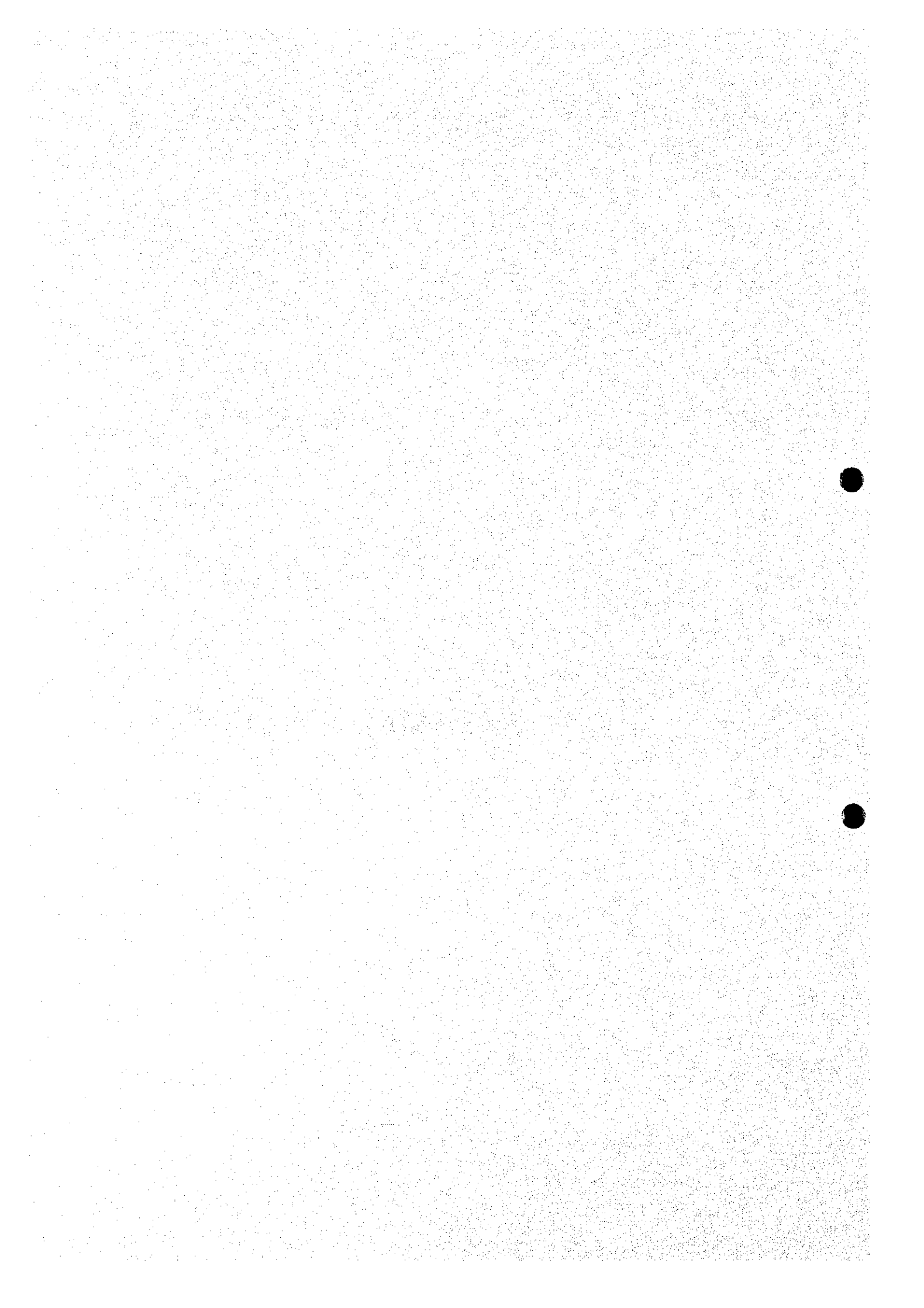


SUMMARY
AND
RECOMMENDATIONS



SUMMARY AND RECOMMENDATIONS

1 BACKGROUND AND OBJECTIVES OF THE STUDY

1.1 BACKGROUND OF THE STUDY

The Government of Romania has the following policy objectives in the agricultural sector:

- to increase the production of irrigated crops to meet national food requirements;
- to increase the export of agricultural products;
- to increase employment in the agricultural sector and to reverse recent rise in unemployment;
- to encourage the irrigated crop production by the small and private farming units including individual farmers and informal associations of them;
- to develop and/or maintain irrigated agriculture where it is viable; and
- to promote a free market economy in the agricultural sector and to reduce the direct role of the Government in the provision of agricultural supporting services.

Once before Romania had been a food export country. However, due to the promotion of development of heavy industries by the Ceausescu's Government, Romania has become a food import country since 1990. Therefore, it is an emergency task for the Government of Romania now to increase the food production in order to achieve self-sufficiency of food for the nation and to activate the agricultural sector in line with the above policy objectives.

In the above circumstances, the Government of Romania has a strong intention to complete the "Irrigation Project in Ruginesti-Pufesti-Panciu, District Vrancea" (hereinafter referred to as the Project), a part of the Siret-Ialomita Agricultural Development Project, as a model development one for other similar projects in Romania. Furthermore, the privatization of land in the Project Area is more progressed compared with other areas. And the Government of Romania also wants that an irrigation development plan which will have a significant influence on other areas will be formulated.

The Government of Romania anticipates that the Project will be accelerated as soon as possible with the financial assistance from the Government of Japan and that the Japanese technology will be introduced in various aspects of farming, water management, farmers' organization, marketing, etc. which is suitable for the free marketing system promoted by the Government of Romania.

In the above circumstances, the Government of Romania requested the Government of Japan to perform the technical cooperation for the Feasibility Study on the Project (hereinafter referred to as the Study) in July 1992. In response to this request, the Government of Japan through

Japan International Cooperation Agency (JICA) sent a project formation mission to Romania to confirm the necessity for the technical cooperation in February 1993. Then the preparatory mission for the execution of the Study was dispatched in December 1993 and the Scope of Work (S/W) for the Study (Appendix-1) was concluded between the Land Reclamation Department (LRD, reorganized to the Land Reclamation Agency, RAIF, in October 1994), the Ministry of Agriculture and Food, representing the Government of Romania, and Japan International Cooperation Agency (JICA), representing the Government of Japan, on 15th of December 1993.

1.2 OBJECTIVES AND SCOPE OF THE STUDY

The objectives of the Study are to make a feasibility study on the Irrigation Project in the Ruginesti-Pufesti-Panciu Area located at the northeastern part of District Vrancea through the irrigation development and related agricultural development based on the above irrigation development in due consideration of the preliminary design of the Project prepared by the Government of Romania and the present conditions of some of the Project facilities which have been already constructed at the site. The Study also includes a study on the soil conservation in the Area which has close relationship with the objective irrigation development.

However, the studies on the erosion control as well as flood control of the rivers themselves which pass through the Area are excluded from the Study. The detailed review and analysis of the basic design of the Siret-Ialomita Agricultural Development Project are also out of scope of the Study. On the other hand, it is one of the main objectives of the Study to carry out technical transfer to the counterpart personnel of the Government of Romania in the course of the Study.

2 BACKGROUND OF THE PROJECT

2.1 BRIEF DESCRIPTION OF THE COUNTRY

2.1.1 National Economy

Since the revolution in 1989, Romanian economy has been reorganized into a new regime of free economy with gradual privatization directed by Land Act and Privatization Law enacted in 1991. Many state-owned enterprises and cooperatives are on the way to privatized enterprises, whose investment share is held by individual members, late employees or the state as a co-investor and former land-owners. Lately, inflation shows falling trends in Romania in food commodities etc.. The share of the industrial sector in GDP has now become smaller as a result of the change in its trade structure. Registered and latent unemployment has reached over 10%.

2.1.2 Agriculture

Romania has abundant agricultural resources. As of December 1992, above 62% of the territorial area was reserved for agricultural activities, of which more than 63% or $9,357 \times 10^3$ ha was categorized as arable land. Agriculture has been sustained by 46% of the total population. $3,419 \times 10^3$ families are engaged in farming individually, while population employed in agricultural sector in 1992 was estimated at $3,127 \times 10^3$. Individual farmers predominate in land holding, but they are now on the way to organized groups or associations as recommended by the Government.

Agriculture comprises crop (with 52% of production share in 1992) and livestock (with 48%) sectors. The latter is indispensable/unseparable partner of crop production in terms of crop rotation and crop nutrient supply, also as draught animal and means of transport. Livestock production is closely linked with cropping activities, and most small holders keep small herd of livestock within their farms. Herds are now on rebuilding stage after a serious slack. Livestock production remains in lower efficiency as to milk yield and meat conversion rate due to lower rate of concentrate feeding.

2.2 GENERAL FEATURES OF VRANCEA DISTRICT

2.2.1 District Economy

Major economic activities so far developed within the District are agriculture and agro-industrial sectors including wineries. Besides, Focsani has an industry specialized in tools, textile and sawing. There have been reported 44 industrial enterprises. Economically active population is totaled at 206×10^3 (52% of the total) of which only 14×10^3 (7%) account for unemployed. About 29% of them are engaged in agriculture, 33% in industry (of which 24% lives in Focsani).

Farm households account for 35% of the total District households, while agricultural population has almost half the share of the District population. Annual production value from agricultural sector amounts to $41,295 \times 10^6$ Lei in 1992 as against $68,943 \times 10^6$ Lei from industrial sector, 90% of which is derived from public sector.

2.2.2 Agriculture

An outstanding characteristic observed in agriculture in Vrancea lies in wine grape production from widely developed vineyards. Arable land formerly belonged to CAP has been for the most part restituted to duly owners, while major part of grass land for pasturing is still held as public properties. As a result, a host of small holding individual farmers were born, and some of them have set up formal AA or informal associations and other private groups.

Crop and livestock herd compositions are similar to those of the whole country, but production from vineyard has much higher share as compared with the country average. Overall crop yield levels are somewhat lower for cereals, but sometimes higher for some cash crops. Acreage under industrial crop declines due partly to relatively low profitability and difficulty in yield improvement. Total cropped area in 1991 accounted for 139×10^3 ha (94.8% of arable land area), of which 86% was cultivated by private sector. In 1992, the area showed a little expansion reaching 144×10^3 ha (97.6% was used and also 86% was covered by private sector). Overall falling trends of wheat and shift to maize still continue in this area.

2.3 HISTORICAL BACKGROUND OF THE PROJECT

The idea to irrigate the Siret-Ialomita area that was one of the most important crop production areas of the country by inducing the river flow of the Siret River the discharge of which was comparatively ample came up in the 1910's. In the 1950's, the Integrated Siret River Development Plan was prepared and the above idea was further materialized.

In line with the above Plan, a multi-purpose dam named Izvorul Muntelui Dam (effective storage capacity: 930×10^6 m³) was completed on the Bistrita River, one of the branch rivers of the Siret River, in 1961. After the completion of this dam, three multi-purpose dams (Galbeni, Racaciuni and Beresti) were constructed on the main stream of the Siret River. The total effective storage capacity of these three dams are 210×10^6 m³. It has been reported that the total 360×10^3 ha of the Siret-Ialomita area will be able to be irrigated by the completion of these dams.

In 1985, the basic design of the Siret-Ialomita Agricultural Development Project covering irrigation area of 500×10^3 ha by constructing two storage dams (Adjud and Prisaca, the total storage capacity: 360×10^6 m³) in addition to the above mentioned existing dams was completed and the implementation of the Irrigation Project in Ruginesti-Pufesti-Panciu, District Vrancea covering irrigation area of approx. 23×10^3 ha (hereinafter referred to as the Project) was approved by the Government as the Phase I of the Siret-Ialomita Agricultural Development Project which was divided into VIII phases. And the construction of the Project works has been started since the same year. In parallel with the implementation of the Project, the construction of the Calimanesti Dam, the main purpose of which being hydraulic power generation, was started in 1987 and completed in 1992 by the Ministry of Energy.

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The construction works of the Project have been executed under the control of two Ministries. That is; the construction of the Siret-Baragan Canal including the intake facilities (hereinafter referred to as the Main Canal) was started in 1986 and has been executing by the Ministry of Water, Forestry and Environmental Protection. On the other hand, the construction of other irrigation facilities such as pump stations, branch canals and pipe lines has been executing by the Land Reclamation Department of the Ministry of Agriculture and Food.

Unfortunately, the construction works of the Project was suddenly stopped due to lack of fund after the revolution to the Ceausescu's Government in December 1989. The upstream section of the Main Canal of 5.5 km, some of the pump stations, some sections of the pipe lines and the Branch Canals and other related structures had been almost completed by that time.

The new Government decided to continue the Project in consideration of its importance for the improvement of Romanian agriculture and has been re-continuing the construction works little by little in compliance with the availability of fund. However, in consideration of lack of the Government fund and achievement of the Project in the earliest time possible, the Government has decided to ask the financial assistance from the Government of Japan and is expecting the immediate financial assistance from Japan.

3 THE STUDY AREA

3.1 GENERAL FEATURES

The Study Area lies on the right bank of the Siret River in the northeastern part of Vrancea District and locates about 200 km northeast from Bucharest, the capital of Romania. The capital city of the Vrancea District is Focsani, which locates at the south-eastern border of the Study Area. The Study Area covered by 19 villages/towns out of 63 villages/towns in Vrancea District. Within these 19 villages/towns, 11 villages/towns are involved in the Study Area wholly, 3 villages are partially included and 5 villages have separated land in the Study Area. The total population in the Study Area (11 villages) was estimated at 68×10^3 .

The National Motor Highway No. 2, which connects Bucharest and Ukraine at Siret, penetrates the Study Area on its eastern border. There are 5 district roads connecting major villages in the Study Area with the total length of 107 km. The electrification in the Study Area has almost completed with 425 km of electric supply network and most of the houses are receiving electricity. Each village has separate water supply system except Pufesti. But they are not fully functioning at present because of lack of water sources, deterioration of systems or operation funds.

3.2 NATURAL FEATURES

3.2.1 Topography

The Study Area lies on the right bank of the Siret River which runs along the foot of the Moldovian Highland. The topographic orientation is, in general, decreasing altitude from north-west toward south-east, following with the Siret River and its tributaries. The Siret River and other tributaries always change their flow channel then shallow and wide flood course is general in the Study Area. The Study Area is divided into two study areas, one is Irrigation Study Area (ISA) and the other is Soil Conservation Study Area (SCSA). Both study areas spread on the Siret terrace, old and recent. ISA locates on the recent terrace with elevation between 80 to 180 m and gradient less than 3 %. ISA is divided into 5 blocks by the tributaries of the Siret River. SCSA mainly locates on the eastern slope of Sub-carpathian Mountains with Elevation more than 200 m. Plateau of these hills, with rather gentle slope, are vineyard and the slope between the tributaries or depressions are partially eroded seriously.

3.2.2 Meteorology

The annual rainfall in the Study Area ranges between 400 and 500 mm. The average annual rainfall at Focsani Station is 538 mm and the rainfall during irrigation period, April to September, occupies more than 60% of the annual rainfall. Mean monthly temperature in Focsani is 10.4°C. In winter between December and February, the monthly mean temperature becomes below 0°C. Absolute maximum and minimum temperature are 38.5°C and -28°C, respectively. Annual number of snowfall days and snow coverage days in the Study Area are 15 to 25 and 30 to 60 days, respectively. The relative humidity at Adjud Station, which locates at the northern border of the Study Area, shows 78% and 72% for the annual average and the monthly average between April and September, respectively. Annual mean evapotranspiration is estimated at 674 mm. The evapotranspiration during April to September is 605 mm corresponding to 90% of the annual. Annual total sunshine duration at Focsani is 2,057 hr. And sunshine duration during April to September is 1,452 hr corresponding to 70% of total annual duration.

3.2.3 Hydrology

The Study Area lies on the right bank of the Siret River about 100 km upstream of the confluence with the Danube in Galati. Generally the rivers in the Study Area have wide and flat low-water channel and wide high-water channel. The water source of the Project is the Calimanesti Dam, which locate at 108 km upstream the confluence of the Siret River with the Danube with catchment area of 25,355 km². Mean annual discharge at Cosmesti Station is 175.4 m³/s. The probable lowest monthly mean discharges for 2, 5 and 10 probable years

estimated based on the discharge records at Cosmesti Station are 46, 31 and 25 m³/s, respectively. If it is judged from the observed data, there will be no trouble in using the Siret River water as the irrigation water for the Project.

3.2.4 Soil

The soils in the Study Area have properties favorable for irrigation, but due to their particularly light texture and non-uniform relief, irrigation might be carried out with extreme care to avoid soil erosion. Most significant factors for agricultural use in the Study Area are slope in relationship with erosion phenomena and skeleton contents in soil. The land class of the Study Area is summarized as follows:

Land Classification	The Study Area		Irrigation Study Area		Soil Conservation Study Area	
	ha	%	ha	%	ha	%
Agricultural Land	44,080	100.0	27,190	100.0	16,890	100.0
Land Class I	11,204	25.4	10,478	38.5	726	4.3
II	25,787	58.5	13,425	49.5	12,362	73.2
III	2,899	6.6	1,668	6.0	1,231	7.3
IV	553	1.3	451	1.7	102	0.6
V	2,571	5.8	292	1.1	2,279	13.5
VI	1,066	2.4	876	3.2	190	1.1
Non-Agricultural Land	7,720	(14.9)	1,710	(5.9)	6,010	(26.2)
Total	51,800	(100.0)	28,900	(100.0)	22,900	(100.0)

Classes I to IV are used for agriculture and viticulture, while Classes V and VI are suitable for pasture and erosion control plantations. The Irrigation Study Area is mainly composed of I and II types of land classes which do not involve restriction of any kinds against agricultural use.

3.3 AGRICULTURE

3.3.1 Land Use

The areas of respective land use and their percentages of the Study Area are as shown below:

Land Use	The Study Area		Irrigation Study Area		Soil Conservation Study Area	
	ha	%	ha	%	ha	%
Agricultural Land	44,080	85.1	27,190	94.1	16,890	73.7
Arable Land	23,350	45.1	20,840	72.1	2,510	11.0
Meadow	100	0.2	20	0.1	80	0.3
Pasture	3,340	6.4	500	1.7	2,840	12.4
Vineyard	17,170	33.2	5,830	20.2	11,340	49.5
Orchard	120	0.2	0	0.0	120	0.5
Non-Agricultural Land	7,720	14.9	1,710	5.9	6,010	26.3
Total	51,800	100.0	28,900	100.0	22,900	100.0

3.3.2 Agricultural Production

The average yields of maize, wheat, barley, grapevine, sunflower, sugar beet and potato in 1992 (drought year) were 1.6, 2.6, 3.4, 3.6, 1.3, 15.3 and 12.8 ton/ha, respectively. The yield of maize was considerably low due to the drought in the year. The normal yield of maize is estimated at about 2.7 ton/ha. The amount of production of wheat, maize, barley, sugar beet, sunflower, potato and grapevine in 19 villages are 15,190, 43,383, 5,323, 3,421, 1,656, 6,187 and 55,474 ton in 1992, respectively, which occupy 33.3, 39.2, 44.0, 9.7, 19.8, 51.3 and 54.0% of those of Vrancea District.

3.3.3 Livestock

Poultry and pig are the most common livestock bred among the individual farmers, that is ; 94.9 % of the farmers breed poultry and 89.9% breed pig, followed by sheep (54.4%), dairy cattle (38.0%), horse (25.3%) and goat (21.5%). The average raised heads of per farm household are 28.5 heads on poultry, 2.0 on pig, 9.4 on sheep, 0.4 on dairy cattle, 0.4 on horse and 1.2 on goat. Bee is also raised in a small scale (1.3%).

3.3.4 Farming Practices

At present, 6 different types of farming exist in the Study Area, namely;

- 1) Individual farmers (I);
- 2) Informal association of private farmers (AAS);

- 3) Formal association of private farmers (AA);
- 4) Commercial company with mixed capitals of state and private (SCM);
- 5) Commercial company with whole private capital (SCCP); and
- 6) Research and production institution with state capital (SCP).

Maize is grown in the Study Area from April to October and occupies about 70% of the cropped area. Prior to sowing, land is prepared by disk harrow. Sowing is done from the middle to end of April by machine by 81% of the farmers. In general, preparation of land for wheat is taken in the last decade of September with machine. Sowing is commenced from the beginning to middle of October by machine by 78% of the farmers. Other crops such as sunflower, sugar beet, potato, tomato and onion are grown as summer crops.

The biggest constraint against the crop production for all the farmers in the Study Area is non-irrigation facility as well as poor marketing system, followed by lack of farming fund and insufficient fertilizer. However, that of association farmers (AA) is shortage of agricultural machinery and lack of farming fund. At present, the agricultural machinery possessed by AGROMECS which has close relation with the Study Area is below a half in number in 1986 except for seeders, which may not meet the farmers' demands in the Study Area. Furthermore, the biggest constraint for SCM and SCCP is insufficient marketing system.

3.3.5 Farm Household Economy

Most of individual farmers have too narrow farm holdings (3 ha per farm household in average) to sustain their household. Therefore, they resort to off-farm income, entailing farm labor shortage or lack of viable, young labor force in their farming. To make the matter worse, marketing media or facility still remains undeveloped within their accessible sphere. The annual household income is estimated at $2,784 \times 10^3$ Lei, while the total annual expenditure amounts to $2,123 \times 10^3$ Lei, leading to a surplus of 661×10^3 Lei. It is estimated that about 35% of the gross income can be counted as net farm income.

Most individual farmers do not use chemicals and inorganic fertilizers for their crops except for vineyard and particular industrial crops for which improved seed and chemical fertilizers are supplied through their marketing or processing channels. Even seed other than hybrid varieties is self-supplied because of lack of fund of them. It follows that they do not have to incur farm expenditure on purchased inputs, but instead longer and harder labor is required to prepare manure, seed and weeding.

3.3.6 Land Tenure

Redistribution of the land owned by noblemen and large land owners to the farmers almost finished in the land reform in 1945. However, with the establishment of the socialist state, the small-scale farmers with holdings of less than 10 ha were forced to join the state cooperatives from 1948 to 1962. After the revolution in 1989, Land Law (Law No. 18, effective on February 19, 1991) provides for the restoration of land operated by the state cooperatives to the former owners or their successors in title.

The process of investigating legal title to land, allotting the land, issuing provisional certificates of ownership and converting the provisional title into the final title with fully registered land is now in progress throughout the country. In eleven towns and villages mainly related to the Study Area, percentage of the farmers who have accepted the provisional certificate and the final title of property to the whole farmers are 85 to 100% and 0 to 48%, respectively.

The total agricultural area of Vrancea District is about 255×10^3 ha, 52% of the total area, as of 1994. Public area, state property and private property of agricultural land in private area are 15.9%, 10.4% and 73.7% of the total agricultural land, respectively. Individual farms occupy 90.7% of the private area, commercial companies occupy 1.2% and formal associations of private farmers occupy 8.1%.

3.3.7 Marketing

Under the premature marketing system and the violent inflation, seasonal fluctuation of the prices of perishable fruits and vegetables is found out except for such food stuffs as bread, meat and edible oil which are controlled and subsidized by the Government. In accordance with the stabilization of macro-economy and the progress of market economy, seasonal fluctuation of food stuffs prices not only of perishable foods but also of other food stuffs is easily forecasted to become wider, which causes high profit competition among growers and traders with the improvement of delivery and marketing system available to do even in off-harvest season.

In the Project Area, the following five remarkable matters on agricultural marketing system are recognized:

- 1) Producers deliver their net marketable cereals excluding stockpiles for self-supply to the state enterprise ROMCEREAL and cash crops to vendors, open-sky markets or peasant markets directly. However, those volumes are quite small.

- 2) The major marketing channel depends on the informal producer-consumer line through relatives and acquaintances by words of mouth. Marketing systems are not yet established originating from the producers to the consumers through collectors or middlemen, agro-processors, wholesalers and retailers;
- 3) A very few middlemen or collectors exist;
- 4) Insufficient credit support for marketing. Transportation of crops depends popularly on horse or cow-drawn carts even though there are trucks and farm trailers operated by the state enterprises;
- 5) Less delivery volume to the market as compared with production; and
- 6) Preference to bring back the final products like sugar and sunflower oil itself instead of payment in cash.

3.3.8 Agro-industry

Most food processing companies suffer so much from the following problems:

- Shortage of supply of raw materials;
- Less than 50% operation efficiency of the factories;
- Time-worn facilities;
- Lack of know-how for operation and management, technology renovation and marketing strategy; and
- Shortage of credit with soft interest.

At present, the agricultural commodities produced in Vrancea District are mostly similar to those in other districts, but the production amounts of such four fruits as grape, cherry, sour cherry and nut are higher than those of other districts. Accordingly, agro-industry in Vrancea District is concentrated on processing of cereals mainly consisting of wheat, barley, maize and rye, industrial crops of sunflower, sugar beet and grape, dairy and animal husbandry of pig, cow, cattle and sheep including power animals and fruits and vegetables.

Forty eight (48) private companies are now recognized in the field of agro-industry and number of the food processing facilities and their capacities are sufficient for processing agricultural commodities to be produced in the Project Area in due course. Existing facilities and equipment are, however, remarkably time-worn.

3.3.9 Agricultural Supporting System

Agricultural supporting system has been established in and around the Study Area accessible to the farmers in it. However, the system is not yet consolidated and some of them do not function well, while others fail to operate in their capacities due to feeble demand, etc. Agricultural Bank

can provide loans to the farmers with subsidized interest rates, by 4 agents in Vrancea District and each village has its branch office for easier access for the farmers. APRO deals chemical fertilizers, agro-chemicals, spare-parts/attachments of machinery, fuels and paints for direct sale to customers. AGROSEM's role is to produce certified seed under contract with farmer/state farm contractors, and to distribute it among the farmers groups. ROMCEREAL, as sole buyer, storer and miller of grains and sunflower seed, purchases cereals and distributes flour among bakeries, delivers bran to feed stuff producers, sunflower seed to oil factories.

AGROMECC provides tractors, combines and sprayers to the farmers and their groups through a rental charge system, while maintain them properly. Centre Agricole (Agricultural Center), established one for each district, will be reorganized into Camera Agricola (Agricultural Chamber) to expand its functional capacity from currently stationed a few staff to those covering all major disciplinary to render technical/information service for the farmers. Animal market sale is held every Saturday for auction sale of farmers' live animals and their products. Currently, activities of AGROSEM are hampered by the failure of contracts with seed producers. AGROMECC can hardly drive rental service in its full capacity either by minutely divided parcels or client's reluctance of paying rental charge or failure of timely operation for crops.

3.3.10 Farmers' Organization

Before revolution, CAPs (Agricultural Cooperative Farms) covered about two thirds of the total farmland in Vrancea, holding fleets of farm machinery. After the disintegration of CAPs, a host of individual small holders have been established. However, many disadvantages such as machinery use, credit access, productivity of crop and livestock and their management have arisen from such small holding. MAF promotes to establish private farmers groups to solve these issues and now the farmers in the Study Area have begun to form associations, companies etc..

3.3.11 Rural Community

The annual living expenditure of the farmers in the Study Area is about 1.2×10^6 Lei in average of 71 samples, and they are thinking that they belong to a "middle class" in the country. And the ideal (or target) of their annual income is 3.7×10^6 Lei which is equivalent to 2.9 times the present their income. After the revolution in 1989, the cooperatives were disorganized and the farm lands have been redistributed to the farmers. The farmers scarcely have any farming tools or farm machinery and they were not supplied with any farm materials during the last 4 years. Their agricultural income has decreased and their living standards have decreased accordingly. The farmers working in AA, AAS and companies think that the farming is wonderful

occupation and intend to keep up farming positively at their present places of work. They want to increase their income by yield increase of present cultivating crops with the introduction of irrigation.

3.4 EXISTING IRRIGATION AND DRAINAGE

3.4.1 Existing Irrigation

Only one irrigation system exists in the Study Area, that is; the Putna Irrigation System. The irrigation water for this system is taken from both banks of the Putna River at its upstream section by constructing temporary cofferdams, and it is led by gravity to the respective irrigation areas through the main canals. These canals are used not only as irrigation canals but also as drainage canals against the flood discharge from the surrounding hills. The total irrigation area covered by both Putna Irrigation Canals (named as the Right Canal and Left Canal) is 2,000 ha. On the other hand, some of the Project facilities have already been mostly completed or are under construction.

3.4.2 Existing Drainage

The river improvement works or flood control works are mostly not progressed in the Study Area except for some sections. As the farm lands in the Study Area have gentle slope toward the rivers or natural streams which flow through the Study Area from west to east, the gravity drainage is generally possible. Therefore, no drainage canal has been constructed except for the catch drain passing through the west edge of the Study Area which was constructed in 1970's in order to protect the upstream area from its soil erosion.

3.5 SOIL CONSERVATION

3.5.1 Present Conditions

Most of SCSA is used for farm land such as vineyards and pastures. Generally, the top of the hills are gently sloped or flat, and the erosion is shallow and slight. Many ravines and gullies are observed in steep slopes along rivers. Deep gullies are developed in places where land slope exceeds 10 %. There are not so many eroded places in this area and observed erosion is shallow and slight. The slope of ISA is, however, very long and the soil of ISA has big possibility for severe erosion. Therefore, the farm land is still exposed to sheet erosion, especially after an irrigation farming. On the other hand, wind erosion is scarce due to the freezing of top-soil in winter and to the high resistibility against wind erosion because of the farm land being strengthened by soil conservative farming. Windbreaks are scarcely observed in the Study Area.

3.5.2 Countermeasures and Existing Facilities

Most of the erosion control facilities were constructed in the 1970's and are obsolete. Therefore, rehabilitation of these works should be emphasized. To prevent the formation of gullies and their growth, the countermeasures carried out at the upstream side should also be emphasized.

3.5.3 Estimation of Soil Losses

The annual soil losses by sheet erosion can be estimated with the USLE (Universal Soil Loss Equation) method. Annual soil losses of the representative crop lands in the Study Area is shown below:

Crops	Slope (%)	(Unit: ton/ha/year)	
		Actual (without irrigation)	Future (with irrigation)
Maize	5	4.6- 8.5	5.5-10.3
	10	12.9-24.1	15.5-29.0
Vineyard	5	4.0- 7.5	4.8- 9.0
	10	11.3-21.1	13.6-25.4

3.5.4 Erosion and Productivity

One of the most important damages caused by sheet erosion is the reduction of crop yields. According to the MAF Report "Instruction for Studies and Necessary Calculations for Soil Erosion Control, 1973", the agricultural yield in Dobrogea decreased averagely by 15% on moderately eroded soils and by 50% on strongly eroded soil. On the other hand, an amount of 60 kg grains is lost by 1 cm depth of eroded soil on condition that an average yield is 4,000 kg/ha for noneroded soils. In a short time, these losses are not so large but these losses will become very severe in a long term.

Erosion Condition	Erosion Rate (m ³ /s/yr)	Thickness of Eroded Soil (cm)	Unit Yield Loss (kg/m ³)	Yield Loss (kg/ha/year)		
				after 5-yrs	after 10-yrs	after 20-yrs
Strong	20	0-30	0.6	180	660	2,520
Moderate	10	30-70	0.5	75	275	1,050
Slight	5	30-70	0.5	38	138	525

3.6 ENVIRONMENTAL CONDITIONS

3.6.1 Natural Environment

The Study Area is mostly intensively used for human settlements and agriculture. Remaining natural areas are limited to terrestrial forest on hills, riverside forest on the Siret River banks, degraded lands (erosion, natural pasture land) and riverbeds of the Siret tributaries. Natural vegetal species have generally been replaced by cultivated species. Vegetal species mainly belong to the group of willow and poplar groves along the Siret, and to the group of durmast woods and mixed species like hornbeam, lime-tree, ash-tree, maple-tree and acacia on hills.

3.6.2 Social Environment

Water resources in the Siret basin area are generally river water for industries, rivers and deep or shallow aquifers for municipal and domestic supplies. In most cases, groundwater source is shallow phreatic water in the Siret River area at a depth of between 10 and 50 m. Groundwater represents almost 100% of water resources in towns and villages. Forestry, fishery and cynegetic resources are not important in the Study Area. In the Siret-Baragan area, water quality of the rivers and aquifers was the major environmental issue in the decade 1980-90. However, water quality has been improving due to the decrease of industrial activity in recent years.

3.6.3 Environmental Permitting System

The environmental permitting system or approval system is composed of 3 kinds of administrative documents: Permit, Authorization and Environmental Impact Assessment (EIA) study. The construction works of the irrigation system within the Project Area started in 1987, before the implementation of the present environmental permitting system. Accordingly, these works are being performed without any permit neither EIA. In the case of the Project, Permit is not needed, but starting its operation after completion of the Project construction works is subject to obtaining Authorization from the Vrancea Branch Agency of MoE. Requirement for Authorization is fulfilled by submitting a technical document about the Project including an analysis of impacts on environment.

3.7 PRESENT PROBLEMS IN AGRICULTURE

On the basis of the results of the field survey and the analysis of the data and information collected, the existing problems in the Study Area in performing the agriculture are summarized as follows:

- 1) The total precipitation during the expected irrigation period from April to September in the Study Area ranges between 200 and 500 mm, and is largely changeable by year. Therefore, the crop yields are largely fluctuated by year accordingly and the yields in the drought years are a very few. The rotation farming in consideration of the maintenance of soil fertility and injury due to continuous cropping is not fixed at present. In order to secure the stable farm income by maintaining the stable high yields of crops, the introduction of the irrigation systems and some new crops in case of necessity and the establishment of a planned rotation farming will be strongly required. With regard to the irrigation, the Irrigation Study Area is mainly composed of the land of Classes I and II in the land classification and the soil of the Area has no restrictions of any kinds for introducing irrigation system.
- 2) The farm income of the households in the Study Area estimated based on the results of interview with the farmers in the Area covers only around 70% of the annual living expenses of them and the remaining 30% depends on their off-farm income. Most of the private farmers in the Area are expecting to increase the agricultural production by introducing the irrigation farming and then to improve their living standards. Therefore, the immediate installation of the irrigation facilities in correlation with the improvement of the marketing channel for the agricultural products is strongly requested.
- 3) It has become clear that the marketing channel related to the agricultural products originating from the farmers through collectors, processors, wholesalers and the retail shops to the consumers is still under structuring. The improvement of the marketing channel is urgently required. In this case, establishment of the financial assistance system to them is very important.
- 4) The capacities of the food processing facilities which exist around the Study Area are sufficient for processing the food to be produced with the Project implementation. However, they are already old enough and the improvement of them is badly necessary.
- 5) The following facts have been cleared through the field survey: "The neuclearization and aging of the families have progressed in the Study Area. The proportion of farm households with multiple income has become high. The full-time farmers including pensionaries are 47%, but those excluding pensionaries are only 8.6%. The farmers earning their major share from the non-agricultural occupation are 53%." It is considered that these specific characteristics of the farmers in the Study Area are helpful to promote organizing the associations of the farmers. Therefore, organizing the associations of the farmers which is recommended by the Government of Romania will be progressed in the near future in consideration of the mutual use of agricultural machines, effective marketing of the agricultural products, effective use of the irrigation facilities, etc..

- 6) The individual farmers are introducing the diversified farming and getting comparatively stable higher yields in all planted crops compared with other types of farming such as associations and companies. Furthermore, the individual full-time farmers have strong intention to continue their agricultural independently without joining some associations nor forming new associations. It will be important to take into consideration the intention of these individual full-time farmers which occupy about 10% of the total farmers in formulating the Project. In order to stabilize the farm income of the individual farmers and to improve the living standard of them, such measures as selection of the most appropriate crops, improvement of marketing channel for the agricultural products and procurement of agricultural machines with low-interest credit services will be necessary.
- 7) The existing agricultural supporting systems such as Agricultural bank, Agricultural input supply company (APRO), Seed Conditioning and Trading company (AGROSEM), Cereal trading company (ROMCEREAL), Agricultural mechanization service company (AGROMECH), Agricultural center and Livestock market are not yet consolidated, and some of them are not functioning well and others fail to utilize their capacities due to feeble demand. Therefore, it will be necessary to improve these agricultural supporting systems by securing the financial sources, establishing the low-interest credit service system, establishing the procurement and/or replacement of agricultural machines/facilities and effective utilization of them, securing the man-power, etc..

It is judged to be very effective to implement an integrated agricultural development project focusing the irrigation development as the main theme in order to solve the problems in agricultural activities mentioned above. Furthermore, implementation of the project will contribute to the improvement of the living standard of the farmers in and around the Study Area and also to the activation of the area.

On the other hand, there exist in and around the Study Area the following problems related with the agriculture which will not be able to be solved only by the implementation of the Project. It is desirable that these problems be solved by the Government of Romania or the Administration of Vrancea District.

- 1) The process of investigating legal title to land, allotting the land, issuing provisional certificate of ownership and converting the provisional title into the final title with fully registered land is now in progress throughout the country. In eleven towns and villages included in the Study Area, the percentages of the farmers who have accepted the provisional certificate to the whole farmers are already 85 to 100%. However, the percentages of them who have the final title with fully registered land are only 0 to 48%.

The delay of the process of land ownership is disturbing the intention of the farmers especially small and medium-scale individual farmers to continue farming and to participate in the associations. Furthermore, it makes it very hard for them to receive any financial assistance from the financial organizations. The promotion of the process of the land ownership is strongly recommended.

- 2) The towns and villages in the Study Area have own water supply systems except for Pufesti. However, they are not fully functioning at present because of lack of water resources, deterioration of the systems or lack of operation funds. The countermeasures against the domestic water shortage should be taken as soon as possible in consideration of the living conditions of the people in the Study Area.
- 3) The establishment of an agricultural financial supporting system such as low-interest credit services to the farmers related to the improvement of marketing channel, agro-industries, agricultural extension services etc. should be materialized as soon as possible.
- 4) The improvement and flood control of the tributaries of the Siret river which pass through the Study Area and the soil conservation at the hillsides located at the west side of the irrigation development area are to be implemented as soon as possible for the success of the Project.

4 THE PROJECT

4.1 OBJECTIVES OF THE PROJECT

This Project is recognized as a model agricultural development project for other future development projects in Romania under its new social and economic systems. The Irrigation Study Area has high potentials for agricultural production owing to the favorable natural conditions such as climate, topography and soil. However, the yield of crops has been largely fluctuated by the meteorological conditions especially rainfall because of no irrigation systems existing. The farmers in the area have strong expectation for the introduction of the irrigation system in order to achieve the stable agricultural production. On the other hand, the anxiety of the farmers to the new social and economic systems might be one of the causes of stagnation of the agricultural production in the area.

In order to promote the activation of the agricultural sector which is one of the Romanian emergency tasks in agricultural sector in parallel with the maintenance of the self-sufficiency of main food in the region which is the other emergency task, with the elimination and/or improvement of the above-mentioned constraints to agriculture in the Project Area, the Project aims:

- to create the sustainable and profitable agriculture as a model agricultural development;
- to show to the farmers the direction of farming by stabilizing the farming conditions and increasing the agricultural productivity; and
- to promote the stable life of the people in the area by activating the regional economy through the improvement of living standard of the farmers.

4.2 BASIS OF PROJECT FORMULATION

The following are the basic concepts in formulating the proposed Project:

(1) Water Resources

The irrigation plan in the Project is prepared on condition that the irrigation water necessary for the Project is provided without any shortage from this completed Calimanesti Dam. The water of the rivers flowing through the Study Area is not be used in due consideration of efficiency of operation of the Project irrigation facilities, the water resources for the future developments in the area, etc..

(2) Planning of Project Facilities

The planning of the Project facilities is made on the basis of the construction works to be completed as of December 1994 in consideration of the remaining new Project works and repairing works of the completed facilities.

(3) Design Conditions of the Project Works

The design conditions for the Project Works adopted by MAF are also generally applied in the formulation of the Project in consideration of the past ample experiences on the irrigation farming for a long time in Romania and the economy of the Project. The modifications and/or changes of the existing design of the Project Works are made in consideration of maximum utilization of the facilities already completed at the site, if any.

(4) Irrigation in Vineyard

The irrigation system is introduced to a part of the objective vineyards, excluding ones where the troublesome soil erosion may occur due to the comparatively steep slope of land and the height of land from the Main Canal is higher than the economical water-lift limit tentatively adopted, in consideration of the results of research and investigation made by the Government organizations concerned, the existing data and information available and the probable big damages for the grapevine in the severely drought year.

(5) Change of Vineyard to Arable Land

The present vineyards scattered in the irrigation development area with small blocks are to be changed to the ordinary arable land in consideration of efficiency of land use and profitability of farming, which corresponds with the actual trend of the land use at the site.

(6) Existing Putna Canal System

The areas within the Irrigation Study Area which is benefited by the existing Putna Canal System at present are converted to the beneficial area of the proposed new irrigation system. However, the Putna Canal System is kept as it is in consideration of the existence of the beneficial area of the System outside of the Project Area and the emergency supplemental use of the water of the System for the Project beneficial area.

(7) Future Farming System

The proposed agricultural development plan is prepared on condition that most of the individual small-scale farmers in the Project Area organize some associations, which meets the policy of the Government of Romania, even though some of them still continue their farming individually.

(8) Soil Conservation Works

The countermeasures for soil conservation in the Project are planned only in the case that the probable soil erosion may directly damage the Irrigation Area to be developed through the Project implementation in consideration of the main objective of the Project and environmental preservation of the Irrigation Area. Other soil conservation works which are necessary for the stability of the area but do not have direct connection with the stability of the Irrigation Area are considered as future projects to be executed with other financial sources.

(9) Cropping Pattern

The proposed crops and cropping patterns are prepared in general based on the crops and cropping pattern presently adopted by the farmers in the Project Area and those proposed in the existing plan prepared by MAF, in consideration of farmers' intention for farming, farmers' self-sufficiency of foods, food demand in the area, technical level of the farmers in farming practices, sustainability of farming, environmental preservation through farming, present conditions of marketing and financial supporting systems, expansion of livestock in the near future, etc..

(10) Marketing System

The efficient functioning of a marketing system is very important for the success of an agricultural development project in addition to the establishment of the irrigation system. However, the establishment and/or improvement of the marketing system are excluded from the Project because of the improvement of the marketing system being the theme of the private sector.

(11) Agro-industries

The operational capacities of the agro-industries presently located around the Project Area are sufficient for dealing with the products to be produced with the Project implementation. Therefore, the improvement of these factories only is required in connection with the implementation of the Project. With the same reason as the above, this matter shall be settled in the private sector.

(12) Agricultural Credit

The financial support is one of the most important factors for the improvement of the farming conditions of the small- and medium-scale farmers. And the improvement of the agricultural credit system is one of the main themes in the Project formulation. This matter is considered as one of the recommendations for the Project implementation.

4.3 PROPOSED AGRICULTURAL DEVELOPMENT PLAN

4.3.1 Land Use Plan

The land use plan for ISA has been prepared in accordance with the results of the Land Classification based on the analysis of soil characteristics, trend of the land use and in consideration of the present land use as shown below. On the other hand, any development plans for SCSA are not considered in compliance with the objectives of the Study. Therefore, the present land use of SCSA is fixed in the Project.

Present		Plan	
Land Use	Area (ha)	Land Use	Area (ha)
Agricultural Land	Arable Land	Arable w/ Irrigation	18,780
		Arable w/o Irrigation	2,070
	Pasture	Pasture w/o Irrigation	500
	Vineyard	Vineyard w/ Irrigation	2,600
		Vineyard w/o Irrigation	1,790
		Arable w/ Irrigation	1,440
	Sub-total	Sub-total	27,180
Non-agricultural Land	1,720	Non-agricultural Land	1,720
Total	28,900	Total	28,900

Based on the above results, the area of 24,150 ha consisting of the arable land and vineyard to be irrigated with the Project (22,820 ha), pasture (500 ha) and non-agricultural land such as urban areas and small streams (830 ha) has been selected as the Project Area.

Land Use	Present (ha)			Plan (ha)		
	Gross	Net		Gross	Net	
Arable land	18,780	18,590	w/o irri.	20,220	19,810	w/ irri.
Vineyard	4,040	4,000	w/o irri.	2,600	2,550	w/ irri.
Sub-total	22,820	22,590		22,820	22,360	
Pasture	500	500	w/o irri.	500	500	w/o irri.
Non-agricultural	830	1,060		830	1,290	
Total	24,150	24,150		24,150	24,150	

4.3.2 Farming Plan

(1) Basic Strategy

To show the direction of farming to a large number of small-scale private farmers who have appeared after the revolution is not only an urgent subject for the Romanian agriculture but also a social problem of this country. From such a point of view, the proposed farming plan focuses on the activation of agricultural sector and the financial independence of the small-scale farmers in the Project Area and aims at a sustainable and profitable agriculture with careful consideration on environment by the introduction of vegetables, which is the most profitable cash crops for a small-scale irrigation farming, into the proposed basic combination farming of "cereal crops, leguminous crop and livestock". In this case, the present production amount of main crops is maintained in consideration of self-sufficiency of main crops. Furthermore, the intention of the farmers in the area for future farming, original farming system in the area, the results of the field survey, the proposed future agriculture in the area, etc. are carefully considered in selecting the proposed crops and preparing the proposed cropping pattern and crop rotation.

(2) Cropping Plan

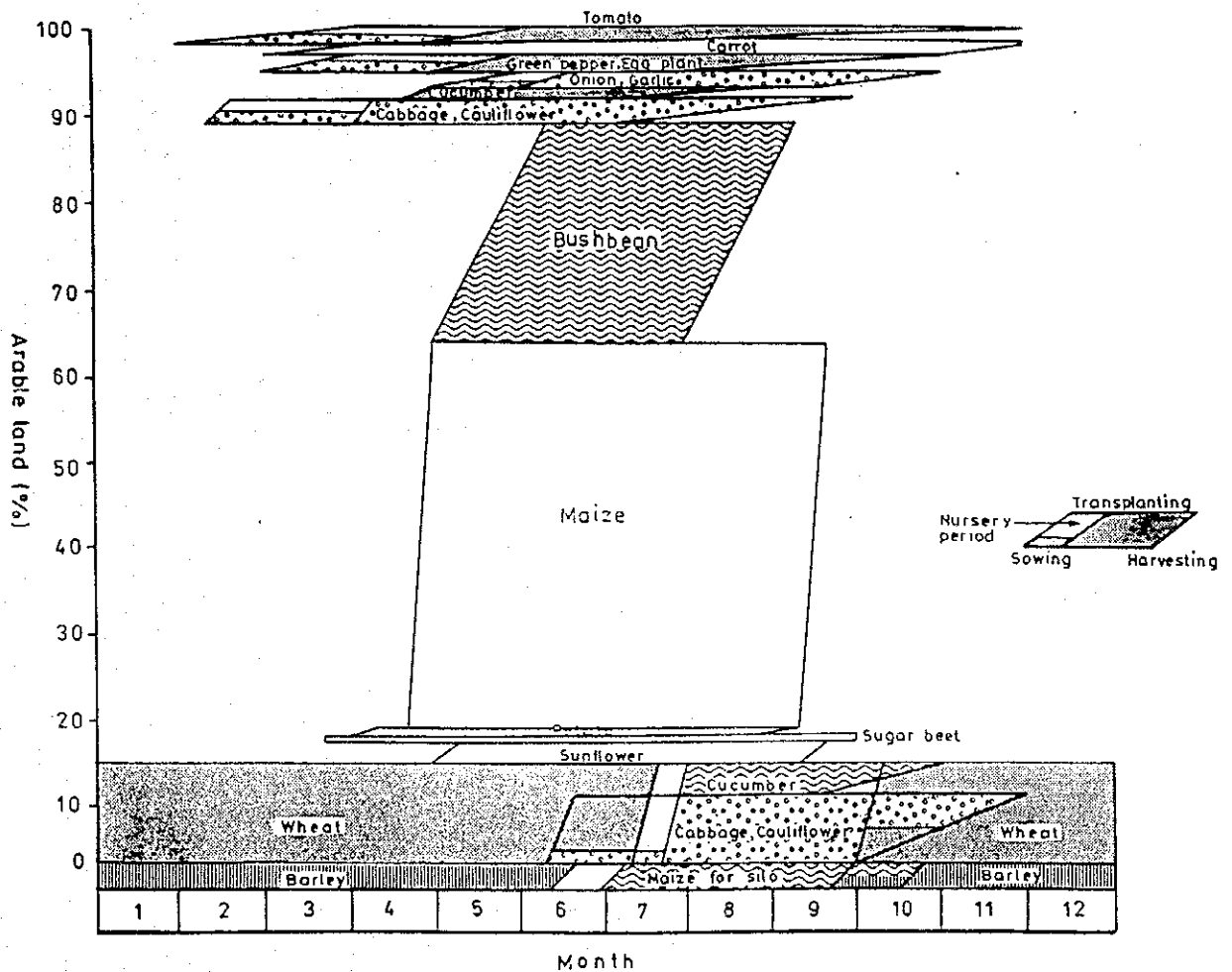
The cropping plan in the Project has been prepared in consideration of the following:

- 1) To ensure the present production amounts of the main crops in the Project Area;
- 2) Introduction of leguminous crop (bush bean or soybean) in order to maintain soil fertility and to produce feedstuff and cash crops;
- 3) Introduction of vegetables as cash crops;
- 4) Effective use of arable land; and

- 5) Change of some of the present vineyard into the arable land in consideration of profitability of farming.

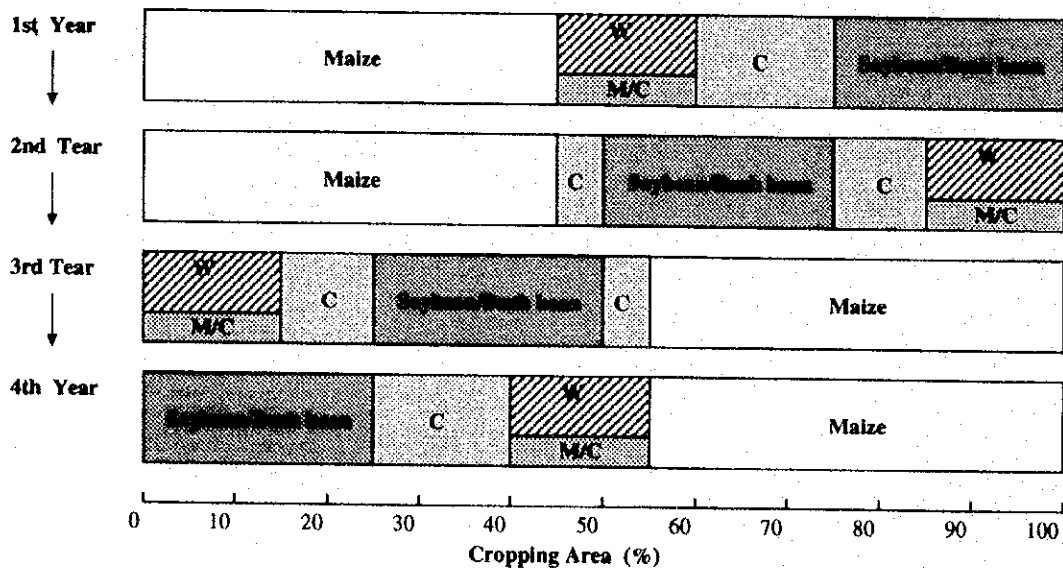
(3) Cropped Area and Cropping Time

The planned cropped area and cropping time in the arable land in the Project Area are as shown below. The areas for respective crops are expressed in the rate to the total irrigated arable land. In the case of vegetables, the proposed plan shall be sifted to more profitable plans with the progress of grower's technology, the development of market and the improvement of transportation of the products.



(4) Crop Rotation System

The planned crop rotation system is as shown below. In the plan, leguminous crop is always planted once 4 years in the same field, which contributes to the maintenance of soil fertility and also the control the growth of weed. The crop rotation system has 6 different cropping patterns. In these patterns, maize is cultivated continuously for 2 years in the same field but other crops are cultivated in the different fields every year except for a part of vegetable fields where the vegetables are cultivated continuously for 2 years as a succeeding crop of wheat.



- W: Wheat and Barley
- C: Cash crops (Vegetables, Sunflower, Sugar beet)
- M/C: Maize for silo, Cash crops (Succeeding crops of wheat and Barley)

4.3.3 Crop Production Plan

The total production amount of crops with the Project (292,764 ton) becomes nearly 3 times the present production amount (100,311 ton). The vegetables as cash crop occupy nearly 60% of the total production amount followed by cereal crop (17%), forage crop (12%), grape, leguminous crop and industrial crop. With the implementation of the Project, it is possible to shift from the present agriculture in which cereal crop (43%) and grape (26%) are the main crops to the profitable and sustainable agriculture in which the remarkable increase of income and maintenance of soil fertility can be expected.

Based on the proposed crop production plan, the total benefit from the crop production in the Project has been estimated as follows:

(Unit: 10⁶ Lei)

Crop	with Project				without Project			
	GI	Cost	NI	NI (%)	GI	Cost	NI	NI (%)
Cereals	7,790	4,660	3,130	3.8	6,660	2,781	3,879	28.4
Cash Crop w/o Veg	11,008	2,959	8,049	9.8	1,579	555	1,024	7.5
Vegetables	89,787	21,105	68,682	83.5	7,916	1,759	6,157	45.2
Forage Crops	810	337	473	0.6	106	52	54	0.4
Grape	3,878	1,928	1,950	2.4	4,441	1,919	2,522	18.5
Total	113,273	30,989	82,284	100.0	20,702	7,066	13,636	100.0
Ratio	547	439	603		100.0	100.0	100.0	

Note: GI : Gross Income , NI : Net Income

4.3.4 Livestock Production Plan

The number of cattle breedable has been estimated based on the amount of feedstuff produced with the Project. As a result of the analysis, 1,600 of adult cattle can be bred per year with the implementation of the Project in addition to the presently bred one.

4.3.5 Marketing Plan

Even after the implementation of the Project, the existing marketing facilities are sufficient in term of capacity for cereals, oil seed, sugar beet and feeds. However, it is required to establish the following packing houses in order to market the volume of vegetables to be produced in the Project Area:

1) Function

Packing houses provided with functions and facilities capable for collecting, grading, washing, packing, pre-cooling, storing and delivering all kinds and volume of vegetables to be produced in the Project Area without quality depreciation.

2) Types of Packing Houses

Three (3) types of packing houses are required; a) for potato and carrot, b) for onion and garlic and c) for other green vegetables, due to collecting and grading methods, harvest period and physical characteristics of each vegetable.

3) Number of Packing Houses

It is required to establish a total of fourteen (14) packing houses consisting of two (2) potato and carrot houses, two (2) onion and garlic houses and ten (10) green vegetable houses inside the Project area to market the volume produced.

Vegetable	On-farm Work			Packing House			
Potato	Harvest ⇒	Steel mesh container ⇒		Washing ⇒	Sizing ⇒	Packing ⇒ (Mesh net)	AC Storage
Cabbage/ Cauliflower	Harvest ⇒	Grading ⇒	Packing ⇒ (Carton)	Pre-cooling ⇒			AC Storage
Cucumber	Harvest ⇒	Plastic container ⇒		Sizing ⇒	Packing ⇒ (Carton)		AC Storage
Onion/Garlic	Harvest ⇒	Steel mesh container ⇒		Sizing ⇒	Packing ⇒ (Carton)		AC Storage
Bell Pepper/ Eggplant/Tomato	Harvest ⇒	Grading ⇒	Packing ⇒ (Carton)	Pre-cooling ⇒			AC Storage
Carrot	Harvest ⇒	Steel mesh container ⇒		Washing ⇒	Sizing ⇒	Packing ⇒ (Carton)	AC Storage

4.3.6 Agricultural Processing Plan

Sufficient facilities with enough capacity are identified for the crops and their quantities expected from the Project, leading to a conclusion that there is no additional need to invest for any new capacity. However, it will be imperative to solve the problems coping with the dilapidated processing facilities, out-dated technology and scarcity of low-interest credit-funds. The best formula to solve these problems will be found in a joint venture with overseas enterprises, envisaging innovation of operational management and technology; faster acquisition of transferable know-how/strategies for sales. In this context, early implementation of plans for promoting joint ventures is advised.

4.3.7 Agricultural Supporting Plan

For the most part, supporting systems have already been established and many of them can be made use of at the project stage without organizing new ones with additional cost to the project budget. However, some of them are not currently existing and hence necessary to establish within the Project Area. They mostly belong to marketing sector, because marketing facility is still a serious bottleneck for national economy and the Project Area is not an exception. Technical input can be delivered by Camera Agricola established in every town/village, since it is already equipped with horticultural, animal husbandry and cereal cropping experts.

Adequate financial sources will be required for the initiation of crop diversification for both individual farmers and associations. However, needs for financial supports will be more acute for the latter, because of larger area to be allotted for new crop species. Both Banca Agricola and Development Bank (Banca Dezvoltare) provides agricultural loans, but as far as the Project Area is concerned, the former has better network or filial branches. Currently 7 filial branches are located in the District, of which 3 are available in and around the Project Area.

In order to perform the proposed cropping schedule smoothly and effectively, it is indispensable to equip an agricultural machinery of sufficient number with well-maintained condition by establishing an effective utilization system of machines. The presently existing agricultural machines which exist in and around the Project Area is sufficient in number to meet their requirement with the implementation of the Project.

4.4 IRRIGATION AND DRAINAGE PLAN

4.4.1 Irrigation Plan

(1) Net Irrigation Water Requirement

The unit irrigation water requirement of 1,460 m³/month/ha in July for maize, which is the major crop in the Project Area, is set as a net irrigation water requirement for planning the Booster Pumps (SPPs). On the other hand, the maximum weighted unit irrigation water requirement of 1,244 m³/month/ha in consideration of cultivated-area ratio of crops (excluding grape) to be introduced with the Project, which appears in July, is set as the unit irrigation water requirement for the Distribution Canals (CDs) and the Distribution Pumps (SRPs).

(2) Irrigation Efficiency

In consideration of the operation conditions of the introduced system and the present conditions of similar irrigation projects in Romania, Ep' ($Ea \times Eb$) is set as 80.8% for SPPs and Ep at 72.7% for CDs and SRPs by assuming $Ea=85%$, $Eb=95%$ and $Ec=90%$.

(3) Gross Unit Irrigation Water Requirement

The gross irrigation water requirements for the facility planning are estimated to be 0.810 and 0.305 lit/s/ha for arable land without vineyard and the vineyard at the SPPs level. On the other hand, one for the SRPs level is estimated to be 0.636 lit/s/ha for arable land without vineyard. In the case of vineyard is included in the area, the gross unit irrigation water requirements are calculated in consideration of the ratio of vineyard area against the area of upland crops.

(4) Irrigation Method

In the Project facility plan, all of the irrigation area are planned with the sprinkler method, considering the proposed crop rotation in the individual farms. In case of furrow irrigation being desired, it can be applied by regulating the water pressure from the hydrants of lateral pipes with pressure regulators.

(5) Irrigation Block

The Project Area divided by 4 major tributaries, the Carecna, Zabraut, Susita and Putna rivers is further divided into 49 irrigation blocks in total by the distribution canals which run along the contour line at 25 to 60 m interval in hight and roads.

(6) Phasing due to the Progress of Siret-Baragan Canal

For the remaining canal portion related to the Project between 5.5 km point and 32 km point where the south-edge booster pumping station SPP-27 locates, MoE does not have any definite construction schedule. Therefore, the implementation of a part of the Project Area to be irrigated with the water directly lifted from the Siret-Baragan Canal section downstream the SRP-V will be deleted due to the probable delay of the construction of that section of the Canal. The total area affected by the delay of the Canal construction is 4,900 ha in net. These irrigation areas are considered to be the Second Phase Project Area.

4.4.2 Drainage Plan

Drainage in the Project Area is consisted with the following 2 categories;

- 1) Drainage of the runoff coming from hillside areas which are located outside of the Project Area such through (to be analyzed in Soil Conservation Plan),
- 2) Drainage of internal runoff within the Project Area (to be analyzed in Drainage Plan).

As same as the irrigation planning, the degree of the drainage is set as a flood probability at 1/5 year (20%). Normally 5% probability (1/20) flood is adopted in Romania, but it is not rational in the light of the probability for the irrigation being 1/5 year, 80% of drought. The design discharges for planning the internal drainage are set at 60.5 mm and 88.0 mm for 24 hours and 72 hours duration, respectively. The unit runoff in the agricultural land is estimated at 4.20 lit/s/ha on condition that 24 hour rainfall in the drainage area is drained within 24 hours and that runoff ratio in the drainage area is 0.60.

4.5 SOIL CONSERVATION PLAN

To protect the irrigated area and facilities, the following countermeasures are planned:

(1) Soil Conservation Farming

As soil conservation farming, contouring and contour-strip-cropping are effective to promote infiltration of rain water, to retain capacity of soil moisture and to minimize the velocity of surface runoff.

(2) Level Terrace

Due to the following reasons, level terrace is proposed to introduce in a part of the irrigation area (1,839 ha):

- Terracing is one of the best practices for soil conservation on sloped land;
- It is effective to promote infiltration of rain water, to retain capacity of rain water and to minimize the velocity of surface runoff;
- It is adaptable to arable land due to the capability of farming even on the terraced land;
- It is effective against the siltation in the distribution canal; and
- It is effective for the reduction of discharge through the drainage canal in the field.

(3) Grassed Waterway

The grassed waterway is planned for the following purposes:

- as outlets for diversions and terraces;
- to dispose of water collected by road ditches or catch drain; and
- to rehabilitate natural drains carrying concentrations of runoff.

(4) Boundary Drainage Canal (BDC)

To prevent the occurrence of soil erosion in the irrigated area, BDC has been planned at the upstream side of the maintenance roads. The total length of the planned BDC is 16.35 km.

(5) Gully and Ravine Control Works

There are several gullies and ravines in the Project Area. Distribution Canals (CD) cross these gullies and ravines. Siphons are planned at these points. To protect these siphons and to control the growth of gully, 6 Sabo dams are planned at the downstream section of the siphons and other protective points. To dissolve the uneasiness of flooding, rehabilitation works are required at the Soimului canal (L=8.0 km) in Odobesti SCPA.

4.6 RURAL INFRASTRUCTURE DEVELOPMENT PLAN

As a rural infrastructure development, the road improvement or new construction with the Project is composed of the following 12 existing roads and 17 O/M roads mainly along the distribution canals;

- 4 lateral roads to be widened and asphalt-paved;
- 8 secondary roads to be widened and gravel-surfaced; and
- 17 O/M roads mainly along the distribution canals to be gravel-surfaced.

4.7 INFRASTRUCTURE FACILITIES PLANNED

The main infrastructure facilities planned in the Project are summarized below:

Item	Description	Unit	Quantity
1 Irrigation Works			
1.1	Distribution Pump Station	4 are almost completed	unit 10
1.2	Booster Pump Station	8 are almost completed	unit 49
1.3	Distribution Canal	11 lines, concrete lined	km 76.4
1.4	Distribution Pipe	ave. 17.7 m/ha	km 418.6
2 Drainage Works			
2.1	Drainage Canal	69 lines, earth canal	km 136.0
3 Soil Conservation Works			
3.1	Level Terrace		ha 1,839
3.2	Grassed Waterway	7 lines	km 33.0
3.3	Boundary Drainage Canal	5 lines	km 16.4
3.4	Sabo Dam		set 6
4 Road Improvement Works			
4.1	Artery Road	asphalt paved	km 31.3
4.2	Secondary Road	gravel paved, ave.B=5.5 m	km 53.8
4.3	O/M Road	gravel paved	km 97.1

5 PROJECT IMPLEMENTATION AND OPERATION & MAINTENANCE

5.1 PROJECT IMPLEMENTATION SYSTEM

5.1.1 Project Implementation Method

The Project Implementation Agency shall execute the detailed design of the Project facilities, preparation of tender documents, tendering and tender evaluation, selection of the contractor, signing the contract and supervision of the construction works with the assistance of the Consultant to be contracted prior to the commencement of the Project. The Consultant shall assist the Implementation Agency mainly for the technical matters involved in the duties of the Implementation Agency. The construction works shall be performed on the contract basis by the successful contractor(s).

5.1.2 Project Implementation Agency

The Implementation Agency for the Project shall be RAIF of MAF. Formerly LRD had been responsible for the execution of such construction works. It was reorganized, however, to RAIF together with its full rights and responsibilities as part of the restructuring of MAF in October 1994. Furthermore, RAIF shall establish the Project Office under the branch office of RAIF in Focsani in order to implement the Project successfully.

5.2 CONSTRUCTION SCHEDULE

The implementation period of the Project construction works is set as 60 months in total consisting of 12 months for the Detailed Design Phase and 48 months for the Construction Phase. During the Detailed Design Phase, the topographic survey and geological investigation of the sites proposed for the main structures, detailed design work, preparation of tender documents, etc. are to be performed. On the other hand, during the Construction Phase, the acquisition of land for the proposed structures, tendering, the construction works of the Project facilities, procurement of operation/maintenance (O/M) equipment, etc. are to be conducted.

5.3 PROJECT COST

The Project cost consists of the construction cost, land acquisition cost, O/M equipment procurement cost, environment preservation cost, administration cost, consulting services cost, and physical and economic contingencies.

5.3.1 Condition of Cost Estimate

The Project cost is estimated on the following conditions:

- 1) The basic costs such as labor cost, material cost and equipment cost are based on the unit costs adopted by RAIF;
- 2) The requirements per unit work are based on the standard adopted by RAIF;
- 3) The prices of domestic materials are based on those including transportation of them to the construction sites. On the other hand, the prices of the imported materials are based on the material CIF Constanta price plus domestic transportation cost and import tax;
- 4) The construction cost are estimated with foreign local components. However, US\$ is used for both components. The unit costs for respective work items consist of direct cost and indirect cost, and the indirect cost is set as 35% of the direct cost in accordance with the regulation of RAIF;
- 5) The exchange rate used is US\$ 1.00 = Lei 1,753 as of October 1994; and
- 6) The physical contingency is set as 10% of the construction cost and other costs. The economic contingency is set as 3% per annum.

5.3.2 Project Cost

(1) Construction Cost

The construction cost is estimated with the foreign and local portions. The foreign portion covers a part of steel works including pumps, construction equipment, electrical equipment, fuel for construction equipment, etc. The total construction cost is estimated to be 72×10^6 US\$ which includes the foreign portion of 11×10^6 US\$ (15%) and 61×10^6 US\$ (85%) as shown below:

(Unit: 10^3 US\$)

Description	L/C	F/C	Total
1. Preparatory Works	2,921	514	3,435
2. Irrigation Works	52,037	9,183	61,220
3. Drainage Works	987	174	1,161
4. Soil Conservation Works	1,654	292	1,946
5. Road Improvement Works	3,369	595	3,964
6. Project Office	339	60	399
Total	61,307	10,818	72,125

(2) Project Cost

The Project Cost is estimated to be 93×10^6 US\$, the foreign component of which represents 15×10^6 US\$ (16.2%) and the local component 78×10^6 US\$ (83.8%).

(Unit : 10^3 US\$)

Description	L/C	F/C	Total
1. Construction Works	61,307	10,818	72,125
2. Land Acquisition	6,171	0	6,171
3. Procurement of O/M Equipment	25	494	519
4. Administration	1,507	0	1,507
5. Consulting Services	1,787	2,328	4,115
Sub-total (1-5)	70,797	13,640	84,437
6. Physical contingency (10%)	7,080	1,364	8,444
Sub-total (1-6)	77,877	15,004	92,881
7. Economic Contingency	11,637	2,248	13,885
Total (1-7)	89,515	17,254	106,769

The disbursement of the Project Cost is to be made in 5 years. The proportions of the disbursement for each year are 0.1% for the first year, 3.5% for the second, 36.6% for the third, 43.7% for the fourth and 16.1% for the fifth.

5.4 OPERATION AND MAINTENANCE

The operation and maintenance (O/M) of the irrigation facilities from the distribution pump stations (SRPs) to the booster pump stations (SPPs) and also the maintenance of the soil conservation facilities shall be made by RAIF. The control system of the above pumps shall be the same as the one having been adopted by the former SCALIF for the time being. The improvement of the control system shall be considered step by step with the improvement of the farming technology and the financial level-up of the farmers involved in the Project. On the other hand, the O/M of the lateral lines (As) including the control of valves at hydrants are to be made by the water users' associations which shall be organized newly by the beneficiaries within the respective irrigation blocks.

6 PROJECT EVALUATION

6.1 BASIS OF EVALUATION

The evaluation criteria used in the economic and financial evaluations are:

- 1) The project life is set as 50 years from the commencement of the Project including detailed design period and construction works period, considering the vital life periods of the Calimanesti Dam and the Siret-Baragan Canal.
- 2) The currency used for the estimation is US\$.
- 3) The exchange rate used is US\$ 1.00 = Lei 1,753 as the official exchange rate of the National Bank of Romania as of October 1994.
- 4) The prices of agricultural products are farm-gate prices and the prices of agricultural production materials and construction materials are prices on delivery at the production and construction sites.
- 5) The discount rates, the opportunity costs of capital, are set as 12% for the economic analysis and 10% for the financial analysis, respectively.

6.2 BENEFIT OF THE PROJECT

The benefit of the Project refers to a difference of net profit expected between with Project and without Project conditions under irrigation and soil conservation developments through the whole project life.

6.2.1 Agricultural Production Benefit

The agricultural production benefit including wine and livestock productions is derived from an increase in cropping rate, a change of cropping pattern and an increase in unit yield which is resulted from introduction of the irrigation system and effective production practices. The agricultural production benefit in financial price is summarized below:

Item	(Unit: 10 ³ US\$)		
	With Project	Without Project	Increased Value
Gross Production Value	64,071	11,763	52,308
Production Cost	17,767	4,056	13,710
Net Production Value	46,305	7,707	38,598

6.2.2 Soil Conservation Benefit

The soil conservation countermeasures are closely related to the agricultural production concerning stability of production and recovery of the productivity of soils. The annual increase of soil conservation benefit is 835x10³ US\$ as shown below:

(Unit: 10³ US\$)

Item	With Project	Without Project	Increased Value
Gross Soil Conservation Value	11,763	10,928	835
Soil Conservation Cost	4,056	4,056	0
Net Soil Conservation Value	7,707	6,872	835

6.3 ECONOMIC EVALUATION

6.3.1 EIRR, ENPV and E.B/C

The evaluation of the Project uses three interrelated indexes; economic net present value (ENPV), economic benefit-cost ratio (E.B/C) and economic internal rate of return (EIRR). As a result of the analysis, EIRR of the Project is 20.5% and at discount rate of 12%, ENPV is 137,884x10³ US\$ at price in October 1994, E.B/C is 2.19 at the same discount rate. The Project evaluation has proven that EIRR exceeds the opportunity cost of capital in agriculture sector of 12%, ENPV is positive and E.B/C exceeds 1.0. It is judged that the implementation of the Project is economically validated.

6.3.2 Sensitivity Analysis

Sensitivity analysis has proven that a change in the construction period has stronger influence on economy of the Project than a change in project cost and project benefit. Furthermore, the implementation of only Phase I portion, EIRR of the Project is 20.2% and at discount rate of 12%, ENPV is 105,195x10³ US\$ at the price as of October 1994, E.B/C is 2.10 at the same discount rate.

Item	EIRR (%)	ENPV (10 ³ US\$)	E.B/C
Base	20.5	137,884	2.19
Project cost increased by 10%	20.2	137,796	2.18
Project benefit decreased by 10%	19.4	113,529	1.98
Construction delayed for 1 year	18.8	113,291	2.00

6.4 FINANCIAL EVALUATION

6.4.1 FIRR, FNPV and F.B/C

FIRR of the Project is 29.9% and at discount rate of 10%, FNPV is 150,851x10³ US\$ at the price as of October 1994, F.B/C is 2.46 at the same discount rate. Project evaluation has proven that FIRR exceeds the financial discount rate in agriculture sector of 10%, FNPV is positive and F.B/C exceeds 1.0. It is judged that the implementation of the Project is financially validated.

6.4.2 Sensitivity Analysis

Sensitivity analysis has proven on finance of the Project that a change in the construction period has stronger influence at FIRR and a change in project benefit has stronger influence at FNPV and F.B/C than a change of other items. Furthermore, the implementation of only Phase I portion, FIRR of the Project is 28.3% and at discount rate of 10%, FNPV is 115,638x10³ US\$ at the price as of October 1994, F.B/C is 2.35 at the same discount rate.

Item	FIRR (%)	FNPV (10 ³ US\$)	F.B/C
Base	29.9	150,851	2.46
Project cost increased by 10%	27.5	144,308	2.31
Project benefit decreased by 10%	26.8	125,401	2.21
Construction delayed for 1 year	24.7	130,862	2.31

6.4.3 Farm Household Economy Plan

Two types of farm management are predictable in future in the light of current Government policy orientation recommending individual farmers to organize associations or agricultural companies to strengthen their economic viability. They are the associations with handy acreage consisting of member farmers who are mostly small-holders and the remaining individual farmers who prefer independent farming because of their confidence or technical superiority/specialty in farming management. The agricultural annual income is estimated for the above two types of production units expected to exist in the project stage. The proposed Project will bring the following improvement:

Management Type	Farm Size (ha)	Farm Income (10 ³ Lei)		
		w/o Project	w/ Project	Growth Rate (%)
Individual	4.0	1,851	8,681	469
Association	500	452,142	707,966	157
Private Winery	500	680,183	896,883	32

6.5 SOCIO-ECONOMIC EVALUATION

The Project will bring about the following secondary or indirect intangible benefits as well as the direct or tangible benefits:

- 1) Contribution to the national development plan
- 2) Stable supply of food

- 3) Increase in employment opportunity
- 4) Improvement of living standard
- 5) Promotion of marketing and processing of agricultural products
- 6) Correction of differences among areas
- 7) Agriculture for environmental consideration
- 8) Economic stimulation

6.6 ENVIRONMENTAL EVALUATION

According to the test result of water samples collected near the Intake at the Calimanesti dam and conducted by the Study Team, the water quality has been proved to be sufficient for irrigation. There is still possibility that the water will be polluted with the inflow of the pollutants from the industries located at the upstream section of the Siret River and also from the agricultural field in a long run. However, an action plan for improving the environment in the upstream area of the Siret River has been taken off in order to improve the water treatment facilities of the factories and towns, and this action will be able to expect as a limiting factor against water contamination.

The sprinkler irrigation may damage the surface soil, if it is done on the sloped vineyard. However, it will be possible to minimize the probable soil erosion by limiting the irrigation, performing the soil conservation works, etc. Furthermore, the soil in the Project Area may be contaminated with the industrial and agricultural pollutants to be brought from the factories and/or farming activities upstream the Project Area. It will also be expected that the contamination of soil will be minimized by the above-mentioned action for water quality improvement, limiting the use of agro-chemicals, soil conservation farming proposed in the Project, etc.

6.7 COMPREHENSIVE EVALUATION

The implementation of the Project allows prediction that the living standard of local people in and around the Project Area is greatly improved, which results from an increase in agricultural production, soil conservation, stable supply of food, increase in employment opportunity, expansion of income, etc. All these benefits are attained mainly by an increase in cropping rate, a change of cropping pattern, an increase in unit yield and an introduction of cash crops owing to the irrigation system. The implementation of the Project is highly evaluated to serve to stabilization of civil living and welfare in Project Area, to give an intensive impact to production activities and to contribute to the national economy.

Thus, the implementation of the Project is judged as valid with the result of economic and financial evaluations as computed from tangible benefit. In addition, socio-economic impact evaluated from intangible benefit is also judged as sufficiently expectable. Any remarkable negative impact from the implementation the Project is not confirmed on the environmental evaluation, and the Project is evaluated as a sustainable agricultural development plan considering the environmental situation.

7 RECOMMENDATIONS

In connection with the implementation of the Project, the following matters should be carefully taken into consideration by the Project Executing Agency of the Government of Romania, Land Reclamation Agency (RAIF):

1) Soonest Implementation of the Project

The Project should be implemented as soon as possible in consideration of the following matters:

- a) The Project is feasible judging from both economic and financial view points, and the implementation of the Project will contribute very much to the improvement of living standards of the farmers in the area and also to the development of the area.
- b) Some of the main Project facilities such as the Calimanesti Dam, the intake structure and some of the main pumping stations have almost been completed, and some sections of the branch canals have already been completed or are under construction.
- c) The Project is very important as the model agricultural development project for the improvement of agriculture not only of the District but also in Romania in cope with the progressing free economic system, even though the initial investment cost is more expensive than those of the rehabilitation works of the existing irrigation schemes mostly located along the Danube River.

Furthermore, it is recommended that Phase I of the Project be implemented even partially as soon as possible, if the construction works of the Siret-Baragan Canal by MoE is delayed with some reasons.

2) Land Ownership and Reallocation of Farm Land

The delay of the process of land ownership from the former state farm to the original owners is hampering the strong desire of the farmers especially individual small and medium-scale farmers to improve their farming and to participate in associations, and also is making it hard

for them to obtain agricultural credit from financial organizations. Therefore, the promotion of the process of land ownership is strongly recommended. However, reallocation of the lands returned to the farmers in accordance with the proposed layout of the irrigation blocks is definitely necessary for the success of the Project.

3) Establishment of Pilot/Experimental Farm

In order to realize the smooth and effective introduction of new crops especially vegetables to the farms in the Project Area, it is strongly recommended that the pilot and experimental farm is established within an association farm under the RAIF administration near the almost completed pump station SRP-V considering the future availability of irrigation water for test farming. Furthermore, it is also important theme of the pilot farm to train the extension workers who will directly visit the farms and train the farmers and/or farm workers in the Project Area and transfer the technique in connection with introduction of new crops and other related matters to them by reorganizing the existing extension workers who are working in the towns/villages in and around the Project Area.

4) Agricultural Credit System

In order to achieve the improvement of marketing system, agro-processing system, agricultural supporting system, etc. necessary for the success of the Project, earlier materialization of low-interest agricultural credit system to the farmers by obtaining financial sources is strongly recommended.

5) Joint Ventured Enterprise

In order to solve the problems in connection with the dilapidated processing facilities, out-dated technology and scarcity of low-interest credit-funds, it is advised to formulate a joint venture with overseas enterprises, envisaging innovation of operational management and technology; faster acquisition of transferable know-how/strategies for sales.

6) Effective Utilization of the Existing Agricultural Machines

In order to perform the proposed cropping schedule smoothly and effectively, it is indispensable to equip an agricultural machinery of sufficient number with well-maintained condition by establishing an effective utilization system of machines. It is proposed to establish users' associations newly where proper number of operators and mechanics are secured by improving the present AGROMECC's facilities at Adjud, Panciu, Marasesti, Odobesti and Cimpineanca in addition to ROMCEREAL's facilities. It is also proposed to introduce a rental system of machines in which the respective farmers can operate the machines by themselves.

7) Importance of Soil Conservation Works

The priority for the implementation of soil conservation works on SCSA is higher than those on ISA due to steeper slope of land in SCSA. Therefore, earlier implementation of soil conservation works including reforestation is strongly recommended in order to increase the productivity of crop production in the Project Area and to maintain the irrigation facilities to be constructed with the Project in operational condition always.

8) Improvement of Rivers in the Project Area

The branch streams of the Siret River; the Putna, Susita, Zabraut, Voilui and Domosita, are flowing through the Project Area, and the countermeasures against progressing erosion and occasional flood on these rivers have not yet been taken satisfactorily. The improvement of these rivers against erosion and flood is urgently required in parallel with the implementation of the Project works.

9) Improvement of Domestic Water Supply

Most of the villages or towns in the Study Area have own water supply system. But they are not fully functioning at present because of lack of water sources, deterioration of the systems or lack of operation funds. Urgent countermeasures against water shortage in the towns and villages in the Study Area are strongly recommended for the improvement of living standards of the people in the area, even though it is not directly connected with the agricultural development.

The Feasibility Study on the Irrigation Project
in
Ruginesti-Pufesti-Panciu District Vrancea

FINAL REPORT
(MAIN REPORT)

TABLE OF CONTENTS

PREFACE
LETTER OF TRANSMITTAL
LOCATION MAP
GENERAL PLAN OF THE PROJECT
PHOTOS OF THE STUDY AREA
SUMMARY AND RECOMMENDATIONS
TABLE OF CONTENTS
LISTS OF TABLES AND FIGURES
ACRONYMS AND ABBREVIATIONS

CHAPTER 1 : INTRODUCTION

1.1	BACKGROUND OF THE STUDY -----	1 - 1
1.2	OBJECTIVES AND SCOPE OF THE STUDY -----	1 - 2
1.3	THE STUDY AREA -----	1 - 3
1.4	THE REPORTS -----	1 - 3

CHAPTER 2 : BACKGROUND

2.1	BRIEF DESCRIPTION OF THE COUNTRY -----	2 - 1
2.1.1	National Economy -----	2 - 1
2.1.2	Agriculture -----	2 - 2
2.2	GENERAL FUTURES OF DISTRICT VRANCEA -----	2 - 3
2.2.1	District Economy -----	2 - 3
2.2.2	Agriculture -----	2 - 4
2.3	HISTORICAL BACKGROUND OF THE PROJECT -----	2 - 5

CHAPTER 3 : THE STUDY AREA

3.1	GENERAL FEATURES -----	3 - 1
3.1.1	Location -----	3 - 1
3.1.2	Administration -----	3 - 1
3.1.3	Population -----	3 - 1
3.1.4	Social Infrastructure -----	3 - 1
3.2	NATURAL FEATURES -----	3 - 3
3.2.1	Topography -----	3 - 3
3.2.2	Meteorology -----	3 - 4
3.2.3	Hydrology -----	3 - 6
3.2.4	Geology -----	3 - 8

3.2.5	Soil -----	3 - 8
3.2.6	Land Classification -----	3 - 10
3.3	AGRICULTURE -----	3 - 11
3.3.1	Land Use -----	3 - 11
3.3.2	Agricultural Production -----	3 - 12
3.3.3	Livestock -----	3 - 13
3.3.4	Farming Practices -----	3 - 13
3.3.5	Farm Household Economy -----	3 - 16
3.3.6	Land Tenure -----	3 - 17
3.3.7	Marketing -----	3 - 18
3.3.8	Agro-industry -----	3 - 20
3.3.9	Agricultural Supporting System -----	3 - 21
3.3.10	Farmers' Organization -----	3 - 22
3.3.11	Rural Community -----	3 - 22
3.4	EXISTING IRRIGATION AND DRAINAGE -----	3 - 25
3.4.1	Existing Irrigation -----	3 - 25
3.4.2	Existing Drainage -----	3 - 25
3.5	SOIL CONSERVATION -----	3 - 26
3.5.1	Present Conditions -----	3 - 26
3.5.2	Existing Facilities -----	3 - 27
3.5.3	Slope Classification -----	3 - 28
3.5.4	Estimation of Soil Losses -----	3 - 28
3.5.5	Assessment of Erosion Control Area -----	3 - 28
3.5.6	Erosion and Productivity -----	3 - 29
3.6	ENVIRONMENTAL CONDITIONS -----	3 - 30
3.6.1	General -----	3 - 30
3.6.2	Natural Environment -----	3 - 30
3.6.3	Social Environment -----	3 - 31
3.6.4	Water Quality -----	3 - 31
3.6.5	Soil Erosion -----	3 - 32
3.6.6	Environmental Permitting System -----	3 - 32
3.7	PRESENT PROBLEMS IN AGRICULTURE -----	3 - 33

CHAPTER 4 : THE PROJECT

4.1	OBJECTIVES OF THE PROJECT -----	4 - 1
4.2	BASIS OF PROJECT FORMULATION -----	4 - 2
4.2.1	Basic Concepts in Project Formulation -----	4 - 2
4.2.2	Presently Proposed Irrigation Plan -----	4 - 4
4.2.3	Present Condition of the Constructed Project Works -----	4 - 6
4.3	PROPOSED AGRICULTURAL DEVELOPMENT PLAN -----	4 - 8
4.3.1	Land Use Plan -----	4 - 8
4.3.2	Farming Plan -----	4 - 10
4.3.3	Crop Production Plan -----	4 - 16
4.3.4	Livestock Production Plan -----	4 - 18
4.3.5	Farm Household Economy Plan -----	4 - 18
4.3.6	Marketing Plan -----	4 - 20
4.3.7	Agricultural Processing Plan -----	4 - 24
4.3.8	Agricultural Supporting Plan -----	4 - 26

4.4	IRRIGATION AND DRAINAGE PLAN -----	4 - 28
4.4.1	Irrigation Plan -----	4 - 28
4.4.2	Drainage Plan -----	4 - 30
4.5	SOIL CONSERVATION PLAN -----	4 - 31
4.5.1	General -----	4 - 31
4.5.2	Selection of Soil Conservation Project Area -----	4 - 32
4.5.3	Countermeasures -----	4 - 32
4.5.4	Selection of Soil Conservation Plan -----	4 - 36
4.6	RURAL INFRASTRUCTURE DEVELOPMENT PLAN -----	4 - 37
4.6.1	Road Network -----	4 - 37
4.6.2	Other Rural Infrastructures -----	4 - 38
4.7	INFRASTRUCTURE FACILITIES PLANNED -----	4 - 39
4.7.1	Summary -----	4 - 39
4.7.2	Irrigation Facilities -----	4 - 39
4.7.3	Drainage Facilities -----	4 - 46
4.7.4	Soil Conservation Facilities -----	4 - 47
4.7.5	Rural and Operation & Maintenance Roads -----	4 - 49

CHAPTER 5 : PROJECT IMPLEMENTATION AND OPERATION & MAINTENANCE

5.1	PROJECT IMPLEMENTATION SYSTEM -----	5 - 1
5.1.1	Project Implementation Method -----	5 - 1
5.1.2	Project Implementation Agency -----	5 - 1
5.2	CONSTRUCTION SCHEDULE -----	5 - 2
5.2.1	Detailed Design Phase -----	5 - 3
5.2.2	Construction Phase -----	5 - 3
5.3	PROJECT COST -----	5 - 4
5.3.1	Conditions of Cost Estimate -----	5 - 4
5.3.2	Project Cost -----	5 - 4
5.4	OPERATION AND MAINTENANCE -----	5 - 7
5.4.1	Operation and Maintenance Method -----	5 - 7
5.4.2	Operation and Maintenance Office -----	5 - 7
5.4.3	Operation and Maintenance Cost -----	5 - 8

CHAPTER 6: PROJECT EVALUATION

6.1	BASIS OF EVALUATION -----	6 - 1
6.1.1	Approach -----	6 - 1
6.1.2	Conditions of Evaluation -----	6 - 1
6.2	BENEFIT OF THE PROJECT -----	6 - 2
6.2.1	Estimation of Benefit -----	6 - 2
6.2.2	Agricultural Production Benefit -----	6 - 2
6.2.3	Soil Conservation Benefit -----	6 - 4
6.3	ECONOMIC EVALUATION -----	6 - 5
6.3.1	Evaluation Criteria -----	6 - 5
6.3.2	Price Conversion -----	6 - 5

6.3.3	EIRR, ENPV and E.B/C -----	6 - 8
6.3.4	Sensitivity Analysis -----	6 - 9
6.4	FINANCIAL EVALUATION -----	6 - 9
6.4.1	Evaluation Criteria -----	6 - 9
6.4.2	FIRR, FNPV and F.B/C -----	6 - 10
6.4.3	Investment and Repayment -----	6 - 11
6.4.4	Farm Household Economy -----	6 - 11
6.5	SOCIO-ECONOMIC EVALUATION -----	6 - 12
6.6	ENVIRONMENTAL EVALUATION -----	6 - 14
6.6.1	Impact of the Project -----	6 - 14
6.6.2	Impact on Natural Environment -----	6 - 14
6.6.3	Impact on Social Environment -----	6 - 15
6.6.4	Main Measures to Improve Environmental Quality -----	6 - 15
6.7	COMPREHENSIVE EVALUATION -----	6 - 16
 CHAPTER 7 : RECOMMENDATIONS -----		 7 - 1
 TABLES -----		 T - 1
 FIGURES -----		 F - 1
 APPENDICES:		
1	Scope of Work for the Study -----	AP 1 - 1
2	Minutes of Meeting on Respective Reports -----	AP 2 - 1
3	List of Persons Concerned -----	AP 3 - 1

LIST OF TABLES

Table 2.1.1	Gross Domestic Product by Branch and Estimated GNP -----	T - 1
Table 2.1.2	Livestock Herds in Romania -----	T - 1
Table 2.2.1	Status of Land Tenure -----	T - 2
Table 2.2.2	Area and Yields of Major Crops in Vrancea District -----	T - 2
Table 2.2.3	Livestock Herds and Products -----	T - 2
Table 3.2.1	Summary of Monthly Mean River Discharge in the Study Area ---	T - 3
Table 3.2.2	Characteristics of Soil Units in the Study Area -----	T - 4
Table 3.2.3	Standard of Land Classification -----	T - 9
Table 3.3.1	Area Cultivated, Production and Unit Yield of Crops in 19 Towns/Villages Related to the Study Area -----	T - 10
Table 3.3.2	Number of Livestock Raised and Their Production in 19 Towns/Villages Related to the Study Area -----	T - 10
Table 3.3.3	Major Agricultural Supporting Organizations -----	T - 11
Table 3.3.4	Population, Number of Households and Private Land Use in the Study Area -----	T - 12
Table 3.5.1	Assessment of the Erosion Control Area -----	T - 13
Table 4.3.1	Project Plan of Cultivation Area and Cropping Time -----	T - 14
Table 4.3.2	Crop Rotation System Planned -----	T - 14
Table 4.3.3	Number of Agricultural Machinery Existing and Required in the Project Area -----	T - 15
Table 4.3.4	Production Plan in the Project Area -----	T - 16
Table 4.4.1	Unit Monthly Irrigation Water Requirement -----	T - 17
Table 4.4.2	Irrigation Blocks -----	T - 18
Table 4.7.1	Design Conditions of Pump Stations (SRP) -----	T - 19
Table 4.7.2	Summary of Distribution Canal (CD) -----	T - 20
Table 4.7.3	River/Drain Crossing Structures (Siphon) -----	T - 21
Table 4.7.4	Field Drainage Canal -----	T - 22
Table 4.7.5	Rural and Operation and Maintenance Roads in the Project -----	T - 23
Table 5.3.1	Summary of Construction Cost -----	T - 24
Table 5.3.2	Project Cost -----	T - 25
Table 5.3.3	Annual Disbursement of Project Cost -----	T - 26
Table 6.3.1	Cash Flow of Economic Cost and Benefit (ENPV and E.B/C) ----	T - 27
Table 6.4.1	Cash Flow of Financial Cost and Benefit (FNPV and F.B/C) ----	T - 28
Table 6.6.1	Environmental Impacts -----	T - 29

LIST OF FIGURES

Fig 3.2.1	Irrigation Study Area by Block and Elevation -----	F - 1
Fig 3.2.2	Meteo-Hydrological Observation Stations -----	F - 2
Fig 3.2.3	Summary of Meteo-Hydrological Conditions in the Study Area ---	F - 3
Fig 3.2.4	Soil Map -----	F - 4
Fig 3.2.5	Land Classification Map -----	F - 5
Fig 3.3.1	Present Land Use Map -----	F - 6
Fig 3.3.2	Present Cropping Pattern (1992)-----	F - 7
Fig 3.3.3	Agriculture Center in the Study Area -----	F - 8
Fig 3.4.1	Existing Putna Irrigation System -----	F - 9
Fig 3.5.1	Classification of the Soil Conservation Study Area (SCSA) -----	F - 10
Fig 3.5.2	Relationship between Erosion and Yield Reduction -----	F - 11
Fig 4.2.1	General Plan Designed by ISPIF -----	F - 12
Fig 4.3.1	Proposed Land Use and Irrigation Area -----	F - 13
Fig 4.3.2	Proposed Cropping Schedule -----	F - 14
Fig 4.3.3	Proposed Crop Rotation -----	F - 15
Fig 4.3.4	Labour Requirement for the Agricultural Production in the Project	F - 16
Fig 4.4.1	Proposed Irrigation System -----	F - 17
Fig 4.4.2	Layout of Irrigation Facilities -----	F - 18
Fig 4.4.3	Layout of Drainage Facilities -----	F - 19
Fig 4.5.1	Proposed Soil Conservation Plan -----	F - 20
Fig 4.6.1	Layout of Road Works -----	F - 21
Fig 4.7.1	Typical Drawing of SRP-----	F - 22
Fig 4.7.2	Standard Cross Section of Distribution Canal -----	F - 23
Fig 4.7.3	Typical Drawing of SPP -----	F - 24
Fig 4.7.4	Standard Cross Section of Drainage Canal -----	F - 25
Fig 4.7.5	Typical Cross Section of Level Terrace -----	F - 26
Fig 4.7.6	Typical Cross Section of Grassed Waterway -----	F - 27
Fig 4.7.7	Typical Cross Section of BDC -----	F - 28
Fig 4.7.8	Typical Cross Section of Soimului Canal -----	F - 29
Fig 4.7.9	Standard Cross Section of Operation & Maintenance Road -----	F - 30
Fig 5.1.1	Organization Chart of Ministry of Agriculture and Food -----	F - 31
Fig 5.1.2	Organization Chart for the Project Implementation -----	F - 32
Fig 5.1.3	Overall Project Implementation Schedule -----	F - 33
Fig 5.3.1	Proposed Tendering Lots -----	F - 34
Fig 5.4.1	Organization of Operation and Maintenance -----	F - 35

ACRONYMS

<i>Acronyms</i>	<i>in Romanian</i>	<i>in English</i>
AGROMECC	Societatea Comerciala de Prestari Servicii pentru Mecanizarea Agriculturii	Commercial Society of Agricultural Mechanization
AGROSEM	Filiale Judetene ale Semrom-ului	District Branch of SEMROM
AQUA PROIECT	Institutul de Proiectari pentru Ape	Institute for Design of Water Resources Project
DA-Vrancea		Department of Agriculture-Vrancea District
DJS-Vrancea	Directia Judeteana de Statistica-Vrancea	Statistic Office-Vrancea District
ICCPT-Fundulea	Institutul de Cercetari pentru Cereale si Plante Tehnice-Fundulea	Research Institute for Cereals and Plants-Fundulea
ICIM	Institutul pentru Cercetari si Ingineria Mediului	Environmental Research and Engineering Institute
ICITID	Institutul de Cercetare si Inginerie Tehnologica pentru Irigatii si Drenaje	Research Institute for Technical Engineering for Irrigation and Drainage
ICLF	Institutul de Cercetari pentru Legume si Fructe	Research Institute of Vegetable and Flower
ICPA	Institutul de Cercetari pentru Pedologice si Agrochimice	Pedological and Agrochemical Research Institute
IGFCOT	Institutul de Geodezie Fotogrammetrie Cartografie si Organizarea Teritoriului	Institute for Geodesy, Photogrammetry, Mapping and Territory Administration
INMH	Institutul National pentru Meteorologie si Hidrologie	National Institute of Meteorology and Hydrology
ISPIF-SA	Institutul de Studii si Proiectari pentru Imbunatatiri Funciare	Institute for Studies and Design of Land Reclamation Projects
LO-Vrancea		Land Office, DA-Vrancea
LRD		Land Reclamation Department (former)
GDCAL		General Directorate for Cadaster, Agricultural Land Management and Land Reclamation
RAIF	Regia Autonoma a Imbunatatirilor Funciare	Land Reclamation Agency
MAF		Ministry of Agriculture and Food
MoE		Ministry of Water, Forestry and Environmental Protection
NCS		National Commission for Statistics
NROCCI		National Register Office of the Chamber of Commerce and Industry
NUTRICOM	Societatea Comerciala pentru Comercializarea Nutretului	Commercial Society for Fodder Trading
OCOT	Oficiul Cadastral pentru Organizarea Teritoriului	Survey Office for Territory Administration
OSPA	Oficiul de Studii Pedologice si Agrochimice	Office of Pedological and Agrochemical Study
RENEL		Romanian Electric Power Supply Company
ROMCEREAL	Societatea Comerciala pentru Comercializarea Cerealelor	Commercial Society for Cereal Trading

ROMLACTA	Societatea Comerciala pentru Prelucrarea Laptelui	Commercial Society for Milk Processing
ROMSILVA SA	Agentia Autonoma a Padurilor	Romanian Forest Authority
SC ZBOINA-SA	Societate pe Actiuni Societatea Comerciala ZBOINA-Constructii	Commercial Society ZBOINA Commercial Society for Construction of Land Reclamation
SCELIF-SA	Societatea Comerciala pt Exploatarea si Intretinerea Lucrarilor de Imbunatatiri Funciare	Commercial Society for Operation and Maintenance of Land Reclamation Works
SCPL	Statiune de Cercetare pentru Plante si Legume	Plant and Vegetable Research Station
SCPP	Statiunea de Cercetari Pepiniere Pomicole	Agricultural Nursery Research Station
SEMROM	Societatea Comerciala pentru Comercializarea Semintelor si Conditionare	Commercial Society for Seed Conditioning and Trading
UNICARNE	Societatea Comerciala pentru Prelucrarea si Industrializarea Carnii	Commercial Society for Processing and Industrialization of Meat
ZAHAROM	Societatea Comerciala pentru Prelucrarea Zaharului	Commercial Society for Sugar Processing
FAO		Food and Agricultural Organization of the United Nations
IUCN		International Union for Conservation of Nature and Natural Resources
JICA		Japan International Cooperation Agency
OECP		Overseas Economic Cooperation Fund of Japan
ISA		Irrigation Study Area
SCSA		Soil Conservation Study Area
AAS	Asociatii Agricole Simple Familiale fara Personalitate Juridica	Informal Association of Private Farmers
AA	Asociatii Agricole Familiale cu Personalitate Juridica	Formal Association of Private Farmers
I	Taranii Individuali	Individual Farmer
SCCP	Societate Comerciala Compania cu Capital Integral Privat	Private Agricultural Company
SCM	Societate Comerciala cu Capital Mixt	State/Private Joint Agricultural Company
SCP	Statiuni de Cercetare si Productie	State Farm
SRP	Statie de Repompare	Distribution Pump Station
SPP	Statie de Punere sub Presiune	Booster Pump Station
CM	Canal Magistral	Main Canal
CD	Canal Distribuitor	Distribution Canal
CP	Conducta Principala	Distribution Pipeline
EC		Electric Conductivity
EIA		Environmental Impact Assessment
O&M		Operation and Maintenance
RBA		River Basin Agency
STAS	Standard de Stat	National Standard
WID		Women in Development

ABBREVIATIONS

mm	:	millimeter
cm	:	centimeter
m	:	meter
km	:	kilometer
cm ²	:	square centimeter
m ²	:	square meter
km ²	:	square kilometer
ha	:	hectare
lit	:	liter
h lit	:	hecto liter (100 lit)
m ³	:	cubic meter
kg	:	kilogram
ton	:	ton
m/s	:	meter per second
m ³ /s	:	cubic meter per second
lit/s	:	liter per second
kg/ha	:	kilogram per hectare
ton/ha	:	ton per hectare
hr/ha	:	hour per hectare
m ³ /ha	:	cubic meter per hectare
m ³ /km ²	:	cubic meter per square kilometer
mm/day	:	millimeter per day
mm/month	:	millimeter per month
mm/year	:	millimeter per year
%	:	percent
El	:	elevation above mean sea level
amsl	:	above mean sea level
No.	:	number
US\$:	United States Dollar
Lei	:	Romanian Lei
°C	:	degree centigrade
approx.	:	approximately
min.	:	minimum
max.	:	maximum
w/	:	with
w/o	:	without

CHAPTER 1
INTRODUCTION

CHAPTER 1 : INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The Government of Romania has the following policy objectives in the agricultural sector:

- to increase the production of irrigated crops to meet national food requirements;
- to increase the export of agricultural products;
- to increase employment in the agricultural sector and to reverse recent rise in unemployment;
- to encourage the irrigated crop production by the small and private farming units including individual farmers and informal associations of them;
- to develop and/or maintain irrigated agriculture where it is viable; and
- to promote a free market economy in the agricultural sector and to reduce the direct role of the Government in the provision of agricultural supporting services.

Once before Romania had been a food export country. However, the promotion of development of heavy industries by the Ceausescu's Government, Romania has become a food import country since 1990. Therefore, it is an emergency task for the Government of Romania now to increase the food production in order to achieve self-sufficiency of food for the nation and to activate the agricultural sector in line with the above policy objectives.

In the above circumstances, the Government of Romania has a strong intention to complete the "Irrigation Project in Ruginesti-Pufesti-Panciu, District Vrancea" (hereinafter referred to as the Project), a part of the Siret-Ialomita Agricultural Development Project, as a model development one for other similar projects in Romania. Furthermore, the privatization of land in the Project Area is more progressed compared with other areas. And the Government of Romania also wants that an irrigation development plan which will have a significant influence on other areas will be formulated.

Before the collapse of autocratic government, the irrigation development projects had been implemented through the centralized national policy and the Project was also once designed based on this national policy. Therefore, the Project design has to be re-evaluated from the stand point of the level of respective farmers involved in the Project. That is; it might be necessary to introduce an irrigation system which can be operated and maintained easily by small-scale farmers instead of the large-scale irrigation system controlled by the state organization which had been adopted in some national farms.

The Government of Romania anticipates that the Project will be accelerated as soon as possible with the financial assistance from the Government of Japan and that the Japanese technology will be introduced in various aspects of farming, water management, farmers' organization, marketing, etc. which is suitable for the free marketing system promoted by the Government of Romania.

In the above circumstances, the Government of Romania requested the Government of Japan to perform the technical cooperation for the Feasibility Study on the Project (hereinafter referred to as the Study) in July 1992. In response to this request, the Government of Japan through Japan International Cooperation Agency (JICA) sent a project formation mission to Romania to confirm the necessity for the technical cooperation in February 1993. Then the preparatory mission for the execution of the Study was dispatched in December 1993 and the Scope of Work (S/W) for the Study (Appendix-1) was concluded between the Land Reclamation Department (LRD, reorganized into the Land Reclamation Agency, RAIF, in October 1994), the Ministry of Agriculture and Food, representing the Government of Romania, and Japan International Cooperation Agency (JICA), representing the Government of Japan, on 15th of December 1993.

1.2 OBJECTIVES AND SCOPE OF THE STUDY

The objectives of the Study are to make a feasibility study on the Irrigation Project in the Ruginesti-Pufesti-Panciu Area located at the northeastern part of District Vrancea through the irrigation development and related agricultural development based on the above irrigation development in due consideration of the preliminary design of the Project prepared by the Government of Romania and the present conditions of some of the Project facilities which have been already constructed at the site. The Study also includes a study on the soil conservation in the Area which has close relationship with the objective irrigation development.

However, the studies on the erosion control as well as flood control of the rivers themselves which pass through the Area are excluded from the Study. The detailed review and analysis of the basic design of the Siret-Ialomita Agricultural Development Project are also out of scope of the Study.

On the other hand, it is one of the main objectives of the Study to carry out technical transfer to the counterpart personnel of the Government of Romania in the course of the Study.

1.3 THE STUDY AREA

The Study Area is the Ruginesti-Pufesti-Panciu Area of 51,800 ha located at the northeastern part of District Vrancea. It has been divided into two sub-areas; one is Irrigation Study Area (ISA) of 28,900 ha which has been selected in consideration of the objective irrigation/agricultural development and the existing design of the Project, and the other is the remaining area of 22,900 ha which is named Soil Conservation Study Area (SCSA) located in the western hilly side of ISA and mainly for the soil conservation study. The Study Area is situated at the most upstream section of the Siret-Ialomita Agricultural Development Project area of approx. 500×10^3 ha and at an elevation of 70 to 350 m amsl.

1.4 THE REPORTS

The Study was conducted from May 1994 to March 1995 in accordance with the Scope of Work for the Study agreed upon by both Governments of Romania and Japan. The overall schedule of the Study is presented in **Annexes**.

The following reports in English have been submitted to the Regia Autonoma a Imbunatatirilor Funciare (RAIF) (formerly represented by the Land Reclamation Department), the Ministry of Agriculture and Food, the representative organization of the Government of Romania in the course of the Study in accordance with the Scope of Work for the Study:

- 1) Inception Report : 10 copies in Jun, 1994 at the start of the Phase I field study
- 2) Progress Report (I) : 10 copies in Aug, 1994 at the end of the Phase I field study
- 3) Interim Report : 10 copies in Oct, 1994 at the start of the Phase II field study
- 4) Progress Report (II) : 10 copies in Dec, 1994 at the end of the Phase II field study
- 5) Draft Final Report : 10 copies in Mar, 1995 at the end of the Study
- 6) Final Report : 30 copies within 2 months after receipt of comments on Draft Final Report from the Government of Romania, if any.

The Final Report is composed of the following two volumes:

- a) **Volume I : Main Report**
- b) **Volume II : Annexes**

CHAPTER 2
BACKGROUND

CHAPTER 2 : BACKGROUND

2.1 BRIEF DESCRIPTION OF THE COUNTRY

Romania is located in the middle eastern part of Balkan Peninsula, the territory of which lies in the spherical range of 20°-15' to 29°-41' longitude East, 43°-37' to 48°-15' latitude North. The territorial land area extends over 237.5x10³ km², where the population as of July 1,1992 was reported at around 22,789x10³. With regard to geographic features, the Danube River flows eastward along its southern border, developing a fertile plain within its basin. While Transilvanian Plateau covers the western part of her territory surrounded by Carpatian mountain range.

Administratively, Romania consists of 41 districts, in which 260 towns and 2,688 villages are distributed. Since the revolution in December 1989, the Government and the Nation have been challenging the task of privatization to economically catch-up with western nations as fast as possible.

2.1.1 National Economy

Since the revolution in 1989, Romanian economy has been reorganized into a new regime of free economy with gradual privatization directed by Land Act and Privatization Law enacted in 1991. Many state-owned enterprises and cooperatives are on the way to privatized enterprises, whose investment share is held by individual members, late employees or the state as a co-investor and former land-owners. Lately, inflation shows falling trends in Romania in food commodities as shown in the following table.

Item	1990	1991	1992	1993	1994
Food Stuff	105	299	325	374	168
Non-food	105	271	289	425	166
Service	106	221	301	338	190
Total	105	274	311	390	170

(Base: the previous year = 100)

GNP per capita in 1992 was 736 US\$ and the share of the industrial sector in GDP has now become smaller as a result of the change in its trade structure (Table 2.1.1). Registered and latent unemployment has reached over 10%. On the contrary, agricultural sector suffers acute shortage of younger labor force due to rural exodus. Radical changes in Romanian international trade structure, as commonly observed among late Comecon countries, are also important factors contributing to the economic situation. Although the trade balance deficit has been

persisted on, the extent of deficit tends to be narrower and the overall balance has turned into positive. Recent major imports of cereals and starchy crops are given below:

(Unit: Quantity: x10³ ton, Value: x10⁶ US\$)

Item	1990		1991		1992		1993	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Wheat	215.6	24.7	458.9	46.0	121.1	16.8	132.2	20.5
Rice	43.0	17.2	52.3	16.0	58.9	21.2	59.3	18.0
Barley	182.1	16.0	765.4	87.6	9.6	1.1	94.6	10.4
Maize	98.2	146.0	304.4	34.8	320.0	48.9	321.9	49.0
Potato	278.9	60.0	38.9	3.9	261.1	55.6	75.0	21.0
Others		100.1		176.7		259.4		356.1
Total		364.0		365.0		403.0		475.0

2.1.2 Agriculture

(1) **Agricultural Land Use and Land Holding**

Romania has abundant agricultural resources. As of December 1992, above 62% of the territorial area was reserved for agricultural activities, of which more than 63% or 9,357x10³ ha was categorized as arable land. The land use pattern is shown below:

(Unit: x 10³ ha)

Total Area	Agricultural Area	Arable Land	Pasture	Meadow	Vineyard	Orchard
23,839	14,790	9,357	3,349	1,481	299	305
share (%)	(100.0)	(63.3)	(22.6)	(10.0)	(2.0)	(2.1)

Agriculture has been sustained by 46% of the total population. 3,419x10³ families are engaged in farming individually, while population employed in agricultural sector in 1992 was estimated at 3,127x10³. Individual farmers predominate in land holding, types of which are given in **Annexes**, but they are now on the way to organized groups or associations as recommended by the Government. Their average holding size is estimated at 2.28 ha per farm household or 0.7 ha per member.

As regards reorganizing and privatizing previous Cooperatives (CAP), a substantial progress has been made in organizing into various types of new farming groups as of July, 1994 as summarized in the following:

Type of Group	Informal Association	Formal Association	Commercial Company	Remaining Cooperative
Number	16,555	4,054	374	617
Area (ha)	1,872,268	1,812,174	84,916	-
Membership	746,805	750,319	34,254	-

(2) Crop and Livestock Production

Agriculture comprises crop (with 52% of production share in 1992) and livestock (with 48%) sectors. The latter is indispensable/unseparable partner of crop production in terms of crop rotation and crop nutrient supply, also as draught animal and means of transport. Food production and per-capita availability in 1992 are given below:

Article	Cereal	Vegetable Oil	Sugar	Vegetable	Meat	Milk
Crop (x10 ³ ton)	12,289	900	2,897	2,632	1,895	4,493
Food (x10 ³ ton)	10,446	315	280	1,974	1,516	3,370
kg/year per capita	458	14	12	87	68	148

Livestock production is closely linked with cropping activities, and most small holders keep small herd of livestock within their farms. Herds are now on rebuilding stage after a serious slack (Table 2.1.2). Livestock production remains in lower efficiency as to milk yield and meat conversion rate due to lower rate of concentrate feeding.

2.2 GENERAL FEATURES OF VRANCEA DISTRICT

Vrancea represents one of the 41 districts in Romania, located in mid-eastern part of the country, extending its surface area of 4,857 km² from 26°25' to 27°30' longitude East and between 45°30' and 46°10' latitude North. District population is reported as 393,400 (numbers of household: 104,950) in 1992 census, 38.5% of which live in urban area, including the District center, Focsani and 3 other towns with an aggregate population of 151,300. Administratively, the District comprises 4 towns (Focsani, Panciu, Marasesti and Odobesti) and 59 villages.

2.2.1 District Economy

Major economic activities so far developed within the District are agriculture and agro-industrial sectors including wineries. Besides, Focsani has an industry specialized in tools, textile and sawing. There have been reported 44 industrial enterprises. Economically active population is

totaled at 206,087 (52% of the total) of which only 14,434 (7%) account for unemployed. About 29% of them are engaged in agriculture, 33% in industry (of which 24% lives in Focsani).

Farm households account for 35% of the total District households, while agricultural population has almost half the share of the District population. Annual production value from agricultural sector amounts to 41,295x10⁶Lei in 1992 as against 68,943x10⁶ Lei from industrial sector, 90 % of which is derived from public sector.

On the basis of land use, 52.6% of the total District land is used for agriculture, 39.3 % for forestry and the rest 8.1 % for other purposes. Wage workers in the District are distributed in the following way:

Year			(Unit: 10 ³ persons)		
	1991	1992	1991	1992	
Total Employees	101.4	84.8	Commerce	5.9	3.8
Agriculture	16.0	10.1	Processing Ind.	39.8	27.5
Transport	10.6	7.3	Construction	5.2	5.0
Education	6.8	6.5	Health Care	4.0	4.3

2.2.2 Agriculture

(1) General

An outstanding characteristic observed in agriculture in Vrancea lies in wine grape production from widely developed vineyards. Arable land formerly belonged to CAP has been for the most part restituted to duly owners, while major part of grass land for pasturing is still held as public properties. As a result, a host of small holding individual farmers were born, and some of them have set up formal associations (AA) or informal associations (AAS) and other private groups (Table 2.2.1).

(2) Crop and Livestock Production

Crop and livestock herd compositions are similar to those of the whole country, but production from vineyard has much higher share as compared with the country average. Overall crop yield levels are somewhat lower for cereals, but sometimes higher for some cash crops. Cropped area and yield level are briefed in Tables 2.2.2 and 2.2.3.

It is observed that acreage under industrial crop declines due partly to relatively low profitability and difficulty in yield improvement. Total cropped area in 1991 accounted for 139,364 ha

(94.8% of arable land area), of which 86% was cultivated by private sector. In 1992, the area showed a little expansion reaching 143,512 ha (97.6% was used and also 86% was covered by private sector). Overall falling trends of wheat and shift to maize still continue in this area. Crop yields were affected by drought in 1992, but the extent of the damage differ greatly by crop.

As for livestock herds in Vrancea, they are fed by private and public sectors, but as far as forage base and herd management are concerned, the latter keeps still leading position, while the former ought to keep livestock for home-consumption, as draft power, as means of carriage/transport and as a source of organic fertilizer.

Food self-sufficiency in grains and foods of protein source within the District in 1992 shows that 1,630 and 370 kg/year/person for farmers in the case of cereals and meats, respectively. Food for domestic consumption within the District is mostly self-sufficient though cereal consumption has by far greater share as compared with that of protein sources.

2.3 HISTORICAL BACKGROUND OF THE PROJECT

The idea to irrigate the Siret-Ialomita area that was one of the most important crop production areas of the country by inducing the river flow of the Siret River the discharge of which was comparatively ample came up in the 1910's. In the 1950's, the Integrated Siret River Development Plan was prepared and the above idea was further materialized.

In line with the above Plan, a multi-purpose dam named Izvorul Muntelui Dam (effective storage capacity: $930 \times 10^6 \text{ m}^3$) was completed on the Bistrita River, one of the branch rivers of the Siret River, in 1961. After the completion of this dam, three multi-purpose dams (Galbeni, Racaciuni and Beresti) were constructed on the main stream of the Siret River. The total effective storage capacity of these three dams are $210 \times 10^6 \text{ m}^3$. It has been reported that the total 360×10^3 ha of the Siret-Ialomita area will be able to be irrigated by the completion of these dams.

In 1985, the basic design of the Siret-Ialomita Agricultural Development Project covering irrigation area of 500×10^3 ha by constructing two storage dams (Adjud and Prisaca, the total storage capacity: $360 \times 10^6 \text{ m}^3$) in addition to the above mentioned existing dams was completed and the implementation of the Irrigation Project in Ruginesti-Pufesti-Panciu, District Vrancea covering irrigation area of approx. 23×10^3 ha (hereinafter referred to as the Project) was approved by the Government as the Phase I of the Siret-Ialomita Agricultural Development Project which was divided into VIII phases. And the construction of the Project works has been

started since the same year. In parallel with the implementation of the Project, the construction of the Calimanesti Dam, the main purpose of which being hydraulic power generation, was started in 1987 and completed in 1992 by the Ministry of Energy.

The construction works of the Project have been executed under the control of two Ministries. That is; the construction of the Siret-Baragan Canal including the intake facilities (hereinafter referred to as the Main Canal) was started in 1986 and has been executing by the Ministry of Water, Forestry and Environmental Protection. On the other hand, the construction of other irrigation facilities such as pump stations, branch canals and pipe lines has been executing by the Land Reclamation Department of the Ministry of Agriculture and Food.

Unfortunately, the construction works of the Project was suddenly stopped due to lack of fund after the revolution to the Ceausescu's Government in December 1989. The upstream section of the Main Canal of 5.5 km, some of the pump stations, some sections of the pipe lines and the Branch Canals and other related structures had been almost completed by that time.

The new Government decided to continue the Project in consideration of its importance for the improvement of Romanian agriculture and has been re-continuing the construction works little by little in compliance with the availability of fund. However, in consideration of lack of the Government fund and achievement of the Project in the earliest time possible, the Government has decided to ask the financial assistance from the Government of Japan and is expecting the immediate financial assistance from Japan.