

Use of land and distribution of vegetation in the target area

(1) Mantasoa zone

	A				B		C		D		E		Unit: ha, %	
													Total area of the zone covered by vegetation	
1	Natural forest (approximate density above 50%)	0.88	0.2	0.00	0.0	0.00	0.0	131.17	3.9	44.59	1.4	176.64	1.6	
2	Natural forest (approximate density less than 50%)	0.00	0.0	0.13	0.0	2.94	0.1	20.50	0.6	13.69	0.4	37.26	0.3	
3	Pine afforestation (approximate density above 40%)	7.88	1.4	314.77	16.2	27.62	1.4	16.38	0.5	62.39	1.9	429.04	3.9	
4	Pine afforestation (approximate density less than 40%)	10.80	1.9	23.51	1.2	17.71	0.9	41.69	1.2	42.23	1.3	135.94	1.2	
5	Eucalyptus afforestation	196.64	34.6	360.62	18.5	868.85	43.5	494.10	14.6	184.82	5.7	2,105.03	19.0	
16	Eucalyptus afforestation (approximate density less than 40%)	19.26	3.4	9.48	0.5	110.72	5.5	174.28	5.2	23.56	0.7	337.30	3.0	
6	Other afforestations	0.00	0.0	10.81	0.6	0.44	0.0	1.31	0.0	0.00	0.0	12.56	0.1	
17	Land preparation for afforestation	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	
7	Shrubs	107.17	18.9	103.99	5.3	117.57	5.9	721.12	21.4	968.67	30.1	2,018.52	18.2	
8	Grass land	115.34	20.3	376.89	19.3	402.67	20.2	1,369.20	40.6	983.19	30.5	3,247.29	29.2	
9	Wet land (flood plain)	22.56	4.0	13.53	0.7	7.14	0.4	17.32	0.5	5.88	0.2	66.43	0.6	
10	Rice field	17.62	3.1	68.98	3.5	108.02	5.4	164.44	4.9	3.50	0.1	362.56	3.3	
11	Fields	10.57	1.9	107.97	5.5	93.71	4.7	55.34	1.6	5.72	0.2	273.31	2.5	
13	Exposed rocks	0.00	0.0	0.00	0.0	12.63	0.6	0.00	0.0	0.00	0.0	12.63	0.1	
14	Housing area (houses, etc.)	4.59	0.8	70.55	3.6	2.51	0.1	1.13	0.0	0.00	0.0	78.78	0.7	
15	Cemetery	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	
18	Water surface	54.48	9.6	486.81	25.0	223.09	11.2	165.07	4.9	882.68	27.4	1,812.13	16.3	
	Total area of the zone	567.79	100.0	1,948.04	100.0	1,995.62	100.0	3,373.05	100.0	3,220.92	100.0	11,105.42	100.0	

Use of land and distribution of vegetation in the target area

(2) Tsiacompaniry zone

		Unit: ha, %											
		A		B		C		D		E		Total area of the zone covered by vegetation	
1	Natural forest (approximate density above 50%)	6.14	0.1	-	-	25.94	0.5	1,668.42	9.2	1,941.67	20.7	3,642.17	9.6
2	Natural forest (approximate density less than 50%)	0.00	0.0	-	-	1.75	0.0	43.08	0.2	60.16	0.6	104.99	0.3
3	Pine afforestation (approximate density above 40%)	245.59	4.8	-	-	884.23	16.0	139.18	0.8	1,046.37	11.1	2,315.37	6.1
4	Pine afforestation (approximate density less than 40%)	107.55	2.1	-	-	263.87	4.8	31.61	0.2	699.54	7.4	1,102.57	2.9
5	Eucalyptus afforestation	355.10	7.0	-	-	297.73	5.4	692.94	3.8	10.81	0.1	1,356.58	3.6
16	Eucalyptus afforestation (approximate density less than 40%)	116.89	2.3	-	-	145.30	2.6	345.82	1.9	0.00	0.0	608.01	1.6
6	Other afforestations	1.75	0.0	-	-	2.84	0.1	7.20	0.0	6.94	0.1	18.73	0.0
17	Land preparation for afforestation	0.09	0.0	-	-	2.31	0.0	13.50	0.1	0.00	0.0	15.90	0.0
7	Shrubs	91.85	1.8	-	-	45.95	0.8	630.99	3.5	385.10	4.1	1,153.89	3.0
8	Grass lands	2,601.52	51.1	-	-	1,576.30	28.6	10,267.73	56.7	3,470.76	37.0	17,916.31	47.0
9	Wet land (flood plain)	26.49	0.5	-	-	17.49	0.3	976.75	5.4	293.04	3.1	1,313.77	3.4
10	Rice field	325.24	6.4	-	-	450.60	8.2	1,052.39	5.8	128.50	1.4	1,956.73	5.1
11	Fields	406.05	8.0	-	-	1,001.14	18.1	1,887.27	10.4	49.55	0.5	3,344.01	8.8
13	Exposed rocks	11.06	0.2	-	-	4.75	0.1	33.94	0.2	0.00	0.0	49.75	0.1
14	Housing area (houses, etc.)	9.62	0.2	-	-	34.58	0.6	58.68	0.3	2.19	0.0	105.07	0.3
15	Cemetery	0.00	0.0	-	-	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
18	Water surface	781.59	15.4	-	-	762.11	13.8	252.05	1.4	1,296.18	13.8	3,091.93	8.1
Total area of the zone		5,086.53	100.0	-	-	5,516.89	100.0	-	100.0	9,390.81	100.0	38,095.78	100.0

Surface of the target area covered by the project

(1) Zone surface

Zone	Mantaso		Tsiazompaniry		Total	
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)
Forest	5,252	56	10,318	29	15,570	35
<i>Natural forest</i>	214	2	3,747	11	3,961	9
<i>Afforestation</i>	3,020	32	5,401	15	8,421	19
<i>Shrubs</i>	2,018	22	1,154	3	3,172	7
<i>Land preparation for afforestation</i>	0	0	16	-	16	-
Grass lands	3,247	35	17,916	51	21,163	48
Wet land (flood plain)	66	1	1,314	4	1,380	3
Rice field	363	4	1,957	6	2,320	5
Fields	273	3	3,344	10	3,617	8
Exposed rocks	13	-	50	-	63	-
Housing areas (houses, etc.)	79	1	105	-	184	-
Total	9,293	100	35,004	100	44,297	100

(2) Area through zoning

Zone	Mantaso		Tsiazompaniry		Total	
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)
A	514	6	4,304	12	4,818	11
B	1,461	16	0	0	1,461	3
C	1,772	19	4,755	14	6,527	15
D	3,208	34	17,850	51	21,058	47
E	2,338	25	8,095	23	10,433	24
Total	9,293	100	35,004	100	44,297	100

Use of land through zoning and distribution of vegetation

(1) Mantasoa zone

Zone	A	B	C	D	E	Unit: ha Total
Forest	342(67%)	823(56%)	1,145(65%)	1,601(50%)	1,340(58%)	5,251(56%)
<i>Ntural forest</i>	1(-%)	-(-%)	3(-%)	152(5%)	58(3%)	214(2%)
<i>Afforestation</i>	234(46%)	719(49%)	1,025(58%)	728(23%)	313(13%)	3,019(32%)
<i>Shrubs</i>	107(21%)	104(7%)	117(7%)	721(22%)	969(42%)	2,016(22%)
<i>Land preparation for afforestation</i>	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Grass lands	115(22%)	377(26%)	403(23%)	1,369(43%)	983(42%)	3,247(35%)
Wet land (flood plain)	23(5%)	13(1%)	7(-%)	17(-%)	6(-%)	66(1%)
Rice field	18(3%)	69(5%)	108(6%)	165(5%)	3(-%)	363(4%)
Fields	11(2%)	108(7%)	94(5%)	55(2%)	6(-%)	274(3%)
Exposed rocks	0(0%)	0(0%)	13(1%)	0(0%)	0(0%)	13(-%)
Housing areas (houses, etc.)	5(1%)	71(5%)	2(-%)	1(-%)	0(0%)	79(1%)
Total	514(100%)	1,461(100%)	1,772(100%)	3,208(100%)	2,338(100%)	9,293(100%)

Note: (%) indicate the percentage. Water surface is excluded.

(2) Tsiazompaniry zone

Zone	A	C	D	E	Unit: ha Total
Forest	925(21%)	1,670(35%)	3,573(20%)	4,150(51%)	10,318(29%)
<i>Ntural forest</i>	6(-%)	28(1%)	1,711(9%)	2,002(24%)	3,747(11%)
<i>Afforestation</i>	827(19%)	1,594(33%)	1,217(7%)	1,763(22%)	5,401(15%)
<i>Shrubs</i>	92(2%)	46(1%)	631(4%)	385(5%)	1,154(3%)
<i>Land preparation for afforestation</i>	-(-%)	2(-%)	14(-%)	-(-%)	16(-%)
Grass lands	2,601(61%)	1,576(33%)	10,268(58%)	3,471(43%)	17,916(51%)
Wet land (flood plain)	26(1%)	18(-%)	977(6%)	293(4%)	1,314(4%)
Rice field	325(8%)	451(10%)	1,052(6%)	129(1%)	1,957(6%)
Fields	406(9%)	1,001(21%)	1,887(10%)	50(1%)	3,344(10%)
Exposed rocks	11(-%)	5(-%)	34(-%)	0(0%)	50(-%)
Housing areas (houses, etc.)	10(-%)	34(1%)	59(-%)	2(-%)	105(-%)
Total	4,304(100%)	4,755(100%)	17,850(100%)	8,095(100%)	35,004(100%)

Note: (%) indicate the percentage. Water surface is excluded.

Composition of forests per zoning**(1) Mantasoa zone**

Unit: ha

Total

	A		B		C		D		E		Total	
Natural forest	1	-%	-	-%	3	-%	152	9%	58	4%	214	4%
Approximate density above 50%	11	-	-	-	0	-	131	-	45	-	177	-
Approximate density less than 50%	0	0	-	-	3	-	21	-	13	-	37	-
Pine afforestation	19	6	339	41%	45	4%	58	4%	104	8%	565	11%
Approximate density above 40%	18	-	315	-	28	-	16	-	62	-	429	-
Approximate density less than 40%	11	-	24	-	17	-	42	-	42	-	136	-
Eucalyptus afforestation	216	63%	369	45%	980	86%	668	42%	209	16%	2.442	47%
Approximate density above 40%	197	-	361	-	869	-	494	-	185	-	2.105	-
Approximate density less than 40%	19	-	9	-	111	-	174	-	24	-	337	-
Other afforestations	0	0%	11	1%	1	-%	1	-%	0	0%	13	-%
Shrubs	107	31%	104	13%	117	10%	721	45%	969	72%	2.018	38%
Total	343	100%	823	100%	1,146	100%	1,600	100%	1,340	100%	5.252	100%

Note: Water surface is excluded.

(2) Tsiazompaniry zone

Unit: ha

Total

	A		C		D		E		Total	
Natural forest	6	1%	28	2%	1,711	48%	2,002	48%	3.747	37%
Approximate density above 50%	6	-	26	-	1,668	-	1,942	-	3.642	-
Approximate density less than 50%	0	-	2	-	43	-	60	-	105	-
Pine afforestation	353	38%	1,148	69%	171	5%	1,745	42%	3.417	33%
Approximate density above 40%	246	-	884	-	139	-	1,046	-	2.315	-
Approximate density less than 40%	107	-	264	-	32	-	699	-	1.102	-
Eucalyptus afforestation	472	51%	443	26%	1,039	29%	11	-%	1.965	19%
Approximate density above 40%	355	-	298	-	693	-	11	-	1.357	-
Approximate density less than 40%	117	-	145	-	346	-	0	-	608	-
Other afforestations	2	-%	3	-%	7	-%	7	-%	19	-%
Shrubs	92	10%	46	3%	631	18%	385	10%	1.154	11%
Land preparation for afforestation	-	-%	2	-%	14	-%	0	0%	16	-%
Total	925	100%	1,670	100%	3,573	100%	4,150	100%	10.318	100%

Note: Water surface is excluded.

Present state of cultivated land and population density

(1) Cultivated land

a. Mantasoa zone

Zone	A	B	C	D	E
	ha	ha	ha	ha	ha
Rice field	18	69	108	165	3
Field	11	108	94	55	6
Total(a)	29	177	202	220	9
Wet land	23	13	7	17	6
Fokontanys concerned	Ambatolaona	Anjozoro Mantasoa Masombahiny	Andrefanivorona	Ambohimanjaka	
Number of households (b)	80	-	67	132	-
(a)/(b) ha	0.4	-	3.0	1.7	-

* Estimate from the average cultivated area: 1,762 at around 22 a/household = 80 households

b. Tsiazompaniry zone

Zone	A	C	D	E
	ha	ha	ha	ha
Rice field	325	451	1,052	129
Field	406	1,001	1,887	50
Total(a)	731	1,452	2,939	179
Wet land	26	18	977	293
Fokontanys concerned	Andriantsiazo Angodongodona	Morarano	Analamihotra Ambohijanaka Kelimafana	Ankazotelo
Number of households (b)	335	474	1,022	100
(a)/(b) ha	2.2	3.1	2.9	1.8

(2) Population density

Zone	A	C	D	E
Mantasoa zone				
Total area (km ²)	5.14	17.72	32.08	-
Population (persons)	1,290	308	662	-
Density (persons/km ²)	251	17	21	-
Tsiazompaniry zone				
Total area (km ²)	43.04	47.55	178.5	43.9
Population (persons)	2,378	3,321	7,159	702
Density (persons/km ²)	55	70	40	16

Estimation of usable land area

(1) Calculation of land use for livestock breeding

Mantasoana zone

Zone	A	C	D
Total number of cattle	37	54	90
Grazing area (ha)	56	81	135

Tsiazompaniry zone

Zone	A	C	D	E
Total number of cattle	630	1,071	1,748	30
Grazing area (ha)	945	1,607	2,622	45

(2) Calculation of the number of cattle heads

The number of cattle heads per village was calculated by "number of households per village x percentage of households raising cattle x average number of raised cattle heads", according to the study documents on socio-economic conditions. In certain villages, this was calculated according to the results of the pilot study.

Mantasoana zone

Zone	A Ambatolaona	$80 \times 0.23 \times 2 = 37$
	C Andrefanivorona	$67 \times 0.27 \times 3 = 54$
	D Ambohimanjaka	$132 \times 0.34 \times 2 = 90$

Tsiazompaniry zone

Zone	A Andriantsiajo	$59 \times 0.88 \times 4 = 208$
	Angodongodona	$276 \times 0.51 \times 3 = 422$
	C Manandriana	$100 \times 0.53 \times 3 = 159$
	Analandambo	$55 \times 0.55 \times 4 = 121$
	Morarano Saofiraisana	$136 \times 0.57 \times 5 = 388$
	Anosibola	$96 \times 0.55 \times 4 = 211$
	Andohariana	$69 \times 0.55 \times 4 = 152$
	Andranofankatia	$18 \times 0.55 \times 4 = 40$
	D Analamihotra	$77 \times 0.71 \times 3 = 164$
	Anovondriana	$68 \times 0.58 \times 3 = 118$
	Kelilafina	$74 \times 0.58 \times 3 = 129$
	Ambohijanaka	$555 \times 0.48 \times 3 = 799$
	Kelimafana	$212 \times 0.56 \times 4 = 475$
	Ambatamitsangana	$36 \times 0.58 \times 3 = 63$

E Ankazotelo (Results of the RRA study) 30

(3) Distribution of land usable area

Mantasoana zone

Zone	A	C	D
Number of households (a)	80	67	132
Cultivated area by 1 household			
Cultivable land (b)	/	3.5ha	3.5ha
Present situation (c)	/	3.0ha	1.7ha
Grass land (d)	/	403ha	1,369ha
For planting (e)	/	34ha	238ha
For livestock raising (f)	/	54ha	90ha
For afforestation (g)	/	315ha	1,041ha
Shrubs (h)	/	117ha	721ha
Areas where can be afforested (j)	/	432ha	1,762ha

Note: The calculation of the grass land area to be used for planting was made: $e = (b-c) \times$ number of households.
Land for afforestation (g) was calculated, d-e-f, areas which can be afforested: (j) g+h.

Tsiazompaniry zone

Zone	A	C	D	E
Number of households (a)	335	474	1,022	100
Cultivated area by 1 household				
Cultivable land (b)	4ha	4ha	4ha	4ha
Present situation (c)	2.2ha	3.1ha	2.9ha	1.8ha
Grass land (d)	2,601ha	1,576ha	10,268ha	3,010ha
For planting (e)	603ha	427ha	1,124ha	220ha
For livestock raising (f)	630ha	1,071ha	1,748ha	30ha
For afforestation (g)	1,368ha	78ha	7,396ha	2,760ha
Shrubs (h)	92ha	46ha	631ha	139ha
Areas where can be afforested (j)	1,460ha	124ha	8,024ha	2,899ha

Note: Calculation of the grass land area to be used for planting was made: $e = (b-c) \times$ number of households.
For afforestation: $g = d-f$, areas which can be afforested: $j = g+h$.

(4) Prospects for addressing of population growth

The following table lists the rates of increase of cultivable land areas relative to the current status.

Zone	A	C	D	E
Mantasoza zone				
Cultivated area by 1 household				
Present situation ha (a)	/	3.0	1.7	/
Cultivable land ha (b)	/	3.5	3.5	/
(b)/(a)%	/	117	206	/
Tsiazompaniry zone				
Cultivated area by 1 household				
Present situation ha (a)	2.2	3.1	2.9	1.8
Cultivable land ha (b)	4.0	4.0	4.0	4.0
(b)/(a)%	182	129	138	222

Assuming the population increase, estimated to be 2.3%, 2.5% as the mean value, the cultivated areas listed in the above table indicate that the population growth can be addressed for the numbers of years shown in the table below as long as the cultivated land increases as the population grows. Furthermore, since comprehensive addressing of population growth is required, efforts are currently made on (1) improvement of land productivity through agroforestry and (2) spread of family planning. It is concluded that the implementation of these items will allow the population growth to be addressed for even more years than shown in the table below.

Zone	A	C	D	E
Mantasoza zone	/	6-7 years	29-30 years	/
Tsiazompaniry zone	24-25 years	10-11 years	13-14 years	32-33years

The Implementation of ZODAFARBs in the Zone of Study

1. Introduction

In the context of management of the watersheds, the Ministry of Water and Forests (MINISTRY OF WATER AND FORESTS) has neither the financial means nor the human means for directly improving the zones to be conserved in the Zone of Study. In fact, the forests and meadows (grasslands), in particular in the areas surrounding Tsiacompaniry lake, are in the process of being transformed into agricultural fields in accordance with the growth of the population. Although, for some cases, the extension of the agricultural lands must be permitted, it is essential, in such case, to determine the zone to be permanently conserved for the purpose of protecting the watersheds on the one hand, and for the purpose of increasing the area of the forests by means of reforestation, on the other hand. Moreover, the residents are interested in the reforestation so as to be able to produce charcoal and to collect wood for heating and for construction for domestic consumption.

The ZODAFARBs (Zones Marked out for Action in Favor of Trees) define the program of the transfer of lands from the State to the rural residents provided that the latter perform the reforestation of the lands. The implementation of ZODAFARBs permits: 1) an effective reforestation and good maintenance, by motivating the rural residents by means of the transfer of the land property rights and the transfer of the planting technology; 2) a consensus at the level of the village, with regard to the zone to be conserved and its maintenance by the individuals.

2. Experience concerning the Implementation of ZODAFARBs

ZODAFARBs have been introduced by the Ministry of Water and Forests in seven rural communities in the prefecture of Fandriana, in the rural commune of Ambatofotsy, the prefecture of Antananarivo, and in the rural commune of Fihaonana, the prefecture of Ankazobe.

The ZODAFARBs which are in progress in Fandriana were started in 1984. Up to the year 1998, the reforestation of Eucalyptus trees was completed in 40 villages, over an area of 4,337 hectares. The evaluation of the progress of reforestation was performed in 1998 in two villages, where it was ascertained that the reforestation has been practically completed on 320 hectares of land. Consequently, the certificates of utilization of lands were issued to 104

operators.

3. The Procedure of ZODAFARBs

Decree No. 3145/87 prescribes the procedure of ZODAFARBs. In practice, the ZODAFARBS follow the following stages in accordance with the regulations of the Ministry of Water and Forests:

- (1) The officials of the Ministry of Water and Forests start the program of increasing the awareness of the residents with regard to the objectives and the procedure of the ZODAFARBs in the targeted village, and also in the rural commune and in the prefecture to which this village belongs.
- (2) In order to implement the ZODAFARBs, a consensus of more than 50 percent of the residents must be attained at the general meeting of the village. A report must be prepared and sent to the Ministry of Water and Forests, in which there shall be given the agreement of the villagers, the list of the places constituting the subject of the ZODAFARBs, and the names of the representatives of each community which is participating in the ZODAFARBs.
- (3) The farmers who are interested in the program must prepare the documentation concerning the request of the ZODAFARBs, in conformity with Article 31 of Law No. 60-004, in collaboration with the Ministry of Water and Forests. The legal status of the ownership of the lands must be verified at the level of the state property department. The rough plan and the plan of the layout of the ZODAFARBs must be prepared. (The zones must be demarcated with stakes on the land.) The zone of the ZODAFARBs is not necessarily a series of properties, but it may be dispersed throughout the village. The status of the ownership of the lands (the titled lands, the lands of which the request for title has been submitted but of which the appraisal is still in progress, the lands utilized in the context of the local custom, etc.) is in principle, known at the level of the village.
- (4) The documents (the official request, the Report, the rough plan, the plan of the layout and the ministerial decree concerning the establishment of the village) must be submitted to the rural commune from the village. After the evaluation by the rural commune, the request is transferred to the prefecture. At this level, the authorities concerned, such as the land property service, the Ministry of Water and Forests and the Ministry of Agriculture, evaluate the request, and the final decision is made for the granting of the lands to the community for the implementation of ZODAFARBs.

- (5) In parallel with the process of the request, the villagers who are interested in ZODAFARBs must register themselves in the program. The division into lots of land to be reforested is discussed between the participants and determined as zones on the map of the ZODAFARBs. Each lot of land must be demarcated on the land with stakes.
- (6) After a certain period of display of the documentation at the prefecture, at the rural commune and at the office of the village, the demarcation of the zone and of the assignment of the lots of land are decided upon by the general meeting of the village, and the Executive Committee of the village will be established.
- (7) In the context of the ZODAFARBs, the Ministry of Water and Forests offers technical assistance, for the setting-up of nurseries and for the planting of young plants. The nurseries are maintained by the operators and the young plants are sold or supplied free of charge, to the operators. The duties of the operators are summarized in the decree.
- (8) If the appropriate reforestation is verified after the implementation of the ZODAFARBs, the certificate of transfer of the right to use the land as a forest will be issued to the residents. Even though the time of verification is not specified in the decree, the evaluation is taken at the end of the third year to verify whether the reforestation has been carried out appropriately, in conformity with the policy of the Ministry of Water and Forests. The second evaluation is made five years later, and if the reforestation activities have been verified, then the certificate is issued to the operator.

4. Relationship between the ZODAFARBs and the land rights

(1) Final transfer of the land rights

The decree of the ZODAFARBs prescribes the final appropriation of the lands to the operators. However, the transfer of the land rights does not take place automatically after the implementation of the ZODAFARBs, because a long period of time and a large sum of money are required for the registration of the land, it being necessary for the said registration to be accompanied by a topographical study and an official verification of the property right by the Ministry of land preparation. Now at last, there is a contradiction between the description on land transfer of the ZODAFARB decree and Law No. 60-004 concerning the land property. Moreover, the ZODAFARB decree itself constitutes a contradiction because the certificate issued to the operators in conformity with the decree does not mention the final appropriation of the land.

In conformity with the property law, a title of ownership is given, based on the request of

the users, to the land within the limit of 30 hectares which has been occupied for ten years as of 1965, whereas the occupation of the lands after the year of 1965 is considered to be illegal until the said request has been evaluated and the land has been titled. However, since the time and the money required for the registration of the land do not permit the rural residents to easily obtain the title, several types of occupation are practiced and permitted in a customary manner at the level of the village, such as the utilization of the land before obtaining the title, or even without claiming ownership. Since the residents know, that in reality, they are still not the owners of the new lands, they are rather hesitant to perform the reforestation which requires a long-term management activity on the lands of which the ownership is not still final.

In the process of the ZODAFARBs, the distribution of the lands is clearly determined, and the certificates are eventually issued by the Ministry of Water and Forests. Since the State guarantees to the operators, by means of certificates, the right of utilization of the land, the incentive is greater for the residents to participate in the ZODAFARBs, even without the official property titles.

(2) Different Implementation of ZODAFARBs depending on the statuses of ownership

In the past, the ZODAFARBs were implemented only on land belonging to the State where there was no dispute concerning the ownership. When the ZODAFARBs are implemented on lands where several interests in the ownership exist, the states of ownership of the land and the modes of present utilization must be considered as follows:

Status of Ownership of the Land		Private Title	Requisition in progress	Customary right to use the land (framed)	Assigned to the Ministry of Water and Forests	Belonging to the State
		(a)	(b)	(c)	(d)	(e)
Mode of present utilization						
Forests utilized in an appropriate manner	①	X	X	X	X	
Lands (except for the forest) utilized in an appropriate manner	②	X	X	X	X	
Lands utilized but to be transformed into forests	③		Z	Z	Z	
Lands not utilized but to be reforested	④		Z	Z	Z	Z
Natural forests	⑤				X	

In the table above, the oblique lines mean "none", "X" means the maintaining of the present utilization, "Z" means the implementation ZODAFARBs. The manner of implementation of the ZODAFARBs, depending on the case, is the following:

③ (b) and ③ (c): For the purpose of protecting the watersheds, the transformation of the lands into forests should be suggested to the present users at the village meeting. The exchange of lands is one option. The procurement of the land title may give them motivation to participate in the ZODAFARBs.

④ (b) and ④ (c): Since the right of utilization of the land and finally, the title of the land will be guaranteed to the participants, active participation in the ZODAFARBs is expected. It is essential to integrate the present occupants of the land in the reforestation activity of ZODAFARBs. The exchange of lands is one option. In light of the equality between the villagers, the redistribution of the lands can be suggested in the process of the deliberation of the village.

③ (d) and ④ (d): Since the Ministry of Water and Forests does not have sufficient means for the reforestation of the lands, these lands must be reclassified in order to become the subject of ZODAFARBs.

④ (e): Ordinary procedure of ZODAFARB will be applied.

5. Implementation of ZODAFARBs in the Zone of Study of the Project

The Zone of Study is classified into three parts from the point of view of paragraph 4(2) above. It is possible to implement the ZODAFARBs in the following manner:

Zone of Study	Implementation of the ZODAFARBs
West coast of Mantasoa lake	It is not necessary to implement ZODAFARBs since most of the lands are classified as ① and ②.
West coast of Tsiacompaniry lake	Large lands are classified as ③ and ④. Before the ZODAFARBs are implemented, the zones to be conserved must be specified and the consensus of the residents with regard to the appropriate utilization of the land must be reached in the deliberation.
East coast of Mantasoa and Tsiacompaniry lakes	Large lands are classified as ④. Before the ZODAFARBs are implemented, the zones to be conserved must be specified.

Calculation of annual quantities of operations

1 Agriculture

1) Fruit production

Village type	I	II	III
Target village	Andriantsijo Angodongodona	Andrefanivorona Ambohimajaka	Morarano, Anosivola Andoharian, Ambohijanaka Kelimafana, Ankazotelo
Number of households	340	200	1,180
Rate of households having interest in the project (%)	Andrian. 25 Angodon. 10	30	36
Number of households having interest in the project	43	60	425
Number of trees per household	20	20	20
Labor per unit (person-days/trees)	0.7	0.7	0.7
Labor required for a household (person-days)	14	14	14
Total labor (person-days)	602	840	5,950
Total quantity of operations (1000)	0.86	1.20	8.50

Note: Labor per unit: Digging hole for Compost = 0.5 person-days/hole, Planting = 0.05 person-days/tree, Nursing = 0.15 person-days/tree. Total 0.7 person-days/tree

2) Compost production

Village type	I	II	III
Target village	Andriantsijo Angodongodona	Andrefanivorona Ambohimajaka	Morarano, Anosivola Andoharian, Ambohijanaka Kelimafana, Ankazotelo
Number of households	340	200	1,180
Rate of households having interest in the project (%)	25	25	30
Number of households having interest in the project	85	50	354
Units per household	3	2.5	2.5
Labor per unit (person-days/unit)	1.5	1.5	1.5
Labor required for a household (person-days)	4.5	3.75	3.75
Total labor (person-days)	383	188	1,328
Total quantity of operations (unit)	255	125	885

Note: Labor per unit: Loading = 1 person-day; switchover = 0.5 person-day; Total = 1.5 person-days. Collection of materials is a daily work that they do on the way back from the farming work, which is not included in this statistics.

2 Agroforestry

1) Hedges

Village type	I	II	III
Target village	Andriantsijo Angodongodona	Andrefanivorona Ambohimajaka	Morarano, Anosivola Andoharian, Ambohijanaka Kelimafana, Ankazotelo
Number of households	340	200	1,180
Rate of households having interest in the project (%)	5	30	30
Number of households having interest in the project	17	60	354
Seedling per household (kg)	1.0	1.5	1.5
Labor per unit (person-days/kg)	2	2	2
Labor required for a household (person-days)	2	3	3
Total labor (person-days)	34	180	1,062
Total quantity of operations (kg)	17	90	531

Not: Labor per unit: 1.5 person-days for 750g, 1.5 person-days/0.75kg = 2 person-days for per kg

2) Fodder production

Village type	I	II	III
Target village	Andriantsijo Angodongodona	No applicable	Morarano, Anosivola Andoharian, Ambohijanaka Kelimafana, Ankazotelo
Number of households	340		1,180
Rate of households having interest in the project (%)	5		30
Number of households having interest in the project	17		354
Number of trees per household	100		100
Labor per unit (person-days/100)	2		2
Labor required for a household (person-days)	2		2
Total labor (person-days)	34		708
Total quantity of operations (100)	17		354

Note: Labor per unit: 50 seedling in hill including division per person-day

3 Forestry

1) Production of young plants

Village type	I	II	III
Target village	Andriantsijo Angodongodona	Andrefanivorona Ambohimajaka	Morarano, Anosivola Andoharian, Ambohijanaka Kelimafana, Ankazotelo
Number of households	340	200	1,180
Rate of households having interest in the project (%)	20	15	50
Number of households having interest in the project	68	30	590
Number of trees per household	1,000	1,500	1,500
Labor per unit (person-days/1000)	8.2	8.2	8.2
Labor required for a household (person-days)	8.2	12.3	12.3
Total labor (person-days)	558	369	7,257
Total quantity of operations (1000)	68	45	885

Note: Per seedbed (10m x 1m), ploughing = 2 person-days; seeding = 1 person-day (incl. sand collection); sun-shading = 1 person-day; sun-shade control = 1.5 person-days; sprinkling = 10 person-days; weeding = 2 person-days; Total = 17.5 person-days. It is planned to make sprinkling 85 times during the period of cultivating young plants: 0.12 person-days x 85 = 10 person days. 3,200 young plants with bare roots per seedbed (200 x 20 x 80%) will be produced. 8.2 person-days per 1000 (1,500/3,200 x 17.5).

2) Afforestation

All households engaged in production of young plants are involved in afforestation. Of types I and III, one half of the households is engaged in the production of one third of young plants in ZODAFARB.

Village type	I	II	III
Target village	Andriantsijo Angodongodona	Andrefanivorona Ambohimajaka	Morarano, Anosivola Andoharian, Ambohijanaka Kelimafana, Ankazotelo
Number of households	340	200	1,180
Rate of households having interest in the project (%)	20	15	50
Number of households having interest in the project	68	30	590
Number of trees per household	825	1,500	1,250
Labor per unit (person-days/1000)	30	27	30
Labor required for a household (person-days)	25	41	38
Total labor (person-days)	1,700	1,230	22,420
Total quantity of operations (1000)	56.1	115.5	737.5

Note: 1) Digging holes for planting = 16.7 person-days; planting (incl. transport of plants) = 10 person-days (13 person-days in Type I and III); total = 27 person-days (30 person-days in Type I and III). For digging holes for planting, 60 holes/person-day is used on the conditions of 40 x 40 x 40 cm (100 holes/person-day) and 70 x 70 x 70 cm (50 holes/person-days) in average. 1000/60 = 16.7 person-days. Planting: made at the same time as transporting young plants; transported twice per day (1.5 times in Type I and III); 50 plants x 2 = 100 plants (50 x 1.5 = 75 plants in Type I and III). Planting = 1000/100 = 10 person-days (1000/75 = 13 person-days).

3) ZODAFARB

Village type	I	II	III
Target village	Andriantsijo Angodongodona	No applicable	Morarano, Anosivola Andoharian, Ambohijanaka Kelimafana, Ankazotelo
Number of households	34		295
Number of trees per household	350		500
Labor per unit (person-days/1000)	40		40
Labor required for a household (person-days)	14		20
Total labor (person-days)	476		5,900
Total quantity of operations (1000)	11.9		147.5

Note: Labor per unit: Digging holes for planting = $1,000/50=20$ holes/person-day at 50 holes/person-day. Planting is made at the same time as transport of young plants. Transport = $1,000/50 = 20$ person-days at 50 plants once per day. The above 2) process is used for zone E at a short distance.

4 Fishery (Fish farming in rice fields)

Fish farming in rice fields

Village type	A	C	D
Target village	Andriantsijo Angodongodona	No applicable	Morarano. Anosivola Andoharian. Ambohijanaka Kelimafana. Ankazotelo
Number of households	340		1,180
Rate of households having interest in the project (%)	10		30
Number of households having interest in the project	34		354
Number of fry per household (fry)	100		100
Labor required for a household (person-days)	4		4
Total labor (person-days)	136		1,416
Total quantity of operations (100)	34		354

Note: Ploughing the fish farming field = 1 peson-day; bait feeding = 3 person-days

Project plan by village type
Quantity of operations

1 Type I

Scope of work		1st year	2nd year	3rd year	4th year	5th year	6th year and after
Agriculture	Fruit production Number of households having interest in the project Per household (tree) Quantity of operations (1000)	Planning	43 20 0.86	43 20 0.86	Independent execution	Independent execution	Independent execution
	Compost Number of households having interest in the project Units per household Quantity of operations (unit)		85 3 255	85 3 255			
Agroforestry	Hedges Number of households having interest in the project Per household (kg) Quantity of operations (kg)		17 1 17	17 1 17			
	Fodder production Number of households having interest in the project Per household (tree) Quantity of operations (100)		17 100 17	17 100 17			
Forestry	Production of young plants Number of households having interest in the project Per household (1000) Quantity of operations (1000)		68 1 68	68 1 68			
	Afforestation Number of households having interest in the project Per household (1000) Quantity of operations (1000)		68 0.825 56.1	68 0.825 56.1			
	ZODAFARB Number of households having interest in the project Per household (1000) Quantity of operations (1000)		34 0.35 11.9	34 0.35 11.9			
	Fish farming in rice fields Number of households having interest in the project Number of fry per household Quantity of operations (100)		34 100 34	34 100 34			

2 Type II

Scope of work		1st year	2nd year	3rd year	4th year	5th year	6th year and after
Agriculture	Fruit production Number of households having interest in the project Per household (tree) Quantity of operations (1000)	Planning	60 20 1.2	60 20 1.2	Independent execution	Independent execution	Independent execution
	Compost Number of households having interest in the project Units per household Quantity of operations (unit)		50 2.5 125	50 2.5 125			
Agroforestry	Hedges Number of households having interest in the project Per household (kg) Quantity of operations (kg)		60 1.5 90	60 1.5 90			
	Fodder production Number of households having interest in the project Number of trees per household Quantity of operations (100)		No applicable	No applicable			
Forestry	Production of young plants Number of households having interest in the project Per household (tree) Quantity of operations (1000)		30 1,500 45	30 1,500 45			
	Afforestation Number of households having interest in the project Per household (tree) Quantity of operations (1000)		30 1,500 45	30 1,500 45			
	ZODAFARB Number of households having interest in the project Per household (tree) Quantity of operations (1000)		No applicable	No applicable			
	Fish farming in rice fields Number of households having interest in the project Number of fry per household Quantity of operations (100)		No applicable	No applicable			

3 Type III

Scope of work		1 st year	2 nd year	3 rd year	4 th year	5 th year	6 th year and after
Agriculture	Fruit production Number of households having interest in the project Per household (tree) Quantity of operations (1000)		Planned 4 villages	Execution Planned 2 villages 148 20 2.96	Execution Execution 425 20 8.50	Independent execution 277 20 5.54	Independent execution
	Compost Number of households having interest in the project Units per household Quantity of operations (unit)			123 2.5 308	354 2.5 885	231 2.5 578	
Agroforestry	Hedges Number of households having interest in the project Per household (kg) Quantity of operations (kg)			123 1.5 185	354 1.5 531	231 1.5 347	
	Fodder production Number of households having interest in the project Per household (tree) Quantity of operations (100)			123 100 123	354 100 354	231 100 231	
Forestry	Production of young plants Number of households having interest in the project Per household (tree) Quantity of operations (1000)			205 1,500 307.5	590 1,500 885.0	385 1,500 577.50	
	Afforestation Number of households having interest in the project Per household (tree) Quantity of operations (1000)			205 1,250 256.25	590 1,250 737.5	385 1,250 481.25	
	ZODAFARB Number of households having interest in the project Per household (tree) Quantity of operations (1000)			102.5 500 51.25	295 500 147.5	192.5 500 96.25	
Fishery	Fish farming in rice fields Number of households having interest in the project Number of fry per household Quantity of operations (100)			123 100 123	354 100 354	231 100 231	

Note: For Ambohijanak and Kelimafana, the work will be planned in the 3rd year and executed in and after the 4th year, but for other 4 villages, the work will be planned in the 2nd year and executed in and after the 3rd year.

Project plan by village type

Labor

1 Type I

Scope of work		1st year	2nd year	3rd year	4th year	5th year	6th year and after
Agriculture	Fruit production Quantity of operations (1000)	Planning	0.86	0.86	Independent execution	Independent execution	Independent execution
	Labor for a tree Total labor (person-days)		0.7 602	0.7 602			
Agriculture	Compost Quantity of operations (unit)		255	255			
	Labor per unit Total labor (person-days)		1.5 383	1.5 383			
Agroforestry	Hedges Quantity of operations (kg)		17	17			
	Labor per unit Total labor (person-days)		2 34	2 34			
Agroforestry	Fodder production Quantity of operations (100)		17	17			
	Labor per unit Total labor (person-days)		2 34	2 34			
Forestry	Production of young plants Quantity of operations (1000)		68	68			
	Labor per unit Total labor (person-days)		8.2 558	8.2 558			
Forestry	Afforestation Quantity of operations (1000)		56.1	56.1			
	Labor per unit Total labor (person-days)		30 1,683	30 1,683			
Forestry	ZODAFARB Quantity of operations (1000)		11.9	11.9			
	Labor per unit Total labor (person-days)		40 476	40 476			
Fishery	Fish farming in rice fields Quantity of operations (100)		34	34			
	Labor per unit Total labor (person-days)		4 136	4 136			

2 Type II

Scope of work		1st year	2nd year	3rd year	4th year	5th year	6th year and after
Agriculture	Fruit production Quantity of operations (1000) Labor for a tree Total labor (person-days)	Planning	1.2 0.7 840	1.2 0.7 840	Independent execution	Independent execution	Independent execution
	Compost Quantity of operations (unit) Labor per unit Total labor (person-days)		125 1.5 188	125 1.5 188			
Agroforestry	Hedges Quantity of operations (kg) Labor per unit Total labor (person-days)		90 2 180	90 2 180			
	Fodder production Quantity of operations (100) Labor per unit Total labor (person-days)			No applicable			
Forestry	Production of young plants Quantity of operations (1000) Labor per unit Total labor (person-days)		45 8.2 369	45 8.2 369			
	Afforestation Quantity of operations (1000) Labor per unit Total labor (person-days)		45 27 1.215	45 27 1.215			
	ZODAFARB Quantity of operations (1000) Labor per unit Total labor (person-days)			No applicable			
Fishery	Fish farming in rice fields Quantity of operations (100) Labor per unit Total labor (person-days)			No applicable			

3 Type III

Scope of work		1st year	2nd year	3rd year	4th year	5th year	6th year and after
			Planned 4 villages	Execution Planned 2 villages	Execution Execution	Independent execution	Independent execution
Agriculture	Fruit production Quantity of operations (1000)			2.96	8.50	5.54	
	Labor for a tree Total labor (person-days)			0.7 2.072	0.7 5.950	0.7 3,878	
Agriculture	Compost Quantity of operations (unit)			308	885	578	
	Labor per unit Total labor (person-days)			1.5 462	1.5 1,328	1.5 2,023	
Agroforestry	Hedges Quantity of operations (kg)			185	531	347	
	Labor per unit Total labor (person-days)			2 370	2 1,062	2 694	
Agroforestry	Fodder production Quantity of operations (100)			123	354	231	
	Labor per unit Total labor (person-days)			2 246	2 708	2 462	
Forestry	Production of young plants Quantity of operations (1000)			370.5	885.0	577.5	
	Labor per unit Total labor (person-days)			8.2 3,522	8.2 7,257	8.2 4,736	
Forestry	Afforestation Quantity of operations (1000)			256.25	737.50	481.25	
	Labor per unit Total labor (person-days)			30 7,688	30 22,125	30 14,438	
Forestry	ZODAFARB Quantity of operations (1000)			51.25	147.50	96.25	
	Labor per unit Total labor (person-days)			30 2,050	40 5,900	40 3,850	
Fishery	Fish farming in rice fields Quantity of operations (100)			123	354	231	
Fishery	Labor per unit Total labor (person-days)			4 492	4 1,416	4 924	

Grounds of addition of expenses related to materials

Fruit trees

As the price per young plant, the purchase price of popular tree species such as apple trees in the PSs, 7,500 fmg, shall be used.

Compost

The number of forks to turning compost shall be two per 22 households, which is the average number in a hamlet ($1,720 \text{ households} / \text{total number of hamlet } 80 = 19$). As one household has 3.0 units and one hamlet has 66 units, one fork per about 33 units shall be prepared. One spray for sprinkling per 66 units shall be prepared.

Fork price: 24,000 fmg, Spray price: 150,000 fmg

Materials cost in the first year: $24,000 + 75,000 = 99,000 \text{ fmg}$ for 33 units

Materials cost in the second year: Expecting 50% of the amount in the first year, i.e. 49,5000 fmg.

Hedges

The price per kg of *Tephrosia vogelii*, 9,500 fmg, shall be used.

Production of fodder

The price per one of *Penissetum*, 750 fmg, shall be used.

Production of young plants

In pots: One-third of the quantity of production of young plants shall be made from seedlings in pots. Price of a pot: 80 fmg

Watering pots: Two watering pots shall be prepared for one hamlet. Price: 24,000 fmg/pot

Seeds: On the assumption that 200,000 seedlings of *E. robustus* per kg will be able to be obtained, a price of seeds for 1000 seedlings shall be used.

Materials cost in the first year: $[80 \text{ (hamlets)} \times 2 \times 30,000 + 998,000 \times 1/3 \times 10/8 \times 80] \times 1/998 + 500 = 38,643 \text{ fmg}/1000 \text{ trees}$

Materials cost in the second year: $[2,400,000 + 998,000 \times 1/3 \times 10/8 \times 80] \times 1/998 + 500 = 36,283 \text{ fmg}/1000 \text{ trees}$

Afforestation

There is no particular necessity of material cost.

ZODAFARB

There is no particular necessity of material cost.

Fish farming in rice fields

Price purchase of fry shall be expected. General prices to purchase fry of different kinds are the same.

Fry price: 200 fmg per one fry

Material expenses by villages

Note: Unit price (fmg), Price (1000fmg)

	Unit	2nd year			3rd year			4th year			5th year			Total	
		Amount	Unit price	Price	Amount	Unit price	Price	Amount	Unit price	Price	Amount	Unit price	Price	Amount	Price
I															
Planting and culture of fruit trees	1000 trees	0.86	7,500 /trees	6,450	0.86	7,500 /trees	6,450								
Compost production	unit	255	99,000 /33	765	255	49,500 /33	382								1.72
Hedging	kg	17	9,500 /kg	162	17	9,500 /kg	162								510
Fodder production	100 trees	17	750 /trees	1,275	17	750 /trees	1,275								34
Production of young plants	1000 trees	68	38,643 /1000	2,628	68	36,238 /1000	2,464								34
Afforestation	1000 tees	56.1	0	0	56.1	0	0								136
ZODAFARB	1000 trees	11.9	0	0	11.9	0	0								112.2
Fish farming in rice fields	100 fishes	34	200 /trees	680	34	200 /trees	680								23.8
Sub-total				11,960			11,413								68
II															
Planting and culture of fruit trees	1000 trees	1.2	7,500 /trees	9,000	1.2	7,500 /trees	9,000								0
Compost production	unit	125	99,000 /33	375	125	49,500 /33	187								2.4
Hedging	kg	90	9,500 /kg	855	90	9,500 /kg	855								250
Production of young plants	1000 trees	45	38,643 /1000	1,739	45	36,238 /1000	1,631								180
Afforestation	1000 trees	45	31,632	0	45	0	0								90
Sub-total				11,969			11,673								90
III															
Planting and culture of fruit trees	1000 trees				2.96	7,500 /trees	22,000	8.5	7,500 /trees	63,750					0
Compost production	unit				308	99,000 /33	924	308	49,500 /33	462					17
Hedging	kg				185	9,500 /kg	1,758	578	99,000 /33	1,734					1771
Fodder production	100 trees				123	750 /trees	9,225	354	750 /trees	26,550					1063
Production of young plants	1000 trees				307.5	38,648 /1000	11,884	307.5	36,238 /1000	11,143					708
Afforestation	1000 trees				256.25	0	0	577.5	38,643 /1000	22,316					1770
ZODAFARB	1000 trees				51.25	0	0	737.5	0	0					1475
Fish farming in rice fields	100 fishes				123	200 /fishes	2,460	354	200 /fishes	7,080					295
Sub-total							48,251			138,080					708
Total				23,929			71,337			138,080					274,917
															321,932

Additions of management expenses**NGO expenses: For 1 year**

Head office:

1 person : 12 months x 20 days/month x 250,000fmg/day=60,000,000fmg

1 person : 8 months x 20 days/month x 200,000fmg/day=32,000,000fmg

Local office

1 person : 8 months x 20 days/month x 250,000fmg/day = 40,000,000fmg

1 person : 8 months x 20 days/month x 200,000fmg/day = 32,000,000fmg

Vehicle expenses:

Vehicle expenses of 4WD should be added up as rental rates. (including fuel and driver fees)

1 vehicle (1 year):12 months x 20days/month x 480,000fmg/day = 115,200,000fmg

1 vehicle (10 months): 10 months x 20days/month x 480,000fmg/day = 96,000,000fmg

For forest management

Motorbike 31,000,000 (including tax) x 2 units = 62,000,000fmg

Motorboat with outboard motor 14,600,000 x 1 unit x 1.2 (tax) = 17,520,000fmg

Office operating expenses:

Office supplies

Expenses for lightning and heating, and communication

and so on

Total expenses: 10% of the total operating expenses (including on-site operating and NOG expenses, etc.) should be anticipated.

Qualitative project evaluation of watershed management plans from the viewpoint of socio-economic conditions

Evaluation item	Contents of evaluation	Evaluation index	Zone	Agriculture		Agroforestry		Forestry			Fishery		
				Planting of fruit trees	Production of compost	Hedge	Production of fodder	Production of young plants	Afforestation	ZODAFARB			
Appropriateness from the viewpoint of residents' technical ability	Fosterage of technique	Necessity	Mantasia	High	High	High	Low	Low	Low	Low	Low	High	
			Tsiazompaniry	High	High	High	High	High	High	High	High	High	High
	Practice of technique	Possibility	Mantasia	High	High	High	Low	Low	Low	Low	Low	High	
			Tsiazompaniry	High	High	High	High	High	High	High	High	High	High
	Spread of technique	Possibility	Mantasia	High	High	High	Low	Low	Low	Low	Low	Unknown	
			Tsiazompaniry	High	High	High	High	High	High	High	High	High	Unknown
	Ability to solve problems	Degree of improvement	Mantasia	High	High	High	High	High	High	High	High	High	Unknown
			Tsiazompaniry	High	High	High	High	High	High	High	High	High	Unknown
Traditional techniques	Influence	Mantasia	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	
		Tsiazompaniry	Low	Low	Low	Low	Low	Low	Low	Low	Low	Unknown	
Appropriateness from the viewpoint of the legal systems	Land ownership system	Appropriateness	Common to both zones	Appropriate	Cannot be determined	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate	
	Land inheritance system	Appropriateness	Common to both zones	Cannot be determined	Appropriate	Appropriate	Cannot be determined	Appropriate	Appropriate	Appropriate	Appropriate	Cannot be determined	
	PE - I	Appropriateness	Common to both zones	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate	
	Forest law system	Appropriateness	Common to both zones	Cannot be determined	Cannot be determined	Cannot be determined	Cannot be determined	Cannot be determined	Cannot be determined	Cannot be determined	Cannot be determined	Cannot be determined	

Appropriateness from the viewpoint of organizational operation	Organizational system of the administration side	Human aspect	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High			
		Financial aspect	Common to both zones	Unknown	Unknown	High	Unknown	Unknown	Unknown	High	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown		
			Common to both zones	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High		
			Common to both zones	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown		
	Facilities aspect	Degree of difficulty	Mantasoa	Low	Low	Low	Low	High	High	High	High	High	High	High	High	High	High	Low	Low		
			Tsiazompaniry	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low		
	Establishment and continuity of residents' organizations	Continuoussness of the organization	Mantasoa	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown		
			Tsiazompaniry	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High		
		Independence of the organization	Mantasoa	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	
			Tsiazompaniry	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
			Common to both zones	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	
	Appropriateness from the viewpoint of natural environment	Forests	Preservation of forest resources	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing		
			Increase in quantity of charcoal	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	
			Soil	Improvement of soil fertility	Low	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
				Prevention of soil erosion	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
		Water	Improvement of function of soil and water conservation	Common to both zones	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	
Common to both zones				Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	
Improvement of potable water sources			Common to both zones	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	
			Common to both zones	Low	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	

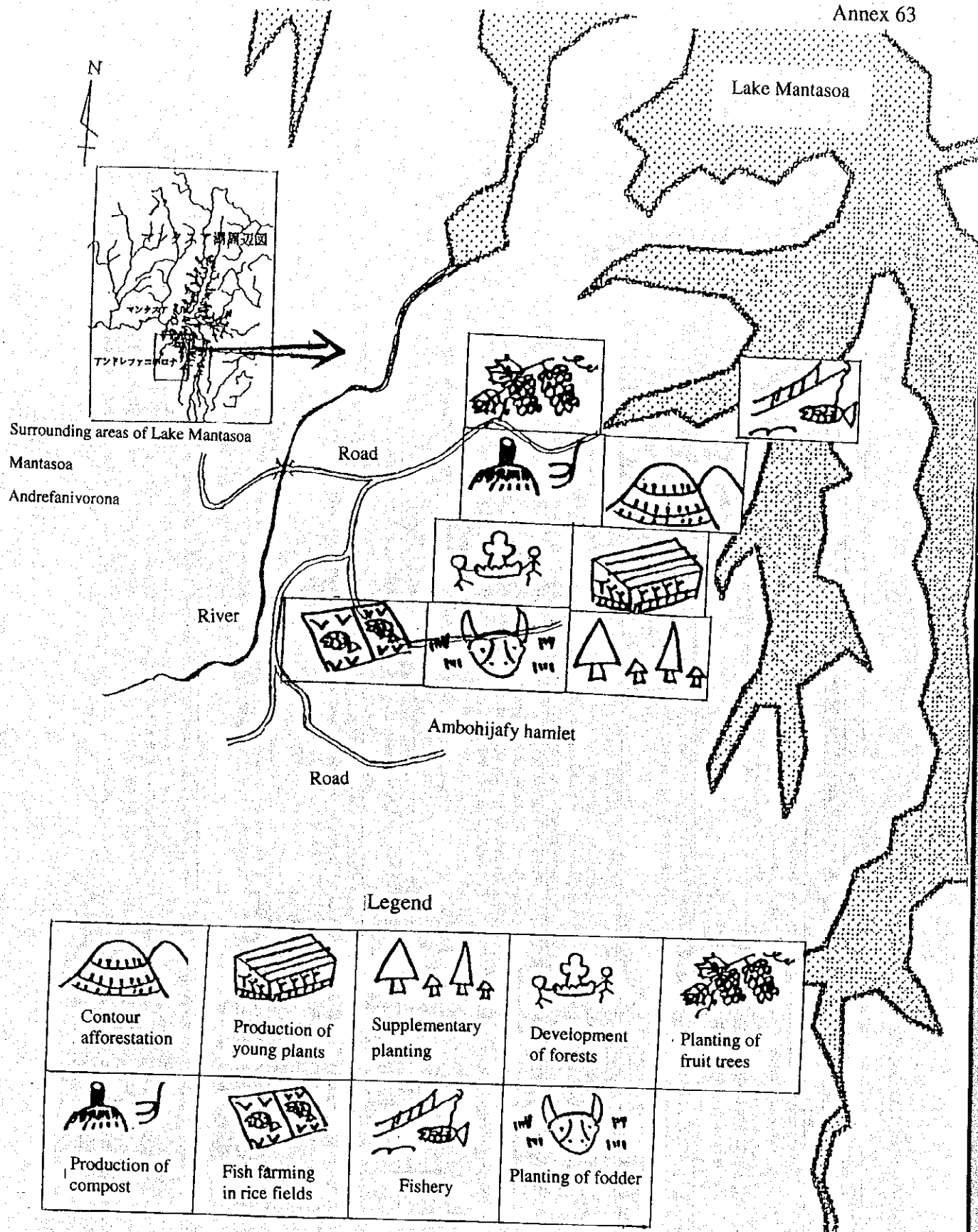
Appropriateness from the viewpoint of social environment	Residents' lives	Improvement of the living standard	Mantasia	High	High	Low	Low	High	High	High	Nothing	High	High			
		Increase in cash income	Tsiazompaniry	High	High	High	High	High	High	High	High	High	High	High		
			Mantasia	High	High	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing	High	
		Reduction of farming away from home	Tsiazompaniry	High	High	High	High	High	High	High	High	High	High	High	High	
			Mantasia	Nothing	High	High	High	Nothing	Nothing	Low	Low	Low	Low	Low	High	
		Reduction of migration	Tsiazompaniry	Nothing	High	High	High	High	High	High	High	High	High	High	High	
			Mantasia	Low	High	High	High	Low	Low	Low	Low	Low	Nothing	Nothing	Low	
		Improvement in inheritance of farmland	Tsiazompaniry	Low	High	High	High	High	High	High	High	High	Low	Low	Low	
			Mantasia	Low	High	High	High	Low	Low	Low	Low	Low	Low	Low	Low	
		Elevation of the status of women	Tsiazompaniry	Low	High	High	High	High	High	High	High	High	Low	Low	Low	
			Mantasia	Low	Low	Low	Low	Unknown	Unknown	Low	Low	Unknown	Unknown	Unknown	Unknown	
		Traditional social organizations	Influence upon Dina (a Hamlet autonomous guarding organization) influence upon Faritanana (an organization for mutual aid for influence upon Indorana (a mutual aid organization)	Tsiazompaniry	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
				Mantasia	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
				Tsiazompaniry	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Mantasia	Low			Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low		
Tsiazompaniry	Low			Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low		
Mantasia	Low			Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low		

Characteristics of PS – (1) MANTASOA zone

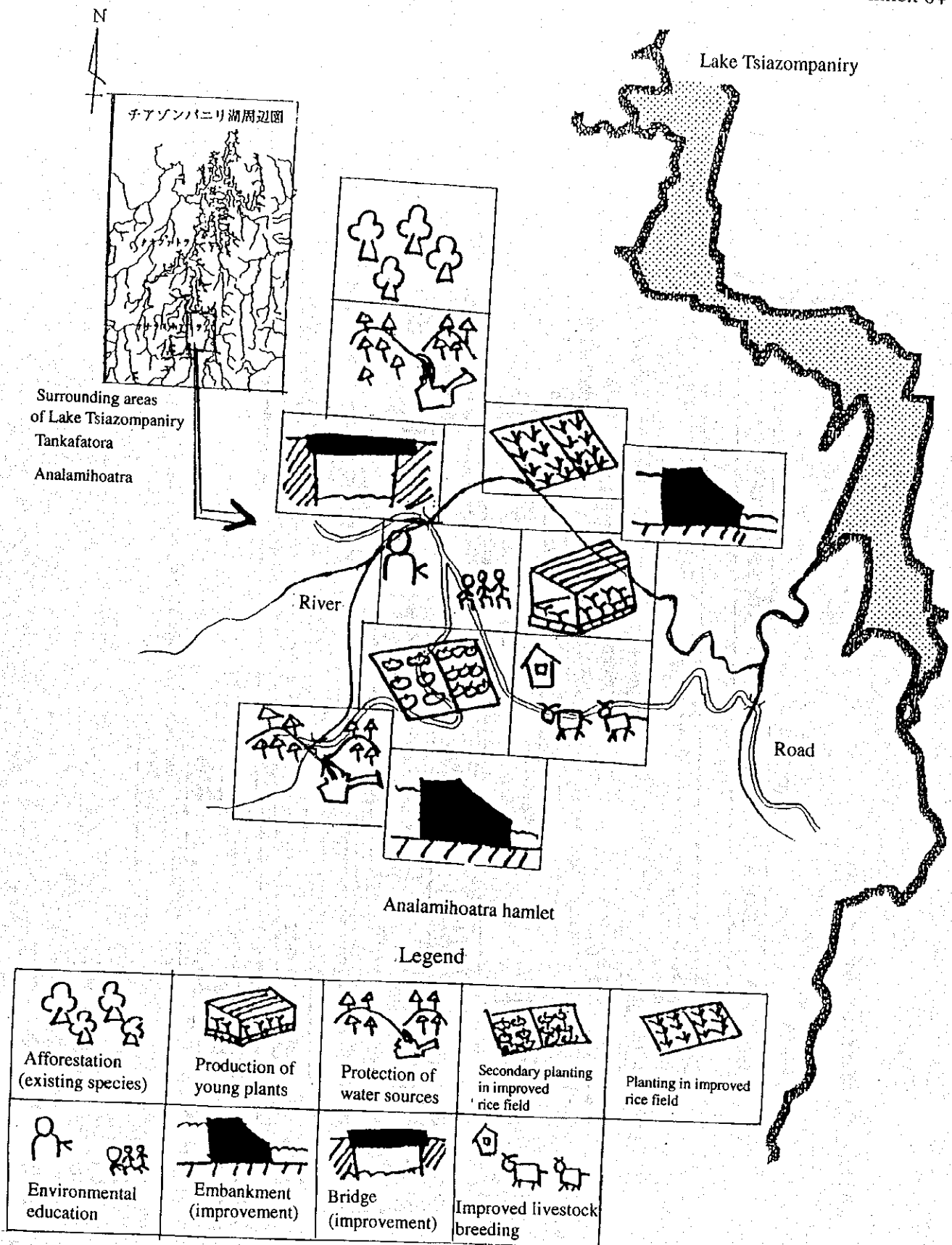
Characteristic	North-east part	North-west part	Western part	Southern part	Eastern part
Form of land ownership	Ministry of Land Management/ Residents	Housing area	Residents	Ministry of Land Management/Residents	Ministry of Land Management/Land occupants
Form of hamlet	Scattered	Houses/hotels	Dense		Small scattered villages
Forest vegetation	<ul style="list-style-type: none"> Ongoing planting of eucalyptus Principally meadows and shrub areas 	<ul style="list-style-type: none"> Principally the planting of eucalyptus and pine trees 	<ul style="list-style-type: none"> Principally the planting of eucalyptus 	<ul style="list-style-type: none"> Existence of natural forests at the edge of the torrent beds, etc. Shrub/meadow areas largely extending from the center to the east Ongoing planting of eucalyptus 	<ul style="list-style-type: none"> Many natural forests at the eastern end Principally shrub/meadow areas outside the eastern end Planting of eucalyptus on lake banks
Use of the forest	Production of charcoal/firewood from planted trees (eucalyptus)	Nothing particular	Production of charcoal/digging of planted trees (eucalyptus) evaluated	Production of charcoal, firewood from natural shrubs and planted trees	<ul style="list-style-type: none"> Cutting of natural trees and charcoal production
Land use	<ul style="list-style-type: none"> Much land unused (meadows and shrub areas) 	Houses/hotels, intensive use of land	<ul style="list-style-type: none"> Typical model: planting of trees based on altitude, starting from the top, use of the lanety, terraces and rice fields Intensive use of land 	<ul style="list-style-type: none"> Use for farming (from the south-west to the center) Partial planting of trees Extensive use of the land due to the small number of villages 	<ul style="list-style-type: none"> Scattered farming activities Partial use of burned fields around natural forests Scattered instances of farming away from home
Conservation of watersheds	<ul style="list-style-type: none"> Land on mild slopes Surface erosion of shrub and meadow areas 	<ul style="list-style-type: none"> Land on mild slopes No particular problem 	<ul style="list-style-type: none"> No particular program if the basic model for land use is respected 	<ul style="list-style-type: none"> Hill area in general Aside from surface erosion on the mild slope at the bottom of the valley, no particular problem 	<ul style="list-style-type: none"> Hill area with relatively mild slopes Short valleys with surface erosion outside the mild slopes of the principal valleys
Socio-economic conditions	Support of family budget through work with wages	Combination of work with wages and farming	Combination of charcoal production, fishing and farming		Arrival of other ethnic groups from the eastern side
Problems	Mild fear of soil erosion due to fragile vegetation	Insufficient trees and flowers to safeguard the natural environment, insufficient trees to nourish birds	<ul style="list-style-type: none"> A single species of trees planted everywhere Saturated use of land 	<ul style="list-style-type: none"> Fear of soil erosion due to the fragile vegetation and extensive use of land 	<ul style="list-style-type: none"> Fear of soil erosion due to the fragile vegetation and extensive use of land
Causes for the deterioration of watersheds	Deterioration of natural vegetation due to forest fires	Nothing particular	<ul style="list-style-type: none"> Acceleration of migration towards other regions due to the reduction in land productivity, or farming away from home Increase of yield 	<ul style="list-style-type: none"> Deterioration of the natural vegetation due to forest fires and illegal cutting Absence of an overall plan for use of the land and soil management 	<ul style="list-style-type: none"> Deterioration of the natural vegetation by forest fires and illegal cutting Absence of forest management measures and absence of forest management
Measures to manage watersheds	Establishment of a land use plan by the residents themselves	We recommend the planting of trees and flowers, including nutritive trees		Establishment of a land use and cutting plan in the area managed by the residents	Establishment of a forest management plan and determination of lands to be used by residents

Characteristics of PS - (2) TSIAZOMPANIRY zone

Characteristic	Northern part		Western part		Southern part		Eastern part		
	Ministry of Land Management/ Residents	Ministry of Water and Forests/ Residents	Ministry of Water and Forests/ Residents	Ministry of Land Management/ Residents	Ministry of Land Management/ Residents	Ministry of Land Management/ Land occupants	Ministry of Land Management/ Land occupants	Ministry of Land Management/ Land occupants	
Form of land ownership	Scattered	Scattered	Slightly Dense	Scattered	Scattered	Small scattered villages	Small scattered villages	Small scattered villages	
Form of hamlet	Scattered	Scattered	Slightly Dense	Scattered	Scattered	Small scattered villages	Small scattered villages	Small scattered villages	
Forest vegetation	<ul style="list-style-type: none"> • Big prairies around the lake banks • Eucalyptus planting area towards the north • No natural vegetation 	<ul style="list-style-type: none"> • Subsistence of some natural vegetation • Reduction of eucalyptus planting towards the south 	<ul style="list-style-type: none"> • Subsistence of some natural vegetation • Reduction of eucalyptus planting towards the south 	<ul style="list-style-type: none"> • Extensive natural forests in the south-west • Extensive meadows in the center 	<ul style="list-style-type: none"> • Extensive natural forests in the northern part • Planting of pine trees around the lakes in the center • Meadows throughout the southern part • Extensive natural forests in the eastern side of a peak in the north-south direction 	<ul style="list-style-type: none"> • Extensive meadows in the northern part • Planting of pine trees around the lakes in the center • Meadows throughout the southern part • Extensive natural forests in the eastern side of a peak in the north-south direction 	<ul style="list-style-type: none"> • Extensive meadows in the northern part • Planting of pine trees around the lakes in the center • Meadows throughout the southern part • Extensive natural forests in the eastern side of a peak in the north-south direction 	<ul style="list-style-type: none"> • Extensive meadows in the northern part • Planting of pine trees around the lakes in the center • Meadows throughout the southern part • Extensive natural forests in the eastern side of a peak in the north-south direction 	<ul style="list-style-type: none"> • Extensive meadows in the northern part • Planting of pine trees around the lakes in the center • Meadows throughout the southern part • Extensive natural forests in the eastern side of a peak in the north-south direction
Use of the forest	Production of charcoal/digging of planted trees (eucalyptus) in the northern belt	Production of charcoal/digging of planted trees (eucalyptus) evaluated	Production of charcoal/digging of planted trees (eucalyptus) evaluated	Production of charcoal/digging of planted trees (eucalyptus) in the south-west part	Production of charcoal/digging of planted trees (eucalyptus) in the south-west part	Production of charcoal by cutting natural shrubs	Production of charcoal by cutting natural shrubs	Production of charcoal by cutting natural shrubs	
Land use	<ul style="list-style-type: none"> • Extensive use of land • Partial planting of trees 	<ul style="list-style-type: none"> • Land use similar to use in the western part of Mantasoa • Extensive use of land and many grazing area towards the south 	<ul style="list-style-type: none"> • Land use similar to use in the western part of Mantasoa • Extensive use of land and many grazing area towards the south 	<ul style="list-style-type: none"> • Limited farm use around villages • Extensive land use except for a portion in the south-west 	<ul style="list-style-type: none"> • Limited farm use around villages • Extensive land use except for a portion in the south-west 	<ul style="list-style-type: none"> • Farming by residents and instances of farming away from home, partial planting on burned land • Use of wide surfaces as grazing areas 	<ul style="list-style-type: none"> • Farming by residents and instances of farming away from home, partial planting on burned land • Use of wide surfaces as grazing areas 	<ul style="list-style-type: none"> • Farming by residents and instances of farming away from home, partial planting on burned land • Use of wide surfaces as grazing areas 	<ul style="list-style-type: none"> • Farming by residents and instances of farming away from home, partial planting on burned land • Use of wide surfaces as grazing areas
Conservation of watersheds	<ul style="list-style-type: none"> • Relief of relatively mild slope • No soil erosion except for surface erosion from the meadows due to the mild slope of the valleys 	<ul style="list-style-type: none"> • Relief with many folds • Steep slopes in some areas, but short torrent bed and mild slope for principal water course, no sand and landslides 	<ul style="list-style-type: none"> • Relief with many folds • Steep slopes in some areas, but short torrent bed and mild slope for principal water course, no sand and landslides 	<ul style="list-style-type: none"> • Principal water source area from the Tsiacompaniry lake • Area of undulated hills, principally meadow/shrub area • Fear of floods in some locations • The principal watercourse is long and there are no landslides due to the mild slope of the valley. However, surface erosion is extensive. • Villages with productive rice fields 	<ul style="list-style-type: none"> • Principal water source area from the Tsiacompaniry lake • Area of undulated hills, principally meadow/shrub area • Fear of floods in some locations • The principal watercourse is long and there are no landslides due to the mild slope of the valley. However, surface erosion is extensive. • Villages with productive rice fields 	<ul style="list-style-type: none"> • Short steep slopes in areas, but the slope in the principal watercourse valley is mild, no landslides. • Extensive surface erosion from the meadows 	<ul style="list-style-type: none"> • Short steep slopes in areas, but the slope in the principal watercourse valley is mild, no landslides. • Extensive surface erosion from the meadows 	<ul style="list-style-type: none"> • Short steep slopes in areas, but the slope in the principal watercourse valley is mild, no landslides. • Extensive surface erosion from the meadows 	<ul style="list-style-type: none"> • Short steep slopes in areas, but the slope in the principal watercourse valley is mild, no landslides. • Extensive surface erosion from the meadows
Socio-economic conditions	Groups of village residents who have migrated due to the building of a dam	Villages with productive rice fields	Villages with productive rice fields	Villages with productive rice fields	Villages with productive rice fields	Concentration of residents	Concentration of residents	Concentration of residents	
Problems	<ul style="list-style-type: none"> • Fear of mild soil erosion due to the fragile vegetation and extensive use of land 	<ul style="list-style-type: none"> • Deterioration of planting sites under the Ministry of Water and Forests • Fear of soil erosion due to extensive use 	<ul style="list-style-type: none"> • Deterioration of planting sites under the Ministry of Water and Forests • Fear of soil erosion due to extensive use 	<ul style="list-style-type: none"> • Fear of erosion due to the fragile vegetation and extensive use of land 	<ul style="list-style-type: none"> • Fear of erosion due to the fragile vegetation and extensive use of land 	<ul style="list-style-type: none"> • Deterioration of natural forests • Deterioration of forested areas under the Ministry of Water and Forests • Fear of surface erosion due to extensive use of land 	<ul style="list-style-type: none"> • Deterioration of natural forests • Deterioration of forested areas under the Ministry of Water and Forests • Fear of surface erosion due to extensive use of land 	<ul style="list-style-type: none"> • Deterioration of natural forests • Deterioration of forested areas under the Ministry of Water and Forests • Fear of surface erosion due to extensive use of land 	<ul style="list-style-type: none"> • Deterioration of natural forests • Deterioration of forested areas under the Ministry of Water and Forests • Fear of surface erosion due to extensive use of land
Causes for the deterioration of watersheds	<ul style="list-style-type: none"> • Deterioration of the natural vegetation by forest fires and livestock breeding • Extensive use of the land 	<ul style="list-style-type: none"> • Extensive use of land • Absence of forest management measures 	<ul style="list-style-type: none"> • Extensive use of land • Absence of forest management measures 	<ul style="list-style-type: none"> • Deterioration of natural vegetation due to forest fires • Absence of an overall land use plan 	<ul style="list-style-type: none"> • Deterioration of natural vegetation due to forest fires • Absence of an overall land use plan 	<ul style="list-style-type: none"> • Deterioration of land due to forest fires and illegal cutting • Absence of measures for forest management and grazing land management 	<ul style="list-style-type: none"> • Deterioration of land due to forest fires and illegal cutting • Absence of measures for forest management and grazing land management 	<ul style="list-style-type: none"> • Deterioration of land due to forest fires and illegal cutting • Absence of measures for forest management and grazing land management 	<ul style="list-style-type: none"> • Deterioration of land due to forest fires and illegal cutting • Absence of measures for forest management and grazing land management
Measures to manage watersheds	<ul style="list-style-type: none"> • Establishment of a land use plan by the residents themselves • Adapted management for grazing land 	<ul style="list-style-type: none"> • Establishment of a forest management plan • Establishment of a land use plan by the residents themselves 	<ul style="list-style-type: none"> • Establishment of a forest management plan • Establishment of a land use plan by the residents themselves 	<ul style="list-style-type: none"> • Establishment of a cutting and land use plan in areas managed by the residents • Establishment of a forest management plan • Establishment of a land use plan by the residents themselves 	<ul style="list-style-type: none"> • Establishment of a cutting and land use plan in areas managed by the residents • Establishment of a forest management plan • Establishment of a land use plan by the residents themselves 	<ul style="list-style-type: none"> • Establishment of a forest management plan and determination of lands used by the residents 	<ul style="list-style-type: none"> • Establishment of a forest management plan and determination of lands used by the residents 	<ul style="list-style-type: none"> • Establishment of a forest management plan and determination of lands used by the residents 	<ul style="list-style-type: none"> • Establishment of a forest management plan and determination of lands used by the residents



Carte d'action Exemple du hameau d'Ambohijafy dans le fokontany d'Andrefanivorona



Carte d'action Exemple du hameau d'Analamihoatra dans le fokontany d'Analamihoatra

Diagram of problems in Andrefanivorona

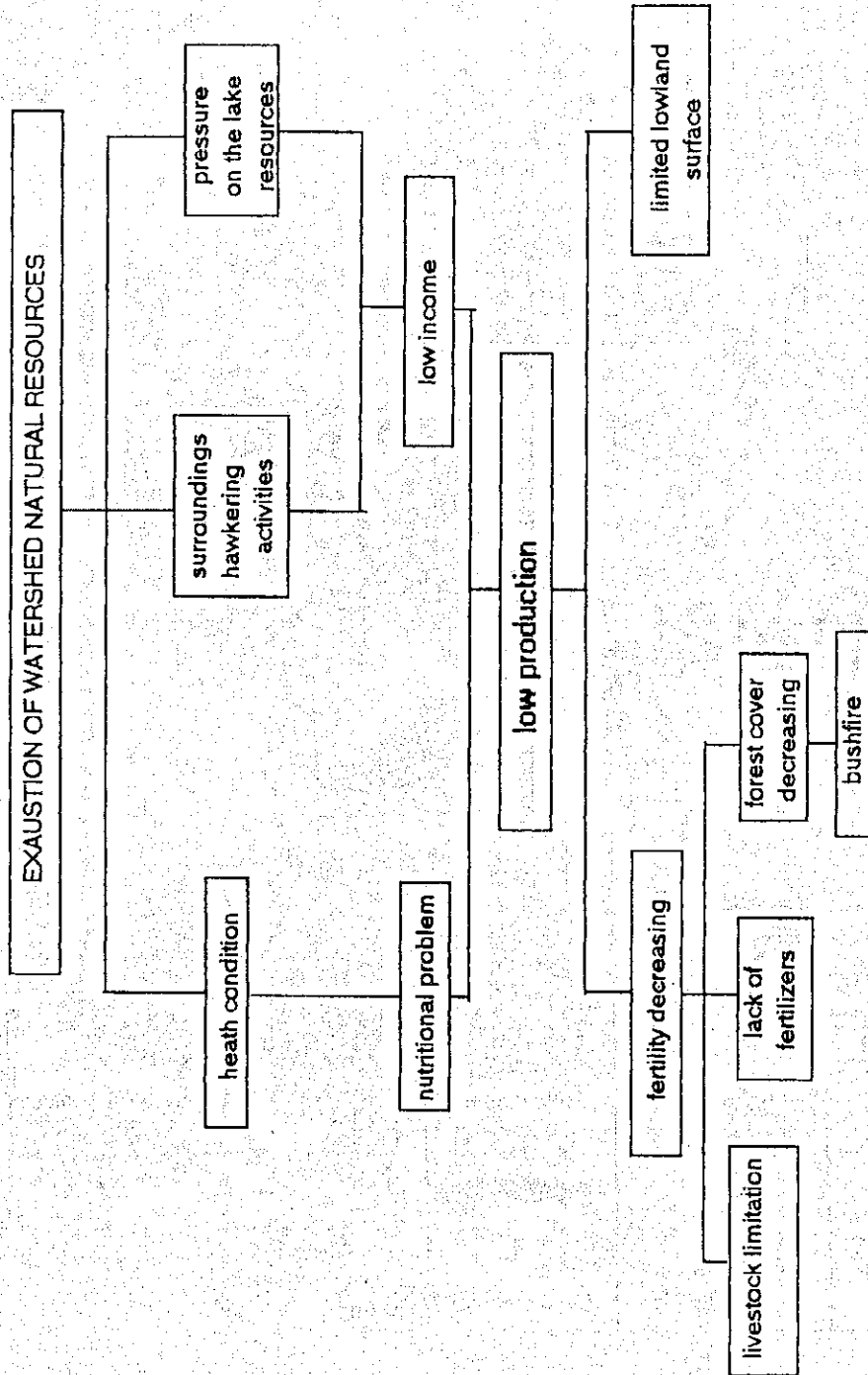


Diagram of problems in Anbohimanjaka

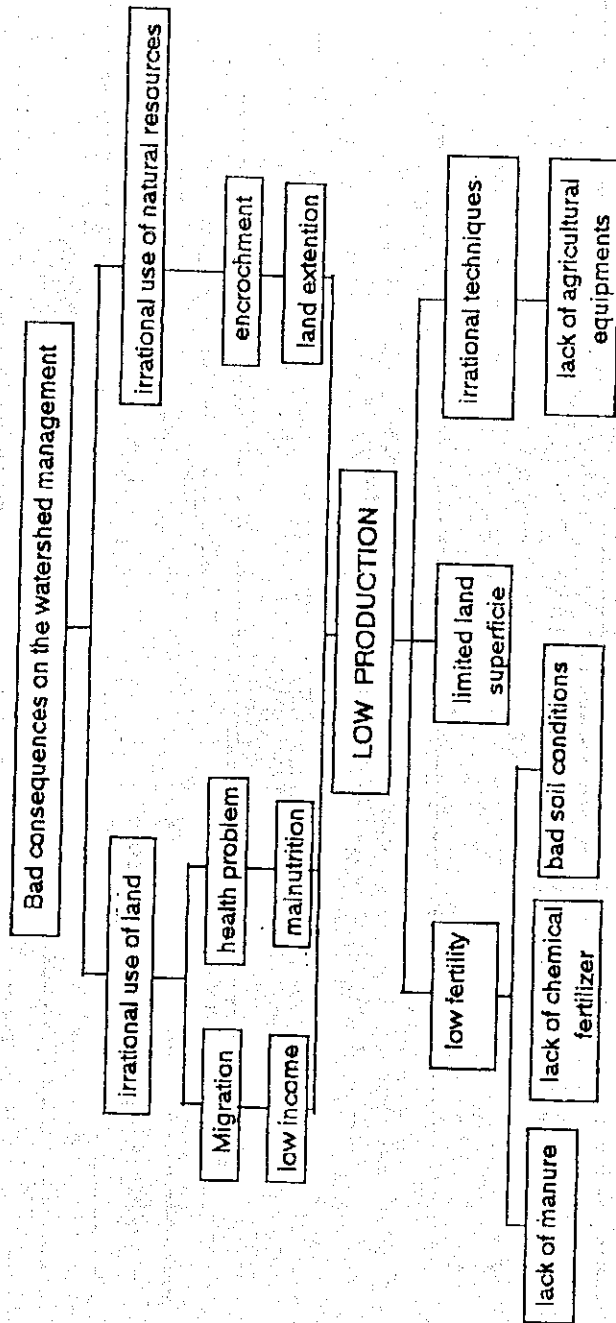


Diagram of problems in Angodongodona

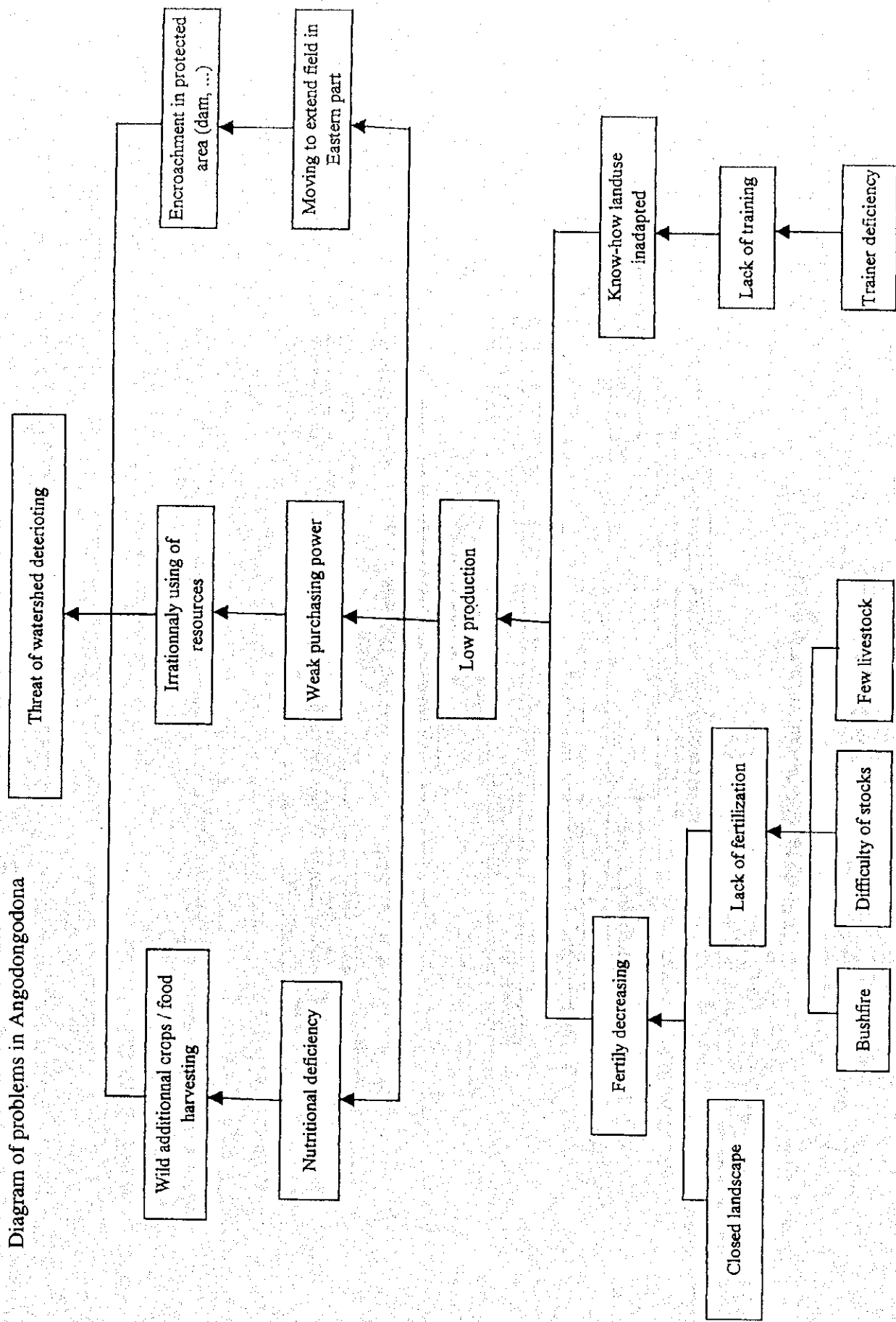
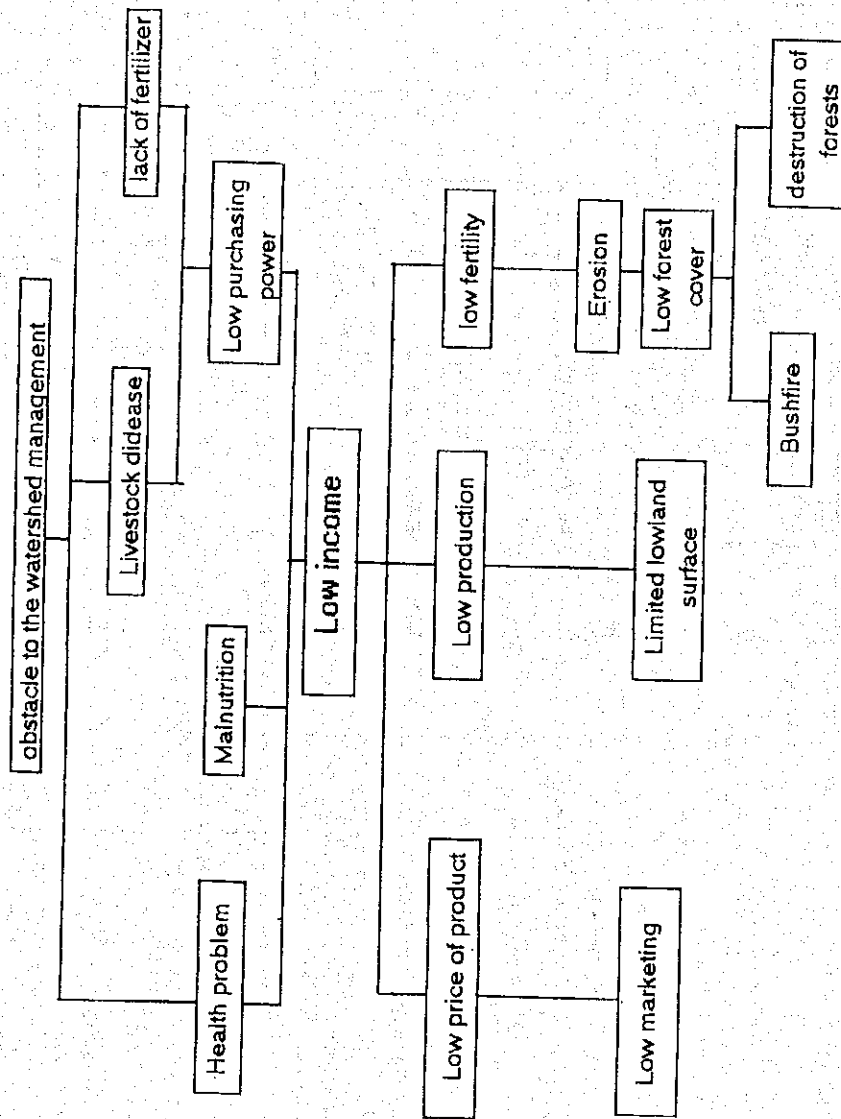


Diagram of problems in Analamihotra



Schedule of various activities (example of Andrefanivorona)

Activities	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
1 - Forestry *tree planting {seedling production {plantation {refilling	information and organization	training	seeding + transplanting	woodlot preparation	plantation/refilling							
*fruit trees nursery grafting plantation * charcoal oven	training on nursery	training on grafting										
2 - Agroforestry soil fertility/management {Live hedges {biomass production {soil conservation	training	information and organization	distribution of seeds	training	preparation and planning							
*compost *Vevyer	training on compost making											
3 - livestock breeding fodder production		information and organization	preparation and planting									
4 - Agricultural support *imputs (revolving system) vegetable seeds	information + organization	distribution of seeds	seeding									
5 - Others *micro - dam	Feasibility study											