical fertilizers.

Since fertilizer imports have dropped to an all time low of 463 MT and actual 1978 production data are not available to document production

increase, stagnation or decline, one must doubt whether progress would be possible in view of the hitherto unsatisfactory development results in the food crop and livestock sectors. The anticipated improvements will only be accomplished if planning objectives are accompanied by concurring policies and supporting and promotional measures in extension and marketing.

VI. Production Constraints

Burundi's most pressing problem is how to increase food crop production to keep pace with raising demand, resulting from population growth. Government plans and foreign assistance interventions geared to cope with this problem through the promotion of food crop production are still in a take off phase, and existing constraints are manifold. Environment, administration, research and technology extension, marketing and supplies are sectors exhibiting the most tangible weaknesses.

Environment

Areas of difficult topography are the most densely populated with subsistence farming being prevalent. From the small average farm size of 1 ha or less, 80% is now under subsistence crops. This is barely enough to support a normal family of 4-5 persons. Under a continuing population pressure on the land resource, by 1982 only one-half as much land would be available per family for food crops as at the present time. Unless per ha yields can greatly be improved and new land in the Western Plains and North East and South East Plateau opened up for production, famine will be imminent. Small farm size and land fragmentation militate against rationalization of cultivation. Soil degradation manifested by erosion and nutrient depletion caused by a reduction of fallowing and declining availability of manure represents the most serious natural obstacle to yield improvement efforts.

Administration

For sometime, GOB has declared that agriculture in general and food crop production in particular are priority sectors. However, the current stagnation of food production development in Burundi to a great extent must be ascribed to the failure of the government to provide adequate resources for production inputs, supporting services and infrastructural improvements. GOB has also been unsuccessful in offering attractive production incentives to farmers and motivating agricultural officials to design and forcefully implement badly needed development measures.

Basic development components like research, a rudimentary extension service and farmers willing to improve crop cultivation in response to incentives do exist. But despite intensified planning activities of the Ministries of Agriculture and Planning it has not been possible to mobilize and orient available resources and institutions to a concerted small farm development effort. Progress remained restricted to the export crop sector in areas covered by previous or ongoing foreign assistance projects. No improvements were achieved in regions depending exclusively on government support. Shortage of manpower, inadequate training and transportation lack of supervision, unequal distribution of funds and a poor infrastructure must be held responsible for the current state of affairs. As a major constraint the lack of a sound statistical information base and its effect on the overall planning and policy determination process has to be mentioned. The negative impact of this shortcoming on evaluation, interpretation and correction of the production situation cannot be overemphasized,

Research and Technology

Food crop production as the domain of the small subsistence farmer is based on traditional hoe and machete cultivation with hand-labor and local, low quality seed as the only inputs. Haphazard planting of frequently disproportioned crop mixtures with arbitrary seed rates and spacings is the common practice which makes inter-plant cultivation and weeding quite difficult. Since only small quantities of animal manure are collected and fertilizer use is restricted to export crops, food crop soils are progressively impoverished and yields declining.

High post-harvest losses further diminish the already small production. Anticipated improvements will depend upon a successful introduction and promotion of advanced crop cultivation practices through effective field extension campaigns. Half-hearted extension efforts aimed at food crop improvement through demonstration of known techniques have failed.

ISABU on its part so far did not develop production and storage technology packages for peasant farmers. Such disregard of small farm research needs proved to be a major constraint that has to be alleviated before future food crop development plans and programs would have a reasonable chance of success.

Input Supply and Marketing

Insufficient imports of modern means of production (fertilizer, pesticides, small farm equipment), inconsistent price policies, lack of credit and a mal-functioning marketing system have kept input utilization by small farmers at a negligible level. SOBUCOV as the government food crop purchasing and storage organization has neither been able to make or guarantee purchases from farmers at reasonable prices nor to establish food crop reserves for times of shortage and price stabilization. Private traders usually offer better prices to farmers but the volumes purchased for the urban markets are too small to stimulate surplus production overall. Thus far government has not developed appropriate price and marketing policies in support of anticipated production promoting projects and programs. Without an economic advantage representing a real incentive to farmers' future food crop development efforts based on modern practices and inputs will lack the decisive momentum for progress in production.

VII. Production Improvement Projects

In view of the long existing production improvement problems numerous foreign assistance projects were launched to develop and implement strategies for successful elimination of constraints and subsequent augmentation of output. Ongoing projects and those in preparation or planned for the next three years are listed hereunder.

Ongoing projects

1. Promotion of food crops, robusta coffee, cotton, oil palm, pasture and livestock production under dryland conditions and irrigation mainly on settlement farms.

Location: Western Plains: Imbo-North; Imbo-Center; Nyanza-Lac.

Duration: 1977-1982

Funding : 200.000.000 FBU (2.2 mill. US \$)

Contributors: FED - AIB - Roumania - GOB

Production improved at a rather slow pace due to remarkable shortcomings in farmer organization and marketing of produce. Settlement concept and strategy proved only partially successful.

2. Tea production and processing; food crop promotion, animal production and soil conservation.

Location: Zaire-Nil Crest perimeters: Igenda, Banga, Rwegura, Remera, Tora, Kisozi: 600 Ha tea on estates - 2500 ha tea on small farms - 1800 ha forest trees - 2800 ha food and animal production.

Duration: 1973-1980 overall

Funding: 1.500.000.000 FBU (170 Mill. US \$) FED

158.000.000 FBU (1.8 Mill. US \$) GOB

Total : 1.658.000.000 FBU (18.8 Mill. US \$)

So far 1800 tea and 600 ha of forest trees have been planted. Tea still receives priority attention through input provision and special technical extension. Food crops remained of secondary importance and get only nominal support which had no visible impact on production.

3. Second phase - Coffee production improvement and intensification of food crop cultivation.

Location: Province of Ngozi (North)

Duration: 1976-1980

Funding : 468.000.000 FBU (5.2 Mill. US \$) IDA/IBRD
108.000.000 FBU (1.2 Mill. US \$) Kuwait Assist. Fund
99.000.000 FBU (1.1 Mill. US \$) GOB

Total : 675.000.000 FBU (7.5 Mill. US \$)

Coffee improvement progressed well due to timely provision of good planting material, fertilizer, pesticides and forceful extension. In contrast food crops got little attention and overall production showed no thorough improvement.

4. Vegetable production pilot project, development of production units with technical assistance through field extension.

Location: Bugarama and Muramvya Provinces.

Duration: 1977-1979; extension requested for 1980-1984.

Funding: 1977-1979 63.000.000 FBU (0.7 Million US \$) ATB
1980-1984 80.000.000 FBU (0.9 Million US \$) ATB

TOTAL : 143.000.000 FBU (1.6 Mill. US \$)

Project so far had no wide impact since general product acceptance in rural areas, marketing and processing are still unsolved problems. The requested project extension until 1984 is still undecided.

5. Production and distribution of improved seed; installation of 30 multiplication and distribution centers.

Location: Bujumbura, Gitega, Muyinga, Ruyigi and Bururi Provinces.

Duration: 1977-1982

Funding : 120.000.000 FBU (1.3 Mill. US \$) ATB

Sixteen centers have been installed. Seed materials are accepted by farmers but parts are often used for consumption. Maintenance of seed quality is a problem. Traditional planting habits favor cross-pollination and accelerated degeneration.

6. Fertilizer procurement and promotion; execution of annual procurement, field extension and distribution programs. Project activities concentrate on food crops.

Location: Project integrated into Department of Agronomy - MOA.

Activities in 12 out of 18 arrondissements.

Duration: 1972-1980.

Funding: 66.000.000 FBU (8.75 Mill. US \$) FAO and ATB
7.000.000 FBU (78.000 US \$) Fed. Rep. of Germany.
6.750.000 FBU (75.000 US \$) UNDP
16.000.000 FBU (180.000 US \$) GOB

TOTAL : 95.000.000 FBU (1.083.000 US \$)

Proper fertilizer use resulted in 80-100% yield increases. Economics depend on an appropriate price subsidy level. Inefficient purchasing and distribution and the uncertainties in the marketability of food crops so far prevented full project success.

7. ISABU - Agricultural Research.

Location: Bujumbura, Kisozi, Luvironza, Mosso, Imbo and sub-stations

Duration: 1978-1981

Funding : 162.000.000 FBU (1.8 Mill. US \$) ATB
45.000.000 FBU (0.5 Mill. US \$) GOB

TOTAL : 207.000.000 FBU (2.3 Mill. US \$)

8. University - Faculty of Agronomy

Location: Bujumbura

Duration: 1978-1982

Funding : 24.000.000 FBU (260.000 US \$) ATB
1.400.000 FBU (16.000 US \$) FED
12.600.000 FBU (140.000 US \$) GOB

TOTAL : 38.000.000 FBU (416.000 US \$)

Projects planned or in preparation

1. Development of irrigated agriculture (robusta coffee, cotton, rice, and other food crops) on a 9500 ha perimeter.

Location: Mpanda - East Imbo.

Duration: Four years - Phase I

Funding: 700.000.000 FBU (7.8 Mill. US \$) FED
700.000.000 FBU (7.8 Mill. US \$) FIDA *)
1.500.000 FBU (17000 US \$) GOB

TOTAL :1401.500.000 FBU (15.617.000 US \$)

2. Third Phase - Coffee production improvement and intensification
of food crop cultivation.

Location: Province of Ngozi

Duration: 1981-1985

Funding : IBRD; cost under study.

3. Basic Food Crops - Phase I (Supplement to No. 2 ongoing projects)
Provision of improved food crop varieties and production techniques to
subsistence farmers.

Location: Remera, Muramvya, Igenda, Tora (Zaire-Nil Crest)

Duration: 1979-1982

Funding : 357.000.000 FBU (4.0 Mill. US \$) U.S.A.I.D.
299.000.000 FBU (3.4 Mill. US \$) FED
75.000.000 FBU (840.000 US \$) GOB

TOTAL : 731.000.000 FBU (8.240.000 US \$)

4. Establishment of an SRD to start plantation production of oilpalm
and robusta coffee.

Location: Rumonge - Western Plains - South

Duration: 10 years

Funding : 1.700.000.000 FBU (18 Mill. US \$) IBRD, Saudi-Arabia,
Agric. Dev. Bank.

*) FIDA : Fonds International de Developpement Agricole.

5. Establishment of 12: "Agricultural Development Centers" in densely populated problem areas. Improvement of cash and food crop productivity in 12 communes through massive field extension.

Location: Muramvya and Gitega Provinces (Central Plateau)

Duration: 6 years

Funding : 1.350.000.000 FBU (15 Mill. US \$) IBRD/IDA

In addition, several integrated rural development projects must be mentioned. All include a food crop promotion and cooperative development components. One project is already operational:

Location: Province of Gitega

Duration: 1974-1980

Funding : 50.400.000 FBU (560.000 US \$) UNICEF
25.200.000 FBU (280.000 US \$) UNDP
900.000 FBU (10.000 US \$) GOB

TOTAL : 76.500.000 FBU (850.000 US \$)

The following are planned or in preparation:

(a) Integrated rural development.

Components: Food crops, animal production, infrastructure, health

Location : Kirundo - NE Central Plateau

Duration : 6 years

Estimated Cost: 1.900.000.000 FBU (20 Mill. US \$)

(b) As above

Location: Kinyinya

Duration: 6 years

Funding: IBRD

Cost: Under study

(c) Integrated rural development with cotton production as basic component.

Location: Kabezi (South of Bujumbura)

Funding : IBRD credit

Cost : Under study

The geographic areas covered by crop production and related projects in operation are illustrated in Annex 9.

VIII. Production Development Possibilities

To cope with the existing calamities in the food crop producing small farm sector, forthcoming foreign assistance interventions should concentrate on areas where rural families must work and live under most disadvantageous circumstances. Such conditions characterized by a sloping topography, high population pressure on the land resource, limited possibilities for cash crop production, eroded soils, backward technology, lack of animals and low income are typical for the Center and South of the Central Plateau where development project activities are still limited. Apart from the prospect of changing the farming and living conditions in this area long-term through sporadic or organized migration to sparsely populated regions, more immediate improvements could be expected from a substantial increase in food crop production. Possibilities for a realization of this objective exist once GOB and outside assistance unite resources and efforts to strengthen productivity related institutional capabilities at national and field level to design and implement strategies for an intensive motivation and support of the small farm sector. This would involve the application of site and situation specific combinations of the following development measures:

- (a) strengthening of the administrative planning and supervisory capacity of the Ministry of Agriculture.
- (b) Intensification of academic, technical and extension training.
- (c) Initiation of special small farm research work.
- (d) Reinforcement of food crop extension in the field.

- (e) Execution of appropriate farmer education campaigns.
- (f) Amelioration of infrastructure and transport capacities.
- (g) Improvement of input procurement, distribution and product marketing services.

For a concerted impact the interdependence and complementary nature of the cited activities must be taken into account. On this basis foreign assistance projects have been successful in developing and implementing strategies for the improvement of export crop production. Food crop cultivation project support is of only recent date and still in an initial stage. This opens many possibilities for additional development assistance which US-AID is also prepared to offer.

IX. Projects Recommended for US-AID Execution

From the agricultural production and research angle specific needs for successful implementation of development measures mentioned under points (a), (b), (c) and (g) can be defined. Thus far, foreign donors have not addressed these needs which gives US-AID the opportunity to provide appropriate project support to meet them.

To put MOA's planning and decision making function on a sound basis, an effectively operating statistics division has to be established. It will have to produce reliable data on which a meaningful production development strategy must be based.

To improve the professional capability of forthcoming generations of agriculturists, their academic training in agricultural sciences and techniques must be intensified. This requires outside assistance for expansion of the still limited university facilities for practical scientific work and teaching.

ISABU's orientation toward conventional research more suitable for a developed agriculture, calls for a special small farm research effort. A research station of limited size should be established in an area where subsistence farming problems are concentrated. It should base its field work on several simulated family units addressing itself to -

- . the full mobilization of indigenous production resources
- . the evaluation and improvement of crop cultivation storage habits and small farming systems including livestock

- . the control of soil erosion and fertility restoration
- . the development of low cash, low risk packages of technical recommendations for production promoting extension campaigns

In support of the recommended small farm research operation, AID assistance is also suggested for ISABU's recently initiated on farm storage research program.

Realizing that a restoration of soil fertility and augmentation of small farm production cannot progress rapidly enough if based only on residue recycling and rotational improvements, the supplementary application of limited amounts of fertilizer nutrients appears essential. However, fertilizer use development in the small farm sector will require substantial strengthening of the poorly performing fertilizer procurement and distribution system. US-AID assistance could help to overcome the existing weaknesses, but would only be appropriate if accompanied by serious government measures aimed at an improvement in purchasing and storage of marketable food crop surpluses.

In this context the following projects are recommended for US-AID execution:

1. Organization of a Statistics Division in the MOA-Planning Department.

Objective: To establish an operable system for collecting, processing, storage and retrieval of agricultural data.

Location: MOA-Bujumbura

Duration: 6 years

Inputs: Expatriate expertise, local and scholarship training, vehicles, office equipment, operational capital.

Approx. Cost: US\$ 2.4 million

Beneficiaries: Ministry of Agr. → Ministry of Planning → the Agric. Economy → the Peasant Farmer.

2. Establishment and operation of a special "Small Farm Research Center".

Objective: To evaluate existing and develop new, suitable family farm systems and to prepare low cash, low risk technological packages for the improvement of food crop production.

Location: Rutegama - Province of Gitega

Duration: 6 years

Inputs: Expatriate specialists, consultancies, local and scholarship training, buildings, water and electricity installations workshop-laboratory-farm-office equipment, animals, operational capital.

Approx. Cost: US\$ 3.1 million

Beneficiaries: ISABU → GOB Extension Service → the small farmer → the Agr. Economy

3. Fertilizer Procurement and Supply.

Objective: Strengthening of the inefficient fertilizer purchasing, storage and distribution system for timely provision of reasonably priced fertilizers to small farmers.

Location: Bujumbura and Country Provinces.

Duration: 5 years

Inputs: Expatriate experts, consultancies, local and scholarship training, storage construction, transport facilities, office equipment, operation capital.

Approx. Cost: US\$ 2.2 million

Beneficiaries: MOA Dept. of Agronomy → National Fertilizer Committee → Input Supply Organizations → the Small Farmer → the Agr. Economy

4. Assistance to the ISABU - On Farm Storage Research Program.

Objective: Development of effective, low cost small farm storage methods to reduce post-harvest crop losses and to strengthen the marketing position of food crop producers.

Location: ISABU research centers

Duration: 3 years

Inputs: Expatriate expertise, vehicles, construction work, local training, consultancies.

Approx. Cost: US\$ 480,000

Beneficiaries: ISABU → MOA Extension Service → the Small Farmer → the Agr. Economy.

5. Support to the Agronomic Faculty - University of Burundi.

Objective: To provide funds for the construction of a teaching laboratory complex of 320 m² plus greenhouse of 100 m² and for an intensification of student field experimentation and practical training.

Location: Bujumbura

Duration: 2 and 4 years respectively

Approx. Cost: US\$ 400,000

Beneficiaries: University of Burundi → the Students → GOB
→ Agric. Administration → ISABU → the Agric. Economy

Project design teams should be composed as follows:

- Project 1. Agric. and Marketing Statistics Expert
Statistical Training Specialist
Agricultural Planning Expert
- Project 2. Small Farm Management Expert (experienced in hill agriculture)
Tropical Agronomist (experienced in peasant farm practices)
Livestock Specialist (with experience in small ruminant
production)
Soil Conservation Expert (with experience in hill agriculture)
- Project 3. Fertilizer Procurement and Marketing Expert (with
experience in developing countries)
Fertilizer Logistics and Distribution Specialist (with
experience in developing countries)
- Project 4. Small Farm Storage Specialist (with experience in
developing countries)
- Project 5. Construction Engineer (with construction experience in
developing countries)
Agricultural Chemist (with experience in laboratory
organization and training)

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AID - Bujumbura

Mr. T. Lambacher - AID Affairs Officer
Mr. W. Egan - General Development Officer
Mrs. V. Kunkle - Assistant Program Officer

Ministry of Foreign Affairs - Burundi

Mr. E. Ntakabanyura - Director Foreign Relations (Europe, USA, Canada)
Mr. M. Nduwingoma - Advisor to the Minister

Ministry of Agriculture - Burundi

Mr. S. Sahinguvu - Dir. Gen. Agricultural Planning
Mr. S. Kremer - Chief Advisor, Agricultural Planning
Mr. P. Hitchoburundi - Coordinator, Agricultural Planning
Mr. D. Ngendehayo - Dir. Rural Development Branch
Mr. J. Kafurera - Chief Department of Agronomy
Mr. J. Sakubu - Gen. Manager SRD - IMBO/MPANDA
Mr. P. Buriguza - Chief Agronomist - Province of Gitega
Mr. E. Baranyizigiye - Manager, Rutegama Agricultural Center

Ministry of Planning - Burundi

Mr. Kleve - General Planning Advisor
Mr. R. Dedner - Agricultural Development Advisor
Mr. L. Dine - Agricultural Development Advisor

Ministry of Education - Burundi

Mr. J. Ndikumana - Dir. Gen. Dept. of Higher Education
Mr. E. Ntibayindusta - Dep. Director, Dept. of Higher Education

ISABU

Mr. E. Barandankikanya - Director General
Mr. J. Dewez - Chief Research Advisor
Mr. J. Ntawe - Chief Admin. Officer
Mr. A. Autrique - Dir. Plant Protection Dept.
Mr. G. Sottiaux - Dir. Soils Management Dept.
Mr. DeBrabandere - Food Crop Res. Coordinator
Mr. J. Neirinckx - Small Farm Mechanization Res. Officer
Mr. M. Ndabihore - Dir. Kisozi Res. Station
Mr. Schaelbrock - Food Crop Res. Officer - Kisozi

LIST OF CONTACTS (Continued)

ISABU (Cont'd)

Mr. J. Ravakulusa - Dir. Ruvyironza Res. Station
Mr. T. Sinzi - Asst. Dir. Messo Res. Station
Mr. Devos - Crop Res. Officer - Mosso
Mr. DeMarcin - Irrigated Crops Res. Officer, Imbo

University of Burundi

Mr. Z. Nicimpaye - Rector of the University
Dr. L. Tack - Dean, Faculty of Agronomy
Dr. D'Haes - Prof. Agr. Economics and Marketing
Dr. J. Standert - Prof. Plant and Crop Storage Protection
Dr. J. Wouters - Prof. Plant Production and Soil Fertility

UNDP/FAO

Mr. F. Ossela - Acting UNDP Resident Representative
Mr. J. Saad - Deputy UNDP Resident Representative
Mr. J. Jalláde - Manager, Integrated Res. Dev. Project - Gitega
Mr. M. Jeandrain - Manager FAO Fertilizer Prom. and Distrib. Project

IBRD

Mr. W. Jones - Regional Development Economist

Assistance Technique Belge

Mr. A. Vaucalck - Secretary General

Fonds Européennes de Développement (FED)

Dr. F. Nagel - Development Assistance Coordinator

Caritas - Catholic Missions Organization

Père Remacle - Director
Père Knoll - Missionary Mutwenzi Mission Station

Alliance of Protestant Churches

Pasteur E. Ntahomereye - Dir. of Mission Activities

Société Mixte d'Etudes Au Burundi (SOMEBU)

Mr. J. Delchambre - Dir. General

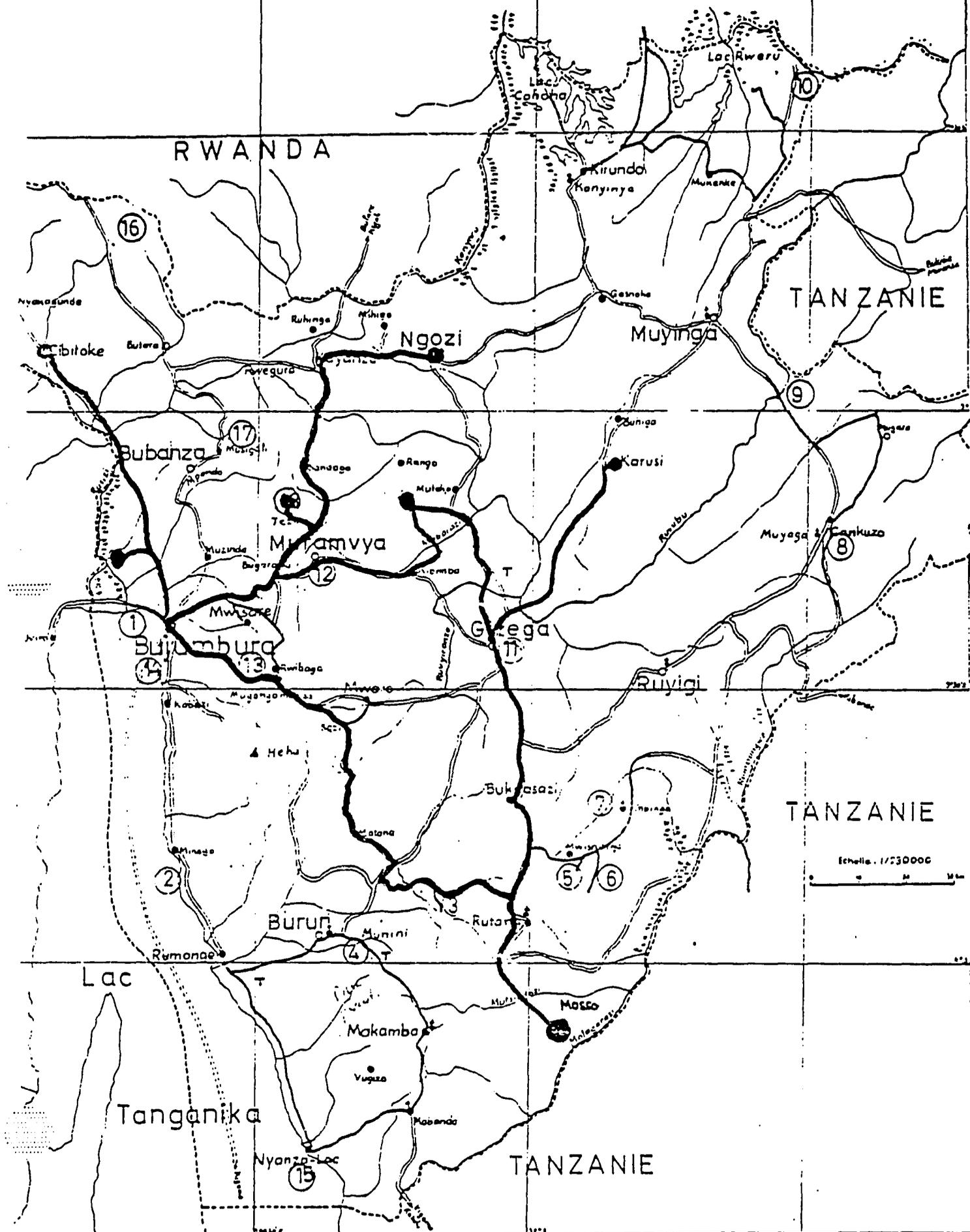
ABBREVIATIONS

ATB	Assistance Technique Belge
FAO	Food and Agric. Organization of the United Nations
FBU	Burundian Franc
FED	Fonds Européennes de Développement
GOB	Government of Burundi
IBRD	International Bank for Reconstruction and Development
IDA	International Development Agency
ISABU	Inst. Des Sciences Agronomiques du Burundi
MOA	Ministry of Agriculture
PNUD	United Nations Development Program
SOBUCOV	Soc. De Stockage et De Commercialization Des Produit Vivries du Burundi
SOMEBU	Soc. Mixte d'Etudes Au Burundi
UNICEF	Fonds Des Nations Unies Pour l'Enfance

Exchange Rate: \$1.00 U.S. = 89.55 FBU

BURUNDI

CARTE TOURISTIQUE



RWANDA

TANZANIE

TANZANIE

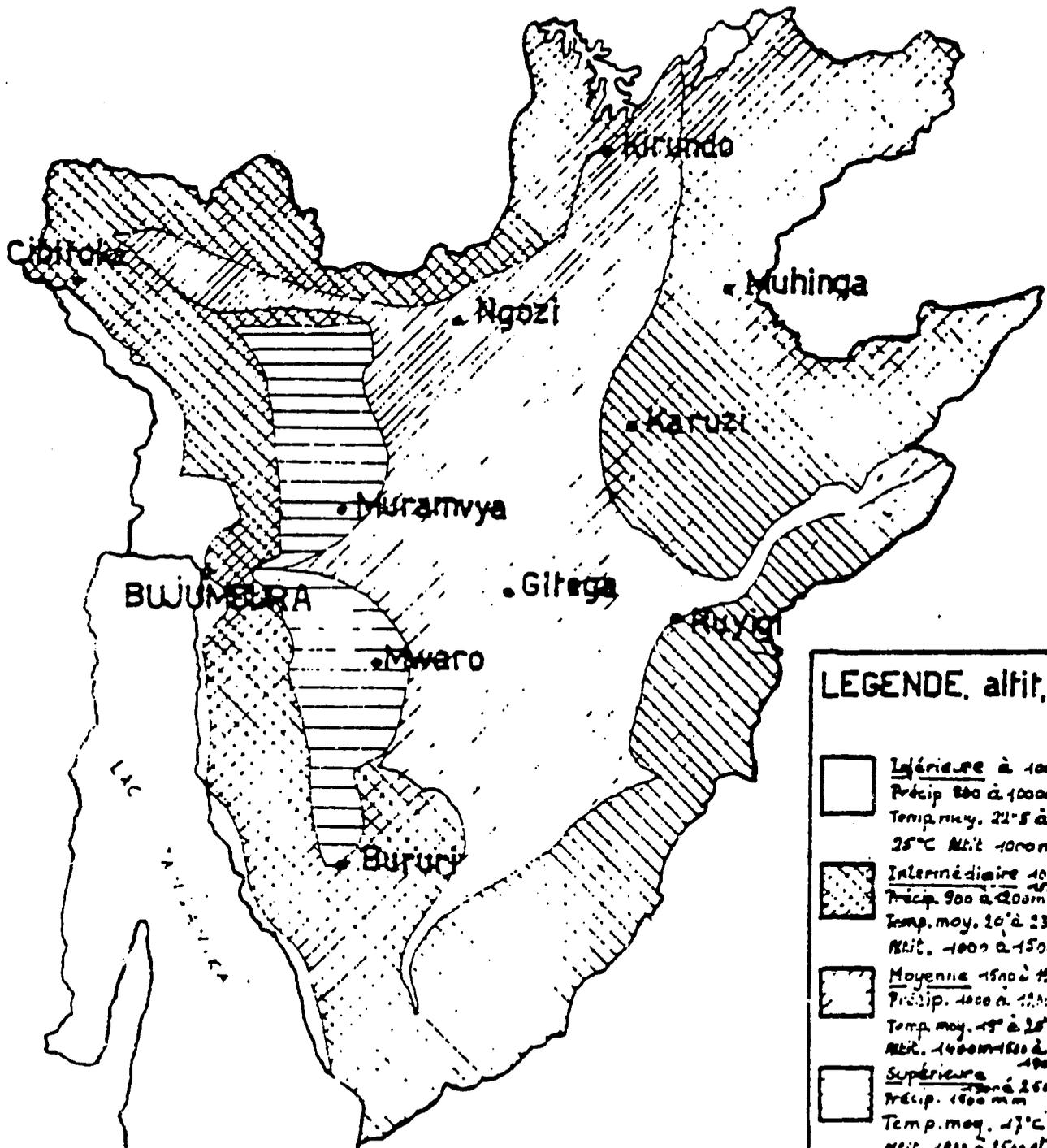
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0 10 20 30 Km

Tanganika

TANZANIE

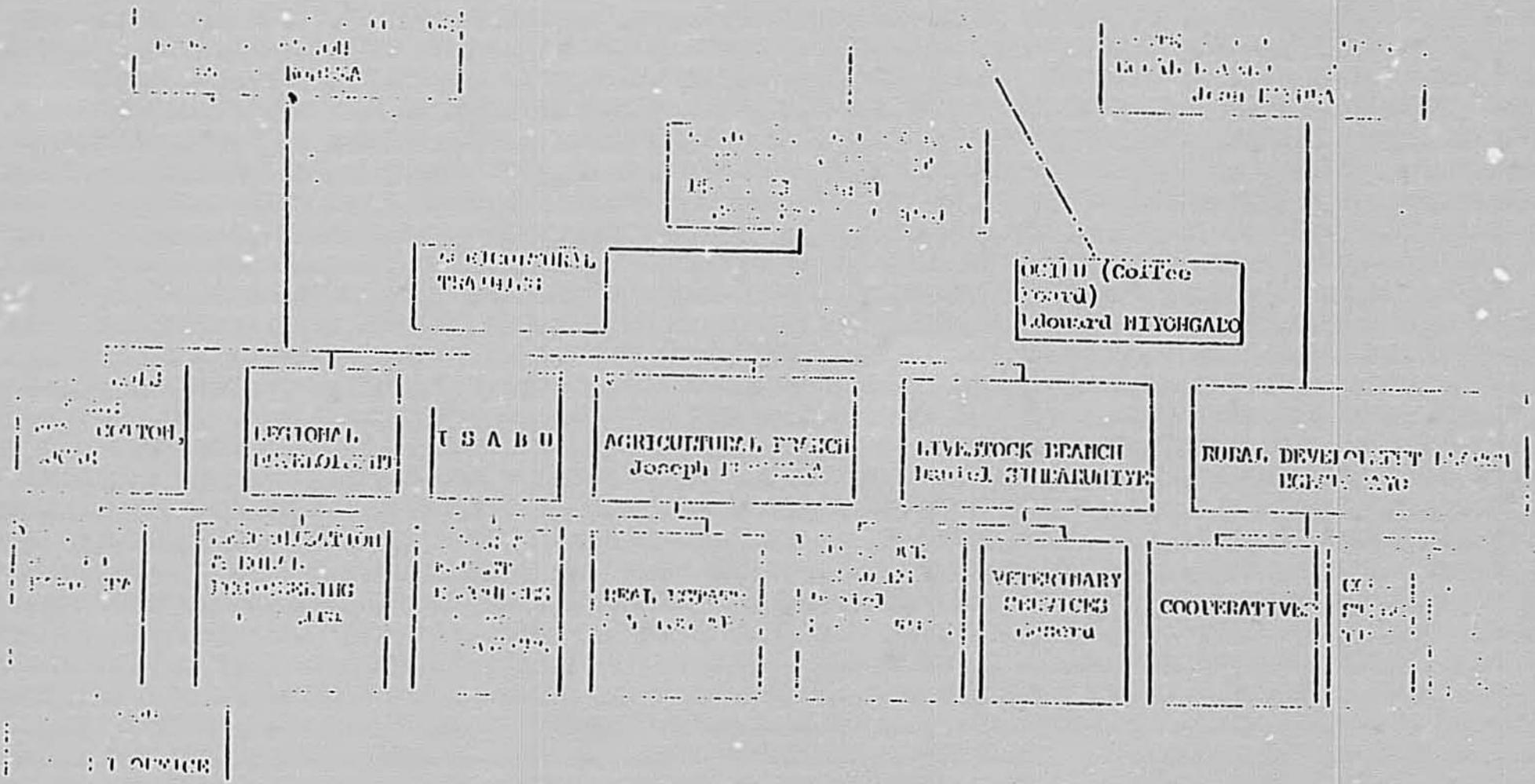
ZONES ECOLOGIQUES DU BURUNDI



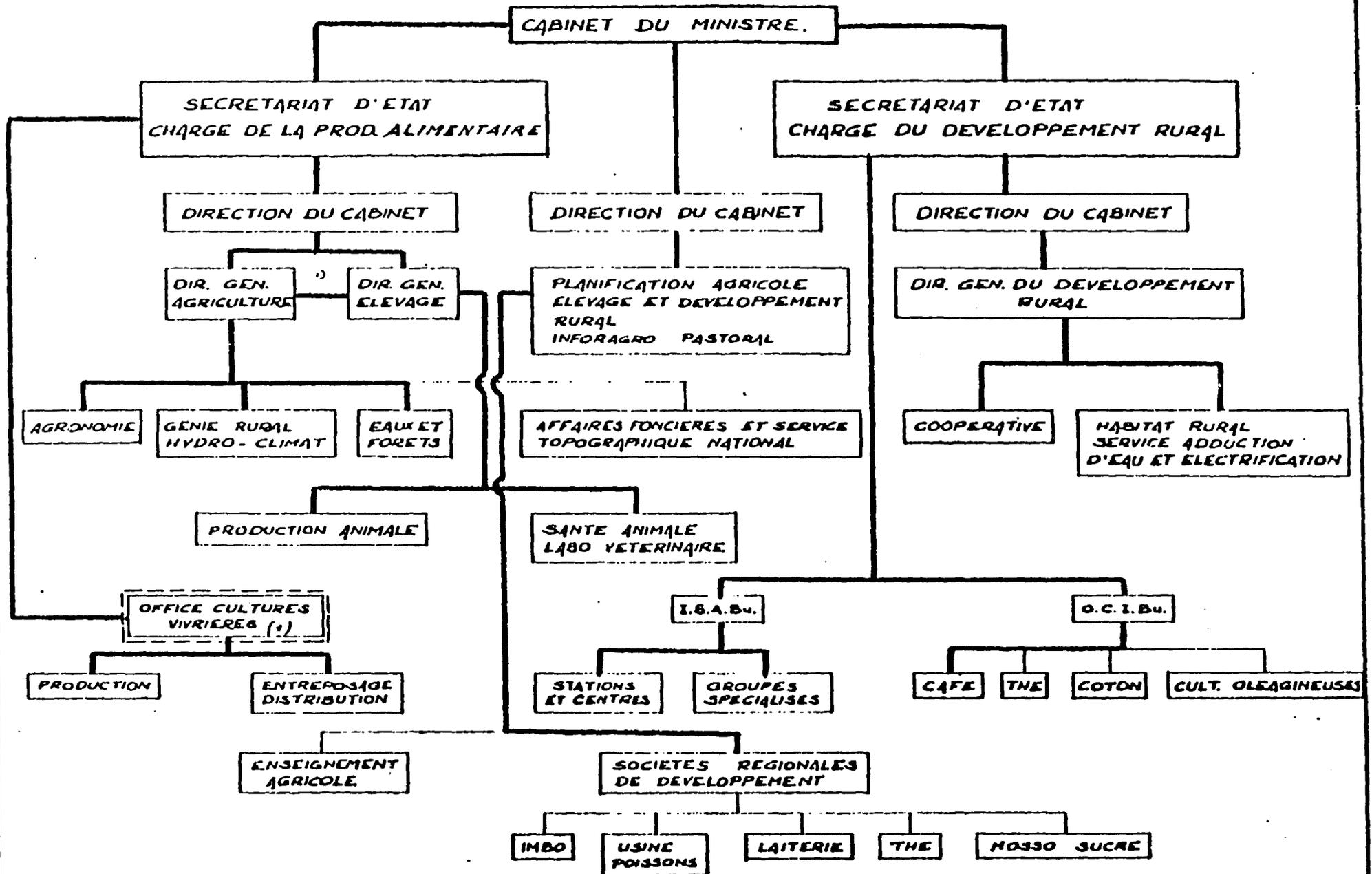
LEGENDE, altit.

	<u>Inferieure à 1000m</u> Précip. 800 à 1000mm Temp. moy. 21°S à 25°C Alt. 1000m
	<u>Intermediaire 1000 à 1500m</u> Précip. 900 à 1200mm Temp. moy. 16° à 23°C Alt. 1000 à 1500m
	<u>Moyenne 1500 à 1900m</u> Précip. 1000 à 1500mm Temp. moy. 15° à 20°C Alt. 1500 à 1900m
	<u>Superieure 1900 à 2500m</u> Précip. 1200 à 1800mm Temp. moy. 13°C Alt. 1900 à 2500 et plus

Echelle: 1:1000 000



1. ORGANIGRAMME DU MINISTRE DE L'AGRICULTURE, DE L'ÉLEVAGE DU DÉVELOPPEMENT RURAL

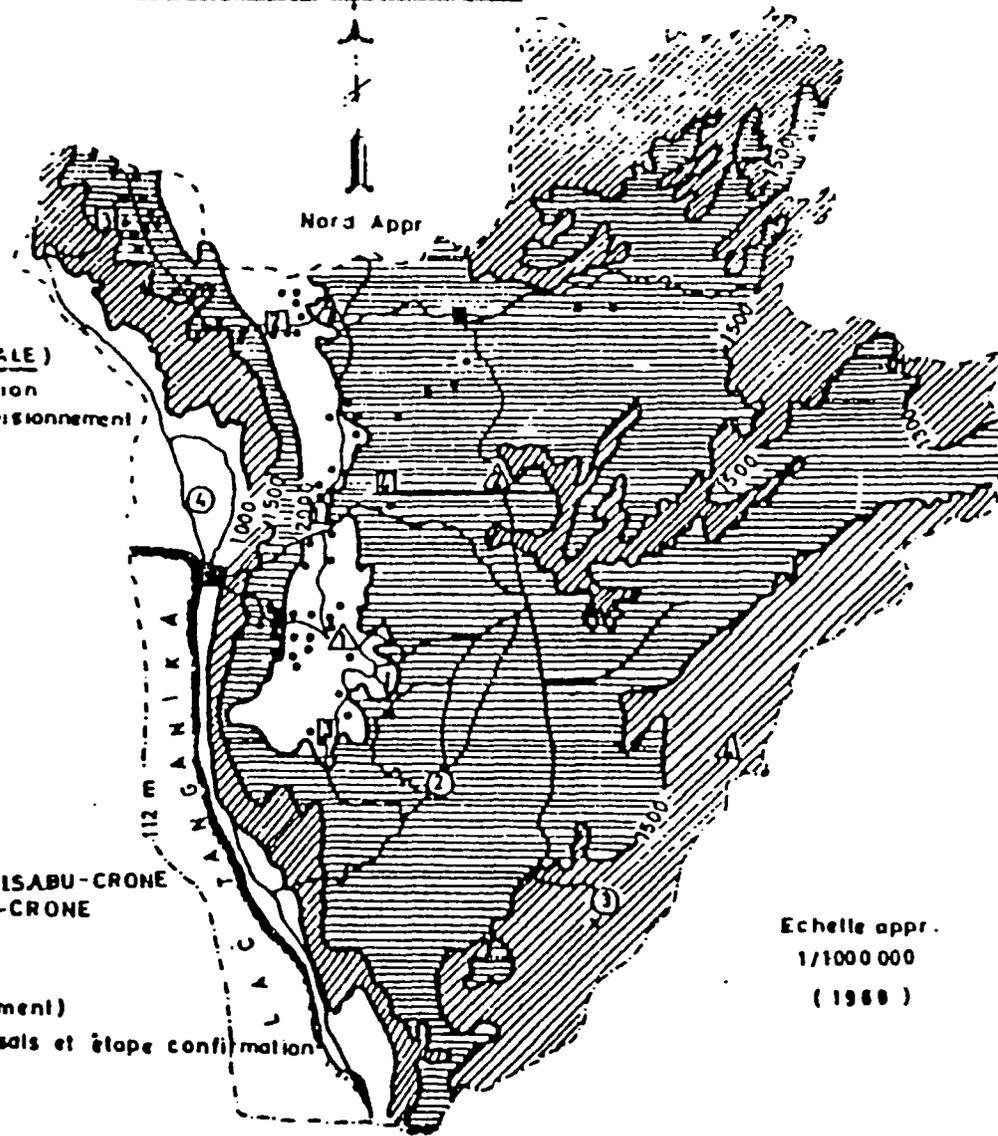


— Liaisons essentielles intéressant le Projet
 (1) En voie de création

ACTIVITES DE L'ISABU

LEGENDE

- Route principale
- 1500 - Courbes hypsométriques
- - - Limite d'état
- BUJUMBURA (DIRECTION GENERALE)
Direction, planification, coordination
Administration, comptabilité, approvisionnement
Pédologie
Phytopathologie
Economie rurale
Coordination thé
- STATIONS I.S.A.B.U
1 Kisozi -
2 Murongwe
3 Mosso
4 Imbo (à créer)
- △ CENTRES AGRICOLES
1 Nyakarara
2 Murongwe
3 Munanira
4 Kininya
- CHANTIERS THE
1 Teza ex. Bugarama: Association ISABU-CRONE
2 Rwegura: Association I.S.A.B.U-CRONE
3 Tora chantier thé INDACOM
4 Muramvya (ISABU)
- Parcelles Thé (Réseau compartement)
- Mission engrais café Ngozi (essais et étape confirmation)
- x Essais Tabac (MOSSO)



Echelle appr.
1/1000 000
(1968)

UNIVERSITE DU BURUNDI
FACULTE DES SCIENCES AGRONOMIQUES.

PROGRAMME DES COURS (1978-1979).

Ière année d'ingénieur agronome.

	<u>Théorie</u>	<u>Trav.pratiques-séminaires</u>
Entomologie générale	30	30
Microbiologie générale	30	30
Biochimie	45	-
Physiologie et anatomie animale	45	15
Génétique	30	15
Compléments de Physiologie végétale	30	-
Phytogéographie	22,5	-
Pédologie générale	45	30
Climatologie et Bioclimatologie	45	15
Zootechne générale I	22,5	7,5
Phytotechnie I	30	15
Topographie	15	30
Hydraulique	15	15
Biométrie et expérimentation	30	30
Economie rurale I	30	15
Nutrition générale	30	15

495

262,5

757,5.

690.

Période de stage sur le terrain : 3 semaines.

+ Période de stage et de travaux expérimentaux du mémoire : 4 mois minimum.

UNIVERSITE DU BURUNDI
 FACULTE DES SCIENCES AGRONOMIQUES.

PROGRAMME DES COURS.

2ème année d'ingénieur agronome.

	<u>Théorie</u>	<u>Travaux pratiques -séminaires.</u>
Phytopathologie (mycologie, virologie)	45	30
Pathologie animale	30	30
Parasites animaux des plantes	15	-
Agrostologie	30	15
Zootecnie générale II	45	30
Foresterie	30	15
Limnologie - Pêche - Pisciculture	45	15
Phytopharmacie	15	-
Fertilisation	30	15
Amélioration foncière	30	15
Technologie	30	15
Economie rurale II	30	15
Photointerprétation	15	30
Classification et cartographie des sols	15	15
Phytotechnie II	30	15
	435	255

690.

Période de stage sur le terrain : 3 semaines.

+ Période de stage et de travaux expérimentaux du mémoire : 4 mois minimum.

UNIVERSITE DU BURUNDI
FACULTE DES SCIENCES AGRONOMIQUES.

PROGRAMME DES COURS.

3e Année d'ingénieur Agronome.

	<u>Théorie</u>	<u>Trav.pratiques -séminaires.</u>
Législation générale et agricole	30	-
Comptabilité	30	15
Marketing des produits agricoles	15	-
Planification agricole	30	15
Séminaires sur les méthodes de vulgarisation -		30
Séminaires sur l'aménagement global du milieu,		30
Sociologie générale et rurale	30	-
Constructions agricoles -Résistance des matériaux	30	30
Machines agricoles	30	30
Amélioration végétale	30	-
Zootechne spéciale	22,5	7,5
	247,5	157,5

405.

Option phytotechnie :

Questions spéciales de phytotechnie	15
Questions spéciales de défense des cultures	15
	30

Option zootechne :

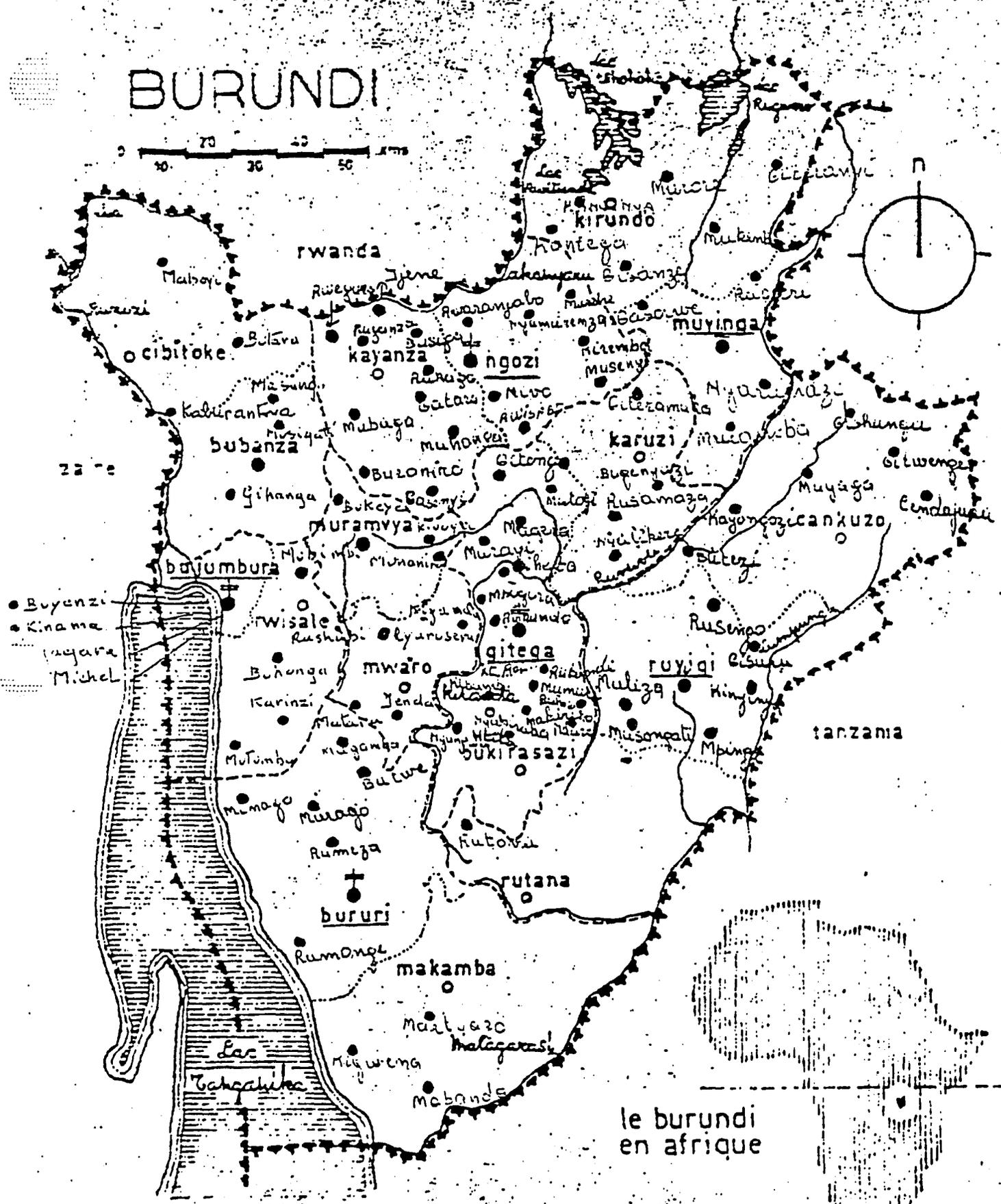
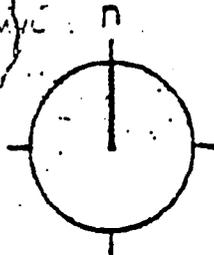
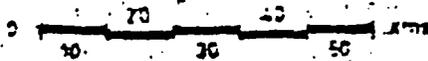
Questions spéciales de zootechne	30
	30

435.

+ Période de stage et de travaux expérimentaux du mémoire : 4 mois minimum.

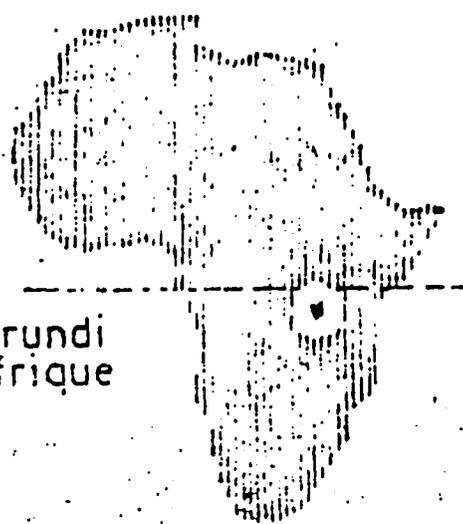
Catholic Mission Stations

BURUNDI



- Buyenzi
- Kinama
- Kayanza
- Michel

le burundi en afrique



isioe stations

DURUNDI CARTE TOURISTIQUE

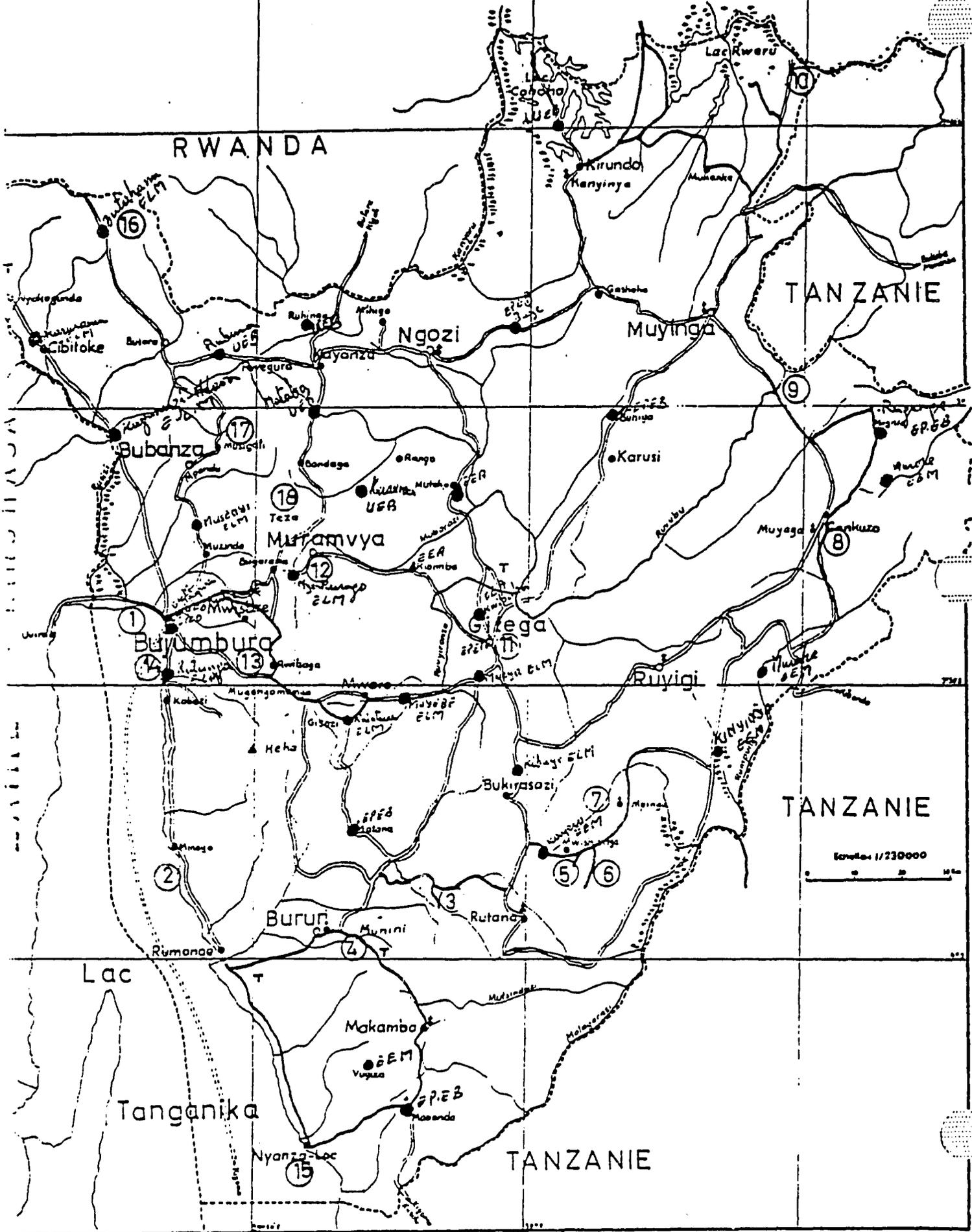


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