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RWANDA

INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT

STAFF APPRAISAL REPORT

May 9, 1980

Eastern Africa Region
Central Agriculture Division

CURRENCY EQUIVALENTS

Currency Unit	=	Rwandese Francs (RF)
US$1.00	=	RF 92
RF 1	=	US$0.0109

WEIGHTS AND MEASURES

Metric		British/US Equivalents
1 meter (m)	=	3.3 feet
1 hectare (ha)	=	2.47 acres
1 are	=	100 m^2 = 0.03 acres
1 kilometer (km)	=	0.62 miles
1 square kilometer (km^2)	=	0.39 square mile (sq. mi.)
1 kilogram (kg)	=	2.2 pounds (lb)
1 liter (l)	=	0.26 US gallon (gal)
		0.22 British gallon (Imp gal)
1 metric ton (m ton)	=	2,204 pounds (lb)

ABBREVIATIONS

ADB	African Development Bank
FRG	Federal Republic of Germany
BGM	Bugesera/Gisaka/Migongo Project
ISAR	Institute of Agricultural Sciences of Rwanda (Institut des Sciences Agronomiques du Rwanda)
MAI	Mean Annual Increment (Volume increment p.a.)
SCM or Stère	Stacked Cubic Meter (equivalent to approximately 0.7 cubic meter solid)
UNDP	United Nations Development Program
PU	Project Unit
PPF	Projet Pilote Forestier
PRODEFOR	Projet de Developpement Forestier

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APPRAISAL OF THE INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT

I. BACKGROUND

A. Project Background

1.01 A Forestry Project was identified in 1977, following discussions with the Government of Rwanda in the course of 1976. The Project was prepared during 1978, essentially by an IDA preparation mission with participation of Rwandese forestry technicians. The Government had initially defined two major objectives: (a) to initiate a eucalyptus plantation program around Kigali for charcoal production; and (b) to initiate a pine plantation program in the Gishwati forest reserve to develop the saw timber production capacity of Rwanda. During a visit to Washington in May 1979, Government officials also expressed an interest in extending the eucalyptus plantation program to other areas of Rwanda, namely Butare, and in including a rural woodlot component. The present report is based on the findings of an IDA mission which visited Rwanda in June/July 1979 to complete the project preparation and appraise the project. The mission included D. Lallement, N. Brouard, and S. Foster (IDA). A post-appraisal mission composed of D. Lallement (IDA), J. Le Hasif and J.L. Houdry (consultants) visited Rwanda in November/December 1979 to complete the appraisal of the livestock component and of the Project preparatory phase.

1.02 The scope of the Project was substantially changed during final preparation and appraisal. A new component was added to the fuelwood and pole plantation program to include a reforestation program around Butare and a pilot rural woodlot program. The approach for the development of the Gishwati Forest Reserve was significantly changed from pure silvicultural development to integrated silvicultural and livestock development. The objective was to protect and to make optimal use of the land resources in the forest area, and to provide a long-term solution to maintain the existing livestock activity. The Government had just completed a separate livestock project proposal for the Gishwati area which the missions were able to take into account in the modification of Project design. A major institution-building component was also added to the Project to strengthen and develop the Forestry Department of the Ministry of Agriculture and Livestock, and to prepare the ground for the development of a forestry policy and legislation in Rwanda. These changes in the scope of the Project were agreed upon by Government in the course of the appraisal and post-appraisal missions. Government has recently evidenced its commitment to the Project by initiating preparatory activities and appointing new staff to the forestry services.

1.03 To date, the Bank Group has financed four agricultural development projects in Rwanda. The Mutara Agricultural Development Project - Phase I (Credit 439-RW) was financed by an IDA Credit of US$3.8 million, and is fully disbursed. The Cinchona Project (Credit 656-RW) is supported by an IDA Credit

of US$1.8 million, and the Bugesera/Gisaka/Migongo Project-BGM (Credit 668-RW) received an IDA Credit of US$14.0 million. These two projects are progressing well and the BGM project is noteworthy in that the flexibility in project design has facilitated an effective dialogue with the Government on all project issues and has made possible careful modifications of project design in accordance with implementation experience. An IDA Credit of US$8.9 million for the Mutara Agricultural and Livestock Development Project - Phase II (Credit 937-RW) was signed on July 13, 1979, and implementation is beginning.

B. The Agricultural Sector

General

1.04 Rwanda is a small, land-locked country on the Zaire-Nile divide in Central Africa. Its population of about 4.8 million is increasing at 2.9% annually. With a total area of about 26,000 km^2, the population density is 183 per km^2, the highest in continental Africa. Rwanda borders upon Uganda to the north, Tanzania to the east, Burundi to the south, and Zaire to the west. The nearest major seaport is Mombasa, Kenya, over 1,700 km away by road and rail; almost all imports and exports are trucked between Mombasa and Rwanda, a three day journey. The route goes through some unstable areas such as Uganda, thereby increasing uncertainty and losses by theft, hijacking etc. Kigali (pop. 118,000) and Butare (pop. 22,000) are the two major urban centers in Rwanda, and over 95% of the population lives in rural areas. Within the rural areas, the population density varies greatly, from 87 per km^2 in the eastern part of the country to 328 per km^2 in Butare prefecture. Rwanda is one of the world's poorest nations and per capita GNP was US$180 in 1978; real GNP growth in the past decade has not kept up with population increase. Although the population is relatively cohesive and homogeneous both ethnically and in terms of living conditions, income distribution is skewed between rural and urban areas; while the national average GNP per capita is US$180, the average rural per capita GNP is estimated at not much more than US$100.

1.05 Rwanda is generally hilly, with elevation and rainfall gradually increasing from east to west. Three major climatic and geographic areas can be discerned. The eastern zone is a savannah region with low rainfall (700-1,000 mm) and long, marked dry seasons. The altitude averages 1,000-1,500 m. The natural vegetation consists mostly of tall grasses and acacia trees. The east is the least populated area of Rwanda, principally because of the lower rainfall, and, until recently, the presence of the tsetse fly. The central high plateau zone is a densely populated area of rolling hills 1,500 to 2,000 m in elevation, with a rainfall of 1,500-2,000 mm. The mountainous western zone includes the Zaire-Nile divide and the volcanic region to the north. The region is generally above 2,000 m average in elevation, has a rainfall of 1,500 mm or more, and a cool climate; parts of this zone are very densely populated. Of the total land area of Rwanda, only about 30% is suitable for cultivation, 22% is pastureland, 6% is forest, and the rest is classified as unusable land.

1.06 Agriculture is the most important sector of Rwanda's economy, and it contributed about 50% of GDP in 1978, three quarters of which was from subsistence crops. Over 90% of the population is engaged in agriculture, and agricultural exports provide two-thirds of total export earnings; coffee alone represents over half of total export earnings. Imports for 1977 totalled US$115 million, of which 11% was spent on food. In spite of the importance of agriculture to Rwanda, until recently investment in the sector has been minimal. This situation is changing, however, and about one third of planned investment for 1977-81 is earmarked for agriculture.

1.07 In Rwanda, agriculture is the province of small farmers who use traditional cultivation methods on plots which average one hectare in size. The use of modern techniques and inputs is virtually non-existent, although the results of extension efforts are visible in certain areas.

Land Tenure

1.08 By law, all land in Rwanda belongs to the Government; unused and uncultivated land can be used by the Government for any purpose. However, most landholding is actually governed by both traditional law and modern regulations. Traditional land tenure practice allows individual usufruct rights to continuously cultivated land. All pasture land is communally held. Most cultivated land can be passed on to heirs; it is rarely sold for cash. Farmers in organized settlement schemes (paysannats) enter into a contract with the Government which grants them the use of a 2 hectare plot; the settlers may not sub-divide their plots among their children. The Government has indicated its intention of establishing a land reform policy which would include: (1) full use of all agricultural land so that land cannot be set aside by prominent landowners for their children; (2) discouragement of cumulative land acquisition by non-farmers; and (3) regrouping of small farms and pieces of land to form larger, consolidated units. To-date, however, little has been done to bring about these changes. Cultivated land under usufruct rights may be acquired by the Government, in which case compensation is paid on the basis of the crops planted, type and number of trees, type of dwelling, etc. Other land, however, may be taken over without compensation to the local community.

Agricultural Production

1.09 Rwanda is fortunate in having relatively good soils and favorable climatic conditions which allow two crops per year in most areas. The variations in elevation and climate allow a wide range of crops to be grown. Subsistence or food crops grown at lower elevations include beans, maize, sorghum, bananas, sweet potatoes, groundnuts, and cassava. The principal food crops grown at higher elevations are peas, potatoes, and sweet potatoes. Cash crops, which account for about 70% of export earnings, include coffee, tea, pyrethrum, and cinchona. About 95% of cultivated land is planted with food crops, with an estimated one quarter of this area under bananas, most of which are used to produce beer. Crop yields are low, and practically no fertilizers are used. Research indicates, however, that yields could be

substantially increased with improved cultivation techniques, better seeds, and the application of fertilizer. Rwanda coffee is of good quality; about 35,000 ha are planted in coffee by some 450,000 farmers.

Livestock

1.10 Livestock has traditionally been seen as a symbol of wealth, rather than as a productive, integral part of the agricultural system. With the increase in population and the land shortage, more and more grazing land has been brought under cultivation, causing overgrazing and destruction of the remaining pasture land. Consequently, in spite of improved animal health, the national cattle herd of Rwanda has been decreasing. In 1977 there were about 640,000 head of cattle, as compared to 750,000 in 1975. Cattle raising in Rwanda is still organized along traditional lines for milk and meat production. The numbers of small livestock, however, are increasing, in particular pigs and rabbits. Goats and sheep, which provide most of the meat consumed in rural areas, numbered about 730,000 and 260,000 respectively, in 1977. In spite of the severe lack of grazing land, few cattle are stall-fed, although most goats and sheep are kept tethered. A major intensification effort has begun throughout the country involving stall-feeding of livestock on forage crops such as Setaria and Pennisetum. The manure is used as organic fertilizer for crops. Much still remains to be done in this area, but initial farmer response has been encouraging. Animal health infrastructure is relatively good but veterinary products are often lacking. Milk production is low, estimated at about 64 million liters in 1977, of which about one-third was for human consumption. Meat production was estimated at 12,000 tons carcass weight in 1977.

Other Agricultural Resources

1.11 Most of Rwanda's fish catch is taken in the lakes. The 1977 fish catch was estimated at 1,450 tons, of which roughly one third was from Lake Luhondo and one third from Lake Kivu. Fish pond production is negligible. Some recent studies have indicated the presence of a much greater fish resource in Lake Kivu than had previously been evaluated, and the Government plans to develop this resource further. The forestry sub-sector is described in Chapter II.

Marketing and Prices

1.12 Most foodcrop production is consumed on the farm, and only an estimated 37% is marketed. Only beans, peas, and potatoes are effectively distributed. Banana beer is the most widely traded item, used to generate cash for urgent needs and in exchange for labor or goods within rural communities. Trade in foodcrops is increasing, however, especially in response to growing demand from towns such as Kigali and Butare. The Government has encouraged this trend and has attempted to promote regional specialization through various administrative changes, especially the creation of marketing organizations and cooperatives. Prices vary substantially according to the season, and farmers who have no way of storing their production or who sell

their harvest for quick cash are often forced to buy part of it back later at twice the price they received. Several storage programs are under way to enable farmers to store their harvest for a nominal fee, thereby enabling them to take out food and seed as needed and contributing to the stabilization of prices. Another attempt at price stabilization is the creation of a National Price Commission, which was set up to establish minimum producer prices and maximum consumer prices; its effectiveness, however, has been limited. Cash crop marketing and some processing are regulated by the parastatal organizations (para. 1.19). Coffee, for example, is supposed to be sold by farmers only to accredited merchants or cooperatives, after which it is sent to processing factories in Kagali and exported by OCIR, a parastatal organization.

Development problems

1.13 Rwanda will continue to be primarily an agricultural country for many years to come. The future prosperity of its people will therefore have to come from increased agricultural production, but in view of the serious problems in the agricultural sector and Rwanda's rapidly growing population, it will be a major challenge simply to maintain present income levels. Agriculture in Rwanda must deal with one unchangeable constraint: the shortage of available land. Increased production will have to come from intensification, not from putting more land into production. Intensification will mean use of new cultivation methods, anti-erosion techniques, improved seeds, and fertilizer; integration of animal husbandry with crop production through stall-feeding and manure collection; use of agricultural residues as compost and mulch rather than as a source of domestic fuel; and planting of fuelwood, building pole and fruit tree species around farm boundaries and homesteads. Intensification requires a major extension effort; major progress has been achieved in recent years in various projects throughout the country in farmers' adoption of some intensification measures, in particular the planting of anti-erosion fodder strips.

Government Strategy and Plans for Agricultural and Rural Development

1.14 The Government of Rwanda has defined the broad objectives for agricultural and rural development in the Second Five Year Plan for 1977-81. Four essential goals are identified:

(i) meeting the population's nutritional requirements;

(ii) promoting better utilization of human resources;

(iii) improving individual and collective living conditions; and

(iv) improving Rwanda's international trade position.

The Plan emphasizes the importance of agriculture in Rwanda's economy, and the priority to be given to this sector, in particular to integrated rural development as one of the means of agricultural growth. The Plan recognizes, however, that diversification is necessary within the sector.

1.15 The specific objectives for agriculture for 1977-81 stated in the Plan are as follows. The agricultural sector as a whole would grow at 5.0% p.a. as compared to 7.1% and 7.2% respectively for the secondary and tertiary sectors. Subsistence crop production would increase at 3.8% p.a. as compared to 12.7% for export/industrial crops, 11.9% for animal products, and 37% for fish. Value added for new traditional crops such as oilseeds (groundnuts, soybeans), potatoes, wheat, rice and vegetables would grow at higher average rates than other subsistence crops. Likewise for livestock products: beef and mutton would only grow at 3.6% p.a. as compared to 22.6% p.a. for pork, poultry, eggs, and milk. Among export crops, value added for relatively new crops such as cinchona, cotton and sisal, medicinal or essential oils, plants, tobacco, etc. would grow at higher rates than traditional crops such as coffee, tea and pyrethrum. Rural income would increase by 4.2% p.a. For the 1977-81 period, the share of agriculture in total national investment would average 8.5%, of which 89% would be financed from external sources, public (65%) and private (35%).

1.16 The Plan recognizes that these targets will be difficult to achieve. The only chances of success would come from a combined effort of the entire population. The communes should become the major catalyst for development, as they provide a solid framework for the people to work on improving their individual or collective environment. The Umuganda system, whereby each adult contributes half a day of labor a week to a collective project, could be a means to develop social services in local communities. The development of cooperatives would also be emphasized, mainly to encourage the production and marketing of agricultural inputs and produce. The Plan also emphasizes the need to develop better technical services for agriculture. The communes would assume part of the training responsibilities by establishing development centers where training sessions would be given to selected farmers who would themselves become the promoters of technological improvement in their community.

1.17 Intensification of production along the lines described in para 1.13 would be the focal point for crop and livestock development, given the land constraints and limited possibilities for opening or reclaiming new lands for cultivation. Other measures would include carrying out further research on higher yielding varieties, and increasing livestock productivity by expanding extension and veterinary services, and developing fodder production and upgrading the genetic value of the herd.

Government Services

1.18 Ministry of Agriculture and Livestock. The Ministry is responsible for all activities related to agriculture in Rwanda. The Minister is assisted by a Secretary General, who coordinates and oversees the activities of the Secretariat and of the four General Directorates (Directions Generales) of Agronomy, Rural Engineering and Soil Conservation, Livestock, and Land. The Director General of Agronomy is responsible for two departments, Agricultural Extension and Waters and Forests. The organization of the Department of Waters and Forests is discussed below (para. 2.08). All prefecture and

commune agronomists, as well as forestry and fishery officers are responsible to the Directorate of Agronomy. Agricultural services are regionalized at the prefecture and commune levels. The Ministry also oversees the work of some parastatal organizations (para. 1.19), the research institutions, and regional development agencies. It also operates a Selected Seeds Service for the production and sale of improved seed varieties.

1.19 Parastatal Institutions. The Ministry of Agriculture and Livestock oversees the work of the five parastatal agencies. The largest is OCIR (Office des Cultures Industrielles du Rwanda) which is responsible for quality control, conditioning, and marketing control of exports of coffee, tea, pyrethrum, and cinchona. OCIR is completely responsible for tea production; it does not market coffee but controls the one authorized exporter and sets producer prices. OPROVIA (Office National pour le Developpement et la Commercialisation des Produits Vivriers et des Productions Animales) is responsible for the procurement, processing, and marketing of food crops and livestock. It has so far limited its activities mainly to the handling and distribution of food donations.

Agricultural Research

1.20 ISAR, the Institut des Sciences Agronomiques du Rwanda, is responsible for agricultural research and has received considerable Belgian assistance. ISAR's crop and livestock research is satisfactory but its findings are not effectively disseminated to farmers. ISAR's Rubona research station has done some work on forestry and employs an expatriate forest researcher. The land at Rubona is considerably more fertile and more easily planted than most of the land now available for forestry development. Also, more research is required on the non-agricultural lands which could be devoted to forestry. The Swiss-financed Pilot Forestry Project at Kibuye (para 2.15) has also done research on nursery techniques, selection of species to be planted, road construction, costs and yields, and on ways to increase the awareness of the population about forestry development.

Agricultural Training

1.21 Three institutions are responsible for providing post secondary agricultural training in Rwanda. The Agronomy Faculty of the National University of Rwanda at Butare is being developed with Canadian aid to train agricultural engineers and zootechnicians; the first class graduated in 1977. The School of Agriculture, in Butare, largely supported by French technical assistance, operates a four-year post secondary course. It trains 20-25 agricultural technicians (A2) and 10-15 assistant level zootechnicians and veterinarians (A2) each year. The Nyagahanga school in Byumba prefecture trains female agricultural technicians; the first class of about 30 students will graduate in 1980. The agriculture school at Kibuye gives a two year course and trains about 20-25 lower level (A3) agricultural technicians each year; a comparable program to train lower level assistant zootechnicians and veterinarians is being undertaken by the Bugesera/Gisaka/Migongo Project. Overseas training of agricultural engineers is becoming less significant for lack of scholarship funds; it is still the only source of veterinarians.

Trained agricultural staff is still very limited in numbers, but each year new graduates from Butare University become available. The Government is actively reviewing the agricultural staff at the prefecture level with a view to improving their effectiveness. Forestry training is described in para 2.09.

Agricultural Credit

1.22 Credit to farmers is not well developed at present. Intensification programs, however, will require some credit to farmers for inputs and especially for cattle purchase. At present some credit to farmers is channelled through the People's Banks (Banques Populaires) which receive deposits and make loans to cooperatives and individuals for working capital. Experimental credit programs are being developed under the IDA-financed Bugesera/Gisaka/Migongo and Mutara projects.

Local Administration

1.23 Rwanda is divided into ten prefectures, each of which is headed by a prefect appointed by the Minister of the Interior. Prefectures are divided into communes, headed by a "bourgmestre", and each commune is divided into "collines" or hills, which usually include about 50 farm families. Each commune has a council of elected representatives who advise the "bourgmestre". There is also a development council and a technical committee which propose and execute projects. All communes set aside 10% of their tax revenues for a communal action fund, which is used to finance projects. Each prefecture and commune in theory has an agronomist and a veterinary technician, although many of these posts are vacant. Each Rwandese citizen is required to work half a day a week on a community project; this movement, called umuganda, has sometimes been surprisingly effective and numerous feeder roads, bridges, schools, etc. have been built, and trees planted with umuganda labor.

II. THE FORESTRY SUB-SECTOR

General

2.01 The forest resources of Rwanda, once much more extensive, now cover less than 6% of the total area and are being destroyed at a very rapid rate. Very few trees have been planted to replace those which have been cut down and sporadic Government tree-planting programs have had only minimal success. Land is so scarce that farmers plant most of the land they have in crops which produce an immediate return. The result has been the decline of wood available for fuelwood and charcoal. Another result is the increased use of agricultural residues for fuel; maize and sorghum stalks, bean and pea hulls, and dried dung are burned instead of being used to improve soil structure and fertility, thereby reducing crop yields. The urban populations which rely on charcoal for their fuel needs are severely affected; in Kigali, the family of a junior civil servant, for example, may spend over one quarter of its cash income on charcoal alone. Cooking is done less often, sometimes as

little as once every two or three days. The Government is becoming increasing aware of the situation but still has to formulate an effective forestry policy. Unless action is promptly taken, the scarcity of fuel resources will become more and more critical, and it will be the poor who will suffer the most. The rural poor will be affected by falling agricultural production and consequent lower incomes, while the urban poor will spend an ever-increasing portion of their income on meeting their basic fuel needs.

Forestry Resources

2.02 Rwanda's present forest resources are estimated to be approximately 170,000 ha, or roughly 6% of the total area. Under the Belgian administration, most of what remained of a dense montane forest on the Zaire-Nile watershed line in the western part of the country had been set aside as natural forest reserves. As reserves, these forests were placed by law under the jurisdiction of the Government, their access was prohibited to the local population, and none of their trees were to be cut down. With population pressure and the lack of adequate protection capacity, enforcement of the law has become negligible over the years. The Nyungwe reserve now covers only about 90,000 ha, and in the Gishwati reserve, out of 28,000 ha, only about 5,000-6,000 ha of primary forest are left. In addition, there are in Rwanda approximately 6,000 ha of Government plantations, 20,000 ha of communal woodlots, 2,000 ha of roadside trees and up to 20,000 ha of individual woodlots. Eucalyptus species make up most of these plantations, with E. grandis/saligna, E. maidenii and E. tereticornis/camaldulensis as the predominant species. Some Grevillea robusta, Cupressus lusitanica and Pinus patula have also been planted, as well as other species. Between 1966 and 1974, land under cultivation increased from 600,000 ha to nearly 800,000 ha, and some of this increase was at the expense of the natural forests of Rwanda.

Wood Consumption and Production

2.03 Wood is used in Rwanda as the principal source of energy for cooking and heating, for construction and building, and as the energy source for rural industries. The main fuel uses of wood are for (1) cooking and heating in rural homes and large institutions such as hospitals; (2) the production of charcoal for urban consumers; (3) the drying of tea, tobacco, and pyrethrum; and (4) the making of bricks, tiles, pottery, and forged metal. Much of the shortage of fuelwood is being made up by the burning of agricultural residues, dried manure, grasses, and leaves. One survey carried out in 1977 showed that in the most densely populated rural areas, wood accounted for only 30% of what is burned; agricultural residues made up the remaining 70%. The result is much lower agricultural yields. Studies have shown, for example, that coffee and other crop yields fall by 50% or more when mulch or organic fertilizer is not used. Government statistics indicate that in 1977, some 21,000 m^3 of wood were cut from state-owned plantations, and 71,000 m^3 from communal woodlots, making a total of 92,000 m^3. Yet these figures would account for less than 10% of estimated consumption and are merely an indication of the extent of illegal cutting of the forest. The same statistics indicate that a total of 3,000 ha

of forest were planted, but other sources indicate that the area planted annually over the last few years rarely exceeded 1,000-2,000 ha. This gives an idea of the imbalance between cutting of the forest and its replacement.

Imports of Wood, Building Materials, and Fuel

2.04 Government statistics indicate that wood imports are relatively limited and account for 1% by value of all imports. For example, in 1977, statistics indicate that 2,000 tons of wood was imported, including about 900 tons of logs and boards, 500 tons of plywood, and 400 tons of boxes and packing crates, for a total value of about FRW 94 million (just over US$1 million). In addition pulp and paper imports represented about 2% of the value of imports. Several Kigali furniture manufacturers import good quality wood from Zaire and Uganda. Metal is also imported to substitute for wood in the furniture and construction industries, but the amount of imported metal used in place of wood cannot be determined from available statistics. Petroleum-based domestic fuels (kerosene and gas) are little used because of their high cost, distribution problems, and the high initial investment required for stoves, lamps and other equipment. Kerosene is used almost exclusively for lighting, and costs RF 36 per liter; in 1977, 3,000 tons were imported for a total value of RF 81 million (US$0.9 million). Butane gas and electricity are used only by the privileged few in Kigali and a few other towns. Rwanda has extensive reserves of peat which, although not yet exploited on a commercial scale, are perhaps the most promising alternative source of low-cost energy (para. 2.12).

Charcoal

2.05 Charcoal is produced mainly in the Bugesera region southeast of Kigali, and is marketed in Kigali and Butare. In recent years wood has become increasingly scarce and the charcoal production center has gradually shifted farther from Kigali. Only a few years ago, most charcoal was produced 40-45 km from Kigali, but the distance is now 80 km or more, considerably increasing the cost of transporting the charcoal to the Kigali market. Small amounts of charcoal are also produced and sold in the area of Gisenyi and Kibuye prefectures. The traditional pit or stack methods are used to produce charcoal. With both methods the yields of charcoal are quite low, from 10 to 15% or less, and the process takes 6 to 8 days. Recent studies estimate that half a hectare of the dwindling Bugesera "forest" is cut for every small truck load of 35-40 bags of charcoal of 30-35 kg each; to meet the charcoal needs of Kigali alone, 780 ha of Bugesera's woodlands are cut down each year. Communes (para 1.23) in which charcoal is produced levy a tax on trucks carrying charcoal according to the size of the truck; for example, a small pickup which carries up to 42 sacks is charged RF 100 per load. The tax is paid at the border of the commune by the transporter. Charcoal prices vary seasonally according to the availability of transport, and are highest during the rainy season when some roads are impassable, and during the coffee harvest when trucks are primarily engaged in transporting coffee. Charcoal is sold in bags of 30-35 kg, and prices were RF 400-500 in Kigali and RF 500 or more in Butare in mid-1979. Small piles of about 1/2 kg are also sold for

RF 20 each; at least two piles are needed for one cooking session. When a bridge was closed for repairs on the road from the Bugesera region to Kigali, prices more than doubled to as much as RF 1000 per sack.

Sawmills

2.06 Rwanda currently has only one small sawmill in operation, run by the Swiss-financed forestry project (para 2.15) at Gisovu. The Swiss recently ceased operation of a second sawmill due to rising operating costs. Another sawmill previously operated in the Butare region also closed down due to the shortage of wood and the obsolescence of its equipment. Almost all sawing is now done by skilled pit-sawyers, who travel to wherever their skills are needed. A two-men team can saw approximately six boards a day, and receives RF 110 per board.

Pricing Policy

2.07 The prices for wood cut from state-owned plantations (boisements domaniaux) are set annually by the Ministry of Agriculture on the recommendation of the Department of Waters and Forests. Market forces and replacement costs do not appear to be an important element in establishing price levels. Cutting permits are issued by the prefecture agronomist and presented by the purchaser on demand to the forestry officer for the particular locality. The 1979 prices of construction wood were set at RF 60 for poles of less than 10 cm in diameter, RF 150 for poles of 10-20 cm, and RF 500 for all wood of more than 20 cm in diameter, regardless of size. The price of RF 500 represents an ad hoc solution since the Department of Waters and Forests lacks the manpower and the means to measure each tree for which a permit is requested. There appears to be no established, regular market for construction poles, and they are cut and transported on a contract basis. Firewood cutting/gathering permits cost RF 160 per stere (1 m^3 of stacked wood, not solid); the wood is sold by merchants at RF 400 per stere, including cutting and transport costs. It became clear in discussions with forest officials that most cutting of wood, especially poles, is done illegally and only in rare instances are permits obtained. Communal woodlots (boisements communaux) are for the use of the commune residents, and may be cut by order of the bourgmestre of the commune. One-quarter of the woodlot is theoretically set aside for the exclusive use of the very poorest families of the commune.

Forestry Services

2.08 The Department of Waters and Forests (Direction des Eaux et Forets) is under the General Directorate of Agronomy of the Ministry of Agriculture and Livestock (para. 1.18). The post of Department director has been vacant for several months. A forestry engineer is to be appointed director shortly. Until July 1979 no trained foresters were assigned to the Department. At present, the staff consists of the acting Director, an agricultural technician (A2) who is also chief of the Afforestation Office, an agricultural assistant who does field work, a topographer,

and two recently graduated forestry engineers. The Department's offices are located in three small rooms of an old building in the commercial district of Kigali, separate from the rest of the Ministry of Agriculture. The forestry field staff includes 53 forest guards (gardes forestiers) and 46 forest extension workers (moniteurs forestiers). The guards are responsible for protecting the remaining natural forests (mainly Nyungwe and Gishwati) by preventing livestock from entering the forest, discouraging illegal cutting of the forest, and reporting forest fires. The guards are under the supervision of the commune and prefecture agronomists, but have limited means and support to accomplish their tasks. The forest extension workers protect and supervise state forest plantations and woodlots; they check cutting permits, supervise nursery workers, and oversee the woodlots. They are responsible to the commune agronomists who have very limited forestry experience and can thus give little guidance. Forestry extension workers in general have only a primary education and some on-the-job forestry training.

Training

2.09 Rwanda has benefited from a generous Swiss program of forestry scholarships, which should give the country enough technicians to meet its needs for the next 3-5 years. The first graduates are now back in Rwanda engaged in various aspects of forestry. Nine have graduated as forest engineers, three of whom are now in a training program at the Swiss Forestry Project in Kibuye. Another three are still studying at Morogoro University in Tanzania, and recr itment is under way for another three or four scholarships which are to be granted. At the forest technician level, one has now graduated, 16 are still studying in Kenya and Tanzania, and three are in training at the Swiss Forestry Project in Kibuye. Four more scholarships at the technician level are being offered and recruitment is now beginning.

Forestry Group of Rwanda (Groupe Forestier du Rwanda)

2.10 Created in 1976, the "Groupe Forestier du Rwanda" is a loose association of research institutions, government departments, local and prefectural authorities, and organizations involved in forestry in Rwanda. It fulfills many of the functions that a stronger Department of Waters and Forests would be expected to assume. The "Groupe" is nominally chaired by the Director of Waters and Forests, but the main driving force behind it is the Swiss-sponsored Projet de Developpement Forestier (PRODEFOR), formerly the Projet Pilote Forestier-PPF (para 2.15). The "Groupe" meets twice a year in different parts of Rwanda to discuss forestry problems, such as the protection of the remaining natural forest, forest fires, termite control, charcoal production methods and their effects on the environment, and so on. The "Groupe" formulates recommendations which are submitted to the Ministry of Agriculture and Livestock, but apparently these have received little response. Nevertheless, the Groupe Forestier du Rwanda performs a valuable service in promoting coordination of forestry projects and an exchange of ideas.

Future Energy Needs and Resources

2.11 It is difficult to make precise estimates of future wood needs because of the many uncertainties about future population size, wood imports, possible alternative energy sources, and above all likely wood availability. The population of Rwanda will be approximately 7.5 million in the year 2000, and theoretical demand for wood can be roughly estimated at 7.5 million m^3 per year which is equivalent to the production of 750,000 ha of plantations. Existing plantations and other forest resources would not even suffice to meet 25% of this demand. The unavoidable conclusion is that, even taking the most optimistic estimates of future wood availability, alternative sources of energy, as yet unidentified will simply have to be found. The only known, realistic substitute for wood energy is peat, since solar technology and methane gas recovery methods are not yet well developed, and petroleum products are too expensive for all but a very few Rwandese. The demand for wood will therefore far exceed the supply, especially in view of Rwanda's rapidly increasing population.

Alternative Energy Sources

2.12 One promising source of energy for Rwanda is its extensive peat bogs, located in valley bottoms throughout the country. According to a consultant's study carried out in November 1978 under UNDP auspices, Rwanda has enough peat to meet its energy needs for 200 years. The study concludes that peat clods extracted and mixed by hand would produce energy at a cost similar to that of wood and charcoal; peat bricks and clods mixed by machine would be more expensive. The production of some bogs could reach 10,000 tons in as little as two years. At present, however, peat is used only for the drying of pyrethrum at Ruhengeri; it is extracted and processed *in situ* but none of the production is sold. Studies are under way to examine the feasibility of using peat in a foundry currently under construction near Kigali. However, the large amount of smoke produced by peat and the need for good ventilation to sustain the burning might hamper the acceptance of peat as a domestic fuel. In addition, it would require sociological changes because (i) it would most likely have to be purchased from a large-scale producer and processor rather than gathered as in the case of firewood, and (ii) it would require the use of a specially designed stove instead of the traditional fireplace made of three stones. Other possible drawbacks to the large-scale use of peat are the possible damage its extraction might cause to the hydrology of a region and the fact that some of the potential extraction sites are currently under cultivation. It is more likely to be used industrially and by institutions such as bakeries, schools, prisons, and the military, than for domestic needs.

2.13 Another possible source of future energy for Rwanda is the methane gas in Lake Kivu. A pilot station near Gisenyi used to produce gas for the brewery, and a UNDP grant will finance needed repairs to the station. Some estimates indicate that as much as 80% of the brewery's energy needs could be met by methane gas. There are many technical obstacles to be overcome,

however, if methane gas is to be produced economically on a scale larger than the existing pilot project. Rwanda, Burundi, and Zaire recently agreed to investigate the possibility of manufacturing fertilizer from the methane gas from Lake Kivu.

Future Programs and Policies

2.14 The major constraint to forestry development in Rwanda to date has been the lack of a rational forestry policy. In spite of the fact that agriculture provides about 50% of the GDP, in 1976 it received only 5.6% of the budgetary allocations, and forestry has long been the poor relation of the agricultural sector. Even the modest planting program of 300 ha per year proposed by the Department of Water and Forests was not funded. Rwanda is fortunate in that it now has a nucleus of trained forestry graduates who are currently gaining experience. They will be responsible for the formulation of a forestry policy which will have to deal with two major problems. The first is the major constraint faced by agriculture in general in Rwanda, the critical shortage of land. Small, scattered, uncultivated hilltops remain, but large areas suitable for forest plantations are virtually non-existent. Reforestation programs will have to confine themselves to areas which are unsuitable for either cultivation or livestock production, and to look for possibilities to integrate tree planting into the farming systems and to plant trees along roadsides; the current Government policy of encouraging each family to plant 5 ares of trees per family member as grouped woodlots can no longer be implemented in the most densely populated areas. The second problem facing forestry policy is the traditional attitude toward wood and forests which assigns a low value to wood. As wood becomes scarce and meeting a family's fuel needs demands an increasing proportion of both time and income, this attitude is likely to change and people should gradually become aware of the real value of wood. The forestry policy must reinforce this change in attitude by setting and enforcing realistic prices, encouraging conservation of the remaining forest, and helping farmers to develop rural woodlots. This will not be an easy task as small plantations are scattered throughout the country, making effective control of forests and woodlots very difficult. The forestry policy will necessarily include protection of the remaining natural forest, control of plantations, planting programs to meet, at least partially, the wood needs of both the urban and the rural populations, rational pricing policies, provision of enforcement means, and a continued training effort. The proposed Project would assist the Government in formulating such a policy and would provide the material and institutional framework with which to implement it.

Other Forestry Projects

2.15 In 1967 the Swiss Government initiated a pilot forestry project, the Projet Pilote Forestier (PPF), which initially concentrated on protecting and utilizing the Nyungwe reserve (para 2.02). Two centers were established to promote both the conservation and rational exploitation of the forest, including a sawmill operation and charcoal production center. Other PPF

activities included the publication of a guide to the main species of the montane forests of Rwanda, a forestry map, and various didactic materials on the importance of forestry to rural development. The Project's accent shifted in 1975 to rural afforestation, especially in Kibuye prefecture, and training (para. 2.09). The PPF began to work more closely on research and documentation with the Institut des Sciences Agronomiques du Rwanda (ISAR) at Rubona in 1977 (para. 1.20), and at about the same time the Swiss helped to form the Groupe Forestier du Rwanda (para. 2.10). The PPF has also attempted to set up a seed distribution network, the Forest Seed Center of Rwanda, and one of the main thrusts of the program has been to improve the quality of locally produced seeds, especially in view of the difficulties involved in importing seeds. The PPF is now changing its emphasis to become a Forestry Development Project (PRODEFOR) which will include support to the Department of Waters and Forests. PRODEFOR will continue the programs of training, afforestation, Nyungwe forest conservation, and forestry education and extension. A technical assistant will be assigned to the Department of Waters and Forests as soon as one can be recruited. The Swiss contribution to forestry in Rwanda has been invaluable; in particular, the scholarship program has been responsible for the creation of a nucleus of trained forestry personnel which is a crucial factor in the development of the forestry sector in Rwanda.

2.16 Other agricultural projects have reforestation components of varying sizes, often as an anti-erosion measure. The IDA-supported Bugesera/Gisaka/Migongo and Mutara projects include the reforestation of several hundred hectares; the agricultural intensification projects sponsored by the German government in Ramba and Gaseke communes, 100 ha per year; and the Banque Africaine de Developpement project in Karago and Giciye communes, 2,000 ha over 5 years. The Belgian Government is planning a project which would afforest 1,000 ha on the borders of the Nyungwe reserve, but this project has not yet been fully appraised or financed. Much remains to be done in terms of standardizing forestry techniques. For example, under the proposed IDA project only selected imported seeds would be used to improve the overall quality of the trees, instead of using seeds gathered locally from the most accessible, and therefore smaller and less vigorous, trees. The seeds would be sown in plastic tubes rather than in bags, to eliminate the need for removing the bag at planting time. Yet the Bugesera/Gisaka/Migongo project and the German-sponsored project in Karago and Giciye communes use locally gathered seeds sown in plastic bags. This problem is by no means unique to forestry projects. A stronger Department of Waters and Forests should be able to standardize and update methods and avoid unproductive experimentation and duplication of efforts.

III. THE PROJECT

A. Objectives and Strategy

3.01 The principal objectives of the Project would be to develop an institutional capacity for policy formulation and implementation in the forestry sector of Rwanda, and to initiate a reforestation program to provide

fuelwood, poles and saw timber for the country. A related objective of the Project would be to sustain the existing livestock industry in the Gishwati area, and to develop it into a high productivity dual purpose (meat and milk) cattle industry (para. 3.07). The Project strategy is based on several complex, interrelated problems facing Rwanda. Forests are fast disappearing because of population increase and pressure on land for crop cultivation. If no remedial action is taken promptly to redevelop tree planting, the forests will completely disappear, and with them the supply of fuelwood, construction poles and timber; Rwanda will be forced to find alternative sources of energy or rely on imports. While fuelwood and pole plantations can be developed on lands too poor or degraded to be used for crop cultivation or grazing, saw timber plantations require better soils. For saw timber, Gishwati is the only suitable area for large scale plantations that has been identified. Today, little of the original Gishwati forest remains; the reserve is mostly bush and grass, providing wood and grazing to the surrounding population; however, it is also an area which requires a careful approach because of the fragile ecology of the region. If forestry were redeveloped in Gishwati in isolation, the cattle industry would of necessity disappear completely. If development is not planned and controlled, farmers could encroach in the area with serious risk of damaging soil cover and the hydrological resources. Therefore, taking into account the economic, social, and environmental needs of the Gishwati area as a whole, it would be desirable to develop forestry together with livestock, with intensified forage production both in existing forest pastures and in the surrounding areas.

3.02 The Project has therefore been designed as the first phase of a long-term program which would redevelop the forestry resources of Rwanda to provide for part of the long-term needs for fuelwood, poles and saw timber. For fuelwood and poles, priority is given to meeting the needs of the urban population of Kigali and Butare while experimenting with reforestation systems for the rural areas. For saw timber, an integrated land use approach in the area of the Gishwati Forest is proposed in order to preserve the natural forest and watersheds, and redevelop forests, while maintaining and intensifying the existing livestock industry in the area. Increased forage production and therefore intensification of the farming system would be promoted in the farming zone outside the forest, while simultaneously developing high-productivity pastures within the forest boundaries. The Project proposals should provide material assistance to the Government in developing appropriate policies and institutions for future forestry development.

B. General Description

3.03 The Project would include the following components:

(i) the strengthening of forestry services within the Ministry of Agriculture and Livestock, including: (a) the restructuring of the Waters and Forests Department; (b) the construction of appropriate offices; and (c) the provision of staff and logistical support;

(ii) the development in Kigali and Butare Prefectures of: (a) 5,000 ha and 3,000 ha respectively, as fuelwood and pole short-rotation plantations to supply charcoal, firewood and building poles for the urban population of Kigali and Butare; and (b) rural woodlots to supply firewood and building poles for the rural population;

(iii) the development in Gisenyi Prefecture of: (a) 4,000 ha as part of a long-term integrated forestry and livestock development program within the Gishwati Forest, including 2,000 ha of softwood plantations for the production of saw timber and 2,000 ha of pastures for cattle production, of which 200 ha would be developed as a technical support center; and (b) integrated crop and livestock services in the farming zones of the seven communes surrounding the Gishwati Forest;

(iv) technical assistance for Project management and on-the-job training for Rwandese staff;

(v) studies and field trials, specifically a study of Rwanda's energy use and needs, trials of more efficient charcoal production techniques, development of new cooking methods for the rural population, and pasture and cattle breeding trials; and

(vi) Project monitoring and evaluation, further project preparation, and some scholarships in forestry, livestock, and financial disciplines.

3.04 The Project would be implemented over a period of about six years, including the Project preparatory phase (para. 4.10). A Project Management Committee within the Ministry of Agriculture and Livestock would have overall reponsibility for supervision of Project implementation, and would delegate overall Project implementation responsibility to a Project coordinator. The Project would be organized into two subprojects: a fuelwood and pole subproject in Kigali and Butare Prefectures, and an integrated forestry and livestock subproject in the area of Gishwati Forest Reserve, in Gisenyi Prefecture. Each Subproject director would be respectively responsible for day-to-day implementation of the Subprojects. The Waters and Forests Department would be responsible for the studies and applied research on forestry related subjects, and the Studies Bureau of the Ministry of Agriculture and Livestock for Project monitoring and further project preparation studies. Training activities would be the direct responsibility of the Management Committee.

C. The Project Areas (Map 14528)

Kigali/Butare Fuelwood and Pole Sub-Project

3.05 Project investments would be carried out in two Prefectures: Kigali and Butare. In Kigali Prefecture, the Government has selected about 20 bare hills in seven communes, ranging in area from 100 to 400 hectares, and totalling about 5,000 ha net, within 50 km to the north and east of the city

of Kigali. If, however, there is a shortfall, some additional land would be available in the south of Byumba Prefecture, just north of the communes of Gikomero and Gikoro. All the fuelwood and pole plantations to supply Kigali would be located on the tops and slopes of these hills which are denuded, very sparsely populated, and do not lend themselves to agricultural production. In Butare Prefecture, the Government has selected two mountain ranges less than 25 km to the west of the town of Butare: a series of bare hills in Runyinya commune, and a long bare mountain range on the boundary of the communes of Runyinya and Maraba, covering a total net area of about 3,000 ha. In addition, the communes of Kigali and Butare Prefectures would also develop rural woodlots for fuelwood and poles, with assistance from the central plantation nurseries.

3.06 Physical Characteristics. The general topography of Kigali and Butare prefectures is hilly. As for most of the country, the underlying geological system of the sub-project area is the Burundian system which consist mostly of quartz and schists, with a belt of the highly metamorphic underlying Rusizian series, east and south-east of Kigali. These are few precise data on the soils, but some information will be collected during the detailed topographical surveys which will be carried out as part of the preparatory activities (para. 4.10). Soil fertility appears to be rather low and many of the hilltops are rocky and lateritic. The vegetation is mostly grass. The altitude ranges from 1,500 m to 1,800 m, and reaches 2,000 m in the north-west of the area. The annual rainfall ranges from 900 mm to 1,100 mm, with the main precipitation occurring from September/October to May, with a peak in April, and the dry season from June through August. The average temperature is around 20°C throughout the year with occasional minima of 10°C - 15°C and maxima of 25°C - 30°C. Hail is said to occur but is not thought to be a problem. Most of the hills selected for planting are denuded, with little or no cultivation. In the final determination of precise plantation boundaries, every effort should be made to ensure that cultivated land and land suitable for crops is not utilized, although it is probable that small planted areas or banana groves will have to be displaced, as farmers tend increasingly to take any unused land for crops, authorized or not, and whether or not it is suitable for cultivation. Where cultivated land is acquired, appropriate compensation would be paid (paras. 1.08, 3.11). Assurances to this effect were obtained at negotiations. Further, the problem of land tenure would be carefully monitored throughout Project implementation (para 4.11) and reviewed by IDA in the context of the annual work plan reviews (para 4.09).

Gishwati Integrated Forestry and Livestock Sub-Project

3.07 The Project area would be located in Gisenyi Prefecture in seven communes which include parts of the Gishwati Forest; total area is about 110,000 ha. The forest reserve itself covers about 25-28,000 ha. An integrated crop and livestock development program would be implemented in the three communes of Mutura, Kanama, and Kayove to the west and south of the Gishwati forest reserve and livestock services would be strengthened in the four communes of Karago, Giciye, Ramba and Gaseke, east of the reserve (see Map 14627R). Extension services for crops are already being strengthened in the communes of Karago-Giciye under a German-financed project. A similar

project is about to start in the communes of Ramba-Gaseke under an ADB-financed project. Both projects aim at promoting intensification in farming methods in line with the Government's policy (para 1.13).

3.08 Topography, soils and climate. The Gishwati Sub-Project area is located on the Zaire-Nile divide. The main geological formation is the very ancient and highly metamorphic Rusizian series, which consists of schists with granitic intrusions. The altitude falls mostly within the 2,200-2,800 m range, with the highest point reaching 3,000 m. The area is mostly hilly with a high proportion of steep slopes, separated by deep but wide valleys. The soils appear to be fertile and formed under forest conditions at the higher elevations, with a thick layer of humus, and under volcanic conditions of the lower elevations. Most of the area is cultivated, except for the Gishwati Forest Reserve. The latter has already been largely exploited: only 5-6,000 ha of virgin natural forest are left, the remainder consisting of widely scattered small trees, shrubs, tall grasses, herbs, and bamboos (Arundinaria). Where the land has been cleared and cultivated, natural Kikuyu grass takes over. The area is well watered. The annual rainfall averages 1,400 mm, but mist also occurs over long periods. The rainy season extends from September to May, with peaks in October and March/April. Temperatures vary between 11°C and 17°C, with mean monthly minima of 10°C and maxima of 25°C.

3.09 Farming systems. The present farming system in the Sub-Project area utilizes the resources of the lowlands and highlands in the farming zone outside the forest, and the resources of the forest. Farmers have developed a complex crop and livestock husbandry system in which altitude is a determining factor. Peas, sorghum, and maize are mostly grown in the lowlands, while peas and potatoes are predominant on the highlands. Peas, potatoes and beans are cultivated as a pure stand while maize and sorghum are often cultivated in association with groundnuts or gourds. Each crop is usually cultivated only once a year on the same plot; potatoes alone enter twice in the crop rotation system, but on different plots. Thus there are no permanent fallows. Terracing is commonly practiced, and the planting of anti-erosion fodder strips, discontinued for many years following Independence, has been resumed by farmers in recent years. Small quantities of improved seeds are available from the local branch of the Selected Seeds Service (para 1.18). Family farm units average about 1.50 ha. Large tea plantations have recently been developed, thereby putting added pressure on land for food crop cultivation. Livestock is raised on post-harvest crop residues and fallows, and in forest pastures when the former are exhausted. About 26,000 head of cattle are reportedly grazing permanently in the area, as well as 7,000 goats and sheep. The traditional system whereby a farmer raised the cattle of a traditional chief is still commonly practiced; in addition, since the post-harvest fallows are opened to everyone, cattle is also brought to the area from other communes or prefectures.

3.10 Although the Project areas have been clearly defined, detailed topographical surveys and mapping were not available at the time of appraisal. They are being undertaken with financing from the Project

Preparation Facility (para 3.34), and work has already begun. It would be a condition of Credit effectiveness that the Government of Rwanda had taken measures satisfactory to the Association to designate the hills selected for afforestation in Kigali and Butare as national plantations (boisements domaniaux), and define the development objectives for the Gishwati Forest. Adequate procedures for the development and management of the national plantations would be established, including the authority of the Waters and Forests Department, with the support of local authorities, to enforce forestry legislation, and the prohibition of goat grazing in plantations. These matters were fully discussed and agreed upon during negotiations.

3.11 The overall objectives of the program, the potential benefits for the population, and the compensation measures in case some farmers must be displaced, would be clearly stated in the Govenment's legal documents on land utilization for the purpose of the Project.

D. Detailed Features

Administrative Support for the Forestry Services and for Project Management

3.12 Under the Project, the forestry services of the Ministry of Agriculture and Livestock would be strengthened. The Waters and Forests Department (paras. 1.18, 2.08) would be restructured, possibly into a Directorate (Direction Generale) and the Forestry Division into a Department (Direction). It was agreed at negotiations that this restructuring would be effected not later than December 31, 1985. The Swiss Government has agreed to assist the Forestry Division/Department by providing an experienced forester under the ongoing Forestry Project (PRODEFOR) (para. 2.15). The main responsibilities of the Forestry Department would be to develop a forestry policy and legislation, to execute national forestry programs not covered by the Project (e.g. the national day of the tree) and to assist other projects, prefectures, communes or institutions with the implementation of afforestation schemes. It would, in addition, develop standards for nursery and plantation techniques, and supervise their application. The managerial and technical capacity of the Waters and Forests Department would also be strengthened through the implementation of the Project. At the end of the Project period, the Project coordinator would be fully reintegrated into the forestry service, and the staff of the fuelwood and pole subproject would take over the responsibilities of the afforestation office. Having acquired experience in planning and implementing afforestation programs, the staff would be in a position to develop and operate similar afforestation activities in other parts of the country. Appropriate buildings for the Forestry Department, including offices, a library/conference room, and a storage room would be constructed and equipped, and would house the Project coordinator, the Project administrative and financial section and the fuelwood and pole subproject, during the Project implementation period. Office buildings

and staff housing would also be built near Butare. Separate subprojects headquaters would be built in Gishwati (para. 3.16). Provisions have been made in the Project for the recruitment and training of surveyors to be permanently attached to the Forestry Department, and for the purchase of vehicles and equipment. The main investment items would include buildings, furniture, equipment and vehicles, and operating costs for the Waters and Forests Department during the Project implementation period, including the Project coordinator and the Project administrative and financial section, and for the fuelwood and pole subproject.

Kigali/Butare Fuelwood and Pole Sub-project

3.13 Kigali Plantations. Under the Project, fuelwood and pole short-rotation plantations totalling about 5,000 ha net would be established mainly for charcoal and pole production for the urban population of Kigali. During the first year of Project implementation, 300 ha would be planted; the planted area would increase to a total of 1,500 ha in the fourth and fifth Project year. The principal species planted would be Eucalyptus grandis/saligna, although some E. tereticornis/camaldulensis might be planted at lower elevations and where the rainfall is below 1,000 mm. Full attention would be paid to soil and climatic conditions. Other species such as Black Wattle would also be tried. Selected seeds would be imported from neighboring countries, preferably from Kenya or Tanzania, through the Forest Seed Center of Rwanda (see para. 2.15), as seed available in Rwanda may be of poor quality. The technical aspects of the plantation program are described in Chapter V. The principal features would be manual ground preparation (pitting), seedling production in one or more nurseries, protection against termites in the nursery, manual planting, experimental fertilizing, and weeding. Eucalyptus plantations would be coppiced at eight yearly intervals, with one seedling and three coppice crops. The principal investment items would be direct afforestation costs for nurseries and planting (materials, equipment, and labor), development infrastructures (access tracts, buildings), and plantation operation and maintenance during the Project period.

3.14 Butare Plantations. Under the Project, short-rotation fuelwood and pole plantations totalling about 3,000 ha net would be established mainly for fuelwood and poles for the urban population of Butare. The planting program would start with 200 ha in the first Project year and would reach 900 ha a year in the fourth and fifth year. The main species planted would be Eucalyptus grandis/saligna. A small office and staff housing would be built near Butare. The technical package and investments would be similar to those envisaged for the Kigali plantations (para. 3.13).

3.15 Pilot Rural Woodlots. In order to encourage the communes, the rural population and various institutions such as missions and schools to participate in the country's reforestation objectives, the central nurseries in Kigali and Butare would produce for sale about 10% more eucalyptus seedlings than needed for the state plantations. The nurseries would also produce for sale limited quantities of fruit tree and fodder tree seedlings. This program would both encourage tree planting and make possible a more realistic assessment of the interest of the rural population in growing trees and woodlots to

supply their domestic needs. This modest introduction is necessary because similar programs have been limited in the past and because of the many constraints on rural afforestation, notably acute land shortage and the higher immediate returns from foodcrops (para. 2.14). If the response is positive, a more widespread rural nursery program could be developed in future agricultural and foresty projects; if the program proved strikingly successful in a shorter period than anticipated, it could be accelerated under the Project. During the Project period, the nurseries would mainly serve communes in Kigali and Butare prefectures. According to the Government's current policy (para. 2.14), rural woodlots would be grouped as far as possible, although they would be individually owned. Fruit and fodder trees would be planted either around the rugo (home) or as anti-erosion hedges. The nursery staff and the staff of the Waters and Forests Department would provide technical advice and supervision to the communes, individual farmers, and institutions growing woodlots. In the first Project year, 100,000 seedlings would be produced, representing 50 ha of woodlots; production would reach 480,000 seedlings in the fourth and fifth year of the Project, representing 240 ha a year. The main investment items would include planting materials (seeds, tubes, etc.), and the incremental cost of nursery operations.

Gishwati Integrated Forestry, Crop and Livestock Development Sub-project

3.16 The objectives of the sub-project would be to make optimal use of the high, but presently underutilized, agricultural potential of the Gishwati area while carefully protecting the ecological balance to develop forestry resources, and to maintain and develop livestock activities. A land use plan for the Gishwati Forest would be prepared and an integrated forestry and livestock development scheme (para 3.17) initiated over 4,000 ha. In addition, crop and livestock services would be strengthened in the farming zones of seven communes surrounding the Gishwati Forest. Subproject headquarters (office, staff housing, workshop) would be established in the Gishwati area (para. 4.04). The existing east-west roads would be permanently upgraded and a connecting north-south access road opened. Additional access roads would be opened as the afforestation and livestock development progresses. Part of the headquarters construction and access-road upgrading would be carried out during the Project Preparatory Phase (para. 4.10). The principal investment items would be technical assistance (para. 3.28), buildings, access road upgrading, equipment and vehicles, and operating costs of the subproject headquarters during the Project implementation period.

(a) Land Use Plan

3.17 Under the Project, a long-term land use plan for the Gishwati Forest reserve would be established. The following long-term objectives have been defined: to provide effective protection for the estimated 5,000 ha of still untouched natural forest; to develop about 10,000 ha of softwood plantations for the production of saw timber over a 25-year period; to develop a minimum of 5,000 ha of pasture land for cattle husbandry; and to retain approximately the remaining 5,000 ha as a military zone in the North. The

Government has indicated that this latter area could also be used for forestry and livestock development, provided that the land preparation and tree planting be undertaken by the army under technical supervision from the forestry service, and that silvicultural operations be carried out in coordination with the military authorities. The pastures established would also serve as firebreaks for the forest blocks. The exact area and location of afforestation blocks and pastures would be determined by several factors, namely the minimum economic size (50 ha) for the planting and exploitation of forest blocks, and the degree of slope, reserving slopes below 20^{o} for pastures, and slopes over 20^{o} and hill and mountain tops for afforestation. For implementation and management purposes, the Gishwati Forest would be divided into four sectors of about 4,000 ha each. The exact boundaries would be determined during the preparation of the development plan: the northern sector, over part of Mutura, Karago, and Kanama communes; the eastern sector, over part of Giciye and Gaseke communes; the southern sector over part of Kanama, Gaseke, and Ramba communes; and the western sector, in part of Kanama commune. Details are given in IBRD map 14527R. The development plan would also include the detailed planning of the major road infrastructure, sub-project headquarters, and staff housing.

3.18 The preparation of the land use plan would consist of: (i) detailed mapping, including aerial photography of the Gishwati Forest Reserve at the $20,000^{o}$ scale, a restitution from aerial photos, an orthophoto plan, and the mapping proper; (ii) a socio-economic survey to identify the existing land tenure system, land use patterns, and farming systems in the seven communes participating in the sub-project; (iii) detailed surveying, including the opening of square lines and the division of the area according to the proposed land uses; (iv) the collection of data on soils, hydrology, and climate; and (v) the preparation of a final report. With the exception of (v), these activities would be undertaken during the Project Preparatory Phase (para. 4.10). Short-term technical assistance would be provided to the Waters and Forests Department to coordinate and supervise these preparatory activities, namely a land use planner and a construction superintendent (para. 3.28), surveyors, a soil scientist, a hydrogeologist, and a sociologist. The final details of the development plan would be prepared by the Gishwati subproject director (para. 4.02), and would be discussed with IDA as part of the first annual work plan review (para. 4.09). The main investments would include mapping expenditures, surveying equipment and tasks, upgrading and construction of access roads, construction of administrative buildings and staff housing, supplies and equipment, technical assistance, and operating costs of the forestry and livestock services directly involved in the preparation of the Gishwati land use plan.

(b) Forestry Development

3.19 (i) Softwood Saw-timber Plantations. Under the Project, 2,000 ha net of softwood would be planted as the first five-year phase of a 25 year program of 10,000 ha net on a 25 year rotation. It is expected that ultimately the 10,000 ha of softwood planted in the Gishwati Forest would supply sawmills which would be built to process the timber produced (para. 7.02). Since land

must be demarcated, cleared and prepared at least one year before planting, the actual planting would start with 200 ha in the second Project year to reach 800 ha in the fifth Project year, making a total of 2,000 ha over five years. The main species planted would be Pinus patula, although other species might be tried on a small scale, such as Pinus kesiya, P. elliottii, and P. oocarpa. Selected seeds would be imported from Kenya or Tanzania (para. 3.13). Detailed technical aspects of the plantation program are described in Chapter V. The main features would be land-clearing and preparation, and maintenance of newly established plantations, seedling production in one or several nurseries, pitting, manual planting and weeding, and minimal fencing of plantation blocks with live hedges to prevent encroachment by cattle. A normal network of forest roads and tracks would be established. The main firebreaks would be the buffer zones of pastures; narrower firebreaks would be established inside each planted block. The main investment items would be direct land clearing and afforestation costs (labor, seeds, planting and small equipment), road and track construction and maintenance, firefighting equipment, a tractor and a trailer for the transport of seedlings and construction materials, administrative costs for plantation development, and operating costs during the Project period.

3.20 (ii) Pilot Rural Plantations. Rural woodlots would be developed in the farming zones of the Gishwati sub-project area, along the same lines as the pilot component proposed for Kigali and Butare (para. 3.15). This program would be an integral part of the agricultural efforts which would be undertaken in the seven communes concerned with the Gishwati sub-project (paras 3.21-3.23). At present the local population takes some fuelwood and poles from the degraded part of the Gishwati Forest, as most of the surrounding land has been cleared for farming. However, once the forestry and livestock developments have been implemented, this source of wood for domestic needs will disappear. Provisions have therefore to be made from the start of the Project period to establish an alternative source of wood. The main species planted would be Eucalyptus although other species would be tested. Seedlings would be produced in the nurseries of the extension sectors (para. 3.21) for sale to interested farmers, and trees would be planted under the supervision of the forestry service. It is estimated that 30,000 seedlings would be produced in the second year, corresponding to 15 ha of woodlots, to reach 240,000 seedlings in the fifth year corresponding to 120 ha of woodlots. Therefore, a total of approximately 225 ha would be afforested which would produce a volume of wood corresponding to approximately the theoretical yield from that part of the Gishwati Forest Reserve which would be cleared and developed under the Project. The main investment items would be direct afforestation costs (seeds, tubes, tools, and chemicals against termites), and incremental operating costs for the nursery and extension services.

(c) Integrated Crop and Livestock Development

3.21 (i) Forage Development and Intensification of Farming Systems. The major short-term objectives would be to intensify farming techniques in order to increase fodder production, to make greater use of land resources, and to accommodate the maximum number of livestock on existing farms the year

around without having to rely on seasonal grazing in the Gishwati Forest The major long-term objectives would be to preserve the production potential of the area and increase crop and livestock productivity. Under the Project, the extension services for crops and livestock would be strengthened and developed in the three communes of Mutura, Kanama, and Kayove; livestock extension services only would be strengthened in the four communes of Karago, Giciye, Ramba and Gaseke, since they already benefit from crop intensification projects (para 3.07). For crop extension, each commune would have one agricultural technician (A2) and one agricultural extension worker in each communal sector (A3), the latter being selected possibly among communal counselors along the lines of the Government's current policy. For animal husbandry, each commune would have one veterinary technician (A2) and one veterinary assistant (A3) for two or three communal sectors. The field extension staff would work under the technical guidance of an agricultural engineer (A0 or A1) for crop and forage production, and of a veterinarian (A0) for animal husbandry. In addition to farm visits, the extension staff would establish demonstration plots, and if necessary, seed multiplication fields and tree nurseries in coordination with the Selected Seeds Service (para 1.18) and the Forestry Service (para 3.21). Animal husbandry infrastructures would be developed, including veterinary dispensaries, treatment crushes, and a few bulling centers. Improved seeds and veterinary medicines would be sold to farmers at cost; veterinary treatments would be provided for a fee, in accordance with the Government's current policy (para 6.02). Farmers would be encouraged to form associations (para. 4.07) and establish a revolving fund for the purchase of veterinary products in particular, but also for the purchase of improved bulls.

3.22 The main features of the technical package are described in chapter V. To increase fodder production, the priority objective would be to promote with a large number of farmers the cultivation of fodder strips along contour lines, namely Setaria, and the improvement of the seasonal kikuyu grass fallow with legumes such as lupin and Vicia sativa. To increase fodder production further, more intensive farming methods would be tried with the most progressive farmers, including double cropping and establishing a permanent fodder crop such as Tripsacum in the rotation system. Technical inputs would consist mostly of improved seeds (para 3.21) and organic fertilizer produced on the farm, although in the long-term, for intensive farming, it would be indispensable to introduce chemical fertilizer, provided satisfactory information is obtained from field trials (para 3.29). Regarding animal husbandry methods, farmers would be encouraged to reduce their use of seasonal grazing in the forest; therefore stall-feeding of livestock would be promoted, starting with night stall-feeding and moving progressively towards all day stall-feeding. In the long-term, more productive livestock would be introduced, in particular dual purpose (milk/meat) cross-bred cattle Ankole x Brown (para 3.25).

3.23 The main investment items would include the construction of staff houses, animal husbandry infrastructures (veterinary dispensary, treatment crush, bulling centers), the development of fodder and tree nurseries, demonstration plots and seed multiplication fields, the purchase of vehicles,

materials and equipment for the extension services, vaccines, veterinary supplies and chemicals, and incremental staff and operating costs for the extension services for crops and livestock.

3.24 (ii) Pasture Development in the Gishwati Forest. Under the Project, 2,000 ha of pastures would be established, of which 1,800 ha would be for farmers' cattle and 200 ha for a technical support center. These pastures would also serve as firebreaks around forest blocks (para. 3.18). High productivity kikuyu grass and white clover pastures would be established. The existing Ankole cattle breed would be progressively improved with Brown Swiss to obtain a high productivity dual purpose (milk/meat) crossbreed, well adapted to the local conditions. Herd management standards would be established and supervised by the livestock extension services. The forest pastures would be developed and utilized by farmers who would organize themselves into associations with assistance and supervision from the Subproject Livestock Services. The membership criteria and operating procedures for the associations would be determined by the Subproject Management (para. 4.07). The associations would establish a revolving fund, which would be maintained by themselves, to pay for veterinary supplies, and possibly to contribute to the development of some infrastructure such as milking barns or kraals; in the long-term, animal husbandry staff costs could also be taken over by these associations. The livestock owners would be expected to husband their cattle and market the livestock products themselves, although the Project Livestock Services could provide them with some assistance. The main investment items would be seeds, tools, veterinary and animal production infrastructure (veterinary dispensaries, dipping tanks, night kraals, milking barns), access roads, veterinary supplies, and incremental operating costs for the animal health and production services.

3.25 (iii) Livestock Technical Support Center. The three main objectives of the center would be: (a) to undertake some forage multiplication and pasture improvement trials; (b) to assist farmers interested in introducing stall-feeding with the procurement of livestock, and (c) to develop a breeding herd of improved cattle for sale to farmers. The center would also provide technical supervision to the pastoral associations. The breeding program would aim at upgrading the local Ankole herd with Brown Swiss, a cross which has given excellent results in the neighboring Kivu province of Zaire, in similar ecological conditions. Local Ankole cows and heifers would be purchased from livestock breeders and crossed with Brown Swiss bulls imported from Europe, or possibly from Kivu, if available. Only crossbred cattle would be sold to farmers. The main investments would include development of infrastructure (buildings, paddocks, access tracks), bulls and semen, seeds, vehicles and equipment, and operating costs during the first years of operation of the center until the animals are sold.

3.26 (iv) Experimental credit. The credit program would aim essentially at providing the financial means for farmers to acquire improved cattle, seeds, and forage material for planting. This program would be coordinated with the other experimental credit programs undertaken under the IDA-financed BGM and Mutara projects (para 1.22). RF 10 million have been included in Project costs for these activities; additional amounts could be allocated to credit activities as adequate estimates of the demand for such credit are obtained during Project imlementation.

3.27 (v) Experimental marketing. The Project management would hire short-term consultants' services to assist with the final design of the experimental marketing component. The milk marketing scheme would consist of organizing an experimental conservation, collection, and distribution system with a few farmers' associations. The livestock and meat marketing activities would consist of first developing an information system for the sale of breeding and slaughter livestock, involving the regular publication of cattle prices, the organization of regular cattle markets and the control of trade permits. Local organization of meat markets, in particular in rural areas would be reviewed and improvement recommended as appropriate. An experimental system of contracts between butchers and a few farmers' associations might also be organized. Provisions have been made in the Project agricultural credit fund (para. 3.26), for the purchase of milk containers. Provisions have also been made for the purchase of a vehicle, and for short-term consulting services to study the local marketing of livestock and livestock products. The incremental operating costs of running these experimental programs have been included in the operating costs for the animal health and production services.

Technical Assistance and Consultants' Services

3.28 Technical assistance would be required for Project management and to train Rwandese staff to manage Project activities. For forestry activities some qualified Rwandese technicians are now available (para. 2.09) but none of them has sufficient managerial experience to manage the proposed Project initially. A team of specialists would be internationally recruited, including an administrative and financial director, a director for the Gishwati Subproject, two silviculturists (one for the fuelwood and pole Subproject, and one for the softwood plantation program), a construction superintendent, and one zootechnician for the Gishwati livestock program. A volunteer could be obtained from a bilateral assistance for the Gishwati workshop (para. 3.16). The land use planner and the construction superintendent recruited for the Project preparatory phase could stay on for the Project implementation if their performance is satisfactory; the land use planner would become the director of the Gishwati Subproject. All contracts would be initially for two years, but could be renewed on an annual basis, depending on the availability of experienced and qualified local staff. Technical assistance would therefore be provided for about 340 man-months corresponding to 1.4 man-year for the Project preparatory phase, five technical assistants for five years, and one for two years for the Project implementation period. The average cost of US$7,600 per man-month includes salaries, overseas travel and subsistence. Short-term consultants' services would be hired to assist Project management with the detailed design of particular aspect of Project implementation, namely for the experimental credit and marketing activities, the design of farmers' associations and for the detailed design of the training component. Twelve man-months of such consultants' services have been included in Project costs, at an average cost of US$10,200 per man-months, including fees, international transport and subsistence.

Assurances were obtained at negotiations that the terms of reference and conditions of employment of such consultants would be acceptable to IDA.

Studies and Field Trials

3.29 Several studies would be undertaken as part of the Project. One study would assess the energy use and future needs of Rwanda; trials would be conducted in more efficient charcoal making with portable kilns, and a study would be carried out to develop simple and economical cooking equipment acceptable to the rural population. In addition, small-scale trials would be carried out on fertilization and on fodder trees. The Project also includes funds for studies in the forestry sub-sector which might be identified during Project implementation, and for the preparation of future forestry projects.

Project Monitoring and Evaluation, and Training

3.30 A simple monitoring and evaluation system would be developed by the Project management in coordination with the studies Bureau of the Ministry of Agriculture and Livestock. For the forestry programs, this system would be retained by the Forestry Department upon completion of the Project (para. 4.11). The financial monitoring would be based on a simple cost accounting system (para. 3.37). The technical monitoring would cover in particular the development of the rural woodlots and the fluctuation of the demand and supply for fuelwood, charcoal and other energy sources in Rwanda.

3.31 Provisions have been made in the Project for post-graduate training of forestry engineers and technicians, and for scholarships in agronomy and livestock related disciplines, e.g. abattoir management and milk processing. Training funds have also been included for scholarships in financial disciplines, namely accounting, financial analysis and management. The technical assistance provided under the Project would also be designed in large part to provide training for Rwandese staff, including both technical staff and intermediate and lower level forestry works. The forestry training program has been designed to complement the ongoing training under the Swiss forestry project (para. 2.15).

E. Project Costs

3.32 Total Project costs are estimated at about RF 2,167 million (US$23.6 million), of which about US$11.8 million or 50% represents foreign exchange costs. Project costs are summarized in the following table:

	Local	Foreign	Total	Local	Foreign	Total
	-----RF million------			-------US$'000-------		
Project Component						
Administrative Support for Forestry Service	10.4	25.2	35.6	0.1	0.3	0.4
Project Management	30.4	32.6	63.0	0.3	0.4	0.7
Kigali/Butare Sub-Project						
Kigali	94.7	71.3	166.0	1.0	0.8	1.8
Butare	60.1	35.7	95.8	0.7	0.4	1.1
Sub-total	154.8	107.0	261.8	1.7	1.2	2.9
Gishwati Sub-Project						
Sub-Project Management	15.5	39.1	54.6	0.2	0.4	0.6
Land Use Plan	5.4	35.4	40.8	0.1	0.4	0.5
Roads	39.7	59.7	99.4	0.4	0.7	1.1
Forestry Plantations	116.0	49.3	165.3	1.3	0.5	1.8
Livestock	165.8	120.6	286.4	1.8	1.3	3.1
Sub-total	342.5	304.0	646.5	3.8	3.3	7.1
Technical Assistance and Consultant's Services	10.8	204.7	215.5	0.1	2.2	2.3
Studies and Applied Research	22.0	16.8	38.8	0.2	0.2	0.4
Monitoring and Evaluation, and Training	4.8	13.8	18.6	0.05	0.15	0.2
Total Base Costs	575.6	704.2	1,279.8	6.2	7.8	14.0
Contingency Allowances						
Physical	72.5	146.9	219.4	0.8	1.6	2.4
Price	430.6	237.7	668.3	4.6	2.6	7.2
Sub-Total	503.1	384.6	887.7	5.4	4.2	9.6
TOTAL PROJECT COSTS	1,078.7	1,088.8	2,167.5	11.6	12.0	23.6

Project costs are estimated at prices as of February 1980. A physical contingency of 15% was applied to forestry developments and Project administration, and of 10% to other Project components to reflect general uncertainty about the detailed scope of Project investments. Price contingencies were calculated on a cumulative basis: local costs at the rate of 18% for 1980, and 15% p.a. for 1981-1985; foreign exchange costs at 10.5% for 1980, 9% for 1981, 8% for 1982, and 7% for 1983-1985. Taxes included in Project costs are negligible since virtually all items would be exempt from import duties. Details of Project costs are summarized in Table 1.

F. Financing

3.33 Financing of Project costs would be shared as follows:

	RF (million)	US$ (million)	%
Government of Rwanda	235.5	2.6	11
IDA	1,932.0	21.0	89
Total Project Costs	2,167.5	23.6	100

3.34 The proposed IDA Credit of US$21.0 million would be to the Government of Rwanda on standard IDA terms. The Credit would finance 100% of the foreign exchange costs, and about 77% of the local costs. The Government of Rwanda would contribute about 11% of total Project costs. A Project Revolving Fund of US$400,000 equivalent would be established and maintained at the level throughout the Project implementation period (through reimbursements from the IDA Credit Account and Government annual contributions), or at any other level on which the Government and IDA agreed. It would be managed by the Project Coordinator and the Project Administrative and Financial Director under the control of the Project Management Committe. The objective of establishing the fund would be to ensure that adequate funds are available for efficient Project administration. IDA would contribute to the establishment of the revolving fund by pre-financing US$300,000. Assurances were obtained at negotiations regarding the establishment and replenishment of this fund to reflect price increases and the balance of costs not reimbursable under the IDA Credit. It would be a condition of effectiveness that the revolving fund be established and the minimum balance of US$100,000 paid up by the Government. US$1.0 million has been advanced under the IDA Project Preparation Facility to finance topographic surveys, mapping of the Kigali/Butare plantations, establishment of the Gishwati Forest land use plan, upgrading of the major access roads in the Gishwati Forest and construction of sub-project administration infrastructure. Amounts disbursed would be reimbursed from the Credit Account.

G. Procurement

3.35 Contracts for the supply of materials and equipment exceeding US$80,000 would be awarded after international competitive bidding in accordance with Bank/IDA guidelines. Contracts would be bulked to the extent possible. Contracts for materials and equipment costing less than US$80,000 would be awarded following Government procurement procedures, with the proviso that for purchases of materials and equipment costing above US$20,000, bids or requests for price quotations should be sought from suppliers representing at least three countries; these procedures were examined during appraisal and were found satisfactory. Proposed awards of contracts for procurement of materials and equipment costing above US$20,000 would be submitted to IDA for review. The civil works envisaged under the Project are small in size, and would be scattered throughout Rwanda; they would therefore be unlikely to attract international firms, and international bidding would not be appropriate. Development of the plantation sites would be undertaken directly by force account under the responsibility of each sub-Project management. For the major buildings (Project headquarters and housing), local contractors would be selected after local competitive bidding in accordance with Government procedures which are satisfactory. The roads and other civil works (small buildings, etc) would be carried out by force account by the Gishwati sub-Project management. Assurances regarding these procedures were obtained during negotiations.

H. Disbursements

3.36 Funds from the Credit account would be disbursed over six and a half years on the following basis:

		US$ million
(a)	100% of foreign expenditures or 95% of total expenditures for vehicles, equipment and materials;	0.5
(b)	95% of total expenditures for civil works, including road works, and direct costs of plantation and livestock developments;	11.5
(c)	30% of total expenditures for operating costs of Project administration and extension services (salaries, and office and vehicle operating costs);	1.0
(d)	100% of total expenditures for technical assistance	3.0
(e)	100% of foreign expenditures or 90% of local expenditures for studies, applied research, monitoring and evaluation, and training;	0.9
(f)	Reimbursement of Project Preparation Facility advance; and	1.0
(g)	Unallocated	3.1
	Total IDA credit	21.0

Disbursements against (a), (d), (e), (f), and civil works by contract under (b) would be fully documented. Disbursements for local expenditures for civil works by force account under (b) and for local expenditures under (c) would be made against statements of expenditure certified by the Project Coordinator and the Administrative and Financial Director, the documentation of which would be retained for inspection by IDA supervision missions. An estimated schedule of IDA disbursements is given in Table 3.

I. Accounts and Audit

3.37 The Project Management would maintain separate accounts adequate to explain all Project activities, and would establish a simple cost-accounting system. These accounts would form part of the Ministry's overall accounts and would be controlled and reviewed following normal Government financial control procedures which are satisfactory. Control procedures involve principally a pre-expenditure control followed by an annual review of Project accounts, both to be carried out by the Ministry of Plan. Project accounts would be audited by independent auditors acceptable to the Association. The auditors would specifically review and comment on the procedures used for control of disbursement against statements of expenditure. The audited accounts would be submitted to IDA within six months of the close of each fiscal year. Assurances on these accounting and audit procedures of Project investments were obtained during negotiations.

J. Environmental Impact

3.38 Not only does erosion increase with the cutting down of trees, but soil fertility decreases as agricultural residues are used for fuel instead of being returned to the land. The main impact of the institution building and fuelwood components of the proposed Project would be to assist the Government's efforts to control this process of erosion and degradation by providing additional sources of firewood and establishing long term policies and practices to protect Rwanda's forest resources. This should reduce illegal cutting of forests and, in conjunction with other projects and programs, provide sufficient fuel so that the rural population reduces its reliance on agricultural residues, dung, etc. for fuel. The Project would have a generally beneficial impact in the Gishwati area. The remaining natural forest would be preserved, and the water and soil resources would continue to be protected with a permanent cover of grass and trees. Erosion-control measures would be reintroduced in the farming zones of the surrounding area.

IV. ORGANIZATION AND MANAGEMENT

A. Project Organization and Staffing - (Chart I)

General

4.01 A Project Management Committee, to be established within the Ministry of Agriculture and Livestock, would have overall responsibility for supervision of Project implementation. It would include the ~~heads of the~~

Minister of Agriculture and Livestock or his delegate, the Project Coordinator, the Administrative and Financial director, and the sub-Projects' directors and their deputies. The Management Committee would be responsible for supervising the detailed planning, implementation, and performance of the Project. It would approve the annual work plans, budgets, and performance reports on the Project. It would delegate day-to-day implementation responsibility to a Project coordinator who would be a Rwandese agriculturalist. Establishment of the Project Management Committee, by Ministerial decree, would be a condition of credit effectiveness. The Prohect coordinator would be assisted by the land use planner recruited for the Project preparatory phase for the initial organization of the Project's logistics and for the detailed planning and start-up of Project implementation. He would also be assisted by an administrative and financial director, and supporting services (secretariat, financial section, and workshop). During the Project implementation period, the Project Coordinator's office would be located in the buildings to be constructed for the Waters and Forestry Department in Kigali (para. 3.12). The technical implementation of the Project would be decentralized into two sub-projects, the Kigali/Butare fuelwood and pole subproject and the Gishwati subproject. Studies, field trials, Project monitoring and evaluation and training would be under the direct responsibility of the Management Committee which would assign implementation responsibilities to the appropriate directorates, institutions or individuals: Waters and Forests and Livestock for the technical studies, the Studies Bureau of the Ministry for Project monitoring, and other Government officials as appropriate.

4.02. Given the very limited availability of trained and experienced manpower in Rwanda, substantial technical assistance would be required for Project management (para 3.28). Apart from the technical assistance team, it would be essential that sufficient numbers of qualified Rwandese staff be available for Project activities; the estiamted Project staffing is given in Schedule 1. This staffing would be essential to ensure satisfactory Project implementation and on-the-job training in Project administrative, technical, and financial management by the technical assistants. Terms of reference for all key Project staff (Project coordinator, administrative and financial director and his deputy, sub-project directors and their deputies, heads of the Gishwati Forestry and Livestock offices and their deputies, and construction superintendent were discussed during negotiations, and assurances were obtained that IDA would approve the terms of reference, qualifications, and terms and conditions of employment of the candidates for these positions. It would be a condition of credit effectiveness that the Project coordinator and the administrative and financial director had been appointed. It would be a condition of disbursement for the Kigali/Butare sub-project that the sub-project director and his two deputies had been appointed, and for the Gishwati sub-project that the sub-project director, the silviculturist and his deputy, and the livestock specialist and his deputy had been appointed.

Management of Project Components

4.03 Kigali/Butare fuelwood and pole sub-project. The fuelwood and pole plantations would be managed by the sub-Project management team during the Project implementation period and would be handed over to the Forest Department upon Project completion. Under the Project,an internationally recruited silviculturist would be sub-project director. He would be responsible for the development and operation of the fuelwood and pole plantations and rural woodlots in Kigali and Butare Prefectures. He would be assisted by two deputy silviculturists, one for Kigali, and one for Butare. Both would be qualified foresters (AO) and employed full-time on the sub-project. They would also be assisted by appropriate support staff and labor: forestry technicians (A2), forestry extension workers, nurserymen, headmen, plantation guards, drivers, and casual labor. The sub-project headquarters would be in Kigali in the same office complex as the Waters and Forests Department and the Project Coordinator's office (para 3.12). The Butare program would have its own office, and staff housing would be provided for the deputy silviculturist and the forestry technicians. These management arrangements would be limited to the plantation establishment and maintenance program under the Project. New arrangements for the possible exploitation of the plantations would be agreed upon between the Government of Rwanda and IDA at a later date (para. 7.02). Site selection, planning and allocation of individual plots for rural woodlots would be done by the commune agricultural extension agent with assistance from the forestry extension workers. Technical support would be provided mostly by the forestry extension agents and the nurserymen, particularly during the time of the year when little work is done at the nurseries. The planting and maintenance and eventual exploitation would be done by the farmers themselves.

4.04 Gishwati Sub-Project. The forestry and livestock development activities would be managed by the sub-project management team during the Project implementation period. A technical Coordination Committee for agricultural projects would be established under the umbrella of Gisenyi Prefecture to ensure coordination between all agricultural projects in the area. Upon completion of the Project, the farming intensification activities would be handed over to the crop and animal husbandry extension services of the Ministry of Agriculture and Livestock. Long-term arrangements for the management of the Gishwati Forest have still to be designed, and an objective of the Project would be to assist in the development of a management system which would ensure appropriate technical control by the Water and Forests Department while ensuring the involvement of the local population to the extent feasible. Assurances were obtained at negotiations that the Government would exchange views with IDA on this issue no later than December 31, 1985. An internationally recruited technician (agriculturalist/zootechnician or forester) would be the director of the Gishwati Sub-project. He would be assisted by a silviculturist as head of the forestry office, a zootechnician or a veterinarian as head of the livestock office, and by appropriate support staff (para 4.02). The latter three technicians would also be recruited internationally. The Sub-project headquarters would include support services: an accountant, a secretary/typist, two mechanics, a storeman, and a team of surveyors. The final location of the sub-project headquarters had not yet been decided. However, it should be centrally located within the sub-project area, preferably on one of the east west roads which crosses the Gishwati Forest. Senior staff housing (sub-project director, heads of

afforestation and livestock offices and their deputies) would be provided either in Gisenyi or near the sub-project headquarters. Junior forestry and livestock staff housing would be provided in the Project area at the Sub-Project headquarters, or at the central nursery, at the Technical Support Center, and in the communes. The location of the Sub-Project headquarters and senior staff housing was discussed and agreed upon between IDA and the Government at negotiations.

4.05 The Forestry Office would be headed by an internationally recruited silviculturist assisted by a deputy, a forester (AO or A1), and appropriate support staff and labor: forest technicians (A2), forest extension workers, drivers, permanent labor and casual labor. The forestry office would include four operational sectors whose geographical coverage would be finalized during the preparation of the land use plan for the Gishwati Forest (para 3.17). The central nursery would be built as close as possible to the sub-project headquarters, depending on the availability of water. It would be headed by a forest technician (A2) who would also be responsible for assisting the forage development and farming intensification section with the rural woodlot activities. One or more small nurseries might be required in order to reduce transport costs. If the Taungya system 1/ were adopted on an experimental basis, the allocation of plots would be made by a plot allocation committee, which would include the Bourgmestre of the interested commune, or his representative, and the sub-project manager and his deputy; priority would be given to landless crop farmers. As in the case of the fuelwood and pole plantations in Kigali and Butare, future management of the plantation for purposes of exploitation would be defined at a future date (para 7.03).

4.06 The Livestock Office would be headed by an internationally recruited zootechnician or veterinarian, assisted by a deputy veterinarian (AO), one agronomist (A2) for the experimental credit and marketing activities, and general support staff. The deputy would be directly responsible for the overall health protection activities, and for the breeding activities at the Technical Support Center. The livestock office would include two operational sections: a pasture development section composed of a Technical Support Center (para. 3.24) and a grazing zone; and a forage development and farming intensification section covering animal husbandry and crop development activities. The two sections would be respectively headed by a zootechnician and an agricultural engineer (AO or A1). The zootechnician (AO) would also head the Technical Support Center and assist with forage development in the farming intensification activities. The livestock office would operate with assistance from extension staff (para 3.21).

4.07 Farmers' Associations would be established both in the grazing zone of the forest and in the farming zone outside the forest. A few such associations already exist in the area and should be a dynamic and supportive instrument of the Project activities. They would eventually form a federation which would be a direct partner of dialogue between the farmers and the sub-project management. Prior to establishing these associations, membership criteria and operating procedures would be prepared by the sub-project management team.

1/ Under the Taungya system farmers are permitted to clear and cultivate land designated for forestry development for a fixed period (normally two years); when the plantation is established, the farmer is allocated a new plot elsewhere.

The results of the socio-economic survey (para 3.18) would be taken into account and information obtained on similar organizational systems, either in Rwanda or in neighboring countries. Assurances were obtained at negotiations that the proposed membership criteria and operating procedures for such associations would be submitted to IDA for approval at the latest by November 1, 1981, as part of the second annual workplan (para 4.09).

4.08 Studies and field trials. The Project coordinator would propose to the Management Committee, for their approval, suitable arrangements for implementation of these components by the appropriate Directorates within the Ministry of Agriculture and Livestock; this would be done in the context of the annual work plans. A study of Rwanda's energy needs and possible sources of supply until the year 2000 would be undertaken by the Forestry Department with assistance from consultants as appropriate. For the collection of statistics, it could use support from the Studies Bureau of the Ministry of Agriculture and Livestock, from the Statistical Institute of Rwanda, and possibly from ISAR. The trials of improved charcoal production methods would also be undertaken by the Forestry Department; it would be necessary to import suitable portable kilns for that purpose. Demonstrations would be made in the Bugesera region which is the main charcoal production area, and in other parts of the country using Eucalyptus wood. A consultant would be recruited to train local operators and supervisors, and arrangements would be made for the takeover of this operation after Project completion. The Forestry Department would also undertake additional studies and trials related to forestry identified during the Project implementation period; the responsibility for the studies and trials to design more efficient cooking methods for use throughout Rwanda could be entrusted to the university or another appropriate institution. Possible studies and trials related to livestock development would be undertaken by the Livestock Directorate. Studies for future project preparation would be undertaken with local staff and consultants. Assurances were obtained at negotiations that the terms of reference and conditions of execution for the studies and trials would be submitted to IDA for approval.

Annual Work Plans

4.09 The Project coordinator and sub-project directors would prepare annual work plans as simple tools for systematic Project management. The major elements of a work plan would be: (a) a detailed description of activities by sub-project; (b) a detailed plan of operations for the forthcoming 12-month period (preferably the fiscal year); (c) a detailed investment and operating budget for this work period; (d) a detailed financing plan; and (e) a staffing plan. All these elements would be supported by appropriate documentation and justification. The draft annual work plans would be approved by the Project management Committee, then submitted to IDA for approval at the latest by October 1 of each year, starting in 1980, so that the approved budget could be entered in the normal budget cycle of the Government. The work plan for fiscal year 1981 would be maintained as a draft until the completion of the preparatory activities, when it would be jointly reviewed and finalized by IDA and the Government. These work plans would also be useful instruments for Project supervision by IDA, and would provide an effective framework for modifying Project investments as experience warrants. Work plan arrangements have worked well under other IDA financed projects, notably the BGM and Mutara Projects (para 1.03). Assurances on the above arrangements were obtained at negotiations.

B. Project Implementation

4.10 The Project would be implemented over a period of about six years, including a preparatory phase and a five-year implementation phase starting about December 1980 Preparatory work has begun since January 1980, but most activities are scheduled to start in July with the arrival of the consultants. A tentative Project implementation schedule has been designed (Charts II and III), and was discussed at negotiations. The Project preparatory phase would include the completion of the surveys and mapping for the fuelwood and pole sub-project, and preparation of the land-use development plan for the Gishwati Forest, and the construction of a minimum of buildings and access roads. For the forestry component, priority would be given to the start-up of the eucalyptus and pine plantations; the rural woodlots would not be started on a large scale before the second Project year.

C. Monitoring and Evaluation,and Reporting

4.11 Monitoring and Evaluation. Under the Mutara Agricultural and Livestock Development Project-Phase II (Credit 937-RW), the Ministry of Agriculture and Livestock is to establish a simple system to monitor Project progress within the Studies Bureau. The system could be expanded to monitor key implementation indicators for the proposed Project. This system would be continuously reviewed by IDA supervision missions, and would be amended from time to time as appropriate. The main indicators for the forestry activities would include the number of hectares cleared, successfully planted and established, both for the fuelwood and pole, and for the softwood saw timber plantations; the lengths of roads, tracks, or firebreaks built or upgraded; the new buildings and housing constructed; the number of seedlings sold to villages and the approximate area in hectares of rural woodlots planted. For the crop and livestock activities, indicators would be the number of farmers' associations established, the number of livestock stalls built, the lengths of fodder anti-erosion hedges traced, planted and established, the number of farms practicing day and/or night livestock stallfeeding, the number of extension agents trained and in post, veterinary and animal production infrastructure and housing built, and the area developed in the forest grazing zone. The socio-economic impact of the forestry, crop and livestock activities on the rural population, and Project costs would also be monitored; cost information would be made available to the Studies Bureau from the cost accounting system established by the Project Administrative and Financial Department (para 3.37)

4.12 Reporting. The Project Management Committee would submit regular semi-annual and annual reports on the Project to IDA. Annual reports would be submitted no later than three months after the end of each fiscal year. Six months after the expected closing date (i.e. September 30, 1986) the Government would prepare a completion report summarizing Project performance and evaluating its successes and failures and would submit the report to IDA. Assurances on the above were obtained at negotiations.

V. TECHNICAL AND PRODUCTION ASPECTS

A. Kigali/Butare Fuelwood and Poles Sub-project

5.01 Species. The main species to be planted would be Eucalyptus grandis/saligna, although E. tereticornis/camaldulensis might be planted at lower elevations and where the rainfall is below 1,000 mm in Kigali prefecture. All these species coppice freely, and would be grown on a rotation of 8 years, with one seedling and 3 coppice crops yielding 10, 10, 9, and 8 m^3/ha per crop respectively (see para 5.06 below). After 32 years or so, the plantation should be completely replanted.

5.02 Nurseries. All the planting stock required would be produced in two central nurseries, one in Kigali and one in Butare, with possible depot nurseries in order to reduce transport costs. Imported seeds, preferably from Kenya and Tanzania, would be used to ensure better results than local seeds. The seeds would be sown in black polythene tubes (50 mm x 120 mm flat, 150-250 gauge) rather than in polythene bags or on seed beds; shading would be avoided as much as possible. The average production cost per seedling has been estimated at RF 1.70.

5.03 Planting. The planting program (ha) and seedling requirements for the Kigali and Butare plantations are summarized below:

	Kigali		Butare	
	Area (ha)	Seedlings ('000)	Area (ha)	Seedlings ('000)
Year 1	300	600	200	400
2	700	1,400	400	800
3	1,000	2,000	600	1,200
4	1,500	3,000	900	1,800
5	1,500	3,000	900	1,800
Total	5,000	10,000	3,000	6,000

In areas susceptible to termite infestation, the seedlings would be treated with a suitable chemical three times at weekly intervals in the nursery prior to planting, in order to ensure that the chemical permeates the soil inside the tubes; seedlings would be planted with their tubes intact, and raised slightly above ground level to prevent any fresh soil from coming into contact with treated nursery soil and plant. Ground preparation would be carried out manually in all plantations which is the method traditionally used in Rwanda. Mechanical ground preparation such as ripping or ploughing is not recommended as it would increase costs substantially without significantly increasing yields and would be impractical on most sites because of

slope. The transport of seedlings from the nurseries would be by two tractors and six trailers in Kigali, one tractor and three trailers in Butare. The spacing between plants would be 2m50 x 2m50, giving an average stocking of 1,600 stems per hectare. Allowing for 25% failures, 2,000 plants would be required on average per hectare. The planting task is assumed to be 150 plants per man-day, equivalent to 11 man-days/ha. Only one tenth of the area would be fertilized, at 100 grams per plant, to determine the need for fertilizer under future planting programs. "Beating up" (the replacement of failures) would only be carried out when the mortality rate exceeded 10 to 20%. Given the fast growth rate of Eucalyptus and the close initial spacing, weeding should be required only in the first year after planting; all weeding would be done manually. Pruning and thinning would not be required, except for a possible coppice reduction - thinning at each coppicing operation.

(b) Indirect Afforestation Activities

5.04 No road construction is necessary in Kigali and Butare as there already exists a well-developed access road network in these areas. For fire protection, 10m wide clean-cultivated strips, with belts of cleared and burned strips, would be used; this would imply about 100m of fireline per ha of plantation, equivalent to a line around all blocks averaging 16 ha. Firebreaks would be maintained; one permanent patrolman would be needed per 100 ha of plantation, and forestry extension workers would be employed for protection against fire, theft, and browsing damage, and for fire-fighting when needed.

(c) Production Costs

5.05 For Kigali and Butare plantations, direct afforestation costs per hectare would be RF 13,220 (US$144), plus continuing maintenance costs (weeding, thinning out coppice); ground preparation would represent 45% of these costs, seedling production 27%, protection against termites 3.5%, transport costs 8%, planting 9%, fertilizing 7%, and failure replacement 1.5%. Average indirect capital costs per hectare are estimated at FR 8,300 (US$90), of which roads would represent 24%, buildings 47%, transport 25%, and fire protection 4%. Recurrent costs per hectare are estimated at about RF 2,700 (US$29) during the Project period, and at about RF 1,600 (US$17) thereafter.

(d) Rates of Growth and Yields

5.06 The rates of growth and yields for Kigali and Butare would be similar. They are summarized below:

Year	MAI (m^3/ha)[1/]	Yields (m^3/ha)
8 - seedling	10	80
16 - coppice 1	10	80
24 - coppice 2	9	72
32 - coppice 3 (followed by replanting)	8	64

1/ MAI - Mean Annual Increment (volume).

5.07 Pilot Rural Woodlots. Rural woodlots would be individually owned but when possible the plantings would be grouped at sites selected by the commune with the technical advice of the forestry extension service. However, given the land shortages in Rwanda, alternative planting locations must also identified, for example along farm feeder roads, along farm and homesite boundaries, and possibly on farms as part of the crop/fallow rotation system. Species like Black Wattle which improve soil fertility would be planted in addition to Eucalyptus on a trial basis. The technical features of the rural woodlot program, in terms of species, spacing, ground preparation, etc. would be similar to the technical features for the eucalyptus plantations. The seedlings would be produced in the central nurseries in each prefecture (para. 3.15), and sold to interested individual farmers, communes, or institutions. The estimated sale price of seedlings would be RF 2.00 if sold at cost. Farmers have not paid for seedlings in the past, and a pragmatic approach to fixing sale prices for seedlings would be essential. Some subsidies for seedlings might therefore be desirable in the initial period to encourage the population's interest, and final price levels would therefore be determined during Project implementation (para. 6.02). Over the project period, an estimated 800 ha would be afforested through rural woodlots in Butare and Kigali. The management and exploitation of rural woodlots would be left to the discretion of the owners, according to their needs. Fuelwood and poles would be cut selectively, but roughly on a five-year cycle. Yields would probably be lower than in the case of regular state plantations. After 30 years, the woodlots should be replanted.

B. Gishwati Integrated Forestry and Livestock Development Sub-Project

Technical features of the Softwood Saw Timber Plantations

(a) Afforestation

5.08 Species. The principal species to be planted at Gishwati would be *Pinus patula*, although other pine species would be tried on a small scale, e.g. *P. kesiya*, *P. elliottii*, and *P. oocarpa*. Pine would be grown on a 25 year rotation. The first thinning would take place at 12 years.

5.09 Nurseries. All the seedlings required would be produced in a central nursery, but depot nurseries would be established as appropriate in order to reduce transport costs. Seeds would be imported from Kenya and Tanzania. Seeds would be sown in block polythene tubes (50 mm x 120 mm flat). The average production cost per seedling is estimated at just over RF 2.00.

5.10 Planting. The planting program and seedling requirements are summarized below:

	Area (ha)	Seedlings ('000)
Year 1	--	--
Year 2	200	280
Year 3	400	560
Year 4	600	840
Year 5	800	1,120
Total	2,000	2,800

No planting would be done in the first year to allow for the completion of the land use plan for the Gishwati Forest (para. 3.17), and the demarcation of roads, fireline boundaries, and areas for planting; some fencing of reforestation blocks might be necessary to prevent cattle damage. It has been assumed that hired labor would be used for ground preparation and maintenance of the plantations. However, alternative land development systems would be experimented with on a small-scale, such as silvicultural associations, or the "Tangya system" (page 35, footnote), in order to determine the system best adapted to local conditions for adoption either in the later years of the Project or in future projects. The transport of seedlings from the nursery would be done with one tractor and three trailers. The spacing would be 3 m x 3 m, giving an average stocking of 1,111 stems/ha; allowing for 25% failures, an average of 1,400 plants/ha would be required. The planting task is assumed to be 150 plants/manday, equivalent to 7.5 mandays/ha. Fertilizing would only be undertaken on a trial basis (e.g. in years 3 and 5) to determine the need for fertilizers. Failures would be replaced. Weeding would be carried out for two years. Pruning would be carried out in years 6, 9, and 12. Thinning would be carried out in years 12, 15, and 18, with clearfelling in year 25.

(b) Indirect Afforestation Activities

5.11 In addition to the upgrading and building of two main all-weather roads (para. 3.11), a basic forest road network would be built at an average density of 3 km of forest tracks per 100 ha. Road maintenance costs are estimated at 10% of initial construction costs. For fire protection, grazing areas would act as wide firebreaks; in addition, narrower firebreaks would be used inside each planted block. Continuing fire protection activities would include firebreak maintenance, fire watching and fire fighting (one patrolman per 200 ha).

(c) Production Costs

5.12 Direct afforestation costs per hectare would be about RF 41,140 (US$453), of which land clearing and ground preparation would represent 85%. Maintenance costs would cover weeding, pruning, and thinning. Indirect afforestation capital costs per hectare are estimated at RF 13,550 (US$147), of which roads would represent 37%, buildings 42%, transport 20%, and fire protection 1%. Recurrent costs per hectare would be about RF 5,515 (US$60) a year during the Project period (72% representing direct costs of expatriates) and RF 1,780 (US$19) a year thereafter.

(d) Rates of Growth and Yields

5.13 The rates of growth and yields per hectare are summarized below:

Operation	Year	Yield: Volume m^3/ha			Average Vol/ Tree Removed
		Sawlogs	Smallwood	Total	(m^3)
Thinning I	12	25	20	45	0.15
II	15	35	20	55	0.22
III	18	40	20	60	0.40
Clearfelling	25	110	30	140	0.47
Total Volume of Production		210	90	300	
MAI = 12 m^3/ha		70%	30%	100%	

5.14 Pilot Rural Woodlots. Technical features and benefits would be similar to those described in para 5.08 for Kigali and Butare.

Technical Features of the Integrated Crop and Livestock Development

5.15 The production system proposed under the Project would be based on farmers' current practices, i.e., terracing, crop rotation, and fallow, and grazing of livestock on post-harvest croplands and within the perimeter of the Gishwati Forest. Given the present shortage of forage in the farming zone, the low productivity of the forest grazing lands, and the limited animal health protection, a four-fold approach for livestock development would be followed. (a) Forage production in the farming zone would be increased: in the short-term, strips of fodder crops, namely Setaria, and possibly some legumes, would be planted along contour lines, also serving as anti-erosion hedges; Kikuyu grass fallows would be improved with legumes such as lupin and Vicia sativa, and cattle or smallstock would be stall-fed part of the time; in the long-term, double cropping and permanent fodder crops such as Tripsacum would be introduced in the cropping system, stock would be stall-fed at all times, and the stocking rate would be controlled on the fallows; (b) a 2,000 ha grazing zone of high productivity pastures would be developed within the perimeter of the Gishwati Forest to accomodate excess cattle from the farming ares, (c) animal health protection would be improved with the strengthening of the extension veterinary services and fully equipped veterinary infrastructures; and (d) the Ankole cattle herd would be improved with Brown-Swiss to produce a high productivity dual purpose (meat/milk) animal. The estimated rates of development are summarized below:

Project Year	Stall-fed Cattle (A.U)	Technical Support Center		Pastoral Zone	
		Ha Cleared a/	Ha under Pastures	Ha Cleared	Ha under Pastures
1	-	-	-	-	-
2	50	100	-	300	300
3	100	100	100	400	400
4	100	-	100	500	500
5	250	-	-	600	600
Total	500	200	200	1,800	1,800

a/ Forage multiplication sector.

5.16 The Project intensification activities would have a greater impact on livestock production than on crop production. Crop yields are assumed to remain constant as the measures introduced under the Project would essentially contribute to maintain rather than increase soil fertility. Crop yields would increase significantly only when more sophisticated farming techniques have been introduced, such as improved seeds, double cropping, and chemical fertilizers. With the Project, cattle productivity and numbers are expected to increase. At full development, after 13 years, about 70 cross-bred bulls would be available for sale every year to farmers. 15,000 A.U. would be accomodated in the forest and 20,000 in the farming zone; incremental milk production has been estimated at 1 million liters, and meat at 13 tons. The following assumptions for the situation at full development have been made on the basis of the improvements resulting from the Project investment, and compared to the pre-Project situation:

	Before Project	With Project - At Full Development (after 13 years)
Area under pastures		
- Forest zone (ha)		5,000
- Farming zone (ha)		10,000
Herd numbers (head)	26,600	35,800
Total A.U. (UBT) a/	23,000	35,000
Stocking rate		
- Forest zone (UBT/ha)	0.7	3
- Farming zone (UBT/ha)	1	2
Calving rate (%)	60	80
Culling rate (%) - Cows	12	15
- Bulls	10	25
Calf mortality rate (%)	23	12
1-2 years old	25	6
Adult mortality rate (%)	5	2
Extraction rate (%)	13	17

1/ UBT: Unite de betail tropical: one adult cattle of 250 kg.

C. Producer Benefits

5.17 For the fuelwood and pole plantations the Government is likely to be the principal beneficiary. An estimated 3,000 farmers would, however, benefit from the pilot rural woodlots, although they would not derive any direct financial benefits since they would consume all the wood themselves. For the timber plantations, the Government would also probably be the principal beneficiary unless, as a result of the socio-economic survey (para 3.18) and trials, and integrated management system for crops and forestry activities in the area were recommended. In this case, farmers from the area could also be the direct beneficiaries as they could participate directly in the management of the area (para. 4.04). The value of sales or consumption from an area of 0.5 ha under crops is valued at about RF 17,000 a year. For the livestock intensification activities, an estimated 40,000 farm families would receive direct assistance under the Project.

VI. GOVERNMENT BENEFITS

6.01 In undertaking the proposed Project, the Government of Rwanda would in effect be committed to a long-term development program that will not yield financial or other benefits for many years. In particular, the Gishwati softwood timber plantation component would fulfill its long-term objectives only if up to 10,000 ha of plantations are eventually established, providing sustained wood supplies for a sawmilling industry. Full benefits would not be attained for 25 years, although some timber could be produced after 12 to 14 years. The Kigali and Butare fuelwood and pole plantations would be fully productive after eight years. For all Government plantations, maintenance costs during the long development period would be the responsibility of the Government, although external financing might be available for some of these costs. Annual recurrent costs of the fuelwood and pole plantations following the Project period (1980 prices) are estimated at about RF 14 million (US$175,000) a year; for the Gishwati timber plantation they would average about RF 4 million (US$44,000) a year from 1986 onwards. In both cases, it is assumed that no further expatriate management assistance would be required. The cost of production of seedlings produced for the rural woodlots would be supported by the farmers; the estimated annual cost in year 4 would be about RF 880,000 (US$9,500). It is expected that at least part of these costs would be recovered from the farmers through payment of a charge reflecting costs of production; at 1980 prices this would be about RF 2 per plant (para. 5.07) and would produce revenues at full development of about RF 1 million per year.

6.02 Introduction of charges to farmers should be gradual, as farmers are not accustomed to paying for many inputs and services and might resist payment for seedlings in cash. Current Government practice is that coffee and other seedlings, except for cinchona, are distributed free of charge, and this might discourage payment for tree seedlings. Government

officials have agreed, in principle, to the establishment of a national policy of recovery of costs of inputs from beneficiaries, principally in order to generate adequate revenue to continue and expand rural services. Charges for seedlings should be introduced in the light of this broader policy, rather than in isolation. If farmers proved unwilling to pay cash for seedlings, and if no coherent cost recovery policy were introduced for other inputs, then the practice of requiring payment for seedlings should be reviewed in order to ensure that farmers had adequate incentives to plant trees. Alternative solutions might involve a reduced charge for seedlings, or distribution of seedlings in conjunction with communal labor schemes. Assurances were obtained during negotiations that the Government would, to the extent feasible, charge to farmers the full cost of seedlings (excluding expatriate management costs), and would consult periodically with IDA on the level of charges for seedlings, including specifically the adequacy of incentives to farmers to plant trees. This issue would be specifically addressed during each annual work plan review (para. 4.09). Revenue to the Government from the fuelwood and pole and the timber plantations would be determined by stumpage charges, which are discussed below in paras. 7.01 and 7.02.

6.03 The costs of forestry, crop and livestock extension services would be covered through general tax revenues and not directly from participants, as these services are normally provided free of charge. The incremental costs involved would represent a very small proportion of the Government budget and should not represent an undue burden. Development and operating costs of the technical support center would be recovered through the sale of breeding stock. Costs of veterinary services would be partly recovered as participants would pay for drugs and veterinary treatments (para. 3.21). Assurances to this effect were obtained at negotiations. Once established, farmers' associations would handle some activities, and take over some operating costs, namely for the operation and maintenance of spray races and bulling centers which have been estimated at about RF 500,000 a year. A tentative Government cash flow is included as Table 5.

VII. MARKETS AND PRICES

Forestry

7.01 Fuelwood and Pole Production. No problems are anticipated in marketing the Project fuelwood and pole production since most of it would be used by Kigali and Butare consumers for charcoal, fuelwood, and poles. The Project estimated total production of 2.4 million m^3 would only represent 32% of total estimated urban demand for these products by the year 2000. Based on the Project's production targets for eucalyptus, a coppice rotation of eight years, four coppice rotations, a mean annual increment of 10 m^3/ha for the first two crops, 9 m^3/ha and 8 m^3/ha respectively for the third and fourth crops, and using a discount rate of 10%, the theoretical stumpage rate (standing value) would be RF 700/m^3 at mid-1979 prices. The average stumpage rate would thus be approximately RF 600/m^3 for fuelwood, and RF 800/m^3 for poles (at the present price ratio). These rates are reasonable when compared with current market prices. For charcoal, the price of a 35 kg bag has been estimated at about RF 400, which is in the range of current prices when charcoal

is readily available; the estimate was based on a 20% yield of charcoal per solid m^3 of wood (specific gravity when dry - 0.6), i.e. 120 kg or 3.4 bags of 35 kg and a doubling of wood costs to allow for transportation. At lower yields of 10% and 15%, the corresponding prices would be RF 540 and RF 820 respectively.

7.02 Saw timber Production. The saw timber produced at Gishwati would be marketed throughout Rwanda. At mid-1979 production costs, and expected yields per ha (para. 5.12), the stumpage rates calculated on the basis of a 10% discount rate would be:

sawlogs:	RF 2500/m^3	(average) (about US$27.20)
smallwood:	RF 500/m^3	(about US$5.4)

Adding the logging and transport costs estimated at RF 1,500/m^3, the delivered cost at a sawmill on the edge of the Gishwati Forest would be approximately RF 4,000/m^3. On the basis of pine plantations, and assuming a 40% recovery rate from sawlog to saw timber and sawmilling costs of RF 3,000/m^3 (sawn), the total cost of one cubic meter of sawn timber at millsite would be RF 13,000/m^3. This would be considerably less than the price quoted for sawn timber imported from Kenya, but considerably more than present prices for local sawn timber. Assuming a total planted area of 10,000 ha after 25 years, a sawmilling capacity of 84,000 m^3 (roundwood), producing 34,000 m^3 of sawn timber, would be required. Several designs could be envisaged. The first sawmill would need to be in operation in year 12 when the first thinnings take place.

7.03 The Government of Rwanda does not yet have well established policies for plantation exploitation and wood pricing. Permits to cut trees from government or communal plantations are issued, but most wood is cut without a permit; firewood permits are FR 160 per stere, and transport taxes for charcoal are only RF 100 per pick-up truck load (about 40 sacks of 35 kg). Prices for poles are established annually without analysis of market forces or replacement costs. The Government agreed during appraisal that pricing policies for the forestry sub-sector need to be better defined, and that appropriate legislation and a stronger system to regulate the management and exploitation of the country's forest resources are urgently required. During Project implementation, the Forestry Department would design detailed proposals for the exploitation of production resulting from the Project; the basic principles would be that stumpage rates would reflect the full costs of plantation and maintenance. During negotiations, assurances were obtained that: (a) a general pricing policy for wood products would be introduced that would be based on production costs for fuelwood, poles, and saw timber, and would be reviewed annually; and (b) a policy for the exploitation of tree plantations would be introduced following consultation with IDA, which would include (i) the establishment of cutting fees for existing plantations, at the earliest possible date but no later than December 31, 1985; and (ii) a proposal for the exploitation of the fuelwood and pole, and of the saw timber plantations established under the Project would be prepared no later than December 31, 1985.

Livestock

7.04 While it is expected that most of the incremental production resulting from the Project investments will be marketed through traditional channels during the Project period, it will become necessary to develop a local milk processing capacity, and perhaps a meat processing capacity as well, thereafter. The production would then be marketed in major urban centers, principally Kigali. These questions would be investigated during the final design of the marketing component (para 3.27).

VIII. BENEFITS, RISKS AND JUSTIFICATION

8.01 The principal direct benefits of the Project would be: (i) fuelwood, charcoal, and building poles produced in the plantations near Kigali and Butare to supply part of the fuel and building poles requirements of Kigali and Butare; (ii) sawn timber and smallwood produced by the Gishwati saw timber plantation to support a future sawmilling industry and help meet other industrial or rural fuel needs; (iii) fuelwood and poles produced in the rural woodlots to meet the needs of participating rural families; and (iv) increased production of meat and milk resulting from the Gishwati livestock component. Further benefits would result if the woodlot program enabled the rural population to return agricultural residues to the soil, thereby increasing soil fertility and reducing erosion.

8.02 The economic rate of return from all directly productive components of the Project is estimated at 14%. The costs of strengthening the Forestry Department, future project preparation and the studies and trials were not included, as benefits from these activities would accrue principally to future projects and programs. Rates of return were also calculated separately for the Kigali, Butare, and Gishwati plantations, and for the Gishwati livestock component. No separate rate of return was calculated for the seedlings produced for rural woodlots, because of the difficulty of determining a value for the eventual wood production. Incremental wood production would probably substitute for agricultural residues as a source of fuel and the principal benefit would thus be increased crop yields and reduced erosion resulting from the use of the residues on cropland.

8.03 The rate of return for the Kigali and Butare fuelwood and poles plantations was calculated on the basis of a per hectare model, including all costs of plantation development and maintenance, using a current market price for charcoal of about RF 500 a bag adjusted for transport and processing costs; this would be equivalent to about RF 1290 or US$14 per m^3 of roundwood. It was assumed that this price level reflects a meaningful market value for the wood produced. The resulting rate of return would be 13% for Kigali and 12% for Butare. If alternative assumptions on the value of wood were utilized, such as taking the equivalent value of imported alternative fuel supplies, wood, or charcoal, the rates of return would be significantly higher. The Project life for the fuelwood and pole plantation model was assumed to be 33 years.

8.04 The economic rate of return for the Gishwati plantations was also calculated on the basis of a per hectare model and would be about 12% over 26 years. All direct costs were included in the analysis. The economic value of the pine production was assumed to be equivalent to the theoretical value of wood received from Kenya, that is RF 5,335/m3 for sawlogs, and RF 500/m3 for smallwood, with values adjusted to take account of logging, transport, and milling costs. This value is appropriate since there is no alternative source of timber readily available, imported timber is prohibitively expensive, and other substitutes for timber such as metal or fiberglass are considerably more expensive; if production were valued at levels reflecting these possible sources of substitution, the rate of return would be significantly higher. The assumptions used in the analysis would imply an economic value of standing timber of about US$58 per m^3. The economic value of production from the pine plantation was adjusted to take into account expected increases in international relative prices for sawn timber. Foreign exchange costs and benefits were valued at the shadow exchange rate of US$1 = RF 110, which was assumed to reflect accurately the value of foreign exchange. It was assumed that the production of the Gishwati saw timber plantations would substitute for imports. Unskilled labor was valued at prevailing market rates which were assumed to reflect the economic value of such labor.

8.05 The economic rate of return for the Gishwati livestock component was calculated on the basis of a herd model of 1,000 head of cattle, and was estimated at about 20%. The life of this component was estimated to be 20 years. All direct costs were included in the analysis. The rates of return were tested for sensitivity, in addition to the analysis of alternative assumptions described in paras 8.03 and 8.04. With a 10% reduction in yields, the Project rate of return would decrease by 1 percentage point from 14% to 13%, and with a one year lag in Project benefits, the rate of return would decrease by one and a half percentage point to 12.5%.

8.06 The Project involves several risks. The scope of the Project is far reaching and requires a long-term Government commitment, and solid management and organization. Delays in implementation could result from management problems, difficulties in recruiting staff, or slow deliveries of material and equipment procured abroad, but these difficulties would not significantly reduce benefits since corresponding expenditures would be slower in consequence. To offset this risk, the Project includes substantial technical assistance, including support for the preparatory and start-up activities. Price escalation is another risk if Project implementation is delayed, but the proposed implementation schedule is viewed as realistic. Another possible risk is that yields from the plantations might be lower than expected, although experience in neighboring African countries suggests that yield estimates are reasonable, and probably conservative. A further risk is the destruction of the plantations by fire but provision has been made for adequate fire prevention measures. The risks that the production might not find a ready market are minimal, since projected wood production will not meet estimated demand. No practical and inexpensive alternative energy source has yet been developed, and it is highly unlikely that wood will be replaced by peat, solar energy, methane gas, or any other fuel in the foreseeable future. The Gishwati forestry component presents an additional risk which is that the local population might not support the plantation program, and could even

sabotage it, if not involved in a development system that will offer direct benefits to farmers. To offset this risk, the Project design was modified to include assistance to the surrounding population and to facilitate the development of plantation and forest extension systems adapted to local conditions during Project implementation as the results of the economic survey are available and as experienced is gained. The main risk of Gishwati livestock component is the time required for farmers to adopt and manage efficiently the proposed technical package, both in the farming zone outside the forest, and in the grazing zone in the forest. To offset this risk, the crop and animal husbandry extension services are being strengthened under the Project.

Employment and Income Distribution

8.07 Project investments would have a posivite employment impact in the Project areas since plantation development would be highly labor-intensive. The Kigali eucalyptus plantation would employ about 125 permanent staff and up to 2,500 laborers; the Butare eucalyptus plantation would employ about 75 permanent staff and up to 1,500 temporary laborers, and the Gishwati pine plantation would require approximately 100 permanent and up to 1,000 casual laborers. The total number of permanent jobs created would be about 400; another 5,000 workers would be employed to meet unskilled labor needs. Another important benefit would be the Project's effect on labor saving and reduction of women's work in the household. Fuelwood collection is generally a women's task in Rwanda, and is an increasingly time-consuming household chore in many parts of the country where forest resources are scant. Convenient provision of fuelwood in these areas would therefore reduce the burden on women. Similarly, the Project's research component would aim at providing households with fuel-saving cooking stoves and benefit women by reducing the amount of fuelwood they would have to cut and/or collect. The time saved in both cases would allow women to increase their participation in directly productive activities. The fuelwood plantation would provide fuel supplies for the urban poor in Kigali and Butare; if current shortages persist, the urban poor would bear the greatest share of the burden. The saw timber plantations would benefit all of Rwanda's population and the wood made available could be used for a wide variety of purposes. The increased supply of meat and milk would contribute to improved nutrition, especially in the densely populated Gishwati area.

IX. AGREEMENTS REACHED ON CREDIT CONDITIONS

9.01 During negotiations, the following issues were discussed:

(a) legal measures to designate the plantation areas (para. 3.10);

(b) Terms of Reference for key Project staff (para. 4.02);

(c) Project Implementation Schedule (para. 4.10); and

(d) Location of the Gishwati Sub-Project headquarters (para. 4.04).

9.02 During negotiations, assurances were obtained on the following issues:

(a) That in the final determination of plantation boundaries cultivated land would be avoided as far as possible and that where cultivated land was included in plantations appropriate compensation would be paid (para. 3.06);

(b) The restructuring of the Waters and Forests Department, including the Forestry Division (para. 3.12);

(c) That the terms of reference and conditions of employment of short-term consultants for studies would be acceptable to IDA (para. 3.28);

(d) That the Government would establish and maintain a Project revolving fund (para. 3.34);

(e) Procurement arrangements for the Project (para. 3.35);

(f) Accounting and audit procedures (para. 3.37);

(g) That the Government would submit the terms of reference and qualifications, terms and conditions of employment of the Project Coordinator, the Administrative and Financial Director and his deputy, the construction superintendent, the sub-project directors and their deputies to IDA for approval (para. 4.02);

(h) That the Government would exchange views with IDA on future management arrangements for the Gishwati Forest no later than December 31, 1985 (para. 4.04);

(i) That the terms of reference and conditions of execution for studies and trials to be carried out under the Project would be submitted to IDA for approval (para. 4.08);

(j) That the Government would submit annual work plans to IDA for approval not later than November 1 of each year and the first work plan would be finalized upon the completion of all preparatory activities (para. 4.09); the second work plan would specifically include proposals for organization of farmers' associations (para. 4.07);

(k) That the Project Management Committee would submit regular half-yearly and annual reports on the Project to the Minister of Finance and to IDA (para. 4.12);

(l) That the Government would prepare a completion report and submit it to IDA not later than six months following the closing date (para. 4.12);

(m) That the Government would, to the extent feasible, charge farmers the full cost of seedlings (excluding expatriate management costs) produced by nurseries and would consult periodically with IDA on the level of charges (para. 6.02);

(n) That veterinary products would be sold at costs, and veterinary treatments rendered at a fee (para. 6.03); and

(o) That the Government would (a) establish and introduce a pricing policy for wood products based on production costs for fuel wood, poles, and saw timber, following consultation with IDA, and review the issue annually with IDA; and (b) establish and introduce a policy for the exploitation of the plantations which would include (i) the establishment of stumpage rates for existing State plantations not later than December 31, 1982, and (ii) the design of a proposal for the exploitation of the plantations to be established under the Project not later than December 31, 1985.

9.03 Conditions of Credit Effectiveness would be that:

(a) legal measures designating the plantation areas and defining the development objectives for the Gishwati Forest had been taken (para. 3.11);

(b) a Project Revolving Fund had been established and the minimum balance of US$100,000 had been paid up by the Goverment (para. 3.34);

(c) a Ministerial Decree establishing the Project Management Committee had been published (para. 4.01); and

(d) that the Project Coordinator, and the Administrative and Financial Director had been appointed (para. 4.02).

9.04 It would be a condition of disbursement for the Kigali-Butare sub-project that the sub-project director and his two deputies had been appointed, and for the Gishwati sub-project that the sub-project director, the silviculturist and his deputy, and the livestock specialist and his deputy had been appointed (para. 4.02).

9.05 Subject to the above conditions, the proposed Project would be suitable for an IDA Credit of US$21.0 million to the Government of Rwanda on standard IDA terms.

May 9, 1980

Schedule 1

RWANDA

INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PROJET DE DEVELOPPEMENT SYLVOPASTORAL

Schedule of Key Rwandese Staff Appointment

Calendrier d'Affectation du Personnel Rwandais Principal

	Year/Année 1	2	3	4	5
Project Headquarters - Kigali					
Project Coordinator (Forestry Engineer Ao or A1)	1	1	1	1	1
Chief Accountant	1	1	1	1	1
Kigali/Butare Fuelwood and Pole Sub-Project					
A. Kigali					
Deputy Silviculturist (Ao or A1)	1	1	1	1	1
Forester (A2)	1	1	2	2	2
Forestry "Moniteur " (A3)	4	4	6	8	8
B. Butare					
Deputy Silviculturist (Ao or A1)	1	1	1	1	1
Forester (A2)	1	1	2	2	2
Forestry "Moniteur " (A3)	2	3	4	5	6
Gishwati Sub-Project					
A. Forestry Office					
Deputy Silviculturist (Ao or A1)	1	1	1	1	1
Forester (A2)	1	1	2	2	2
Forestry "Moniteur " (A3)	4	4	6	8	8
B. Crop and Livestock Office					
Deputy Veterinarian (Ao)	1	1	1	1	1
1. Technical Support Center					
Zootechnician (Ao)	1	1	1	1	1
Agronomist or Veterinarian (A2)	1	1	1	1	1
2. Pastoral Zone					
Agronomist or Veterinarian (A2)	1	1	1	1	1
Assistant Veterinarian (A3)	-	-	1	2	2
3. Crop and Livestock Intensification					
Veterinarian (A2)	1	2	3	3	3
Agronomist (A2)	-	1	2	3	3
Agronomist (A3)	-	-	-	-	38
Veterinarian (A3)	12	12	14	14	14

Siège du Projet - Kigali
Coordinateur du Projet (Ingénieur forestier Ao or A1)
Chef comptable
Sous-projet plantations bois d'énergie et de construction de Kigali/Butare
A. Kigali
Silviculteur adjoint (Ao ou A1)
Forestier
Moniteur forestier
B. Butare
Silviculteur adjoint (Ao or A1)
Forestier (A2)
Moniteur forestier (A3)
Sous-Projet de Gishwati
A. Bureau forestier
Silviculteur adjoint (Ao or A1)
Forestier (A2)
Moniteur forestier (A3)
B. Bureau agropastoral
Vétérinaire adjoint (Ao)
1. Centre d'appui technique
Zootechnicien (Ao)
Agronome ou veterinaire (A2)
2. Zone pastorale
Agronome ou veterinaire (A2)
Vétérinaire assistant (A3)
3. Intensification agropastoral
Vétérinaire (A2)
Agronome (A2)
Agronome (A3)
Vétérinaire (A3)

February 1980

février 1980

RWANDA

Table 1/Tableau 1

INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PROJET DE DEVELOPPEMENT SYLVOPASTORAL

Summary of Project Costs
(RF'000)

Résumé des Coûts du Projet
(en milliers de FRw)

Project Component	Preparatory Phase / Phase préparatoire	Project Year/Annee du projet 1	2	3	4	5	Total	Foreign Exchange/Devises Amount/Montant	%	Composante du Projet
Administrative Support for Forestry Services										**Support administratif aux Services forestiers**
Office buildings and housing	-	6,500	6,500	-	-	-	13,000	5,200	40	Bureaux et logements
Equipment and vehicles	-	2,400	4,740	1,200	-	-	8,340	6,465	48	Equipements et véhicules
Incremental operating costs	-	3,000	4,900	6,400	-	-	14,300	13,585	95	Coûts de fonctionnement supplémentaires
Sub-total	-	11,900	16,140	7,600	-	-	35,640	25,250	71	Total partiel
Project Coordination Unit										**Bureau de Coordination du Projet**
Office buildings and housing	4,600	17,760	-	-	-	-	22,360	8,945	40	Bureaux et logements
Equipment and vehicles	1,200	5,440	3,160	-	1,200	-	11,000	6,290	57	Equipements et véhicules
Wages and salaries	-	1,880	1,880	1,880	1,880	1,880	9,400	-	-	Salaires et rémunérations
Other incremental operating costs	1,200	3,250	3,950	3,950	3,950	3,950	20,250	17,370	86	Autres coûts de fonctionnement supplém.
Sub-total	7,000	28,330	8,990	5,830	7,030	5,830	63,010	32,605	52	Total partiel
Kigali/Butare Fuelwood and Pole Sub-Project										**Sous-projet bois d'énergie et de construction de Kigali et Butare**
A. **Kigali**										A. **Kigali**
Office buildings and housing	-	5,160	-	-	-	-	5,160	2,065	40	Bureaux et logements
Vehicles and equipment	1,200	12,390	-	-	2,700	-	16,290	15,475	95	Equipements et véhicules
Cartography	1,570	-	-	-	-	-	1,570	160	10	Cartographie
Materials	-	1,150	2,650	3,850	5,830	5,990	19,470	18,110	93	Matériaux
Labor	-	3,570	9,580	15,020	22,680	25,440	76,290	-	-	Main d'oeuvre
Seedling nurseries	-	110	225	365	550	550	1,800	720	40	Pépinières
Wages and salaries	-	1,280	1,280	1,710	1,880	1,880	8,030	-	-	Salaires et rémunérations
Other direct operating costs	1,200	7,075	7,275	7,275	7,275	7,275	37,375	34,750	93	Autres coûts de fonctionnement directs
Sub-total	3,970	30,735	21,010	28,220	40,915	41,135	165,985	71,280	43	
B. **Butare**										B. **Butare**
Office buildings and housing	2,760	4,590	2,100	-	-	-	9,450	3,780	40	Bureaux et logements
Vehicles and equipment	-	5,650	1,200	-	-	-	6,850	6,510	95	Equipements et véhicules
Cartography	1,570	-	-	-	-	-	1,570	160	10	Cartographie
Materials	-	580	1,110	1,670	2,510	2,520	8,390	7,800	93	Matériaux
Labor	-	2,195	5,210	8,330	12,670	14,235	42,640	-	-	Main d'oeuvre
Nurseries of seedlings	-	75	145	220	330	330	1,100	440	40	Pépinières
Wages and salaries	-	1,160	1,245	1,590	1,675	1,760	7,430	-	-	Salaires et rémunérations
Other direct operating costs	-	3,380	3,670	3,760	3,760	3,760	18,330	17,050	93	Autres coûts de fonctionnement directs
Sub-total	4,330	17,630	14,680	15,570	20,945	22,605	95,760	35,740	37	Total partiel
Total Sub-Project	8,300	48,365	35,690	43,790	61,860	63,740	261,745	107,020	41	Total du Sous-projet
Gishwati Integrated Forestry, Crop and Livestocks Sub-Project										**Sous-Projet agrosylvopastoral de Gishwati**
A. **Administrative Support**										A. **Support administratif**
Office buildings and housing	5,750	16,650	-	-	-	-	22,400	8,960	40	Bureaux et logements
Vehicles and equipment	2,400	4,600	500	-	-	2,400	9,900	9,405	95	Equipements et véhicles
Operating costs	2,400	3,360	4,130	4,130	4,130	4,130	22,280	20,720	93	Coûts de fonctionnement
Sub-total	10,550	24,610	4,630	4,130	4,130	6,530	54,580	39,085	72	Total partiel
B. **Land Use Plan**										B. **Plan d'utilisation du sol**
Cartography	7,100	-	-	-	-	-	7,100	6,035	85	Cartographie
Socio-economic survey	1,105	-	-	-	-	-	1,105	-	-	Enquête socio-économique
Topographical survey	26,625	-	-	-	-	-	26,625	23,963	90	Relevés topographiques
Technical services	5,980	-	-	-	-	-	5,980	5,382	90	Services techniques
Sub-total	40,810	-	-	-	-	-	40,810	35,370	87	Total partiel
C. **Roads**	15,745	23,885	14,400	14,300	15,600	15,500	99,430	59,660	60	C. **Routes**
D. **Forestry**										D. **Volet forestier**
Office buildings and housing	-	13,260	5,600	-	-	-	18,860	7,545	40	Bureaux et logements
Vehicles and equipment	1,200	5,650	1,000	310	2,400	-	11,760	11,170	95	Equipements et véhicules
Materials	-	65	875	1,130	1,205	1,700	4,975	4,635	93	Matériaux
Labor	-	505	9,120	18,620	28,360	36,395	93,000	-	-	Main-d'oeuvre
Nurseries of seedings for sale	-	-	35	70	140	280	525	210	40	Pépinières
Wages and salaries	-	1,370	1,370	1,800	1,970	1,970	8,480	-	-	Salaires et rémunérations
Other direct operating costs	1,200	4,610	5,210	5,960	5,960	5,960	27,700	25,760	93	Autres coûts de fonctionnement directs
Sub-total	2,400	25,460	23,210	27,890	40,035	46,305	165,300	49,320	30	Total partiel
E. **Crop and Livestock**										E. **Volet agropastoral**
Land development infrastructures	-	1,710	24,775	26,510	16,165	19,400	88,560	4,100	5	Aménagements et infrastructures
Office buildings and housing	-	27,200	16,500	7,745	7,660	3,175	62,280	26,080	40	Bureaux et logements
Vehicles and equipment	3,600	12,050	1,325	1,970	4,845	8,370	32,160	27,340	85	Equipement et véhicules
Purchase of cattle	-	-	-	3,050	-	300	3,350	1,190	35	Achat du bétail
Credit fund	-	2,000	2,000	2,000	2,000	2,000	10,000	-	-	Fonds de crédit
Revolving fund for veterinary products	-	4,500	7,000	-	-	-	11,500	10,925	95	Fonds de roulement pour les produits vétér.
Wages and salaries	-	2,050	4,295	4,900	5,040	5,040	21,325	-	-	Salaires et rémunérations
Other direct operating costs	-	9,150	10,745	11,840	12,390	13,060	57,185	50,915	89	Autres coûts de fonctionnement directs
Sub-total	3,600	58,660	66,640	58,015	48,100	51,345	286,360	120,550	42	Total partiel
Total Sub-Project	73,105	132,615	108,880	104,335	107,865	119,680	646,480	303,985	47	Total du Sous-projet
Technical Assistance and Consultants' Services										**Assistance technique et prestations de services**
Technical assistance	15,300	48,000	48,000	31,000	31,000	31,000	204,300	194,085	95	Assistance technique
Consultants' services	-	-	5,600	5,600	-	-	11,200	10,640	95	Prestations de services
Sub-total	15,300	48,000	53,600	36,600	31,000	31,000	215,500	204,725	95	Total partiel
Studies, Field trials										**Etudes et Essais d'accompagnement**
Energy needs	-	-	2,150	3,225	1,075	-	6,450	2,580	40	Besoins en énergie
Charcoal trials	-	-	2,150	3,225	3,225	2,150	10,750	4,300	40	Essais de charbon de bois
Improved cooking equipment	-	-	1,075	2,150	1,075	-	4,300	1,720	40	Cuisinières améliorées
Field trials	-	-	1,875	1,875	1,075	1,075	4,300	1,720	40	Essais d'accompagnement
Future project preparation	-	-	-	2,200	5,400	5,400	13,000	6,500	50	Préparation de futurs projets
Sub-total	-	-	6,450	11,875	11,850	8,625	38,800	16,820	43	Total partiel
Monitoring and Evaluation, and Training										**Suivi et évaluation, et formation**
Monitoring and evaluation	-	1,075	1,075	2,150	2,150	2,150	8,600	4,300	50	Suivi et évaluation
Training	-									Formation
Forestry	-	-	-	-	1,500	1,500	3,000	-	-	Foresterie
Agronomy	-	-	500	1,000	1,000	1,000	3,500	-	-	Agronomie
Financial disciplines	-	-	500	1,000	1,000	1,000	3,500	-	-	Finances
Sub-total	-	1,075	2,075	4,150	5,650	5,650	18,600	13,800	74	
Total base costs	103,705	270,285	231,825	214,180	225,255	234,525	1,279,775	704,205	56	Total couts de base
Contingencies										**Provisions**
Physical	-	49,090	43,075	40,903	42,362	43,920	219,350	146,890	58	Dépassement des quantités
Price	9,480	64,515	86,260	118,070	170,305	219,715	668,345	237,685	36	Dépassement des prix
Sub-total	9,480	113,605	129,335	158,973	212,667	263,635	887,695	384,575		Total partiel
TOTAL PROJECT COSTS	113,185	383,890	361,160	373,153	437,922	498,160	2,167,470	1,088,780	50	COUT TOTAL DU PROJET

February 1980

fevrier 1980

Table/Tableau 2

RWANDA

INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PROJET DE DEVELOPPEMENT SYLVOPASTORAL

Preparatory Phase - Detailed Project Costs and Financing
Phase préparatoire. Coûts détaillés du Projet et financement

	Local En monnaie locale	Foreign En devises (US$)		Total Total	IDA IDA	Government Gouvernement
A. Cartography						
1. Gishwati						
Field work	6,030	670	(10%)	6,700	-	-
Aerotriangulation	-	6,500	(100%)	6,500	-	-
Restitution	1,890	210	(10%)	2,100	-	-
Map design	3,690	410	(10%)	4,100	-	-
Infra-red aerial photography	-	15,000	(100%)	15,000	-	-
Orthophotoplan (1/20,000)	-	42,250	(100%)	42,250	-	-
Sub-total	11,610	65,040		76,650	76,650	-
2. Kigali/Butare						
Field work	31,500	3,500	(10%)	35,000	-	-
Restitution	10,800	1,200	(10%)	12,000	-	-
Map design	11,700	1,300	(10%)	13,000	-	-
Sub-total	54,000	6,000		60,000		
	65,610	71,040	(52%)	136,650	136,650	-
B. Vehicles						
Purchase price (tax free)	-	115,000	(100%)	115,000	-	-
Operating costs	9,000	36,000	(80%)	45,000	-	45,000
Sub-total	9,000	151,000	(94%)	160,000	-	45,000
C. Socio-economic survey - Gishwati	12,000	-		12,000	12,000	
D. Infrastructures						
1. Start office building - Kigali	30,000	20,000	(40%)	50,000	-	-
2. Staff housing and office building Butare	18,000	12,000	(40%)	30,000	-	-
3. Staff housing and office building - Gishwati	36,000	24,000	(40%)	60,000		
4. Roads and access tracks - Gishwati						
- minor repairs on east-west roads	1,760	2,640	(60%)	4,400	-	-
- Major repairs on east-west roads						
. Fixed costs				45,160		
. Pavement (50%) 1/				14,950		
. Bridges (50%) 1/				22,920		
. Drainage (50%) 1/				44,400		
	50,970	76,460	(60%)	127,430		
. Grid of access tracks including expatriate topographers (for topographical, pedological and hydrogeological survey work)	28,940	260,460	(90%)	289,400		
Sub-total	159,670	391,560	(71%)	551,230	795,350	55,880
E. Technical Assistance						
development planner/team leader (9 months)				105,000		
Infrastructure specialist (8 mos.)				61,000		
Pedologist (3 mos)				32,500		
Hydrogeologist (3 mos)				32,500		
Sub-total	23,100	207,900	(90%)	231,000	231,000	
Total	278,380	822,500	(75%)	1,100,880	1,000,000	100,880

A. Cartographie
1. Gishwati
Travaux sur le terrain
Aérotriangulation
Restitution
Dessin carte
Photographie aérienne-infra-rouge
Orthophotoplan (1/20,000)
Total partiel
2. Kigali/Butare
Travaux sur le terrain
Restitution
Dessin carte
Total partiel
B. Véhicules
Prix d'achat (HT)
Coûts de fonctionnement
Total partiel
C. Enquête socio-économique - Gishwati
D. Infrastructures
1. Démarrage construction du bureau de Kigali
2. Construction du bureau et des maisons du personnel à Butare
3. Construction du bureau et des maisons du personnel à Gishwati
4. Routes et maillage - Gishwati
- Réparations mineures sur les routes Est-Ouest
- Réparations permanentes sur les routes Est-Ouest
. Coûts fixes
. Chaussée (50%) 1/
. Ponts (50%) 1/
. Drainage (50%) 1/
. Maillage de layons y compris les coûts des topographes expatriés pour les travaux pédologiques et hydrogéologiques)
E. Assistance technique
Aménagiste/chef d'équipe (9 mois)
Chef de travaux (8 mois)
Pédologue (3 mois)
Hydrogéologue (3 mois)
Total partiel
Total

1/ 50% of these works will be completed in preparatory phase, the rest during project implementation.
50% de ces travaux seront achevés pendant la phase préparatoire, le reste pendant l'exécution du projet.

Table/Tableau 3

RWANDA

INTEGRATED FORESTRY AND LIVSTOCK DEVELOPMENT PROJECT
PROJET DE DEVELOPPEMENT SYLVOPASTORAL

Estimated Schedule of Disbursements — Calendrier Estimatif des Décaissements

IDA Fiscal Year and Quarter PPF	Cumulative Disbursements at End of Quarter Décaissements cumulés en fin de trimestre (US$ million)	Année fiscale de l'IDA et trimestre
1981 - September 30, 1980	0.3	1981 - 30 septembre 1980
December 31, 1980	0.9	31 decembre 1980
Credit		
1981 - March 31, 1981/a	1.2	1981 - 31 mars 1981/a
June 30, 1981	1.5	30 juin 1981
1982 - September 30, 1981	1.8	1982 - 30 septembre 1981
December 31, 1981	2.3	31 décembre 1981
March 31, 1982	2.8	31 mars 1982
June 30, 1982	3.6	30 juin 1982
1983 - September 30, 1982	4.4	1983 - 30 septembre 1982
December 31, 1982	5.2	31 décembre 1982
March 31, 1983	6.2	31 mars 1983
June 30, 1983	7.2	30 juin 1983
1984 - September 30, 1983	8.2	1984 - 30 septembre 1983
December 31, 1983	9.2	31 décembre 1983
March 31, 1984	10.2	31 mars 1984
June 30, 1984	11.2	30 juin 1984
1985 - September 30, 1984	12.2	1985 - 30 septembre 1984
December 31, 1984	13.2	31 décembre 1984
March 31, 1985	14.2	31 mars 1985
June 30, 1985	15.2	30 juin 1985
1986 - September 30, 1985	16.2	1986 - 30 septembre 1985
December 31, 1985	17.2	31 décembre 1985
March 31, 1986/b	18.4	31 mars 1986/b
June 30, 1986	19.6	30 juin 1986
1987 - September 30, 1986/c	21.0	1987 - 30 septembre 1986/c

/a Expected date of effectiveness November 30, 1980

/b Expected date of completion March 31, 1986

/c Expected closing date 30 September, 1986.

/a Date prévue de mise en vigueur le 30 novembre 1980

/b Date prévue pour l'achèvement du Projet, le 31 mars, 1986

/c Date de clôture prévue pour le 30 septembre 1986

May 1980

Mai 1980

RWANDA

INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PROJET DE DEVELOPPEMENT SYLVOPASTORAL

Economic Analysis — Analyse Economique

Year / Année	Cost of Kigali Fuelwood and Pole Plantations / Coût des plantations bois d'énergie et de construction - Kigali	Cost of Butare Fuelwood and Pole Plantations / Coût des plantations bois d'énergie et de construction-Butare	Cost of Gishwati Saw Timber Plantations / Coût des plantations de bois d'oeuvre - Gishwati	Cost of Crop and Livestock Development / Coût de dev. des cultures et de l'élevage	Other Project Costs / Autres Couts du Projet
1	10.00	7.60	15.90	91.40	13.80
2	26.20	16.70	37.70	96.40	19.40
3	41.30	26.90	65.20	94.30	18.70
4	62.50	40.60	94.20	83.50	14.30
5	69.60	45.00	46.50	87.60	6.60
6	26.00	15.50	31.50	49.70	0.00
7	17.90	10.90	11.70	49.70	0.00
8	16.20	10.00	8.90	49.70	0.00
9	13.80	8.80	5.30	49.70	0.00
10	12.10	8.00	5.90	49.70	0.00
11	12.60	8.30	5.10	49.70	0.00
12	13.20	8.70	5.30	49.70	0.00
13	13.20	8.70	6.20	49.70	0.00
14	11.20	7.50	5.90	49.70	0.00
15	11.20	7.50	6.30	49.70	0.00
16	11.20	7.50	7.40	49.70	0.00
17	11.40	7.60	5.00	49.70	0.00
18	12.20	8.00	5.30	49.70	0.00
19	12.60	8.40	6.00	49.70	0.00
20	13.20	8.70	5.00	49.70	0.00
21	13.20	8.70	5.30	0.00	0.00
22	11.20	7.50	5.60	0.00	0.00
23-24	11.20	7.50	4.50	0.00	0.00
25	11.20	7.60	4.50	0.00	0.00
26	11.40	8.00	4.60	0.00	0.00
27	12.20	8.40	4.60	0.00	0.00
28	12.60	8.70	4.00	0.00	0.00
29	13.20	8.70	2.90	0.00	0.00
30	13.20	7.50	0.00	0.00	0.00
31-32	11.20	7.50	0.00	0.00	0.00
33	11.40	7.60	0.00	0.00	0.00
34	11.30	7.40	0.00	0.00	0.00
35	10.10	6.70	0.00	0.00	0.00
36	8.60	5.60	0.00	0.00	0.00
37	5.40	3.50	0.00	0.00	0.00

Year / Année	Benefit of Kigali Fuelwood and Pole Plantations / Bénéfice des plantations bois d'énergie et de construction-Kigali	Benefit of Butare Fuelwood and Pole Plantations / Bénéfice des plantations bois d'énergie et de construction-Butare	Benefit of Gishwati Saw Timber Plantations / Bénéfices des plantations de bois d'oeuvre - Gishwati	Benefit of Crop and Livestock Development / Bénéfice de dev. des cultures et de l'élevage	Other Project Benefits / Autres Benefices du Projet
1	0.00	0.00	0.00	53.80	
2	0.00	0.00	0.00	35.30	
3	0.00	0.00	0.00	77.40	
4	0.00	0.00	0.00	65.30	
5	0.00	0.00	0.00	60.30	
6	0.00	0.00	0.00	63.80	
7	0.00	0.00	0.00	76.90	
8	0.00	0.00	0.00	88.30	
9	31.00	21.00	0.00	92.40	
10	72.00	41.00	0.00	112.20	
11	103.00	62.00	0.00	122.60	
12	154.00	92.00	0.00	191.90	
13	154.00	92.00	34.00	198.80	
14	0.00	0.00	68.00	218.00	
15	0.00	0.00	102.00	218.00	
16	0.00	0.00	182.50	218.00	
17	31.00	21.00	93.60	218.00	
18	72.00	41.00	140.50	218.00	
19	103.00	62.00	238.00	218.00	
20	154.00	92.00	102.50	218.00	
21	154.00	92.00	153.70	0.00	
22	0.00	0.00	204.70	0.00	
23-24	0.00	0.00	0.00	0.00	
25	28.00	18.00	0.00	0.00	
26	65.00	37.00	143.90	0.00	
27	93.00	55.00	287.70	0.00	
28	139.00	83.00	430.90	0.00	
29	139.00	83.00	574.00	0.00	
30-32	0.00	0.00	0.00	0.00	
33	25.00	16.00	0.00	0.00	
34	58.00	33.00	0.00	0.00	
35	82.00	49.00	0.00	0.00	
36-37	123.00	74.00	0.00	0.00	

Year / Année	Total Cost / Coût total	Total Benefit / Bénéfice Total
1	138.70	53.80
2	196.40	35.30
3	246.40	77.40
4	295.10	65.30
5	255.30	60.30
6	122.70	63.80
7	90.20	76.90
8	84.80	88.30
9	77.60	144.40
10	75.70	225.20
11	75.70	287.60
12	76.90	437.90
13	77.80	478.80
14	74.30	286.00
15	74.70	320.00
16	75.80	400.50
17	73.70	363.60
18	75.20	471.50
19	76.70	621.00
20	76.60	566.50
21	27.20	399.70
22	24.30	204.70
23-24	23.20	0.00
25	23.30	46.00
26	24.00	245.90
27	25.20	435.70
28	25.30	652.90
29	24.80	796.00
30	20.70	0.00
31-32	18.70	0.00
33	19.00	41.00
34	18.70	91.00
35	16.80	131.00
36	14.20	197.00
37	8.90	197.00

Economic Rate of Return/Taux de rendement economique: 14.35%

RWANDA

INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PROJET SYLVOPASTORAL

Government Project-Related Cash Flow
(RF million in February 1980 terms)

Cash-flow du Gouvernement
(en million de FR, février 1980)

Year / Année	Preparatory Phase / Phase Préparatoire	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	
Sources of Funds																																							**Origine des fonds**
IDA Credit a/	73.6	153.0	241.9	250.0	235.0	265.1	300.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Crédit IDA a/
Fuelwood and pole plantations b/	-	-	-	-	-	-	-	-	-	28.0	63.6	89.6	134.4	134.4	-	-	-	28.0	61.6	89.6	134.4	134.4	-	-	-	25.2	35.4	80.6	121.0	121.0	-	-	-	22.4	49.3	71.7	107.5	107.5	Plantations de bois d'énergie et de construction b/
Softwood sawtimber plantations c/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.5	29.0	43.5	77.5	39.0	58.5	100.0	44.0	66.0	88.0	-	-	-	58.0	116.0	176.0	232.0	-	-	-	-	-	-	-	Plantations de bois de sciage c/
Sale of seedlings d/	-	0.2	0.4	0.5	0.9	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Vente de plantules d/
Total Sources of Funds	73.6	153.2	242.3	250.5	235.9	266.0	300.6	-	-	28.0	63.6	89.6	134.4	134.4	14.5	29.0	43.5	105.5	100.6	148.1	234.4	178.4	66.0	88.0	-	25.2	35.4	138.6	237.0	297.0	232.0	-	-	22.4	49.3	71.7	107.5	107.5	Total des fonds
Use of Funds a/																																						**Emplois des fonds a/**
Admin. support to forestry services	-	11.9	16.1	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Appui administratif aux services forestiers
Project administration	7.0	28.3	9.0	5.8	7.0	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Administration du Projet
Fuelwood and pole subproject																																					Sous-projet bois d'énergie et de construction
- Kigali	4.0	30.7	31.0	28.2	40.9	41.1	8.7	8.7	8.7	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	Kigali
- Butare	4.3	17.6	14.7	15.8	20.9	22.6	5.2	5.7	5.7	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	Butare
Gishwati Sub-project																																					Sous-projet de Gishwati
- Administration	10.6	24.6	4.6	4.1	4.1	6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Administration
- Land use plan	60.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Plan d'utilisation des sols
- Roads	13.7	23.9	16.4	14.3	15.6	15.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Routes
- Forestry development	2.4	29.5	23.7	27.9	40.0	46.3	3.9	3.9	4.4	4.4	4.8	4.8	4.8	4.8	5.3	5.3	5.3	5.3	5.3	5.3	4.8	4.8	4.8	4.8	4.4	4.4	3.9	3.9	3.9	3.9	3.9	-	-	-	-	-	Développement forestier
- Livestock development	3.6	58.7	66.6	58.0	49.1	31.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Développement de l'élevage
Technical assistance	14.3	58.0	58.7	41.7	41.0	41.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Assistance technique
Studies and trials	-	-	6.5	11.9	11.9	8.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Etudes et essais
Monitoring, evaluation and training	-	1.1	2.1	4.2	5.7	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Suivi, évaluation et formation
IDA Credit service charge	0.5	1.7	3.5	5.4	7.1	9.0	11.2	11.2	11.2	11.2	11.2	26.2	26.1	26.0	25.9	25.8	25.6	25.5	25.4	25.3	25.7	25.1	24.8	24.5	24.1	23.8	23.4	23.1	22.8	22.4	22.1	21.7	21.3	21.0	20.6	20.1	19.7	Charge du crédit IDA
Total Uses of Funds	106.2	282.0	240.6	224.70	242.3	253.6	29.0	29.0	29.5	30.6	31.0	46.0	45.9	45.8	46.2	46.1	45.9	45.8	45.7	45.6	45.0	44.9	44.6	44.3	43.5	43.5	42.9	42.8	42.7	42.5	42.1	36.7	36.4	66.1	66.7	65.4	65.1	64.7	Total emplois
Annual surplus (deficit)	(30.6)	(128.8)	1.9	25.80	(6.6)	(7.6)	271.6	(29.0)	(29.5)	(2.6)	30.6	43.6	88.5	88.6	(31.7)	(17.1)	(2.4)	59.7	44.9	102.5	189.4	133.5	(8.6)	13.7	(73.5)	(58.0)	(16.9)	66.6	165.3	229.7	161.0	(66.8)	(66.4)	(43.7)	(16.4)	6.3	42.4	42.8	Excédent (déficit) annuel de trésorerie
Cumulative surplus (deficit)	(30.6)	(159.4)	(157.5)	(131.70)	(138.1)	(145.5)	126.1	97.1	67.6	65.0	95.6	139.2	227.7	316.3	284.6	267.5	265.1	324.8	369.7	472.2	661.6	795.1	786.5	770.7	696.7	638.7	621.8	688.4	853.7	1,077.4	1,238.4	1,171.6	1,105.2	1,061.5	1,045.1	1,051.4	1,093.8	1,136.6	Excédent (déficit) cumulé

a/ Excluding price contingencies on external financing and Project costs
Imprévus du financement externe et des coûts du Projet ne sont pas compris.

b/ Assuming a stumpage rate of RF 700/m³ of eucalyptus.
Au taux de FR 700/m³ pour l'Eucalyptus sur pied.

c/ Assuming stumpage rates of RF 7500/m³ for sawlogs and RF 500/m³ for smallwood.
Au taux de FR 7500/m³ pour le bois d'oeuvre et FR 500/m³ pour les petites dimensions.

d/ At RF 2 per seedling.
Au prix de FR 2 par plantule.

e/ Balance to be amortized beyond 37 years according to standard IDA terms.
Après 37 ans, le solde sera amorti selon les conditions normales de l'IDA.

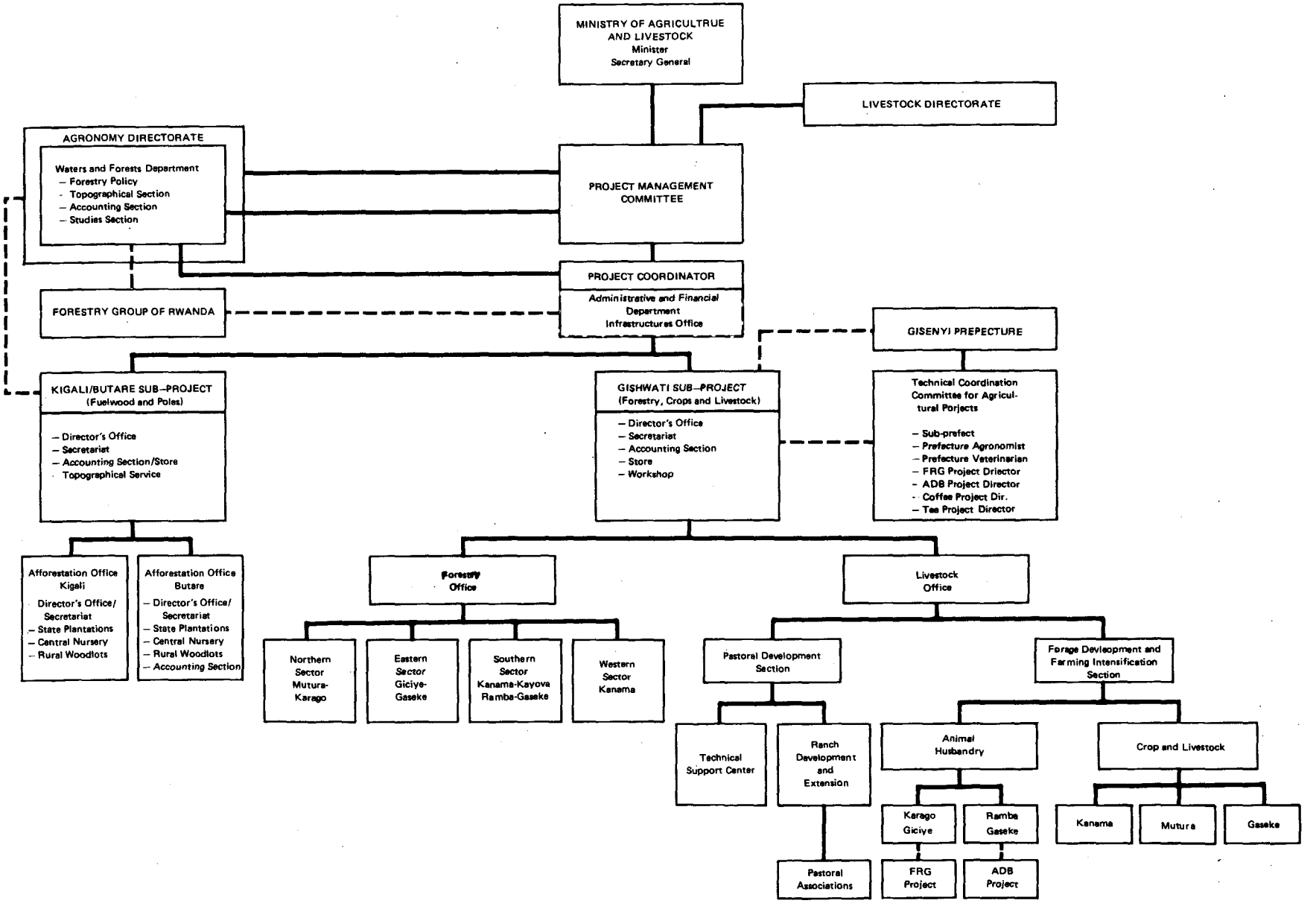
February 29, 1980

Février 29, 1980

Table/Tableau 5

-57-

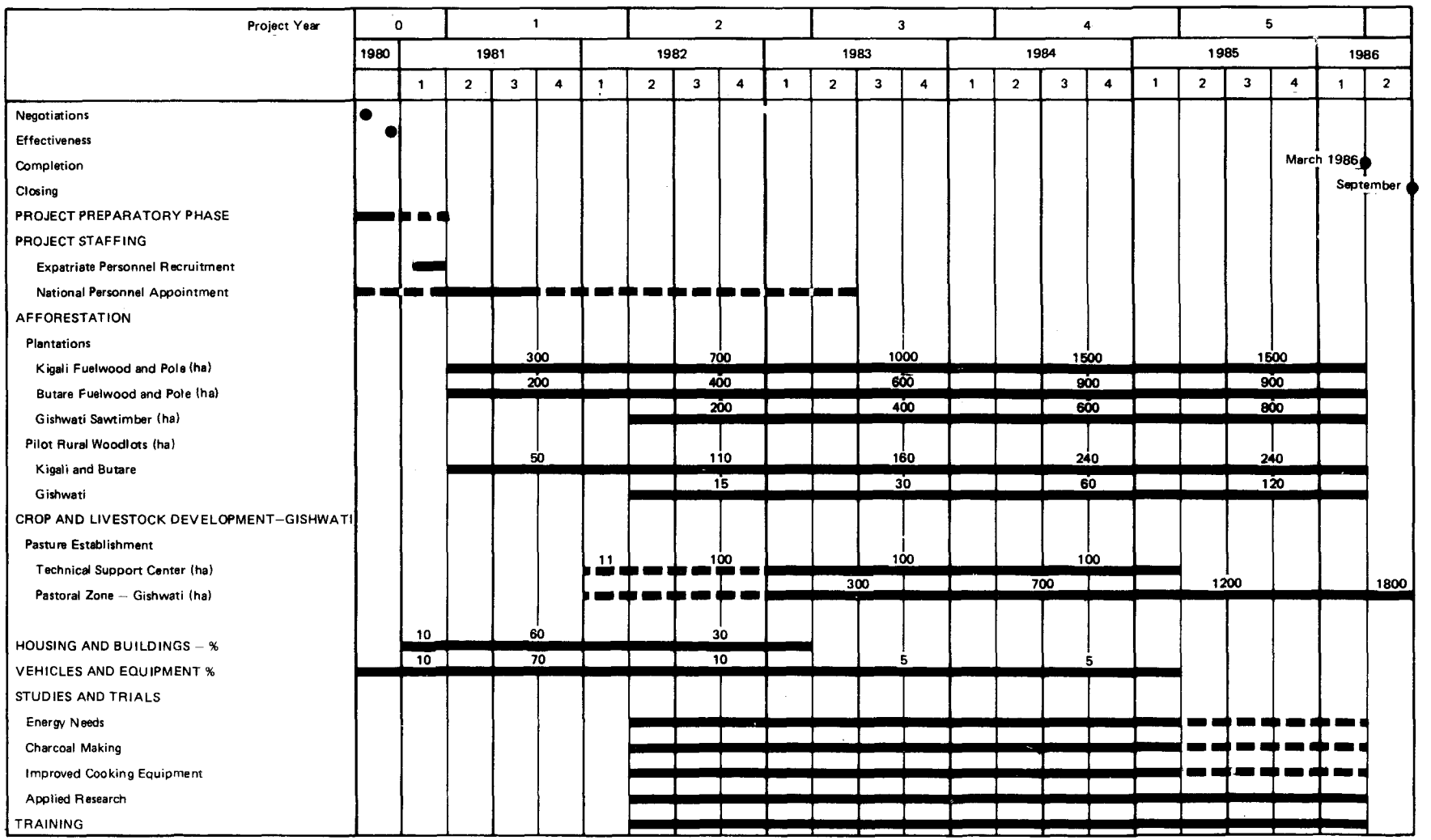
RWANDA
INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
ORGANIZATION CHART



World Bank – 21307

Chart I

RWANDA
INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PROJECT IMPLEMENTATION SCHEDULE



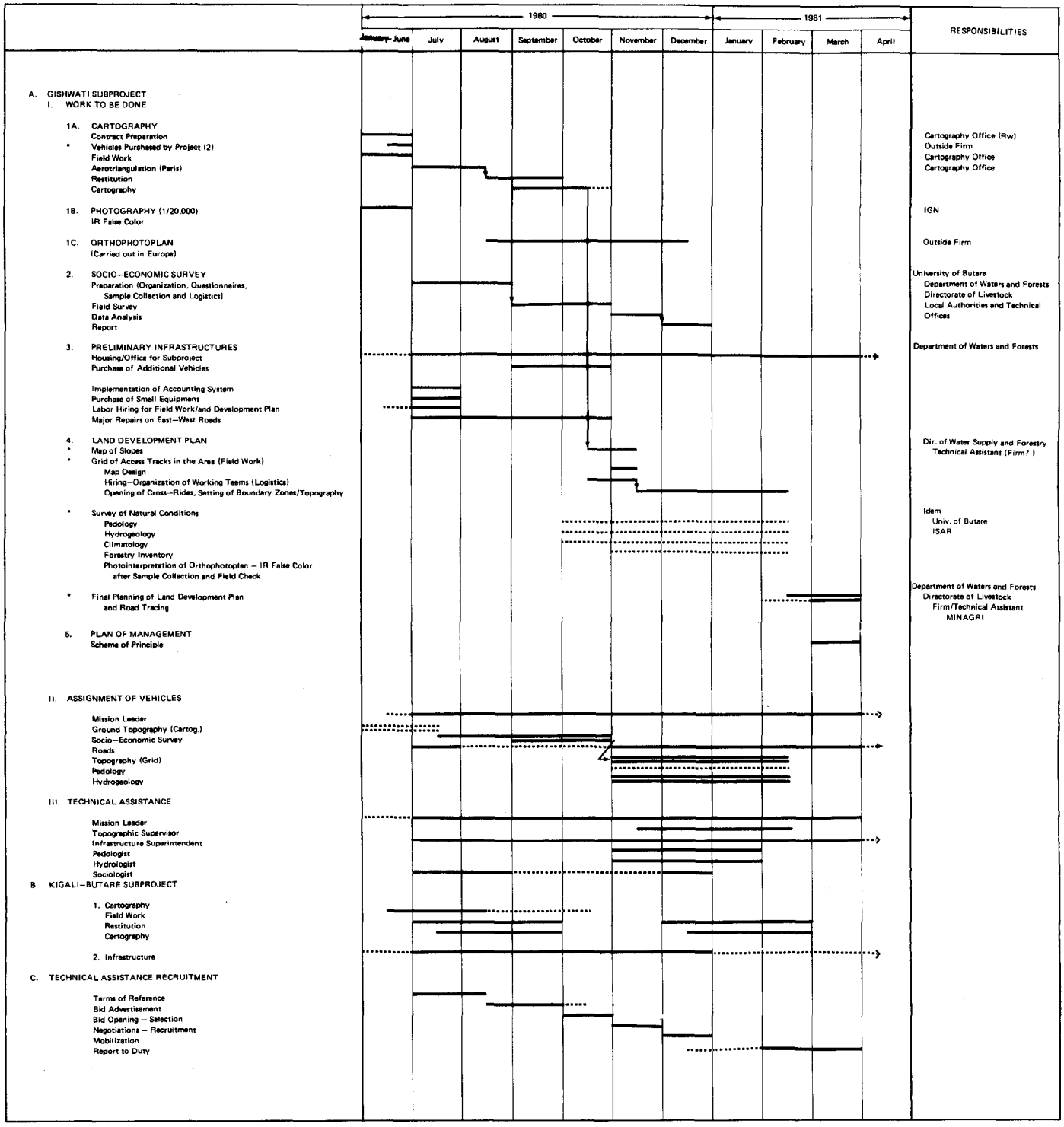
February 20, 1980

World Bank – 21401

Chart/Diagramme II

Chart/Diagramme III

RWANDA
INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PREPARATORY ACTIVITIES
Implementation Schedule



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RWANDA

INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT

List of Materials Available in the Technical Annexes

1. Proposed Forestry Developments - Technical Description

2. Proposed Forestry Developments - Project Costs

Gishwati Sub-Project

3. Road Component

Appendices:

I. Cost of Bridges
II. Cost of Culverts Under Road
III. Cost of Vehicles
IV. Detailed Breakdown of Topographic Grid Construction Costs
V. Reconnaissance of Existing Tracks, Condition of Drainage Facilities and Bridges

4. Livestock Component

Tables:

1. Herd Projection (1,000 head)
2. Investment Costs
3. Operating Costs
4. Land Development and Infrastructure
5. Construction Schedule for Buildings
6. Equipment Purchase Schedule
7. Schedule of Staff Appointment
8. General Implementation Schedule
9. Unit Price Estimate

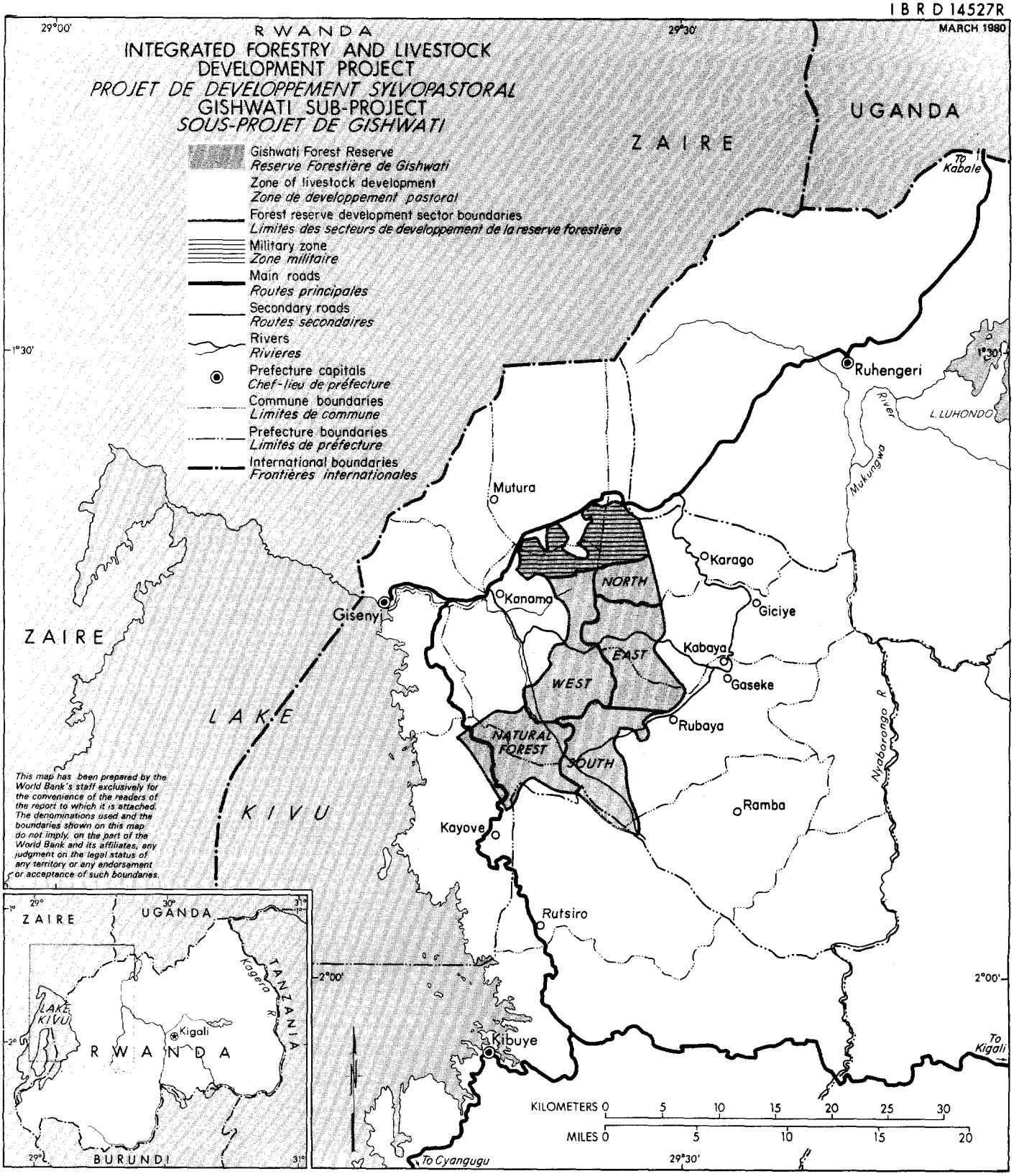
Appendix: The Present Production System

Tables:

1. Basic Data
2. Cropping Pattern
3. Farm Model IA (Before Project)
4. Present Cattle Herd Composition and Technical Coefficients

IBRD 14527R
MARCH 1980

RWANDA
INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PROJET DE DEVELOPPEMENT SYLVOPASTORAL
GISHWATI SUB-PROJECT
SOUS-PROJET DE GISHWATI



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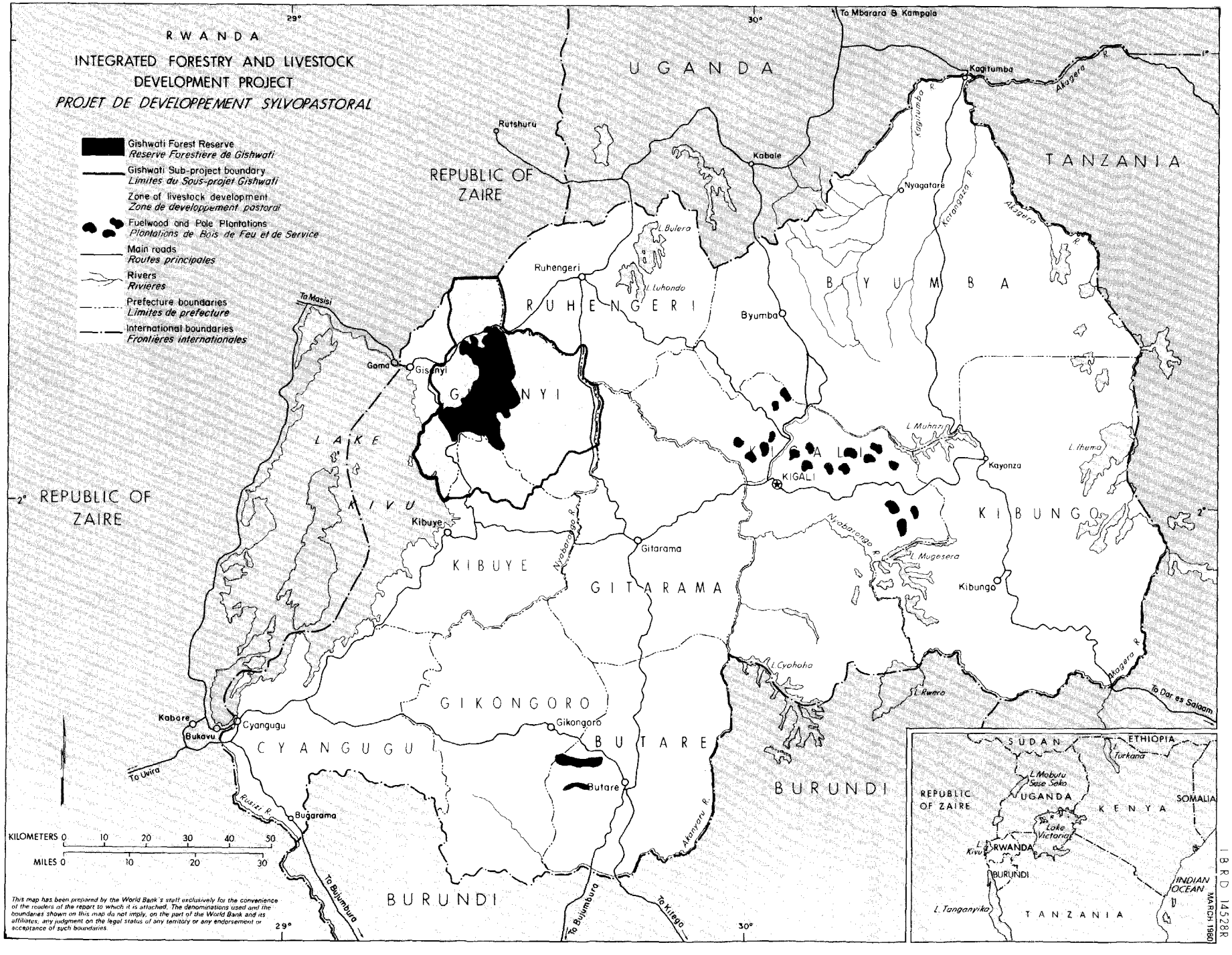
RWANDA
INTEGRATED FORESTRY AND LIVESTOCK DEVELOPMENT PROJECT
PROJET DE DEVELOPPEMENT SYLVOPASTORAL
Gishwati Forest Reserve
Reserve Forestiere de Gishwati
Gishwati Sub-project boundary
Limites du Sous-projet Gishwati
Zone of livestock development
Zone de developpement pastoral
Fuelwood and Pole Plantations
Plantations de Bois de Feu et de Service
Main roads
Routes principales
Rivers
Rivieres
Prefecture boundaries
Limites de prefecture
International boundaries
Frontières internationales
UGANDA
TANZANIA
BURUNDI
REPUBLIC OF ZAIRE
To Mbarara & Kampala
Kagitumba
Rutshuru
Kabale
Nyagatare
Ruhengeri
Byumba
To Masisi
Gisenyi
Gama
KIGALI
Kayonza
Kibuye
Gitarama
Kibungo
Kabare
Bukavu
Cyangugu
Gikongoro
Butare
Bugarama
To Uvira
To Bujumbura
To Kitega
To Dar es Salaam
L. Bulera
L. Luhondo
L. Muhazi
L. Ihema
L. Mugesera
L. Cyohoha
L. Rwero
Kagitumba R.
Akagera R.
Karangara R.
Nyabarongo R.
Ruzizi R.
Akanyaru R.
LAKE KIVU
RUHENGERI
BYUMBA
GISENYI
KIBUYE
GITARAMA
GIKONGORO
CYANGUGU
BUTARE
KIBUNGO
KILOMETERS 0 10 20 30 40 50
MILES 0 10 20 30
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ETHIOPIA
Turkana
L. Moburu
Sese Seko
UGANDA
KENYA
SOMALIA
REPUBLIC OF ZAIRE
Lake Victoria
L. Kivu
RWANDA
BURUNDI
INDIAN OCEAN
L. Tanganyika
TANZANIA
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