4) *R. pseudoacacia* Forests (F11 and F12)

Damage Grade	Cutting Rate	Cutting Method of Damaged Trees
Strong	100%	• Clear cutting
Moderate	100%	• Clear cutting
Weak	20%	• Individual cutting of usable Grade 3 and Grade 4 declined forests and trees which may damage forests

5) *Populus* spp. Forests (F13)

Damage Grade	Cutting Rate	Cutting Method of Damaged Trees
Strong	100%	• Clear cutting
Moderate	100%	• Clear cutting
Weak	0%	• No cutting

3.2.2 Cutting Area and Cutting Volume

The following table shows the cutting area, regeneration area and cutting volume by county for damaged forests.

County	Stand Area (ha)	Current Stand Volume		Cutting Area (ha)	Actual Regeneration Area (ha)	Cutting Volume (m^3)
		(m^3)	(m^3/ha)			
OLT	2,865.4	396,329	138.3	2,865.4	805.7	146,688
DOLJ	6,293.7	748,056	118.9	6,293.7	2,508.5	339,176
Total	9,159.1	1,144,385	124.9	9,159.1	3,314.2	485,864

3.3 Items Related to Reforestation

3.3.1 Regeneration and Tending Methods

(1) Regeneration Method

1) Regeneration Method

In the case of *Quercus* spp., regeneration is, in principle, conducted by means of artificial regeneration with natural regeneration being selected at sites of excellent

natural regeneration. For this purpose, supplementary planting will be conducted at sites with few regenerated trees. In regard to coppicing, priority will be given to the fostering of root suckers.

In the case of *R. pseudoacacia*, artificial regeneration will be selected together with natural regeneration by coppicing. Artificial regeneration will be selected for *Populus* spp.

2) Soil Preparation Method

The concrete soil preparation method based on the damage grade and planting species is described below.

a) *Quercus* spp. Planting Site - A (Strongly Damaged Sites of F5, F6, F7, F8, F11 and F12 Types)

Removal of the limbs and tips, digging and removal of the stumps and soil preparation are conducted at a 10 m-wide transect belt. The stumps are left without soil preparations at the next 5 m-wide transect belt. The removed limbs, tips and stumps are accumulated at those transect belts where soil preparation is not conducted.

b) *Quercus* spp. Planting Site - B (F1, F2, F3, F4 and Moderately Damaged Sites of F5, F6, F7, F8, F11 and F12 Types)

Alternate 0.8 m-wide belts of soil preparation areas and non-soil preparation areas are alternatively introduced. The stumps are left at both types of sites and soil preparation is conducted avoiding the stumps even if this means that work line does not always constitute a straight line. The limbs and tips are accumulated at those belts where soil preparation is not conducted. A mini back-hoe is used at the soil preparation sites to plough and harrow the ground to a depth of 40 cm. Planting holes are dug manually using a hand tool.

c) *Quercus* spp. Planting Site - C (Strongly Damaged Sites of F13 Type)

Soil preparation work identical to that for *Quercus* spp. planting site - A is conducted using a rake-dozer and a tractor over the entire cut-over area. In view of the relatively soft soil, however, work using a ripper to strip the soil is unnecessary. The limbs and tips are accumulated outside the cutting area. Planting holes are dug manually using a hand tool.

d) *R. pseudoacacia* Planting Site (Strong Damaged Sites of F9 and F10 Types)

Soil preparation work identical to that for *Quercus* spp. planting site - A is conducted using a rake-dozer and a tractor over the entire cut-over area. In view of the sandy soil, however, work using a ripper to strip the soil is unnecessary. The limbs and tips are accumulated outside the planting area. Planting holes are dug manually using a hand tool.

e) *R. pseudoacacia* Natural Regeneration Site (Moderately Damaged Sites of F9 and F10 Types)

The limbs and tips are removed and are accumulated and cleared at standing tree sites to avoid any disruption to the growth of coppiced regenerated trees and of supplementary planted trees. Planting holes are dug using a hand tool or an earth auger.

f) *Populus* spp. Planting Site (Moderately Damaged Sites of F13 Type)

Soil preparation work identical to that for *Quercus* spp. planting site - A is conducted using a rake-dozer and a tractor over the entire cut-over area. In view of the sandy soil, however, the use of a ripper to strip the soil is unnecessary. The limbs and tips are accumulated outside the cutting area. Planting holes are dug manually using a hand tool.

3) Standard Planting Method and Planting Density

a) *Quercus* spp. (Including Species for Mixed Planting with *Quercus* spp.)

The target species (*Q. frainetto, Q. cerris, Q. robur, Q. petraea, Q. pedunculiflora, Fraxinus excelsior, Tilia platyphyllos* and *Pyrus pyraster*) will be mixed planted with assistant species.

There will be three planting densities per ha, i.e. 4,000 trees (2,667 trees of the target species and 1,333 trees of assistant species with a planting density of 1.5 m x 1 m), 6,250 trees (4,167 trees of the target species and 2,083 trees of assistant species with a planting distance of 1.6 m x 1 m) and 6,667 trees (4,445 trees of the target species and 2,222 trees of assistant species with a planting distance of 1.5 m x 1 m).

b) *Robinia pseudoacacia*

R. pseudoacacia, the target species, will be planted together with *Gladitschia triacanthos* and *Elaeagnus angustifolia* in lines or groups. *E. angustifolia* in particular will be planted at forest edges and the sites with poor soil conditions, such as at former *R. pseudoacacia* planting sites which have become grassland following the death of planted trees.

The planting density will be 5,000 trees per ha with a planting distance of 2 m x 1 m.

c) *Populus* spp.

Populus alba or *Populus nigra* will be planted at a density of 625 trees per ha and with a planting distance of 4 m x 4 m.

(2) Tending Standards

The tending standards are shown in the following tables.

Tending Standards for *Quercus* spp.

(times)

Stand Age	1	2	3	4	5	6	7	8	9	10	15	20	35	45	55	65	75
Supplementary Planting		(1)	(1)	(1)													
Correction of Planting		1															
Trimming and Tree Forming		1															
Scarifying	2	2	2	2	2	2											
Weeding by Cutting (at Transect Belts Without Soil Preparation)	1	1	1														
Improvement Cutting (Non-Target Species)							1			1							
Improvement Cutting (Including Target Species)											1	1					
Thinning													1	1	1	1	1

Note: Supplementary planting will be conducted when deemed necessary in view of the supplementary planting criteria *"Indrumari Tehnice pentre Compozitii"*.

Tending Standards for *R. pseudoacacia*

(times)

Stand Age	1	2	3	4	5	6	7	8	9	10	15	20
Supplementary Planting		(1)	(1)									
Correction of Planting		1										
Trimming and Tree Forming		1										
Scarifying	2	2										
Improvement Cutting (Including Target Species)				1				1				
Thinning										1	1	1

Tending Standards for *Populus* spp.

(times)

Stand Age	1	2	3	4	5	6	7	8
Supplementary Planting		(1)						
Correction of Planting		1						
Scarifying	2	2	2					
Brush Cutting				1				
Removal of Lateral Buds	1	1						
Pruning							1	
Thinning								1

3.3.2 Reforestation Area

The reforestation area by species is shown in the following table.

Forest Management Type	Present Stand Structure	Regeneration Species	Regeneration Method	Damage Grade	Actual Regeneration Area (ha)		
					Olt	Dolj	Total
F5	Qf	Qf	Planting	Strong	142.7	298.3	441.0
				Moderate	210.9	262.9	473.8
F6	Qc	Qc	Planting	Strong	80.5	338.1	418.6
	Qf, Qc	Qf, Qc		Moderate	178.6	757.8	936.4
	Qc, Qf, Others	Pp					
F7	Other *Quercus* spp.	Qr, Qc	Planting	Strong	20.8	48.7	69.5
	Qr, Qp	Qpet, Qped, Tp		Moderate	22.5	67.2	89.7
F8	Other *Quercus* spp.	Qr	Planting	Strong	99.4	46.6	146.0
	& Other spp.	Qpet, Qped, Fe, Tp		Moderate	25.7	41.2	66.8
F9	Rp above 20 years	Rp, Gt, Ea	Planting	Strong	3.8	230.1	233.9
	apt for Rp	Rp	Coppicing	Moderate	3.5	127.6	131.1
F10	Rp under 20 years	Rp, Gt, Ea	Planting	Strong	6.0	174.3	180.3
	apt for Rp	Rp	Coppicing	Moderate	8.0	31.9	39.9

Forest Management Type	Present Stand Structure	Regeneration Species	Regeneration Method	Damage Grade	Actual Regeneration Area (ha)		
					Olt	Dolj	Total
F11	Rp above 20 years	Qc, Qf	Planting	Strong	1.9		1.9
	apt for Rp	Qc, Qf	Coppicing	Moderate		1.8	1.8
F12	Rp under 20 years	Qc, Qf	Planting	Strong		2.5	2.5
	not apt for Rp	Qc, Qf	Coppicing	Moderate			
F13	*Populus* spp.	Qr, Fe, Tp	Planting	Strong		17.1	17.1
		Pa	Planting	Moderate	1.6	8.2	9.8
Total					805.7	2,454.2	3,259.9

Seed Forest

F1	Qf	Qf	Planting	Strong		19.7	19.7
F2	Qc	Qc, Qf	Planting	Strong		27.1	27.1
				Moderate		6.1	6.1
F3	Qpub, Qped	Qped, Qpet, Qc	Planting	Moderate		1.4	1.4
Total						54.3	54.3

Planting Total	794.2	2,347.3	3,141,5
Coppicing Total	11.5	161.3	172.8
Total	805.7	2,508.5	3,314.2

Note: Qf: *Q. frainetto*; Qc: *Q. cerris*; Pp: *Pyrus pyraster*; Qr: *Q. robur*; Qpet: *Q. petraea*; Qped: *Q. pedunculiflora*; Tp: *Tilia platyphyllos*; Rp: *Robinia pseudoacacia*; Pa: *Populus alba*; Qpub: *Q. pubescens*; Fe: *Fraxinus excelsior*; Ea: *Elaeagnus augustifolia*; Gt: *Gladitscia triacanthos*

3.3.3 Tending Area

The tending area is shown in the following table.

Tending Area

Type of Work	Planting Species			Total (ha)
	Quercus spp.	*Robinia* sp.	*Populus* spp.	
Supplementary Planting	543.9	234.1	2.1	780.0
Correction of Planting	2,719.3	585.2	9.8	3,314.2
Trimming and Tree Forming	2,719.3	585.2		3,304.4
Scarifying	32,631.5	2,374,8	58.8	35,065.1
Weeding	8,157.9	180.8	9.8	8,348,4
Improvement Cutting of Brush	5,438.6	585.2		6,023.7
Intraspecific Improvement Cutting	5,438.6	585.2		6,023.7
Removal of Lateral Buds			19.6	19.6
Pruning			9.8	9.8

3.4 Items Related to Nursing

The planting stock required for the Plan will be supplied in the form of seedlings and cuttings. In the case of *Q. frainetto*, a small quantity of planting stock will be produced from cuttings to supplement the production volume of seedlings in normal years.

3.4.1 Seeds

The seeding quantities for the main species follow the relevant Romanian standards.

3.4.2 Nursing

(1) Production of Seedlings

The nursing period for seedlings and the standards for planting stock follow the relevant Romanian standards.

(2) Production of Planting Stock by Cuttings

Planting stock will be produced from cuttings as a supplementary method to compensate for the low production volume of seedlings in years of low seed production of *Q. frainetto*. The production of planting stock from cuttings of *Populus alba* will be conducted in a similar manner to that of *P. euroamericana*.

1) Collection of Cuttings

Cuttings are collected from young mother trees of good quality to improve the rooting rate. In the case of *Q. frainetto*, cuttings are collected from 2 - 3 year old seedlings. As new branches are used as cuttings, they are usually collected around early May when the first growth of new branches is completed.

2) Rooting Treatment of Cuttings

After dipping the cuttings in clean water or a one or two-thousandth part silver nitrate solution for 12 hours, either S2 or oxiberon powder is applied to the cut end.

3) Cutting Bed

The cuttings are placed in a bed inside a mist house. The soil used for this purpose consists of a mixture of peat moss and sand in equal parts and the soil bed thickness is approximately 30 - 40 cm.

4) Production Period and Planting Stock Standards

The rooted cuttings are removed from the mist house and are transplanted in an open field in the autumn of the same year. They are grown in this field for 1 - 2 years to allow sufficient rooting. For reforestation purposes, cuttings which show the same degree of rooting as seedlings are used. If rooting is considered to be insufficient, the cuttings are further nursed in the nursing field.

5) Construction of Mist House

Given the demand for planting stock and the availability of seeds, some 24,000 planting stock must be produced a year from cuttings in years other than bearing yeas. Two mist houses with a floor area of 410 m^2 each will be constructed.

3.4.3 Production Volume of Planting Stock

The production volume of planting stock under the Plan is shown in the following tale.

Species	Number of Nursery Stock		
	Total	Olt	Dolj
Q. frainetto	5,120,108	1,742,390	3,377,718
Q. cerris	4,481,849	845,903	3,635,946
Q. robur	876,078	330,550	545,528
Q. petraea	149,367	62,534	86,833
Q. pedunculiflora	117,268	53,592	63,676
Fraxinus excelsior	144,949	74,418	70,531
Tilia platyphyllos	98,523	44,660	53,863
Pyrus pyraster	515,642	95,866	419,776
Robinia pseudoacacia	2,979,130	81,760	2,897,370
Gladitschia triacanthos	207,100	4,900	202,200
Elaeagnus angustifolia	103,550	2,450	101,100
Populus spp.	7,350	1,200	6,150
Assistant Trees	4,855,144	1,371,651	3,483,493
Total	19,656,057	4,711,873	14,944,184

3.4.4 Designation of Seed Stands and Management of Seed Orchard

In order to attempt increased seed production under the Plan, healthy forests capable of producing seeds are newly designated as seed stands. Moreover, appropriate management, including fertiliser application and pest control using chemical insecticides, will be conducted at the existing seed orchard in order to produce seeds.

(1) Designation of Seed Stands

Healthy upper-story trees with a large crown and good quality will be selected as seed trees. In the case of forests which are younger than 80 years old, thinning will be repeated every 10 - 15 years to remove trees other than seed trees in order to facilitate the full development of the crown with a target standing tree density of approximately 0.5 - 0.6.

(2) Management of Seed Orchard

No new seed orchards are planned under the Plan and the existing seed orchard at Balasan in the area of the Perisor Forest Range Office will be utilised.

3.5 Items Related to Drainage and Infiltration Works

Drainage and infiltration works will be constructed mainly in those areas where standing trees are remaining in damaged *Quercus* spp. forests to drain stagnant water in the top soil layer and to improve the water retention function of the soil. The following specifications will be adopted for drainage and infiltration works.

1) The standard depth and width are approximately 20 cm and 50 cm respectively.
2) The standard interval is 12.5 m. In principle, the work will run in a straight line but will avoid standing trees.
3) The total channel length per hectare is 800 m.

Four wheel drive tractors equipped with either a disc plough or carried plough will be used for the construction work. A disc plough will be used at those sites where the ground surface is reasonably soft while a carried plough will be used at those sites with a hard ground surface. The planned annual work volume for the construction of drainage and infiltration works as a damage restoration measure and the cost are shown in the following table.

Annual Work Volume and Direct Cost of Drainage and Infiltration Works as Damage Restoration Measure

County	Operation Year										Total (ha)	Cost (US$)
	1	2	3	4	5	6	7	8	9	10		
Olt				448.1	1,500.0						1,948.1	14.741
Dolj				383.1	1,500.0	1,500.0					3,383.1	25,601
Total				831.2	3,000.0	1,500.0					5,331.2	40,341

3.6 Supplementary Planting at Forest Mantle

In the case of those stands of which the coverage ratio by forest mantle is less than 60%, supplementary planting will be conducted to achieve the target coverage ratio of 80% for the purpose of suppressing the progress of forest decline through reduction of the damage by drought, high temperatures, strong wind and stock raising. The supplementary planting standards are as follows.

1) The planting species will be *R. pseudoacacia*, *Elaeagnus angustifolia* and *Gladitschia triacanthos*. The standard planting density will be 10,000 trees/ha with a planting distance of 1 m x 1 m.
2) For soil preparation, a mini backhoe will be used to plough the ground for a width of 50 cm and a depth of 40 cm.
3) For tending, a 30 cm wide cultivator will mainly be used to scarify the ground.

The planned annual work volume of supplementary planting at forest mantle and the direct cost are shown in the following table.

Annual Work Volume and Direct Cost of Supplementary Planting at Forest Mantle

County	Operation Year										Total	Cost
	1	2	3	4	5	6	7	8	9	10	(ha)	(US$)
Olt				6.0	7.4						13.4	24,117
Dolj				6.0	6.0	7.1					19.1	34,375
Total				12.0	13.4	7.1					32.5	58,492

3.7 Items Related to Forest Road Network

The forest road surface will be improved for the proper maintenance of and safe passage on forest roads. The total length of improvement work will be 77 km at a direct cost of US$ 266,900.

3.8 Items Related to Forestry Machinery

The range of the required machinery and their costs for the implementation of the Plan are shown in the following tables.

Machinery/Equipment Required for Timber Production

Machinery/Equipment	Purpose	Quantity	Cost (US$ 1,000)
4 WD Tractor	Skidding and stacking	12	728
<Attachments for Above>			(Inclusive of attachment cost)
Skidd	Skidding	6	
Grab for Stacking	Stacking and arrangement of wood	6	
Chainsaw	Felling, trimming and cross-cutting	112	68

Machinery/Equipment Required for Reforestation

Machinery/Equipment	Purpose	Quantity	Cost (US$ 1,000)
Mini Back-Hoe	Soil preparation at group selective cutting sites and forest mantles	10	475
Earth Auger	Digging planting holes at forest mantles	4	9
Cultivator (60 cm wide)	Scarifying at cut-over sites	60	44
Cultivator (30 cm wide)	Scarifying at group selective cutting sites	71	70

Machinery/Equipment Required for Drainage and Infiltration Work Construction

Machinery/Equipment	Purpose	Quantity	Cost (US$ 1,000)
4 WD Tractor	For both damaged forests and prevention forests	2	11
<Attachments for Above>			(Inclusive of attachment cost)
Disc Plough		2	
Carried Plough		2	

3.9 Items Related to Local Development

Among the subject forests of the Plan, those with recreational use and landscape maintenance functions will be improved in order to facilitate the increased use of forests by local people for public health, educational and cultural purposes.

3.9.1 Establishment of General Arboretum

Under the Plan, an arboretum consisting of species found in the Study Area and *Prunus* spp., and a turfed area will be created. The use of these areas for observation and recreation by local people is intended to assist their understanding of the forest ecosystem and the development of outdoor recreational activities by local people. These areas are planned at the following sites.

• Craiova Forest Range Office UP IV Cosoveni

144A 20.1 ha (50 years old)
144E 5.2 ha (50 years old)

The work period to create a general arboretum is planned to be three years at a direct cost of US$ 115,316.

3.9.2 Establishment of Forestry Work Demonstration Forests

Following the progress of the privatisation of forests as well as work related to national forests, improvement of the forestry skills in the private sector is becoming increasingly necessary. Accordingly, the establishment of forestry work demonstration forests at the following sites where such skills can be learned is planned under the Plan.

• Bals Forest Range Office UP V Saru

142B 1.3 ha (75 years old)
157E 2.4 ha (75 years old)

• Craiova Forest Range Office UP IV Cosoveni

145A 19.2 ha (50 years old)

The work period to create these demonstration forests is planned to be 10 years at a direct cost of US$ 35,329.

3.10 Items Related to Technical Development and Extension of New Techniques

A breeding technique for resistant trees will be developed to create *Q. frainetto* and *R. pseudoacacia* stands which are highly resistant to drought. The types of work required and direct cost of developing a breeding technique for resistant trees are described below.

Selection of candidate resistant trees	: US$	1,740
Propagation of resistant planting stock	: US$	212,245
Testing of resistance	: US$	1,290
Establishment of seed orchard	: US$	1,933

3.11 Work Volumes of Damage Restoration Measures

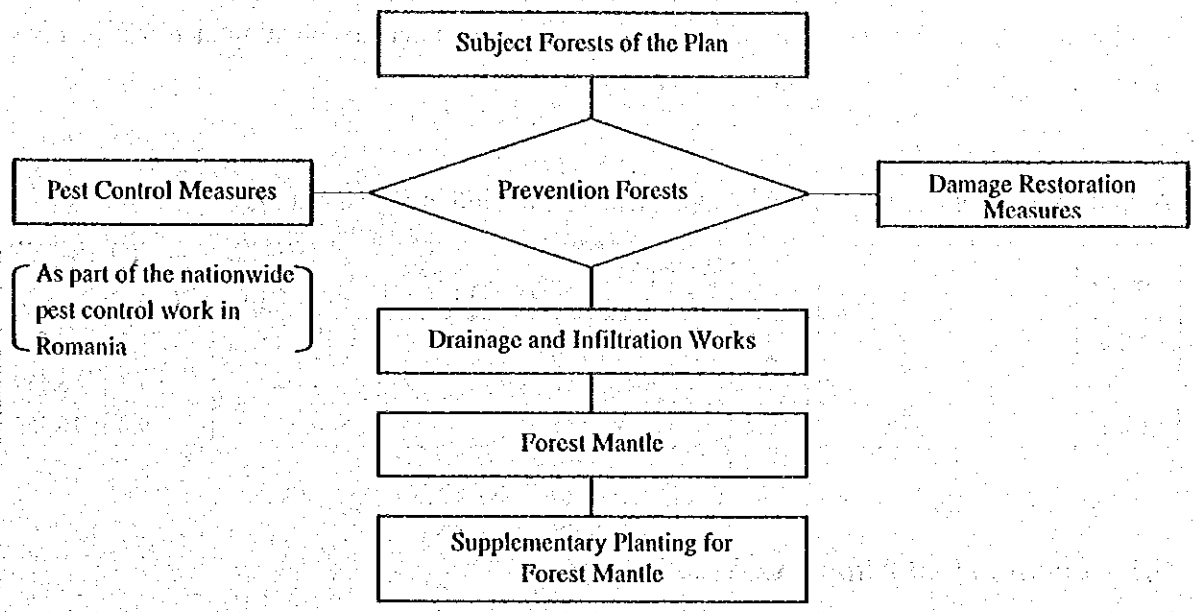
The planned work volumes of the main damage restoration measures are shown in the following table.

Work Volumes of Main Damage Restoration Measures

Type of Work	Work Volume	Remarks
Cruising, Cutting, Bucking and Yarding	485,864 m^3	
Sale of Wood — Clearance of Damaged Trees: Total	485,864 m^3	
Wood for Forest Products Industry: Sub-Total	9,717 m^3	
Pulpwood and Firewood: Sub-Total	476,147 m^3	
Reforestation	3,314.2 ha	By planting species
Main Species of Present Stands: *Quercus* spp.	2,696.0 ha	2,719.3 ha
Robinia sp.	591.4 ha	585.2 ha
Populus spp.	26.9 ha	9.80 ha
Tending		
Supplementary Planting	780.0 ha	
Correction of Planting	3,314.2 ha	
Scarifying	35,030.9 ha	
Weeding	8,348.4 ha	
Improvement Cutting of Brush	6,023.7 ha	
Intraspecific Improvement Cutting	6,023.7 ha	
Removal of Lateral Buds and Pruning	29.4 ha	
Drainage and Infiltration Works	5,331.2 ha	
Supplementary Planting at Forest Mantle	32.5 ha	
Improvement of Forest Roads	77 km	
Cruising (at Time of Thinning)	257,520 m^3	
Sale of Standing Trees (at Time of Thinning) Total	257,520 m^3	
Cruising (at Time of Final Cutting)	1,065.210 m^3	
Sale of Standing Trees (at Time of Final Cutting) Total	1,065,210 m^3	
Wood for Forest Products Industry	405,916 m^3	
Pulpwood and Firewood	659,293 m^3	

4.1 Forest Decline Prevention System

Drainage and infiltration works and supplementary planting at forest mantles are planned under the Plan to prevent forest decline.



4.2 Construction of Drainage and Infiltration Works

Drainage and infiltration works will be constructed at prevention forests to reduce the water stress at these forests by means of facilitating the drainage of stagnant water in the top soil layer and enhancing the water retention function of the soil so that the progress of forest decline is contained. The specifications of the planned drainage and infiltration works and machinery to be used are the same as those for the drainage and infiltration works under the damage restoration measure. The annual work volume and direct cost of the drainage and infiltration works as a decline prevention measure are shown in the following table.

Annual Work Volume and Direct Cost of Drainage and Infiltration Works as Decline Prevention Measure

County	Operation Year										Total	Cost
	1	2	3	4	5	6	7	8	9	10	(ha)	(US$)
Olt				722.0	1,051.9						1,773.9	13,423
Dolj				1,374.8	1,116.9						2,491.7	18,855
Total				2,096.8	2,168.8						4,265.6	32,278

4.3 Supplementary Planting at Forest Mantle

Supplementary planting will be conducted at those stands where the forest mantle coverage is less than 60% to achieve a target coverage of 80% for the purpose of containing the progress of forest decline by means of preventing damage due to drought, high temperatures, strong wind and stock raising. The annual work volume of supplementary planting at forest mantle and the cost are shown in the following table.

Annual Work Volume and Cost of Supplementary Planting at Forest Mantles

County	Operation Year										Total	Cost
	1	2	3	4	5	6	7	8	9	10	(ha)	(US$)
Olt				4.5							4.5	8,100
Dolj				4.7							4.7	8,459
Total				9.2							9.2	16,559

5.1 Environmental Impacts Assessment

Damage restoration work is centered around: 1) ploughing the top layer of soil using civil engineering and agricultural machinery at the sites where cutting, sawing and clearing primarily of damaged trees are conducted, 2) planting and growing species that are highly drought-resistant and suitable for the soil conditions at the sites in question. Drainage and infiltration works will be performed between remaining standing trees in order to facilitate the drainage of stagnant water and permeability in the top soil layer.

The topography of the Plan's target forests is generally flat and soil preparation work is conducted while creating remaining areas of healthy standing trees. As a result, the work involves little risk to soil conservation.

It is anticipated that natural vegetation will quickly emerge on the ploughed top soil after planting and will proceed to cover the ground surface as the planted trees grow, thereby restoring the natural environment and enhancing various forest functions.

5.2 Evaluation of Planned Work

5.2.1 Financial Analysis

The cost and income associated with the implementation of the planned work are compared here to evaluate the suitability of the scale and the profitability of the Plan. The cost required for the implementation of the major work is listed in the following table.

Type of Work	Unit	Total for Two Counties		
		Quantity	Direct Cost (US$)	Total Cost Inclusive of Indirect Cost
Cruising	m^3	485,864	113,333	130,332
Production Work	m^3	485,864	953,907	1,096,993
Reforestation Work	ha	3,314.2	6,167,210	7,092,292
Drainage and Infiltration Works	ha	5,331.2	35,079	40,342
Supplementary Planting at Forest Mantles	ha	32.50	50,866	58,496
Improvement of Forest Roads	km	77	266,921	306,959
Total of Original Work			7,587,315	8,725,413
				Including Repair Cost
Procurement of Machinery	No.	271	1,366,613	1,503,274
Hand Tool			10,049	11,054
Cruising (Thinning)	m^3	257,520	167,917	193,105
Cruising (Final cutting)	m^3	1,087,442	198,003	227,703
Total of Damage Restoration Measures			9,329,897	10,660,549
Drainage and Infiltration Works	ha	4,265.6	28,067	32,278
Supplementary Planting at Forest mantles	ha	9.2	14,399	16,559
Total of Decline Prevention Measures			42,466	48,837
Grand Total			9,372,363	10,709,386

The total cost of damage restoration measures is approximately US$ 10.66 million, of which reforestation and tending expenses account for 66.5%.

The income from damage restoration measures is expected to be approximately US$ 99.38 million which is roughly 9.7 times higher than the initial restoration cost of approximately US$ 10.27 million.

The annual difference between the income and expenditure indicates that there will be over-expenditure of some US$ 1 million in the tenth year but in the other years will be less than US$ 0.43 million. In view of the recent annual wood sales figures of the two forest branch offices concerned, the above deficit level may be adjusted within the RNP budget.

The period of financial analysis stretches to the 169th year when the final harvest of the planted *Quercus* spp. will be completed. The FIRR (Financial Internal Rate of Return) calculation results for this long period of time is 3.5%.

The average annual economic growth rate of Romania in recent years is 3.4% but the real economic growth is judged to be extremely low in view of various economic indices. It is, therefore, important for the RNP to increase the economic value of forests by means of preventing forest decline, restoring declined forests and enhancing wood resources and also to contribute to the preservation of the agricultural as well as living environments around forests by means of managing forest land which appears to be decreasing as forests.

5.2.2 Economic Analysis

The economic analysis items for the Plan, taking activities other than wood production into consideration, including the harvesting of such forest by-products as medicinal herbs and small fruits, hunting and apiculture. The annual potential production values of these activities to contribute to the local economy based on the area of damaged forests are estimated to be approximately US$ 33,000 for forest by-products, approximately US$ 43,000 for hunting and approximately US$ 35,000 for apiculture, totalling approximately US$ 111,000.

The estimated EIRR (Economic Internal Rate of Return) for 169 years, when the above potential earnings are added to the income from wood production, is 5.6%. As in the case of the FIRR results, the anticipated scope of the economic effects may not justify the introduction of external funds. However, the wood production and other forest-related productive activities mentioned above should serve as a valuable component of a sustainable local agricultural economy where economic performance level remains stable.

5.2.3 Impacts on Local Economy

The restoration of damaged forests could have indirect impacts on the local economy which may not be manifest as tangible effects for economic evaluation.

The expected annual economic contribution of restored forests to the local economy includes some US$ 12.1 million by the windbreak effect of boosting agricultural production behind forests, some US$ 22.8 million by the water resources conservation effect of supplying irrigation water, some US$ 0.54 million by the soil conservation effect of nullifying the cost of soil retaining work required to contain the amount of soil which would be discharged if forests did not exist and some US$ 15,000 by the recreation effect of forests as the estimated expenditure on picnics in forests around local cities. Moreover, the provision of working opportunities in forestry for many potential or surplus workers should constitute a positive effect of the implementation of the Plan for local people.

RECOMMENDATIONS

The Plan intends the restoration of declined forests and promotion of the enhancement of the economic and public benefit functions of forests, thereby contributing to improvement of the lives of local people. The following recommendations are made in relation to the implementation of the Plan.

1. Priority of Planned Work

   The most important work is improvement of the soil conditions of reforested forest land as well as forest land where standing trees are remained for the purpose of sustaining the healthy growth of forest trees rather than simply attempting forest restoration through planting.

   From this viewpoint, the important requirements for the restoration of damaged forests are soil preparation by ploughing together with deep strips at cut-over sites and drainage and infiltration works where channel-like ploughed strips are created at remained areas and weakly damaged forests. In the case of prevention forests, the introduction of drainage and infiltration works is important.

2. Improvement of Profitability of Restoration Activities

   The restoration of declined forests requires a vast amount of expenditure and the planted trees, mainly *Quercus* spp. require a long time to grow. It is, therefore, important to improve the profitability of the Plan as much as possible by means of establishing a system whereby both the public and private sectors cooperate with each other to facilitate the production of forest by-products, hunting and apiculture, etc. to produce annual income utilising various forest functions.

3. Integrated Implementation of Forest Plan

   The proper management of the entire existing stands which are distributed as consolidations is essential for the restoration of declined forests so that these forests can fully perform their respective forest functions. Accordingly, the promotion of an integrated forest plan for each watershed is important even though there has been a trend to privatise national forests.

4. Improved Awareness of Importance of Forests

Forests are able to perform some functions meaningfully as individual stands, and others meaningfully in concert with one another as part of a watershed. It is important to improve the understanding of local people concerning the various functions of forests so that when making use of them they will do so in a manner that sustains their natural resources and environmental assets.

The privatisation of national forests is currently underway. The forest ratio of the Southern Plain in Romania is already lower than that of neighboring countries and should forests diminish in size, there is a danger that they will be unable to perform their diverse functions.

It is therefore essential for the Government of Romania to publicize the importance of forests to everyone in the country. The Government of Romania should also consider strategies to expand forest area and actively engage in the development and widespread adoption of appropriate forestry technologies.

5. Development and Improvement of Various Techniques Required for Healthy Growth and Management of Forests

Forest decline at Romania's Southern Plain has been strongly affected by the long-term phenomenon of low precipitation. The Government of Romania must be actively assumed in the following work to overcome the problem of continuing forest decline.

- Development and improvement of techniques to select and grow suitable trees as well as suitable species
- Development of a monitoring system capable of evaluating the results of implemented activities

MAIN REPORT

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ABBREVIATION

AGVPS	: Asociata Generala a Vinatorilor si Pescarilor / General Association of Hunting and Fisheries
CO_2	: Carbon dioxide
COMECON	: Council for Mutual Economic Assistance
C/P	: Counterpart personnel
DBH	: Diameter of Breast Height
DDT	: Dichlorodiphenyltrichloroethane
DF/R	: Draft Final Report
EC	: European Community
EC (μ s/cm)	: Electric Conductivity
EIRR	: Economic Internal Rate of Return
F/R	: Final Report
F/S	: Feasibility Study
FAO	: Food and Agriculture Organization of the United Nations
FAO/TCP	: FAO/Technical Cooperation Project
FD/R	: Field Report
FIRR	: Financial Internal Rate of Return
4WD	: Four wheel drive
GDP	: Gross Domestic Product
GIS	: Geographic Information System
GMOF	: General manager's office of forestry
GPS	: Global Positioning System
IC/R	: Inception Report
ICAS	: Institutel de Cercetari si Amenajari Silvice / Forest Research and Management Institute
ICP Forest	: International Co-operative Programme on Assessment and Monioring of Air Pollution Effects on Forests
ICPA	: Institutul de Cercetari pentru Pedologice si Agrochimice / Pedological and Agrochemical Research Institute
IEE	: Initial Environmental Examination
ILO	: International Labor Organization
IT/R	: Interim Report
JICA	: Japan International Cooperation Agency
M/M	: Minutes of Meeting on Scope of Work for The Feasibility Study on Forests Restoration in Romanian Plain
MWFEP	: Ministerul Apelor, Padurilor si Protectiei Mediului / Ministry of Waters, Forests and Environmental Protection
NGO	: Non Governmental Organizations
NO_3	: Nitrogen Trioxide
OJT	: On the Job Training
PDM	: Project Design Matrix
OS	: Ocol Silvic / Forest Range
pF	: pF value
pH	: pH value (Potential of Hydrogen)
PR/R	: Progress Report
RNP	: Regia Nationala a Padurilor / National Administration of the Forest
S/W	: Scope of Work for The Feasibility Study on Forests Restoration in Romanian Plain
Study Area	: Dolj and Olt Counties

Study Team	: The Study Team on The Feasibility Study on Forests Restoration in Romanian Plain
The Plan	: The Forest Restoration Plan
The Study	: The Feasibility Study on Forests Restoration in Romanian Plain
ua.	: unitatea amenajamentul / compartment
UN-ECE	: Economic Commission for Europe of the United Nations
UNESCO	: United Nations Educational Scientific and Cultural Organization
UP	: Unitatea productie / Production unit

UNITS

cm^2	: square centimeter
m^2	: square meter
ha	: hectare
km^2	: square kilometer
mg	: milligram
g	: gram
kg	: kilogram
t	: ton
/s	: per second
/min	: per minute
/hr	: per hour
/mon	: per month
/y	: per year
mm	: millimeter
cm	: centimeter
m	: meter
km	: kilometer
cc	: cubic centimeter
ml	: milliliter
l	: liter
hl	: hecto liter (100lit)
m^3	: cubic meter
%	: percent
°C	: degrees Celsius
min	: minimum
max	: maximum
No.	: number
DM	: Deutsche Mark
Leu/Lei	: Romanian currency (Leu: singular, Lei: plural)
US$	: United States Dollar

VALUE

1US$=7,168Lei	: Average value (1998)
1US$=8,865Lei	: Average value in the third quarter of 1998

Names of Organizations Used in this Report

At the end of December, 1998, the RNP underwent radical reorganization. The names of organizations as of 31st December, 1998 are mainly used in this Report. Those organizations which were incorporated with other organizations are identified by the prefix "former" as shown in the list below.

Old Name as of 31st December, 1998	Name Used in This Report
Forest Branch Office (Directia Silvica)	Forest Branch Office (Directia Silvica)
Slatina Forest Branch Office	*Ramnica Valcea Forest Branch Office or Former Slatina Forest Branch Office*
Craiova Forest Branch Office	*Targu Jiu Forest Branch Office or Former Craiova Forest Branch Office*
Forest Range Office (Ocol Silivic)	Forest Range Office (Ocol Silivic)
Bals Forest Range Office	Bals Forest Range Office
Caracal Forest Range Office	Caracal Forest Range Office
Corabia Forest Range Office	*Former Corabia Forest Range Office*
Slatina Forest Range Office	Slatina Forest Range Office
Draganesti-Olt Forest Range Office	*Former Draganesti-Olt Forest Range Office*
Vulturesti Forest Range Office	Vulturesti Forest Range Office
Amaradia Forest Range Office	Amaradia Forest Range Office
Calafat Forest Range Office	Calafat Forest Range Office
Poiana Mare Forest Range Office	*Former Poiana Mare Forest Range Office*
Craiova Forest Range Office	Craiova Forest Range Office
Filiasi Forest Range Office	Filiasi Forest Range Office
Perisor Forest Range Office	Perisor Forest Range Office
Sadova Forest Range Office	Sadova Forest Range Office
Apele Vii Forest Range Office	*Former Apele Vii Forest Range Office*
Segarcea Forest Range Office	Segarcea Forest Range Office

FIRST PART

STUDY FINDINGS

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

The Romanian Plain, the subject area of the Study, is an area where damage to forestry and agriculture due to drought has often occurred. The phenomenon of forest decline in the Southern Plain caused by decreasing rainfall since 1984 in particular has affected nearly 35,000 ha of forests.

Under these circumstances, the Government of Romania believed it to be essential to conduct a fact-finding survey, including analysis of the causes of forest decline and examination of possible forest restoration measures, and made a request to the Government of Japan in September, 1994 for the provision of technical cooperation for the formulation of a forest restoration plan.

In response to this request, the Government of Japan sent the Preliminary (Preparatory) Study Team to Romania in April, 1996, followed by the dispatch of another Preliminary (S/W) Study Team in April, 1997 which subsequently concluded the Scope of Work (S/W). It was then decided that the present Feasibility Study on Forests Restoration in Romanian Plain (hereinafter referred to as the Study) would be implemented in accordance with the S/W.

1.2 Objectives of the Study

The forest areas distributed in Olt and Dolj Counties located on the Southern Plain in Romania are established as the Study Area. The objectives of the Study are to investigate the state of forest decline, the types and level of damage and vegetation in the Study Area using aerial photographs and the field survey results and also to formulate a forest restoration plan (hereinafter referred to as the Plan) by means of analysing the existing measures to deal with the phenomenon of forest decline in Romania.

1.3 Scope of the Study

The scope of the Study covers 115,806 ha of national forests located in Olt and Dolj Counties. The forest areas of these two counties are shown in the following table.

(Unit: ha)

County	County Area (A)	Forest Area (B)	Broad-Leaved Forest Area	Coniferous Forest Area	National Forest Area (C)	B/A (%)	C/A (%)	C/B (%)
Olt	549,800	51,800	51,300	500	42,999	9.4	7.8	83.0
Dolj	741,400	81,700	76,900	1,100	72,807	11.0	9.8	89.1
Total	1,291,200	133,500	128,200	1,600	115,806	10.3	9.0	86.7
Ratio	100.0%	10.3%	9.9%	0.1%	9.0%			

Source: *The Romanian Forests Planning*

In accordance with the objectives of the Study, field surveys were conducted on national forests which have already been damaged and threatened with decline due to drought (these two types of national forests are collectively called "declined forests" in this report).

1.4 Basic Principles of the Study

In regard to the implementation of the Study, the main focus was placed on (i) changes of such climatic conditions as precipitation and temperatures, (ii) characteristics of such forest site conditions as topography and soil, (iii) forest structure and ecological environment and (iv) state of damage by diseases and pests, etc. with a view to studying and analysing the most characteristic issues and phenomena using existing information and data collected in advance.

In regard to the formulation of the Plan, countermeasures that would be appropriate for the types and degree of forest damage were formulated while taking the Forest Code and other legal and institutional systems in Romania and the state of use of labour and equipment, etc. into consideration.

A preliminary assessment of the predictable environmental impacts and costs/benefit of execution of the Plan was also conducted.

1.5 Outline of the Study Items

(1) Forest Conservation

To establish the precise causes of forest decline, it is essential to clarify the environmental characteristics of declined forests compared to those of healthy forests. In particular, when deterioration of the land conditions is the problem instead of such highly independent factors as diseases and pests, the functions of specific factors, including

moisture content and others, must be clarified within the framework of the overall environment because of their strong inter-relationship. Such a general assessment of specific factors is essential even if special emphasis is placed on certain factors. From this point of view, common environmental factors for both healthy and declined forests were surveyed to clarify their relationship with the growth of forest trees. To be more precise, the factors surveyed were those related to land conditions, such as topography, soil, geology and climate, including precipitation, and characteristic factors of a stand, such as tree height, DBH, crown density, tree density and root system, etc.

(2) Forest Ecology and Environment Survey

In order to analyse the causes of forest decline, the results of the forest decline monitoring conducted in Romania were examined and a stand composition survey and fact-finding survey on forest decline were conducted at natural forests and artificial forests of *Quercus* spp. and major broad-leaved forests in the Study Area. As the declined stands were composed of multiple species, the tree form, state of tree top death and degree of defoliation, etc. of individual trees were checked to judge and classify the type and level of stand damage.

As a result of these surveys, it became clear that the degree of stand decline reflected the characteristics of individual species and that, among *Quercus* spp., *Q. frainetto* showed the highest level of decline.

In regard to the environmental impacts assessment, the Initial Environmental Examination (IEE) was compiled.

(3) Reforestation and Nursing Survey

The current standards of forest management and situation of forest growth were surveyed to establish forest management standards for the Plan. In addition, the results of the breeding experiment using cuttings were analysed and the feasibility of creating a *Quercus* spp. seed orchard and the breeding of high resistance seeds were confirmed.

(4) Forest Diseases and Harmful Insects Survey

The study on the disease and pest control system of the Regia Nationala a Padurilor (RNP) found that a nationwide survey on the changing situation of pest outbreaks is conducted every year and that the RNP has been successful in preventing the spread of pest damage by means of selecting extensively damaged areas (as well as high risk areas) based on the annual survey results and the spraying of biological pesticides. Coupled

with the analysis result of existing data, it is judged that the spread of diseases and pests in Romania can be prevented by the continual application of the existing control method and that the introduction of special pest control measures for declined forests under the Plan is unnecessary. Meanwhile, the survey on damage to local forests by defoliators, wood borers and seed borers concluded that their predators have controlled the density of pests in forests, indicating a need to protect and propagate these natural enemies within the disease and pest control plans in Romania.

(5) Soil Survey

A soil profile survey was conducted on the typical soil of forest areas to establish the relationship between the forest decline factors and soil type. The leading soil unit (based on the FAO/UNESCO system) of declined forests is LVx (Chromic Luvisols) which is distributed at plateaus and middle terraces, followed by LVa (Albic Luvisols), CHk (Calcic Chernozems), PHl (Luvic Phaeozems), CMv (Vertic Cambisols) and PDj (Stagnic Podzoluvisols). Among Luvisols, LVh (Haptic Luvisols) and LVj (Stagnic Luvisols) are less linked to forest decline. Forest decline is less apparent at mountain foot slopes, low terraces, riverside terraces and flood plains. The soil of declined forests typically shows a high clay content and high hardness. The decrease of fine pores due to compaction of the soil has produced poor physical soil properties in terms of water permeability and retention.

(6) Climate and Forest Hydrology Survey

A climate and forest hydrology survey was conducted to clarify the causes of forest decline and to establish desirable forest tending methods. The precipitation is found to have declined from 1980 to 1994 while the temperature has shown an increasing trend since the late 1980's. Farmland has the highest top soil layer infiltration capacity, followed by grassland and forest land in terms of the land use category. The groundwater level is generally linked to the water level of nearby large or medium size rivers. Declined forests are often observed at middle and high terraces where the groundwater level is comparatively deep.

(7) Forest Survey

Using the plot survey findings, the structure of declined forests was established and the aerial photograph interpretation criteria were finalised. The area of declined forests was estimated based on the relevant field survey results and aerial photograph interpretation results. During the Fifth Field Survey, a verification survey on the aerial photograph

interpretation results was conducted, and the subject area of the Plan was finalised. Then thematic maps and a forest damage survey book were prepared.

(8) Forest Management Survey

Using materials provided by the RNP, the forest planning and management systems were analysed. In addition, a field survey and interview survey were conducted to obtain and analyse information and data on the system for forest management, cutting and production work, regeneration and tending work, forest roads and erosion control work, etc. Based on the results of these surveys, it is judged that the RNP is capable of continuously implementing the work to restore declined forests in addition to its usual work.

(9) Financial and Economic Analyses

Analysis of the implementation cost of the various works and the expected benefits of forest restoration work found that the implementation of work involving large forestry machinery will be very expensive and that timber prices in Romania are much lower than the international market prices. The survey on the local availability of labour and equipment, both of which are essential for the implementation of forest restoration work, found that both are sufficiently available locally. A survey was also conducted on (i) the current state of damage to forest trees, (ii) possible impacts of forest decline on wood-related industries as well as the local demand for firewood and (iii) possible impacts on the various public benefit functions of forests which affect agriculture and the lives of local communities, etc. The general conclusions in these aspects are that apart from a decline of the wood quality, no major damage due to forest decline has emerged in the Study Area even though there is concern in regard to its adverse impacts on forest by-products and farming in nearby areas.

(10) Socioeconomic Survey

The socioeconomic conditions of the subject counties were surveyed using Romanian annual statistical reports and annual reports for Dolj and Olt Counties. In addition, local people were interviewed on such issues as their use of forests, expected functions of forests and role of forest to contribute to local development. This interview survey found that there are increasing expectations among local people for various environmental protection functions, including the windbreak effect, and the use of forests for apiculture, hunting and recreational activities in addition to the timber production function of forests.

(11) Examination of Measures Regarding Declined Forests

Based on the causes and mechanism of forest decline established by the forest survey and analysis of the results, measures to restore forests were examined. This examination concluded that planting after deep ploughing by large machinery as well as water infiltration works by 4WD tractors fitted with carried ploughs or disc ploughs and work to encourage root suckers will be effective for damaged forests and that work to facilitate water infiltration by means of 4WD tractors fitted with carried ploughs or disc ploughs will be effective for prevention forests. In addition, it will be particularly important in the coming years to further examine such issues as "the selection of suitable sites", "improvement of the drainage conditions of specific sites", "silviculture techniques suitable for the characteristics of *Quercus* spp.", "selection of resistant species" and "improvement of nursing techniques".

For the purposes of the Plan, it was decided to call damaged national forests "damaged forests" and to call the work designed to restore damaged forests "damage restoration measures". It was also decided to call national forests of which the decline should be avoided and the work designed to ensure the avoidance of forest decline "prevention forests" and "decline prevention measures" respectively.

The area of declined forests is shown in the table below based on existing data and the field survey findings.

County	National Forest Area A	B	C	B + C	(B + C)/A
Olt	42,999 ha	2,866 ha	1,774 ha	4,640 ha	10.8%
Dolj	72,807 ha	6,338 ha	2,492 ha	8,830 ha	12.1%
Total	115,806 ha	9,204 ha	4,266 ha	13,470 ha	11.6%

B: Area of damaged national forests, i.e. damaged forests
C: Area of national forests where forest decline must be controlled (prevention forests)

The total subject area of the Plan is 13,470 ha [the sum of the above forest categories of B and C (declined forests)].

The Study was conducted for three fiscal years from fiscal 1997 to fiscal 1999. Fig. 1-5-1 shows the flow of the Study.

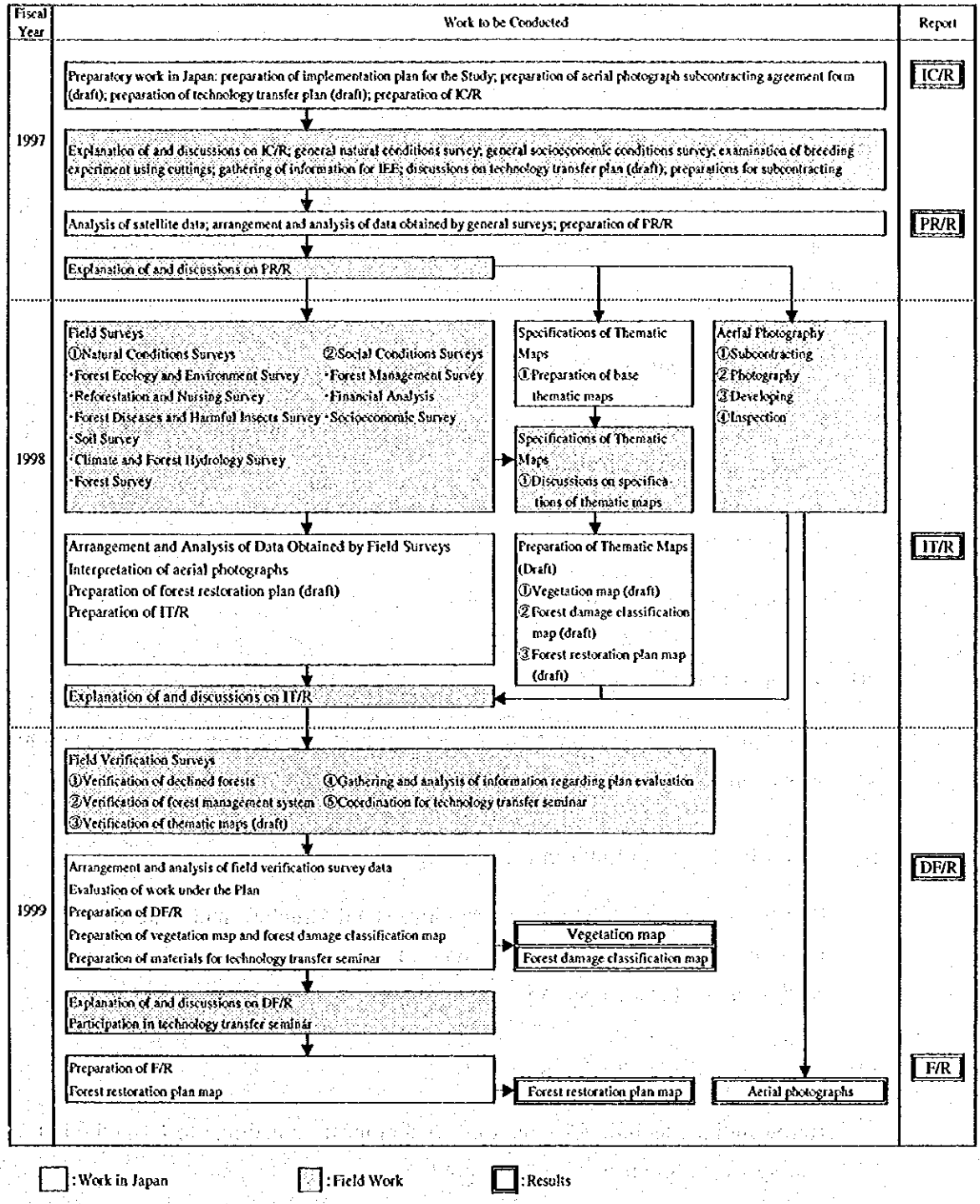

Fig. 1-5-1 Flow Chart of the Study

1.6 Transfer of Technology

(1) Transfer of Technology/Techniques in Romania

1) Field Survey Training (OJT: On-the-Job Training)

The transfer of technology/techniques featuring the following items in each specialist area was conducted by means of OJT (counterparts mainly selected from the RNP, ICAS and forest management offices).

i) Forest Conservation

Forest restoration plan formulation techniques; analysis of relationship between factors of forest decline

ii) Financial and Economic Analysis

Financial analysis; economic analysis

iii) Socioeconomic Survey

Forest landscape preservation survey; initial environmental examination; survey on forest functions and development of local communities

iv) Forest Ecology and Environment Survey

Belt-transect survey of forest vegetation, stand structure and state of decline; forest ecology survey; survey of state of propagation of *Quercus* spp. using seed traps; root system survey

v) Reforestation and Nursing Survey

Reforestation techniques; nursing techniques; breeding test method for cuttings; breeding test method for grafts

vi) Forest Diseases and Pests

Ecological survey of disease and pest damage

vii) Soil Survey

Soil profile survey; soil penetration survey

viii) Climate and Forest Hydrology Survey

Soil moisture content survey; soil infiltration capacity survey; groundwater level survey

ix) Forest Survey

General forest survey; forest survey methods in Japan; aerial photograph interpretation techniques; global positioning system (GPS) utilisation techniques

x) Forest Management Survey

Site index survey; yield table survey; aerial photograph interpretation techniques; comparison of effectiveness of relevant legislation in other countries

2) Technology Transfer Seminar

A technology transfer seminar was held in November, 1999 at the conference room of the RNP in Bucharest. Three topics from the Study Team, one topic from the JICA Advisory Team and five topics from the Romanian counterpart personnel were presented at this seminar.

(2) Transfer of Technology/Techniques in Japan

The following training has so far been conducted in Japan for four counterpart personnel.

1) Mr. Mihai Dragos

- Period: 29th January - 13th March, 1999

· General review of forest pests	Japan Forest Civil Engineering Consultants Foundation
· Defoliator control techniques	Forestry and Forest Products Research Institute
· Gypsy moth control and prediction	Hokkaido Forestry Research Institute of its outbreak
· Pine wilt disease control techniques	Fukuoka Prefecture Forest Research and Extension Centre

· Seed borer control techniques	Forest Tree Breeding Centre
· Forest preservation techniques	Mt. Unzendake (Nagasaki Prefecture) Sakurajima Island (Kagoshima Prefecture)
· Broad-leaved tree management	Miyoshi Town History Museum, Saitama Prefecture
· Remote sensing	Pasco International (Co., Ltd.)

2) Mr. Blujdea Viorel Neul Bellmondo

· Period 1st November - 1st December, 1998

· Forest hydrology (forest decline and forest hydrology)	Department of Agriculture, Kyushu University
· Plant physiology (plant physiology and forest hydrology)	Department of Agriculture, Kyushu University
· Plant physiology (carbon assimilation)	Experiment Forest of Department of Agriculture, Kyushu University
· Forest hydrology (evapotranspiration and water resources)	Department of Agriculture, Tokyo University
· Plant physiology (environmental stress and forest decline)	Department of Agriculture, Tokyo University
· Forest restoration	Technical Research Institute, Japan Forest Civil Engineering Consultants Foundation

3) Mr. Popovici Laurentiu

· Period 25th August - 21st September, 1999

· Forest management (forestry administration in Japan)	Forest Policy Research Institute

· Forest management (public benefit functions and forestry operation)	Miyoshi Town History Museum, Saitama Prefecture
· Regeneration techniques	Hokkaido Forestry Research Institute
· Nursing techniques (seed stand)	Annaka City, Gumma Prefecture
· Nursing techniques (nurseries and breeding of resistant species)	Forest Tree Breeding Centre
· Forest restoration (meteorological damage; disease and pest damage)	Forestry and Forest Products Research Institute
· Forest restoration (restoration of degraded forests)	Technical Research Institute, Japa n Forest Civil Engineering Consultants Foundation

4) Mr. Biris Adrian Iovu

· Period 14th November – 14th December, 1999

· Forest management (monitoring survey)	Forestry and Forest Products Research Institute
· Forest Ecology (root system survey)	Forestry and Forest Products Research Institute
· Forest management (acrial photography)	Japan Forest Civil Engineering Consultants Foundation
· Planning of Restoration Plan/Financial and Economic Analysis	Japan Forest Civil Engineering Consultants Foundation
· Forest Ecology (ecological observation method for deciduous trees)	College of Hokkaido, Senshu University
· Forest Ecology (methods of observing activities of deciduous trees)	Hokkaido Forestry Research Institute
· Forest management (remote sensing)	Hokkaido Forestry Research Institute Pasco International Co. Lt.

· Forest management (remote sensing)	Hokkaido Forestry Research Institute Pasco International Co. Lt.
· Forest restoration (soil erosion control using deciduous trees)	Hokkaido Forestry Research Institute
· Forest restoration (devastated forest restoration)	Technical Research Institute, Japan Forest Civil Engineering Consultants Foundation
· Forest management (public functions and forestry)	Miyoshi Town History Museum, Saitama Prefecture