

Figure II-4.2.9 Distribution of areas set aside from logging operation

4.3 Wood production

Wood production scale is estimated based on the logging operation area, forest type, log processing capacity/demand and management policy. The estimation follows principles shown in the master plan. The process to focus logging operation areas mainly consists of a combination of the following four separate areas. These areas are described on the GIS map and processed, and defined as the target areas for logging operations.

- a. Fix the forest areas where matured ((Block 494, 495, 496, 497, 498, 499, 501, 502, and 503, Forest type A, B1, B2, C1, and C2 including combined type of p).
- b. Fix the areas to be set aside from logging operation based on conservation purposes such as, water, soil and land conservation, wildlife conservation, steep area.
- c. Fix the areas needed for daily water source protection for isolated hamlets and paddy fields.
- d. Select the areas for villager support (target areas for agro-forestry and/or farm land development).

The logging operation area (LA) is defined as: $LA = a - (b + c + d)$

Total logging operation area by forest type is shown in Figure II-4.3.1 and Table II-4.3.1. The total logging operation area is estimated at 8596 ha.

Table II-4.3.1 Area and wood volume in logging operation area (Forest condition 2001 in logging operation area)

Forest	Area (ha)								
	495	496	497	498	499	501	502	503	Total
A	251.42	65.68	280.74	426.34	570.90	182.60	692.01	1,484.88	3,954.57
B1	8.15	175.25	95.73	57.58	453.09	242.75	357.33	311.12	1,701.00
B2	47.38	6.82	35.15	57.74	137.18	16.40	101.07	131.06	532.80
C1	40.81	105.61	65.07	6.60	46.01	103.48	120.86	32.14	520.58
C2	27.06	191.64	302.40	101.98	259.15	43.23	152.55	91.08	1,169.09
C3	17.74	48.50	20.90	0.43	43.63		13.60		144.80
D1	9.26	52.45	51.93		9.19	26.75	7.77	8.40	165.75
D2	47.09	25.37	105.73	17.60	11.01		28.74	44.94	280.48
D3			9.23						9.23
E	66.90	5.49	21.14		5.44	10.61	5.90	2.07	117.55
Total	515.81	676.81	988.02	668.27	1,535.60	625.82	1,479.83	2,105.69	8,595.85
Volume (m³)									
A	66,123	17,077	72,151	112,981	135,305	51,676	168,851	359,344	983,508
B1	1,810	38,555	20,870	12,899	90,618	58,262	73,968	63,780	360,762
B2	9,570	1,364	6,960	11,780	24,967	3,575	19,000	24,379	101,595
C1	9,058	23,237	14,186	1,478	9,202	24,836	25,018	6,589	113,604
C2	5,466	38,328	59,876	20,804	47,165	9,426	28,682	16,942	226,689
C3	2,874	7,761	3,303	70	6,371		2,041		22,420
D1	1,407	7,869	7,738		1,259	4,387	1,095	1,176	24,931
D2	6,169	3,299	13,639	2,341	1,300		3,508	5,437	35,693
D3			637						637
E	4,081	330	1,247		299	690	331	116	7,094
Total	106,558	137,820	200,607	162,353	316,486	152,852	322,494	477,763	1,876,933
Growth/year									
A	992	256	1,082	1,695	2,030	775	2,533	5,390	14,753
B1	27	578	313	193	1,359	874	1,110	957	5,411
B2	144	20	104	177	375	54	285	366	1,524
C1	136	349	213	22	138	373	375	99	1,704
C2	82	575	898	312	707	141	430	254	3,400
C3	54	147	62	1	120	0	39	0	424
D1	33	183	180	0	29	102	26	27	581
D2	144	77	318	55	30	0	82	127	832
D3	0	0	20	0	0	0	0	0	20
E	125	10	38	0	9	21	10	4	218
Total	1,737	2,195	3,229	2,455	4,798	2,340	4,889	7,223	28,866

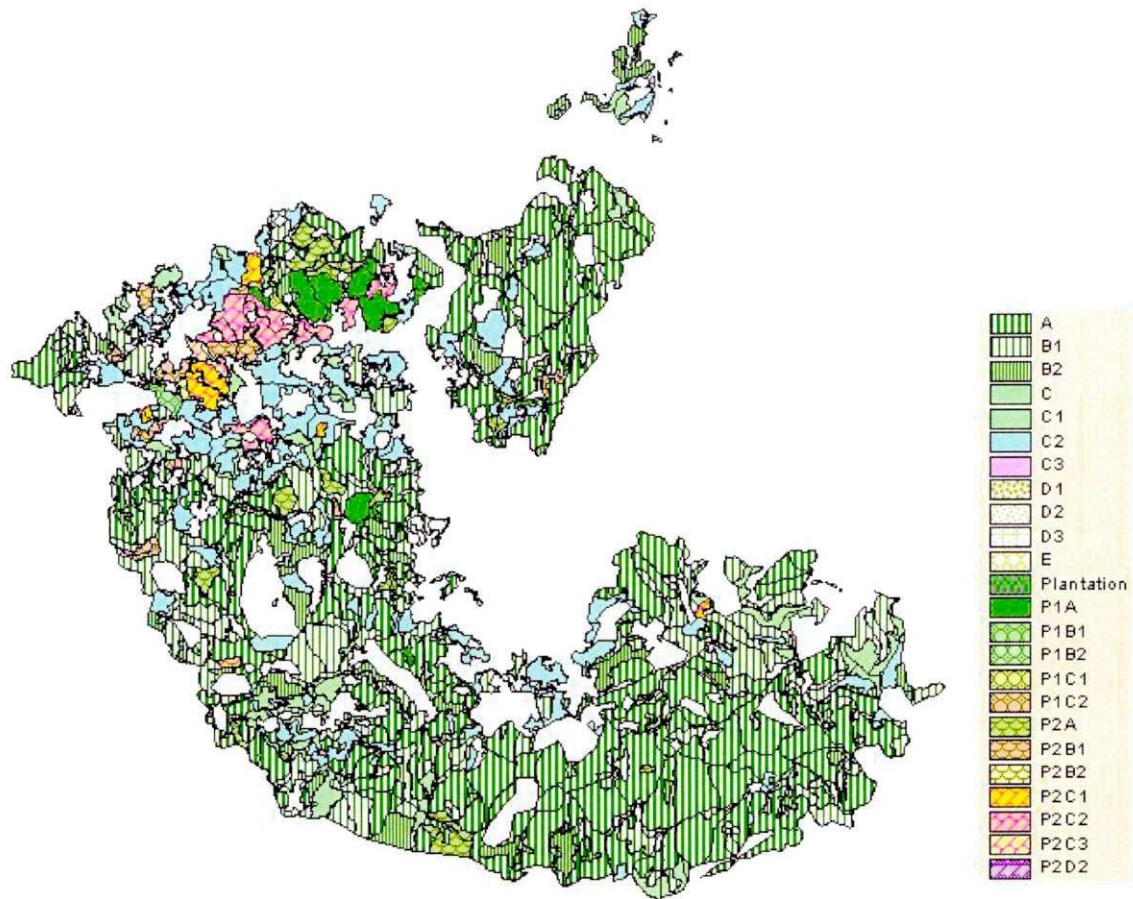


Figure II-4.3.1 Areas by forest type for logging operation area

4.3.1 Standard cutting volume

In this subsection, the allowable annual cut based on the principle of sustained yield is calculated. The calculation is based on the idea that the cutting volume should not exceed the actual growth increment to maintain the existing volume of forest stands. In this management plan, the standard cutting volume was estimated based on the assumption that the forest operation would be carried out following the cutting operation standard in Vietnam; e.g. selective cutting, 35 years cutting cycle, 35% of allowable maximum yield percentage, then cutting areas as one term of 5 years were designated in consideration with standardization of cutting volume and continuum of the cutting areas. Finally the estimated cutting volume was determined after the cutting areas were arranged so that the allowable cutting volume would be almost the same in each cutting area.

The study established seven yieldings so that the income from stumpage sales would be distributed as evenly as possible in light of the differences in forest physiognomy among the blocks and the compartments. It was assumed that logging for the next 10 years will be conducted in the first and second yielding units. The zoning of the yielding units was conducted using the area yield regulation

method with compartments as the minimum unit, then adjusted with the help of the volume yield regulation method so that there would be no significant differences in the yield volume. The standard cutting volume obtained by the estimation is shown in Table II-4.3.2.

Table II-4.3.2 Estimated allowable annual cut by type of formula (m³)

Cutting time	Maximum allowable cutting volume (for 5 years, stem volume) (m ³)
After 2.5 years	93,189
After 7.5 years	94,747
After 12.5 years	95,219
After 17.5 years	94,836
After 22.5 years	99,900
After 27.5 years	98,316
After 32.5 years	102,453

4.3.2 Method for selective cutting

(1) Cutting ratio

Under the Vietnamese regulations, the cutting cycle for selective logging is basically set at 35 years. The actual cutting cycle is determined primarily by the cutting ratio and the volume increment and is adjusted by such factors as the management purposes, technology, and cost effectiveness. It is generally believed that if the road network is well developed and the forests can meet the individual market needs, then it is desirable to adopt a shorter cutting cycle and a low cutting ratio and to harvest evenly from commercial forests.

Yet the study has decided that it is practical to adopt a 35-year cutting cycle in accordance with the Vietnamese regulations since it is difficult to manage the spur roads so that they can be used all the time. Table II-4.3.3 shows an estimate of how much the average forest stand will have recovered in 35 years based on the assumptions that the existing forest stands will be logged at different cutting ratios and that the current increment rate is maintained. Based on this estimate, the study has decided to exclude the stands of the forest types (C3, D1, D2, D3 and E) whose volumes will, at the time of the next logging, fall short of the average volume of the stands currently classified as type A. The study has also decided that it is appropriate to set the cutting ratio for each forest type in the range of between 35% and 20% (in the case of the lower rows in the table). The cutting ratio in the case of selective logging is set at no more than 35% for type A, no more than 30% for type B1 and C1, and no more than 20% for type B2 and C2.

Table II-4.3.3 Analysis of selection of cutting ratio

Ftype	Case of 35% cutting			Logging After 2.5	After Yielded	Year passed after logging					Next Yield period	
	Ha/V	Growth (%)				7.5	12.5	17.5	22.5	25.5	37.5	42.5
	A	260	1.5	35	270	175	189	204	219	236	255	274
B1	220	1.5	35	228	148	160	172	186	200	215	232	250
B2	200	1.5	35	208	135	145	157	169	182	196	211	227
C1	220	1.5	35	228	148	160	172	186	200	215	232	250
C2	200	1.5	35	208	135	145	157	169	182	196	211	227
C3	160	1.89		168	168	184	202	222	244	268	294	323
D1	150	2.33		159	159	178	200	216	232	250	269	290
D2	130	2.33		138	138	155	173	195	218	235	253	273
D3	70	3.07		75	75	88	102	119	138	161	187	218
E	60	3.07		65	65	75	88	102	118	138	160	186
Case of 30% cutting												
Ftype	Ha/V	Growth (%)		After 2.5		7.5	12.5	17.5	22.5	25.5	37.5	42.5
A	260	1.5	30	270		189	204	219	236	254	274	295
B1	220	1.5	30	228		160	172	186	200	215	232	250
B2	200	1.5	30	208		145	157	169	182	196	211	227
C1	220	1.5	30	228		160	172	186	200	215	232	250
C2	200	1.5	30	208		145	157	169	182	196	211	227
C3	160	1.89		168		168	184	202	218	235	253	272
D1	150	2.33		159		159	178	200	216	232	250	269
D2	130	2.33		138		138	155	173	195	210	226	243
D3	70	3.07		75		75	88	102	119	138	161	187
E	60	3.07		65		65	75	88	102	118	138	160
Case of different cutting ratio to lead to more than 250 m ³												
Ftype	Ha/V	Growth (%)		After 2.5		7.5	12.5	17.5	22.5	25.5	37.5	42.5
A	260	1.5	35	270		175	189	204	219	236	255	274
B1	220	1.5	30	228		160	172	186	200	215	232	250
B2	200	1.5	20	208		166	179	193	208	224	241	260
C1	220	1.5	30	228		160	172	186	200	215	232	250
C2	200	1.5	20	208		166	179	193	208	224	241	260
C3	160	1.89		168		168	184	202	218	235	253	272
D1	150	2.33		159		159	178	200	216	232	250	269
D2	130	2.33		138		138	155	173	195	210	226	243
D3	70	3.07		75		75	88	102	119	138	161	187
E	60	3.07		65		65	75	88	102	118	138	160

(2) Yielding unit

Table II-4.3.4 shows seven yielding units (one term: 5 years) that have been adjusted based on this idea, so that the cutting area is almost evened out and the cutting volume does not significantly vary from unit to unit. The cumulative total of the cutting volume for the seven units over five years is estimated at 93,000-102,000 m³. The cutting volume will grow gradually, although the growth rate will differ more or less from unit to unit. The stand volume will increase from 1,850,000 m³ immediately after the first logging to 2,098,000 m³ due both to an increase in the volume of the stands that will not be logged in this cutting cycle and to the growth increment of the other stands after logging. As a result, it is estimated that the average stand volume of all the forests covered by the

logging operation will increase from 214.8 m³ /ha in 2002 to 263.0 m³ /ha in 2037. The logging sites for the next ten years will be selected in Units 1 and 2 in such a way that the efficiency of the operation of the next logging (35 years later) will not be undermined significantly. The result of this selection is detailed in the logging and afforestation plan that appears in a separate volume. Figure II-4.3.2 shows the physical relationship among the seven yielding units. Since Unit 6 and 7 contain a significant proportion of stands that were logged over the past ten years, logging will not be conducted for the next 25 years in these units.

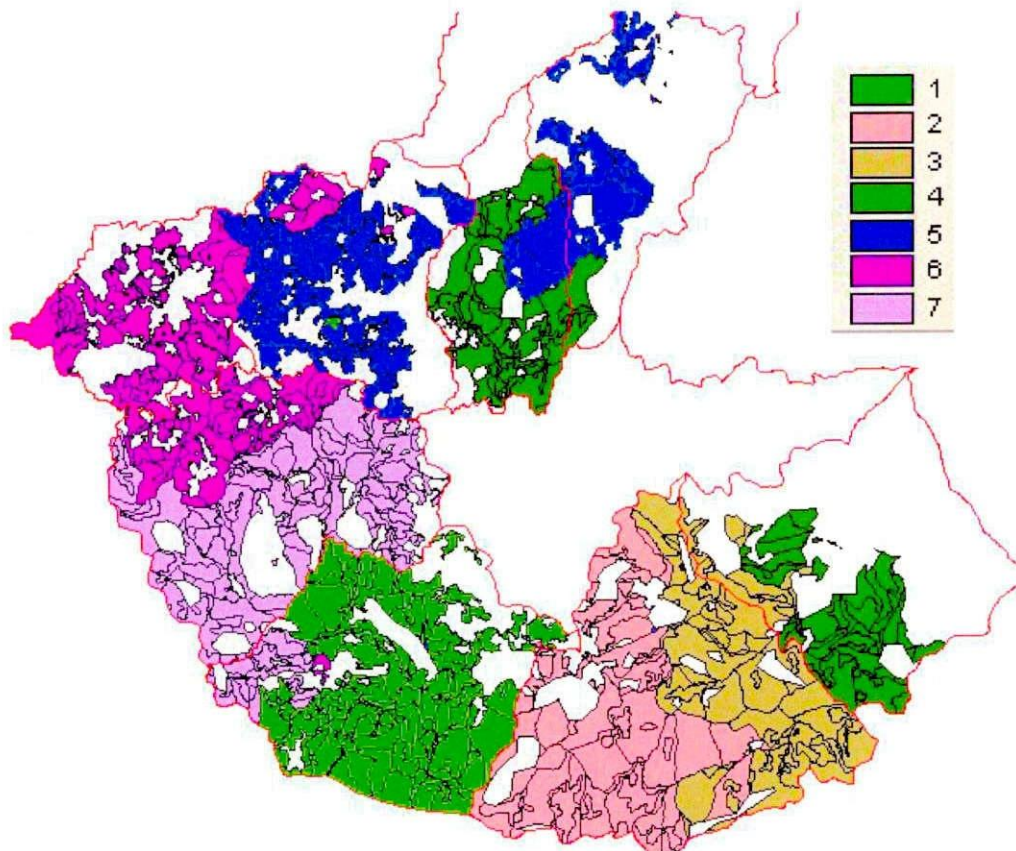


Figure II-4.3.2 Yielding units for 7 groups rotation

evening out in the strict sense of the word, since the adjustment is basically made with compartments as the minimum unit. Table II-4.3.4 shows an estimate of the allowable cutting area and the yield volume for each yielding unit. It should be noted that the study tried to even out the yield volumes by first compiling a table showing changes in the stand volume of each unit using the spreadsheet software Excel and then adding or subtracting a compartment(s) that borders the yielding unit to be logged in the next term. Table II-4.3.4 also shows the projected changes in volume every five years based on this assumption. The forest management plan aims to achieve the target forests (with an average volume of 260 m³/ha) in 105 years by effecting these changes. The table showing projected changes in the stand volume is in a separate volume that contains reference materials.

In evening out the yield volumes, on the assumption that logging will be conducted in the mid-term years (Y2.5, Y7.5, Y12.5 ... Y32.5), the study added the estimated growth increment until each cutting year to the allocated volume. Finally, the study evened out the yield volumes thus calculated. With growth expected in forest types C3, D and E, it is estimated that the average volume of all the forest stands will increase to 256 m³/ha at the end of the first cutting cycle (from 233 m³/ha immediately after the first logging). At the time of the second logging, it will be possible to raise the allowable annual cut if the following three conditions are met: (i) the logging operation is conducted in line with this estimate, (ii) the forest conversion is limited to the stands that are excluded from this estimate as reserves for the Villager Support Program, and (iii) there is no encroachment on timber stands or unplanned logging.

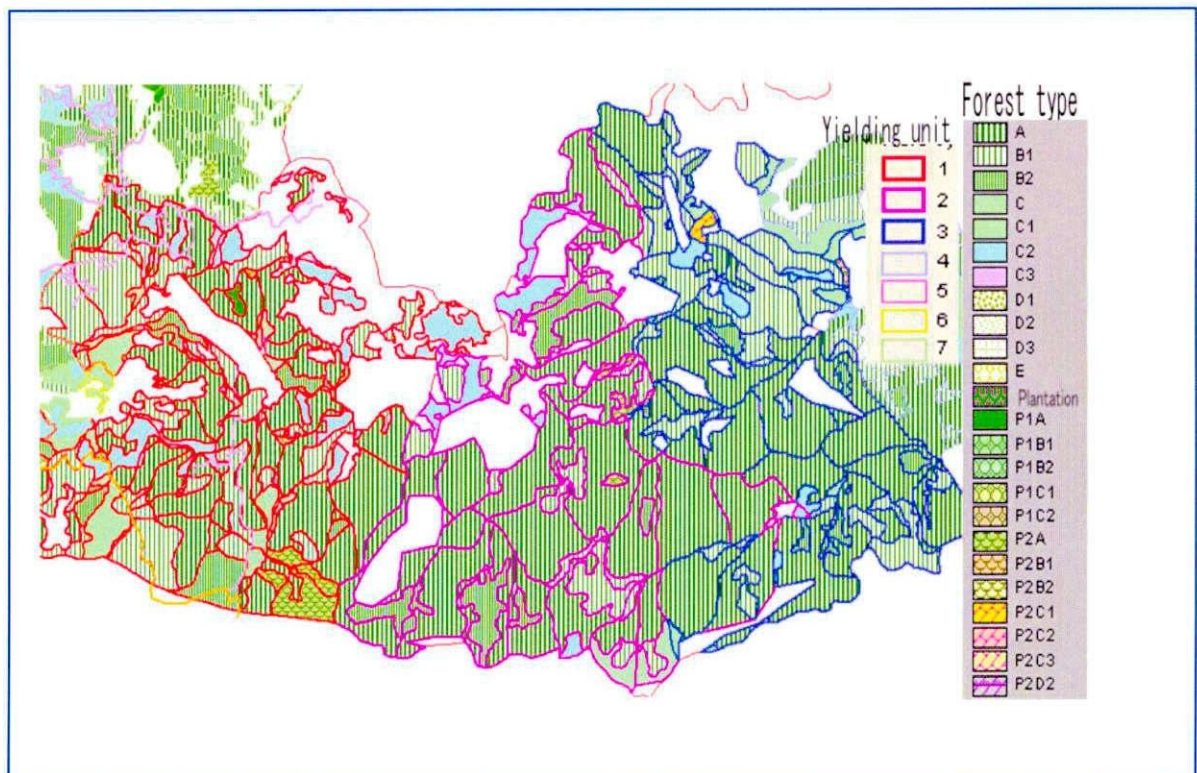


Figure II-4.3.3 Yielding unit 1 & 2 (Target area for logging in next 10 years) and forest types

4.4 Plantation and rehabilitation

For rehabilitation and plantation planning, the areas of degraded forest, bush, grassland and some part of farmland (slash and burn) have to be evaluated. Figure II-4.4.1 shows the distribution pattern of these lands. Concentrated grassland areas are located on the east side of block 440, and 502. Other degraded areas are scattered in surrounding villages. Scattered areas are mainly where slash-and-burn cultivation had been done. Some areas are abandoned, and some areas are fallow. Rights for use of these old scattered upland farming sites traditionally belong to the initial cultivator.

The degraded areas belonging to traditional users are expected to be basically rehabilitated by them. But given the real circumstances of the villagers, to plant trees by themselves is almost impossible, therefore, collaboration work with the FE is expected.

The selection guidelines proposed by the master plan are:

- a. Areas surrounding villages (hamlets) and other areas in need are expected to be rehabilitated as far as possible.
- b. Far from village areas, basically wait for natural regeneration.
- c. Between (a) and (b) above, FE will carry out rehabilitation operation.

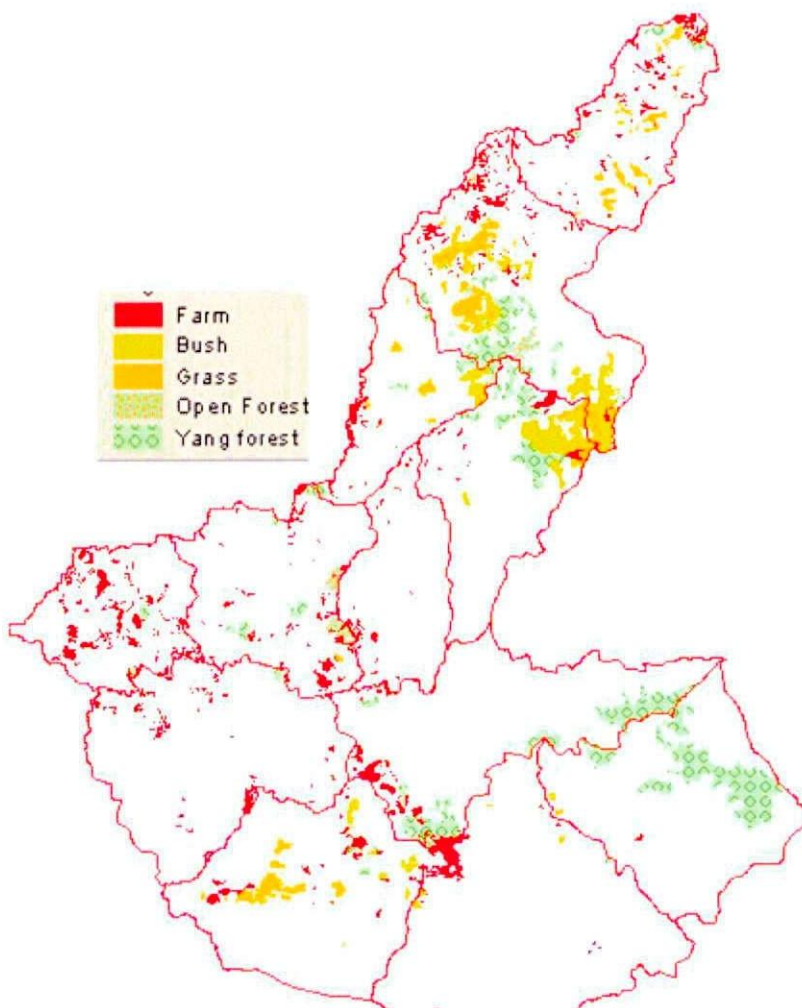


Figure II-4.4.1 Distribution pattern of the lands for rehabilitation and plantation

Based on this idea, the rehabilitation plan identifies its target areas while taking the following considerations into account.

- a. The areas that were excluded from the target of the logging operations under the villager support program as defined in 4.2.5 were reserved primarily for common use by the local

residents. It is up to the local residents to decide whether these reserved areas will be converted to forest land by such means as planting and agroforestry. Therefore, these areas are not included in the plantation and rehabilitation plan to be implemented by the FE but they are dealt with under the villager support program. In implementing this program, it is preferable that the extension officers of the FE promote agroforestry activities by local residents. To this end, the extension officers are expected to explain to local residents the need for maintaining the multiple functions of the forests and for developing a forest in a given area, hold consultations with them on land use, and obtain their cooperation.

- b. Local residents consider land surrounding the village as land that has traditionally belonged to them, although such areas, which are classified as “village territory” in 4.3.6, are defined otherwise under the law. The land in the village territory is under the jurisdiction of the FE, except for rice paddies. It is generally believed, however, that local residents are allowed to practice slash and burn in degraded areas in the village territory. It should be noted that local communities recognize the right of those who practiced slash and burn in a degraded area in the past to use the area in the future and that such rights are respected in many degraded areas. Nonetheless, in grassland and bush, FEs are to make efforts for afforestation with mutual communication with local people. In the production forests, the areas under shifting cultivation in the land classified as areas required for ‘water, soil and land conservation’, ‘water source protection’, and ‘steep areas’ would be converted to forest lands through agroforestry practices along with the villager support program as much as possible.
- c. The category of far isolated areas refers to areas generally covered with forest that have no roads and few villages and where new encroachment is unlikely (Figure II-4.4.3). Typical examples include the area at the bottom of the escarpment in Block 501, a large part of Blocks 495, 500 and 503, and the eastern half of Block 440. Grassland and bush are expected to achieve recovery through natural regeneration. The stands targeted by the logging operation in these areas are not included in the logging target, at least during the first rotation period. In other words, the growth increments of these stands are not considered in estimating the allowable annual cut.
- d. Grasslands and bushes that lie between the areas surrounding villages and far isolated areas will be the target of plantation or stand improvement operations by mainly FEs. Afforestation operations in the protection areas should be subcontracted to local residents wherever possible with the use of Program 661. Table II-4.4.1 shows the targets for the rehabilitation plan.

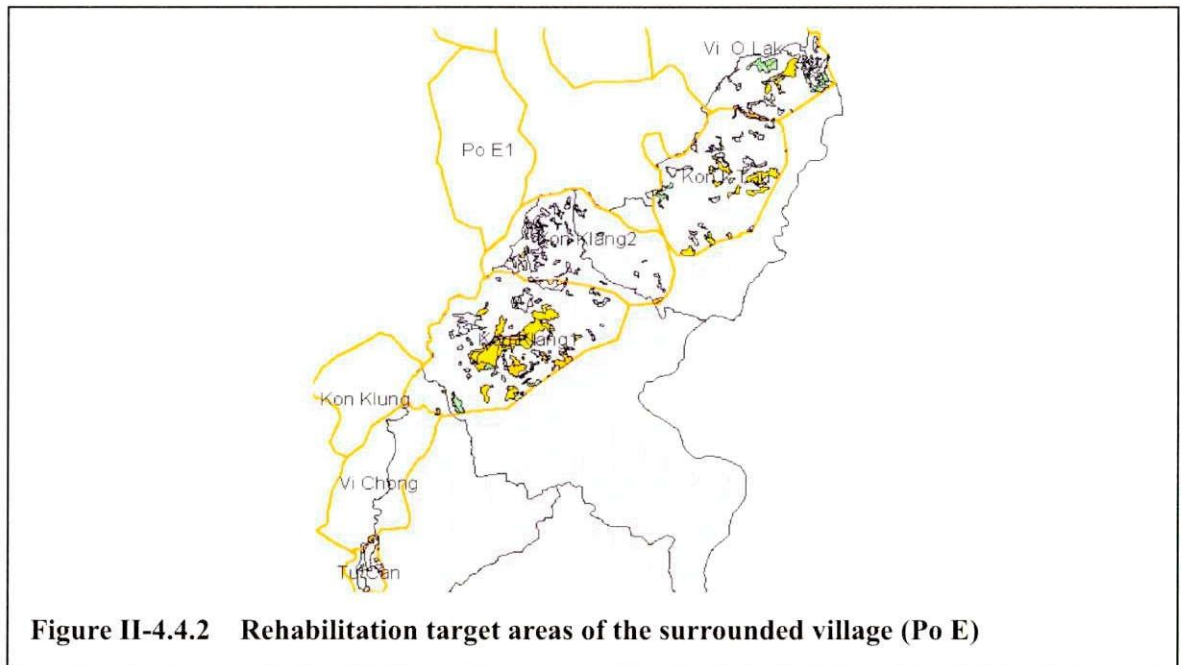


Table II-4.4.1 Rehabilitation target area for FE (ha)

Block	Grass	Bush	Farm	Total
495	0.00	0.00	4.44	4.44
496	0.00	0.62	100.32	100.94
497	0.09	0.00	52.50	52.59
498	0.00	0.00	11.59	11.59
499	0.00	0.00	47.66	47.66
502	63.73	23.20	62.70	149.63
503	0.00	4.14	14.04	18.18
Subtotal	63.82	27.96	293.25	385.03
439	46.54	5.80	53.59	105.93
440	69.00	67.06	72.38	208.44
493	14.25	29.55	23.92	67.72
	129.79	102.41	149.89	382.09
500	0.00	0.00	57.10	57.10
Subtotal	129.79	102.41	206.99	439.19
Total	193.61	130.37	500.24	824.22

