REPORT

ON

THE INTEGRATED FOREST MANAGEMENT SYSTEM

IN THE PANTABANGAN WATERSHED AREA

March 1992

Japan International Cooperation Agency

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PREFACE

The Integrated Forest Management Plan (hereinafter referred to as "the forest management plan") was made to contribute to the development and improvement of the integrated forest management system, an activity stipulated in the Record of Discussion (R/D) for Phase II. And a main point described in the forest management plan is to show the standard forest works adapted to the forest land use classification.

The standard forest works is recommended to be done based on the specific techniques which have been developed and improved during the Phase I and II including those techniques under research. For whatever change of techniques cannot be denied that it happens between the times the Plan book is written and when Phase II is terminated. Those changes are also integrated into a system of forest work through the application of the management cycle, "plan-do-see", to the forest management plan making.

The forest land use classification is also recommended to show the order of priority of which view points are afforestation/reforestation, forest conservation, social forestry and those concerning the Project activities. The thought that it is necessary to cover the mountains in the Project site with man-made forest has been generated from the common consciousness/understanding on the participation of the rural communities into afforestation. The experiences accumulated in the Phase I helped to succeed the start of the Phase II. The connection of forestation/rehabilitation techniques and the rural communities to the existing Project site's forest condition can be reflected concretely in planning item of the forest land classification for the forest management plan.

The aforementioned matters are described based on the following consciousness under the present conditions of the Project area which is declared as critical watershed that causes forest cutting banned:

a) The fulfillment of multiple forest functions including forest products, water resources and soil conservation can be further obtained by means of adequate forest works including harvesting of man-made forest which is unlikely different from prohibited forest cutting for the reservoir of the Pantabangan dam;

b) Effective forest protection from damages like forest fire, gained through the execution of UFBP and CBRP. the participation of rural communities in afforestation and utilization of forest land which will be followed by the new forestry policy like the "forest land tenure security" is expected to be realized in the critical watershed areas.

It is inevitable that forest works suitable to forest land conditions need to be declared and maintained for a long time even if the person in charge might be transferred, because it takes a longer time to get a yield compared to other industries, e.g. in agriculture, fruits can almost be produced in a year.

At present, what is to be done is to keep the management cycle, "plan - do - see", to upgrade the contents of the management plan step by step.

The forest management plan is hoped and expected to be treated well for a long time by the persons concerned.

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I History of the RP-Japan Project

1. Phase I

(1) "The Technical Cooperation for Afforestation of the Pantabangan Area (Phase I)" was started upon the signing of the Record of Discussion in June 18, 1976. This was based on the request of the Philippine Government to the Japanese Government for immediate reforestation and rehabilitation of the watershed area of Pantabangan dam for its increasing sediment in the reservoir.

(2) Problems should be solve such as the annual rite of destruction, adverse climate and long dry season in the area which resulted to infertile and acidic soil. For example: in such circumstances, what suitable species should be planted? In case of being able to find out the right species, how could seedlings be obtained?

According to whether purchasing seedlings to a specialty shop or taking care of them in one's own nursery, initial plan/basic attitude towards the works would be changed. Other problems would be counted up easily.

(3) Some of the problems had been solved, and the concerned techniques were developed and improved step by step through trials and test plantations, nursery operation and other related forest works.

(4) The techniques on forest civil engineering such as forest road construction, check dam as an erosion control work and the like had been developed and improved simultaneously with afforestation.

(5) The construction of the "Training Center for Forest Conservation" agreed by both parties (August, 1978) actually started in the early month of 1979 for the purpose of disseminating techniques in the Project activities through training such as "The Middle Level Forestry Technicians Training". Trainees from all over the country participates and they acquire knowledge and skills which can be dilated nationwide.

In July 24, 1982, the Record of Discussion for another five (5) years extension of the project was signed and consequentially changed the name of the Project from "The Technical Cooperation Project" to "The Forestry Development Project".

(6) The results of the main activities of the Project in the duration of Phase I were as follows:

a. Seedling production: 15 million seedlings (Acacia auri: 21%, Yemane (Gmelina arborea): 19%, Narra

(Pterocarpus indicus): 12%, Giant ipil-ipil (Leucaena laucocephala): 9%).

NOTE:

1977 ~ 1987 - duration of the above statistical figures. The figures shows round number.

b. Planted area: 9.1 thousand ha. (New plantation: 7.1 thousand ha., Replanting: 2.0 thousand ha.)

c. Forest road construction: 150 km.

d. Erosion control works, construction of fire protection belt and other matters are omitted. For more information refer to the literature mentioned below.

(7) Not all problems were solved during the Phase I. Throughout the implementation, in doing the activities several kinds of problems were experienced unendingly such as:

Some planted areas resulted in poor forest.

The outbreak of forest fire which had been unsolved since the start of the Project in spite of unending efforts in taking countermeasures to stop it.

The remaining problem in developing and improving techniques concerned with silviculture in areas such as steep slope or places strongly affected by strong winds.

New problem is the necessity in gaining the active participation of rural community in afforestation. Involved participants are expected to maintain, tend, protect manmade forests especially to prevent forest fire.

(8) As the Joint Evaluation team evaluated the activities of Phase I including its follow-ups, the recommendation is that to implement a new Project just after Phase I's termination, and the following items be the subjects in its application:

a. Development and improvement of techniques on species alteration, including tending and forest protection.

b. Development and improvement of techniques on afforestation combined with erosion control works.

c. Development and improvement of techniques on forest conservation applicable to the Philippine conditions..

d. Technical training on afforestation, forest protection and forest conservation.

e. Development of the system of plantation establishment and forest protection with deep involvement of rural people, and

f. Establishment of the integrated watershed management system through the implementation of the above mentioned items.

2. Phase II

(1) "The Forestry Development Project-Watershed Management" in Pantabangan and Carranglan, Nueva Ecija (Phase II) was started July 24, 1987 with the characteristics of research and development, a little different with the afforestation and rehabilitation in Phase I. Phase II activities were as follows:

a. Development and improvement of the techniques on tending, forest protection and species alteration.

b. Development and improvement of the techniques on erosion control works applicable to the local conditions and the techniques on afforestation combined with erosion control works.

c. Technical training on afforestation and forest conservation: Erosion Control, Afforestation, and Social Forestry.

d. Development and improvement of the techniques to introduce social forestry.

e. Development of the integrated forest management system in the Pantabangan watershed area.

(2) The details of activities such as placement of experimental plot, observation, examination and research have been executed based on the contents of the "Tentative Schedule of Implementation (TSI).

(3) The results of these activities had been reported/published in taking opportunities of the Joint Committee and the like in spite of worsening surrounding condition such as experimental plots damaged by the occurences of such big forest fire in Mankitkit (March 13, 1990), the strong earthquake (July 16, 1990) and subsequent heavy rains.

(4) To make matter worse, Japanese experts have been obliged not to enter the Project site in consonance with the U.S.A. Peace Corp's withdrawal from the Philippines and ordered to return to America, and the technical transfer between experts and counterparts has been ordered to be

carried out in the Central office (Manila) and San Jose CENR office (July, 1990).

In connection with the abovementioned, the Technical Guidance Team recommended that the Project activities initially planned and mentioned in the R/D be revised according to the surrounding condition of the Project (November, 1990).

(5) Although under such additional condition as the experts' going home without sucessors, the activities to be done have been holding on.

(6) The Joint Evaluation Committee recommended the following:

a. The RP-Japan Forestry Development Project-Watershed Management (Phase II) be brought to termination as a result of the evaluated outputs on its activities.

b. Implementation of the Phase-out plan including effective utilization of the facilities, acquired knowledge, and skills on the 16 years cooperation in Phase I and Phase II be continuously done by responsible and relevant authority.

(7) In relation to the research and development activities, Afforestation Promotion Program and Middle Level Man Power Training Program have been carried out according to the initial plan in spite of the sorroungding condition such as the above mentioned.

The results of the above mentioned programs in Phase II were as follows:

Planted area: 1.4 thousand ha. (New planting: 0.7 thousand ha., Replanting: 0.7 thousand ha.)

Middle Level Forestry Technician's Training:

Graduates: 259 (Reforestation Plannning Course: 71, Watershed Management Course: 113, and Social Forestry Course: 75).

3. A chronological table

Refer to Table I for details on the Project history "Chronological Events".

4. Literature

(1) "Terminal Report in the RP-Japan Forestry Development

Project of the Pantabangan area (1976-1987)" by Kato (March 31, 1988).

(2) "RP-Japan Forestry Development Project" (Pamphlet) by Bureau of Forest Development and JICA (March, 1984).

(3) "RP-Japan Forestry Development Project-Watershed Management, Carranglan, Nueva Ecija (Phase II)" (pamphlet) by DENR and JICA (August, 1990).

(4) "Project Accomplishment (Phase II)" RP-Japan Forestry Development Project-Watershed Management (as of February, 1991).

Table I Chronological Events

NO.	DATE	DETAILS	NOTE
1	May 1973	The Minister of Agriculture and Natural Resources of the Philippines requested to the Japanese Ambassador for a Technical Cooperation Project in the field of afforestation.	Then Ambassador Urabe, Secretary Arturo Tanco The construction of the Pantabangan Dam in 1974.
2	September 1973	Discussing the matter between the Minister of the Philippines and the Minister of Agriculture and Forestry of Japan.	The Minister of Agriculture and Forestry; Mr. Sakurauchi.
3	October 1973	The results of the discussion formalized by an official letter of the Philippine Government to the Japanese Government through the Japanese Embassy (Manila).	
4	February to March 1975	Follow-ups request Japan to send the forestry survey mission.	
5	April 1975	Pre-feasibility study by JICA	
6	October 1975	Preliminary negotiation by both sides.	
7	December 1975	Second forestry survey by JICA.	
8	June 1976	Signing of the Record of Discussion (R/D) by BFD and Japanese forestry survey team of JICA.	Director E. V. Cortes (BFD), Mr. K. Kotari (JICA, Director of the team).
9	November 1976	Activation by two Japanese experts arrival.	
10	August 1978	Signing of the Exchange of Notes between both countries about Japanese grant aid for the Forest Conservation Training Center.	Turned over to the Phillipine Government in September 1982.
11	July 1982	Extension of R/D for another 5 years. The Project name changed to "The Forestry Development Project of Pantabangan Area" from "The Technical Cooperation Project for Afforestation of the Pantabangan Area".	

12	September 1984	Signing of the Exchange of Notes between both countries about Japanese grant aid to upgrade the Forest fire fighting system.	103 Million Yen. The equipment for the scheme arrived from Japan in 1986.
13	December 1986	The joint team composed of two country members agreed to recommend to both governments to establish a new project immediately after the termination.	
14	July 1987	Signing of the R/D between the DENR and JICA for 5 years extension, Project named "The Forestry Development Project-Watershed Management in Pantabangan and Carranglan, Nueva Ecija". Phase II started.	Mr. M. Miyamoto (JICA in Philippines) Mr. P. E. Julico (DENR Undersecretary)
15	July 1988	Tentative Schedule of Implementation (TSI) signed in the R/D.	Amendment of the R/D assigned in August and October, 1988.
16	March 1990	Forest fire destroyed the large area of famous man-made forest of the Project in Mankitkit	March 14, burned areas about 90 ha., species: A. auri.
17	July 1990	Japanese experts ordered not to enter the Project site and at the same time pull-out of the U.S. Peace Corps and asked to return to America.	The great earthquake occured in July 16, 1990.
18	November 1990	Technical guidance team recommended that the way of technical transfer be done in the Central Office (manila) and San Jose, CENR office, and that output as initially planned and mentioned in the R/D be revised.	
19	February 1992	The Joint Monitoring Evaluation Committee recommended that the Project (Phase II) be terminated on its termination term.	Mr. E. Shimokawa (Leader, JICA Evaluation Team), Mr. A. A. Tria (Undersecretary, DENR)
20	March 1992	San Jose CENR office moved from San Jose to Munoz, 10 minutes drive from San Jose.	

II The Present Condition of the Project Site

II-1 The Present Condition of the Forest

1. Outline of the Project Locations

Located within the municipalities of Pantabangan and Carranglan, Nueva Ecija. Approximately 150 km distant in a straight line from the Capital of Manila, 121 4' East longitude, 15 57' North latitude.

The three majors rivers flowing into the dam: the Carranglan River, Manablong River and Diaman River.

The soil is red podzolic characterized by high acidity and infertility with very poor physical properties.

Vegetation in the area consists predominantly of cogon (Imperata cylindrica), samon (Themedia triandrea) and talahib (Saccharum spontaneum) with strips of spots of natural forests.

11,000 hectares (ha.) total project area are subdivided into four (4) parcels - Parcel I, II-A, II-B and III. As to the location refer to the Figures II-1, and as to the areas, Table II-1-1.

2. The Outline of the Parcels

The areas of man-made forest, natural forest, left over area and the like are referred to in Table II-1-1.

a. Parcel I

Parcel I consists of five (5) Blocks: 33 and 54 to 57 with total areas of about 2,900 ha.. It is located west side of Carranglan municipality and on the right bank of Carranglan River. It is convenient for doing forest activities like afforestation for it is along the provincial road. It is where the Project offices, nursery, forest road check dams, including the Training Center for forest conservation built. So to speak, it is called the birth place of the Project. The rate of man-made forest occupied in the Parcel shows 46% high in comparative.

The highest rates of man-made forest is in Block 33 and 57 ranging from 62% and 57% respectively. The reasons are that it is the center of all activities such as the trial experiments on tree species selection, soil and water conservation and nursing seedlings.

On the other hand, low rates of man-made forest is in Block 54 and 56 with only 33% because it is comparatively covered with natural forests ranging from 46% and 58%. This Blocks are used as the model for soil/water conservation works because of its eroded and steep slopes at the foot of Mt. Carranglan, 600 meters in elevation above sea level (Asl.) at the look-out tower.

b. Parcel II-A

Parcel II-A consists of four (4) Blocks, 87, and 89 to 91 with a total area of about 2,500 ha. It is located north of Carranglan municipality and on the left bank of Carranglan River. Its elevation ranges from low land like rice fields (about 220 m. Asl.) up to Mt. Olong Amo (about 1,200 m. Asl.) and it ranges topographically from plateau like Block 91 to steep slopes of other Blocks. As a whole, it has comparatively high rate of natural forest (25%) compared to the average rate of the Project (20%) and high rate of left over area (7%) compared to average rate of the Project (4%).

In an individual view, Block 91 which has the highest rate of man-made forest (67%) is known for its success in Acacia auriculiformis (A. auri.) plantation. However, it was regretable that 92 ha. of the plantations were burned on March 14, 1990.

Block 87 is 76% bald caused by forest fire same as Parcel II-B.

Block 89 with 51% natural forest is thought to have little influence in planting trees because natural forests mainly exists near the high elevation of the mountain top and the lower places remains suitable for planting.

c. Parcel II-B

Parcel II-B consists of six (6) Blocks from 81 to 86 with total areas of about 2,500 ha. and located at the northern part of the municipality of Carrangan and on the left bank of Carranglan River as well as Parcel II-A. Its elevation ranges from low land like rice field (about 220 m. Asl.) up to Mt. Degued (about 1,000 m. Asl.) and Pinus look-out tower (about 970 m. Asl.) topographically it has steep slopes.

The Parcel has 24% man-made forest and 7% natural forest, and a high rate denuded area (65%) distinctively, a result of ample forest fires. In short, the Project target is to plant trees in severely denuded grass land with poor soil due to continuous

forest burning and to grow them well without the fear of another forest fire disturbances.

As viewed individually, Block 81 , 82 and 85 have high rate of no plantation areas ranging from 85%, 82% and 71%. Furthermore, Block 81 has no man-made forest. There is a hope to be seen in afforestation because Block 84 has man-made forest at high rate (60%).

d. Parcel III

Parcel III consists of nine (9) Blocks from 100 to 103 and from 107 to 111 with total area of about 2,800 ha.. The Parcel is located in the northern part of Pantabangan municipality and on the left bank of Diaman river. Its elevation has a little range from the surface of the reservoir of Pantabangan dam (about 220 m. Asl.) to the Block 109 look-out tower (about 470 m. Asl.).

Block 100, 109, 110, and 111 have high rate of ma-made forest 53%, 70%, 80% and 76% respectively. Blocks 102 with 44% no plantation area and Block 101 with 62% of natural forest can be seen. It can be said that the parcel will have a good man-made forests as well as Parcel I in the future.

3. Outline of man-made forest

a. General state

General state of man-made forest is as follows (Table II-1-1 to II-1-3 as references):

a.1. The average rate of man-made forest in the Project areas is 38%. Parcel III and I, 50% and 46% each. On the contrary, Parcel II-A and II-B have low rates, 30% and 24% individually. Gross area of man-made forest is 4,048.24 ha. of which details are: Parcel I: 32%, II-A: 18%, II-B: 15% and III: 35%. Parcel I and II sum up about 2,700 ha. which occupy 67% of the Project areas.

a.2 The planted species (Table II-1-3) are A. auri., Yemane, Benguet pine of which rates are 61%, 22% and 7% respectively, summing it up 90% is occupied by man-made forest.

b. Specific state

b.1 A. auri.

A. auri. (Japanese Acacia) has been planted constantly since 1981, earnestly since 1983. which started later planting than any other species like Yemane and Benguet pine. About half rate of the areas of A. auri. (47%) are in Parcel III, and 27% in Parcel I (see Table II-1-2-1). The distribution of age classes of A. auri. is generally regular compared to other species, which is thought to be good for making plan for thinning, yielding and the other production plan like charcoal making for Social Forestry Program.

b.2 Yemane

Yemane has been planted constantly since the beginning of the Project, (refer to Table II-1-2-2). The demands for Yemane is strong because it is fire resistant tree. Though Parcel I has higher rate (30%) of Yemane plantation than in other parcel, it can be said that Yemane has been planted evenly in all Parcels. The area of Yemane is a little less than A. auri., but the distribution of age classes is nearly regularly even in each area. So it is easy to make plan for utilizing Yemane resources as thinning and harvesting and the concerned.

b.3 Benguet pine

Benguet pine has been planted continuously since early age of the Project like Yemane (see Table II-1-2-3). It has been planted suitably for high elevated areas. In Parcel I, Benguet pine is about half of the area (48%) and Parcel II-B is 40%. Parcel II-A and III have had a little opportunity for Benguet pine because it has high rate of natural forest and because natural forest exists in higher elevation in the former Block and having lower range of elevation of the latter.

b.4 Other species

Other species had been planted more than the species mentioned above from the beginning of the Project to about 1980. (see Table II-1-2-4). Based on the trial experiments of species selection, and earned knowledge, the "other species" had been changed to the above mentioned species found to be more suitable to the Project site condition. As to area of the "other species" 58% was occupied in Parcel I and some of them might be used as a reference to determine the right species and site. In other Parcel except Parcel I "other species" were observed to be growing rarely.

However, recently it can be seen that there are signs of increasing trend in the planting area because concerned people are wondering which ways and what really are the suitable species except the three would be chosen.

c. Matters for references

a. Outline of references

a.1 Parcel I (refer to Table II-1-3-1)

A. auri. occupies 50% plantation compared to the average rate of 61% (see Table II-1-3), "others" are planted at rate 19% which is higher than the total average rate of 11%.

a.2 Parcel II-A (refer to Table II-1-3-2)

The Parcel has A. auri. and Yemane which predominate higher rate (63% and 28% each) and Benguet pine and "Others" are planted with lower rate (4%) than the total avergae rate of 7% and 11% each.

a.3 Parcel II-B (refer to Table II-1-3-3)

It has lower rate of A. auri (32%) and higher rate of Yemane (35%) as compared to the total average rate as mentioned above.

a.4 Parcel III (see Table II-1-3-4)

A. auri predominates this area with 81% and its distribution of age classes is thought to be in good order. Benguet pine has not been planted yet on the supposition of ranging low elevation unsuitable for planting.

b. Outline of crown density of man-made forest (refer to Table II-1-4)

The crown density of man-made forest. which is less than 5 in degree occupies 10% of all.

The way of tending the low crown density of man-made forest works needed like additional planting, under inter-planting, is referred to "V Standard/Criteria of Forest Works" mentioned later.

4. Literature

(1) "Basic map arrangement and improvement of forest inventory book of the RP-Japan Forestry Development Project" by J. Watanabe (short term expert) and A. F. Parcia (May 24, 1990).

(2) "Forest register data base system on Dbase III plus" by Y. Kimura (December, 1990).

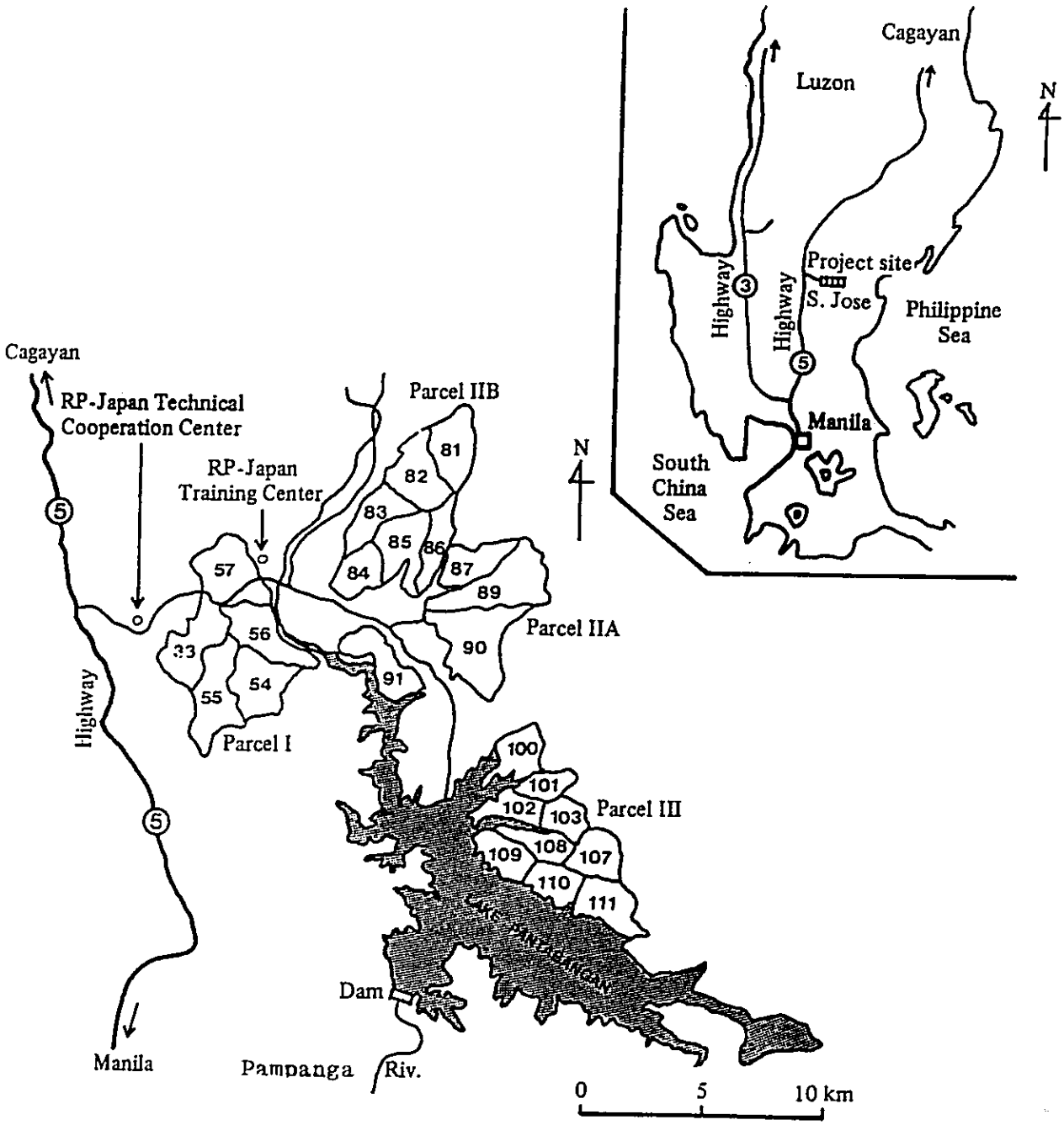


Fig. II-1 **Location of the Project Site**

TABLE II-1-1 FOREST AREA (each Parcel (P), Block, Manmade forest, Natural Forest, etc.)

ITEM	PARCEL I						PARCEL II-B						
	33	54	55	56	57	TOTAL	81	82	83	84	85	86	TOTAL
MAN MADE FOREST	(62) 356.06	(33) 171.38	(43) 284.68	(33) 178.68	(57) 320.71	(48) 1,311.51	-	(1) 7.85	(43) 185.93	(50) 181.82	(21) 101.75	(44) 132.21	(24) 589.56
NATURAL FOREST	(21) 120.71	(20) 107.18	(28) 187.58	(8) 45.24	(9) 48.82	(18) 509.49	(8) 37.61	(13) 71.11	(2) 8.55	(1) 2.83	(7) 36.66	(10) 29.76	(7) 186.52
NO PLANT	(5) 25.77	(46) 210.51	(27) 177.86	(58) 320.05	(22) 124.15	(31) 888.34	(85) 400.70	(82) 454.10	(49) 187.43	(30) 89.96	(71) 350.20	(45) 133.86	(85) 1,616.25
LEFT OVER	(11) 60.76	1.30	(2) 10.07	-	(11) 81.00	(5) 133.13	(4) 17.96	(4) 21.37	(5) 20.27	(8) 23.92	0.87	-	(3) 84.39
PROVINCE ROAD	0.21	-	-	-	1.65	1.86	-	-	-	-	-	-	-
FOREST ROAD	(1) 6.23	(1) 3.74	3.02	(1) 2.93	(1) 6.39	(1) 22.31	0.86	2.07	(1) 3.20	(1) 3.35	(1) 2.70	(1) 2.30	(1) 14.48
FIRE BREAK	1.26	1.54	-	0.98	1.66	5.44	-	-	-	1.37	1.82	-	3.19
TOTAL	(100) 571.00	(100) 525.63	(100) 663.19	(100) 547.88	(100) 564.38	(100) 2,877.08 (27)	(100) 457.13	(100) 556.50	(100) 385.38	(100) 303.25	(100) 494.00	(100) 298.13	(100) 2,494.39 (23)

(Unit: HA)( ) %

ITEM	PARCEL II-A					PARCEL III										G.TOTAL
	87	89	90	91	TOTAL	100	101	102	103	107	108	109	110	111	TOTAL	
MAN MADE FOREST	(11) 36.07	(8) 126.52	(27) 254.73	(67) 320.62	(30) 737.94	(53) 204.17	(9) 17.58	(29) 91.62	(42) 119.35	(44) 166.37	(31) 93.42	(70) 201.78	(80) 230.22	(76) 284.72	(50) 1,409.23	(38) 4,048.24
NATURAL FOREST	(10) 34.40	(51) 364.76	(22) 206.32	(1) 5.54	(25) 611.02	(33) 125.04	(26) 126.45	(26) 82.69	(31) 89.32	(37) 148.35	(35) 106.35	(17) 49.39	(14) 39.55	(22) 81.32	(30) 848.46	(20) 2,155.49
NO PLANT	(76) 255.50	(30) 216.97	(34) 316.27	(27) 128.82	(37 917.53	(7) 27.08	(44) 58.10	(44) 110.13	(32) 62.23	(16) 62.88	(33) 100.04	(13) 37.68	(5) 13.99	(1) 3.98	(18) 506.11	(37) 3,928.23
LEFT OVER	(2) 8.12	(2) 10.84	(16) 149.53	(3) 15.87	(7) 184.36	(6) 23.11	2.06	-	(5) 13.27	1.49	(1) 1.92	-	-	(1) 2.11	(2) 43.96	(4) 445.84
PROVINCE ROAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.86
FOREST ROAD	(1) 2.79	1.44	(1) 6.71	(1) 4.59	(1) 15.53	(1) 3.29	(1) 0.50	(1) 1.62	(1) 2.39	(1) 2.97	(1) 1.89	0.59	0.68	2.25	(1) 16.18	(1) 68.50
FIRE BREAK	-	0.81	-	(1) 2.94	3.75	-	-	0.32	-	-	0.32	0.81	(1) 2.90		3.45	15.83
TOTAL	(100) 336.88	(100) 721.31	(100) 933.56	(100) 478.38	(100) 2,470.13 (23)	(100) 382.69	(100) 204.69	(100) 316.38	(100) 286.56	(100) 382.06	(100) 303.94	(100) 290.25	(100) 286.44	(100) 374.38	(100) 2,827.39 (27)	(100) 10,663.99 (100)

(Note) 1. ( ) is round number

Table II-1-2

Manmade forest (As of May 1, 1990)

Total(Parcel (P) I, P IIA, P-IIB, P-III), (Ha.), ( ) %

Year	Parcel-I	Parcel-IIA	Parcel-IIB	Parcel-III	Total
'77	56.63	0	0	0	56.63
'78	29.95	2.46	16.08	4.16	52.65
'79	26.1	0	75.5	8.98	110.58
'80	63.08	8.61	0	35.0	106.69
'81	124.18	67.79	22.01	198.0	411.98
'82	97.45	63.08	142.21	33.88	336.62
'83	55.6	28.29	0	42.41	126.3
'84	69.78	74.36	38.81	71.15	254.1
'85	47.61	97.87	22.21	149.43	317.12
'86	25.01	159.58	57.92	163.88	406.39
'87	297.66	66.67	54.01	412.94	331.28
'88	223.51	90.26	48.37	111.74	473.88
'89	194.93	78.49	112.44	177.65	563.51
T.	1311.49	737.46	589.56	1409.22	4047.73
	(32)	(18)	(15)	(35)	(100)

(note)

1 ACA, GMA and PIK are abbreviations for "Acacia auriculiformis", "Gmelina arborea" and "Pinus kesiya".

2 ( ) is round number.

3 The difference of total areas of man-made forest in Table II-1-1 and Table II-1-4 is caused by the computerization of the Forest Inventory Book.

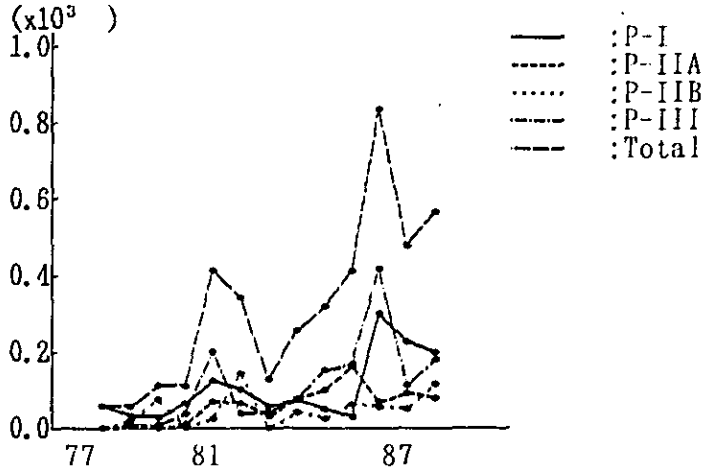


Table II-1-2-1

Manmade forest (As of May 1,1990)

"ACA" Total(Parcel (P)-I, P-IIA, P-IIB, P-III), (Ha.), ( )%

Year	Parcel-I	Parcel-IIA	Parcel-IIB	Parcel-III	Total
'77	0	0	0	0	0
'78	3.81	1.00	0	0	4.81
'79	0	0	0	0	0
'80	0	8.61	0	0	8.61
'81	9.17	36.72	1.29	166.87	214.05
'82	38.99	22.22	12.74	17.62	91.57
'83	30.66	9.53	0	12.9	53.09
'84	24.08	51.3	16.09	64.26	155.73
'85	26.19	16.57	0.93	108.14	151.83
'86	17.0	124.96	31.00	151.49	324.45
'87	253.51	54.31	19.41	391.6	718.83
'88	159.22	81.94	48.37	64.28	353.81
'89	98.9	55.24	56.22	169.1	379.46
T.	661.53	462.4	186.05	1146.26	2456.24
	(27)	(19)	(8)	(47)	(100)

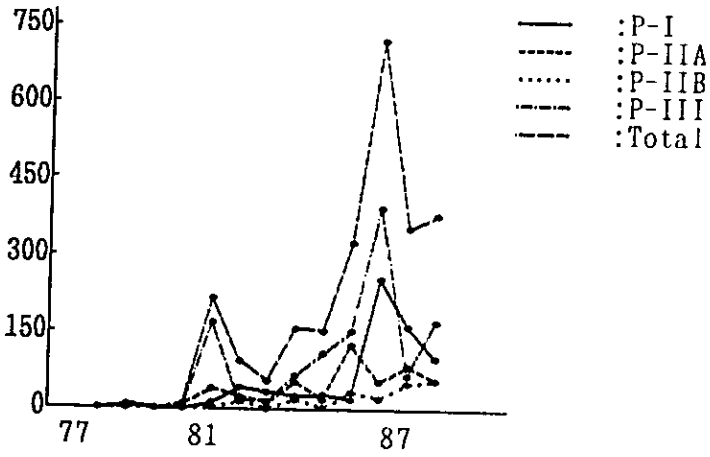


Table II-1-2-2

Manmade forest (As of May 1,1990)

"GMA" Total(Parcel (P)-I, P-IIA, P-IIB, P-III), (Ha.), ( )%

Year	Parcel-I	Parcel-IIA	Parcel-IIB	Parcel-III	Total
'77	1.12	0	0	0	1.12
'78	2.31	1.46	16.08	0	19.85
'79	0.7	0	18.58	8.3	27.58
'80	20.19	0	0	0.74	20.93
'81	81.83	28.22	20.72	31.13	161.9
'82	45.47	40.86	119.38	16.26	221.97
'83	16.71	18.76	0	24.94	60.41
'84	29.39	0	22.72	6.89	59.0
'85	11.07	69.32	0	41.29	121.68
'86	6.72	33.19	6.45	2.05	48.41
'87	22.13	12.36	2.6	18.23	55.32
'88	14.1	5.78	0	47.46	67.34
'89	17.36	0	0	8.55	25.91
T.	269.10	209.95	206.53	205.84	891.42
	(30)	(24)	(23)	(23)	(100)

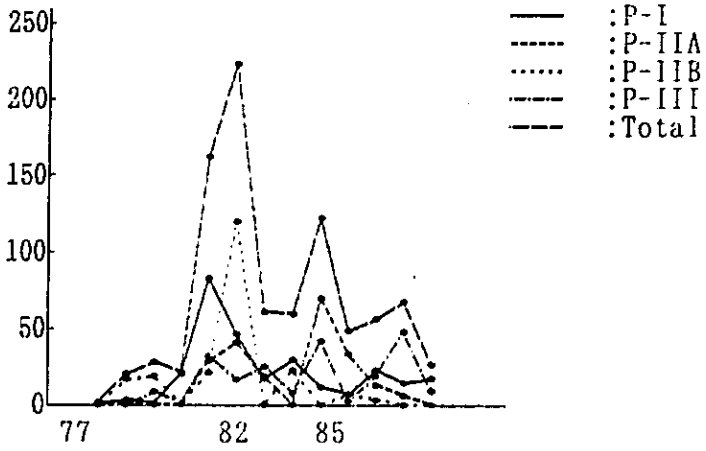


Table II-1-2-3

Manmade forest (As of May 1,1990)

"PIK" Total(Parcel (P)-I, P-IIA, P-IIB, P-III), (Ha.), ( )%

Year	Parcel-I	Parcel-IIA	Parcel-IIB	Parcel-III	Total
'77	9.57	0	0		9.57
'78	0.68	0	0		0.68
'79	8.94	0	3.59		12.53
'80	13.37	0	0		13.37
'81	28.27	0	0		28.27
'82	0	0	0		0
'83	0	0	0		0
'84	10.05	20.89	0		30.94
'85	0	11.98	21.28		33.26
'86	0	0	8.25		8.25
'87	0	0	17.86		17.86
'88	32.11	0	0		32.11
'89	27.56	0	56.22		83.78
T.	130.55	32.87	107.2		270.62
	(48)	(12)	(40)		(100)

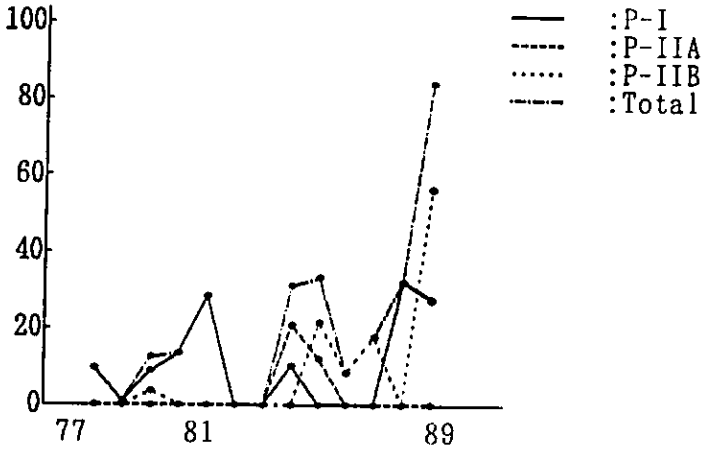


Table II-1-2-4

Manmade forest (As of May 1,1990)

"Others" 'Total(Parcel (P)-I, P-IIA, P-IIB, P-III), (Ha.), ( )%

Year	Parcel-I	Parcel-IIA	Parcel-IIB	Parcel-III	Total
'77	45.94	0	0	0	45.94
'78	23.15	0	0	4.16	27.31
'79	16.46	0	53.33	0.68	70.47
'80	29.52	0	0	34.26	63.78
'81	4.91	2.85	0	0	7.76
'82	12.99	0	10.09	0	23.08
'83	8.23	0	0	4.57	12.8
'84	6.26	2.17	0	0	8.43
'85	10.35	0	0	0	10.35
'86	1.29	1.43	12.22	10.34	25.28
'87	22.02	0	14.14	3.11	39.27
'88	18.08	2.54	0	0	20.62
'89	51.11	23.25	0	0	74.36
T.	250.31	32.24	89.78	57.12	429.45
	(58)	(8)	(21)	(13)	(100)

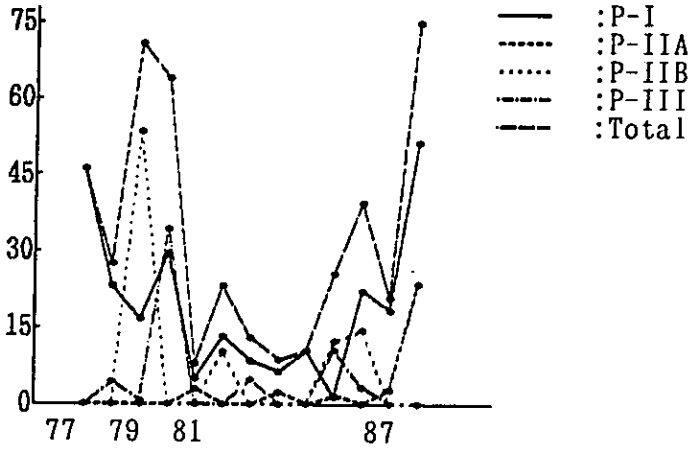


Table II-1-3

Manmade forest (As of May 1, 1990)

Total(Species; ACA, GMA, PIK and Others), Ha., ( )%

Year	T o t a l	A C A	G M A	P I K	O t h e r s
'77	56.63	0	1.12	9.57	45.94
'78	52.65	4.81	19.85	0.68	27.31
'79	110.58	0	27.58	12.53	70.47
'80	106.69	8.61	20.93	13.37	63.78
'81	411.98	214.05	161.9	28.27	7.76
'82	336.62	91.57	221.97	0	23.08
'83	126.3	53.09	60.41	0	12.8
'84	254.10	155.73	59.0	30.94	8.43
'85	317.12	151.83	121.68	33.26	10.35
'86	406.39	324.45	48.41	8.25	25.28
'87	831.28	718.83	55.32	17.86	39.27
'88	473.88	353.81	67.34	32.11	20.62
'89	563.51	379.46	25.91	83.78	74.36
T.	4047.73	2456.24	891.42	270.62	429.45
	(100)	(61)	(22)	(7)	(11)

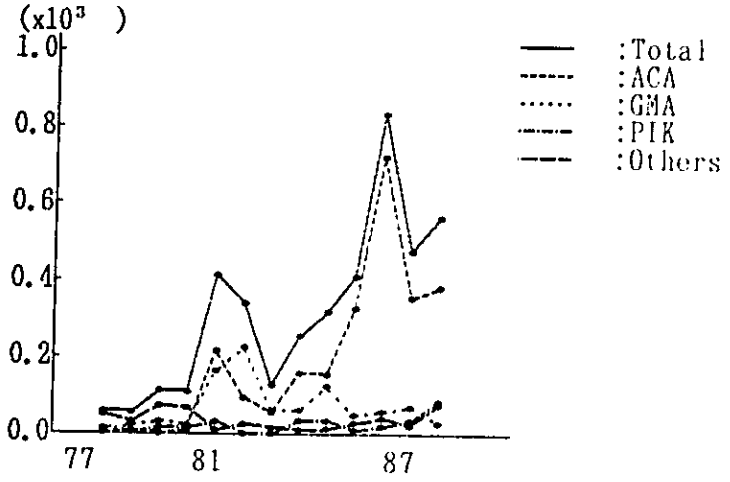


Table II-1-3-1

Manmade forest (As of May 1,1990)

Parcel-I, (Ha.), ( )%

Year	Total	ACA	GMA	PIK	Others
'77	56.63	0	1.12	9.57	45.94
'78	29.95	3.81	2.31	0.68	23.15
'79	26.1	0	0.7	8.94	16.46
'80	63.08	0	20.19	13.37	29.52
'81	124.18	9.17	81.83	28.27	4.91
'82	97.45	38.99	45.47	0	12.99
'83	55.6	30.66	16.71	0	8.23
'84	69.78	24.08	29.39	10.05	6.26
'85	47.61	26.19	11.07	0	10.35
'86	25.01	17.0	6.72	0	1.29
'87	297.66	253.51	22.13	0	22.02
'88	223.51	159.22	14.1	32.11	18.08
'89	194.93	98.9	17.36	27.56	51.11
合計	1311.49	661.53	269.10	130.55	250.31
	(100)	(50)	(21)	(10)	(19)

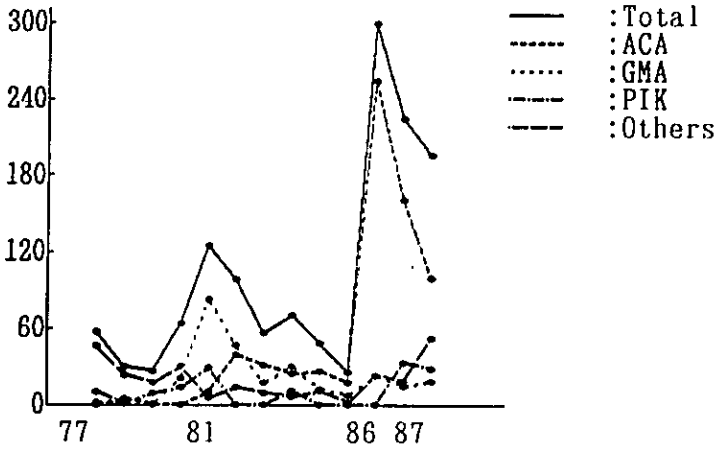


Table II-1-3-2

Manmade forest (As of May 1, 1990)

Parcel-IIA, (Ha.), ( )%

Year	Total	ACA	GMA	PIK	Others
'77	0	0	0	0	0
'78	2.46	1.00	1.46	0	0
'79	0	0	0	0	0
'80	8.61	8.61	0	0	0
'81	67.79	36.72	28.22	0	2.85
'82	63.08	22.22	40.86	0	0
'83	28.29	9.53	18.76	0	0
'84	74.36	51.3	0	20.89	2.17
'85	97.87	16.57	69.32	11.98	0
'86	159.58	124.96	33.19	0	1.43
'87	66.67	54.31	12.36	0	0
'88	90.26	81.94	5.78	0	2.54
'89	78.49	55.24	0	0	23.25
T.	737.46	462.4	209.95	32.87	32.24
	(100)	(63)	(28)	(4)	(4)

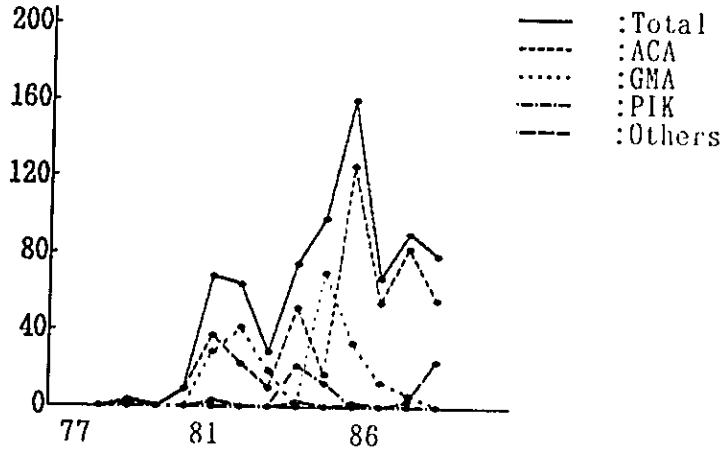


Table II-1-3-3

Manmade forest (As of May 1,1990)

Parcel-IIB, (Ha.)、( ) %

Year	T o t a l	A C A	G M A	P I K	O t h e r s
'77	0	0	0	0	0
'78	16.08	0	16.08	0	0
'79	75.5	0	18.58	3.59	53.33
'80	0	0	0	0	0
'81	22.01	1.29	20.72	0	0
'82	142.21	12.74	119.38	0	10.09
'83	0	0	0	0	0
'84	38.81	16.09	22.72	0	0
'85	22.21	0.93	0	21.28	0
'86	57.92	31.00	6.45	8.25	12.22
'87	54.01	19.41	2.6	17.86	14.14
'88	48.37	48.37	0	0	0
'89	112.44	56.22	0	56.22	0
合計	589.56	186.05	206.53	107.2	89.78
	(100)	(32)	(35)	(18)	(15)

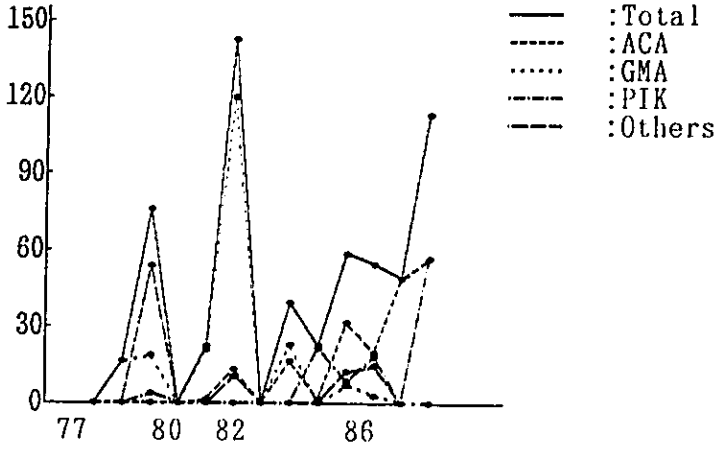


Table II-1-3-4

Manmade forest (As of May 1,1990)

Parcel-III, (Ha.), ( )%

Year	Total	ACA	GMA	PIK	Others
'77	0	0	0		0
'78	4.16	0	0		4.16
'79	8.98	0	8.3		0.68
'80	35.0	0	0.74		34.26
'81	198.0	166.87	31.13		0
'82	33.88	17.62	16.26		0
'83	42.41	12.9	24.94		4.57
'84	71.15	64.26	6.89		0
'85	149.43	108.14	41.29		0
'86	163.88	151.49	2.05		10.34
'87	412.94	391.6	18.23		3.11
'88	111.74	64.28	47.46		0
'89	177.65	169.1	8.55		0
T.	1409.22	1146.26	205.84		57.12
	(100)	(81)	(15)		(4)

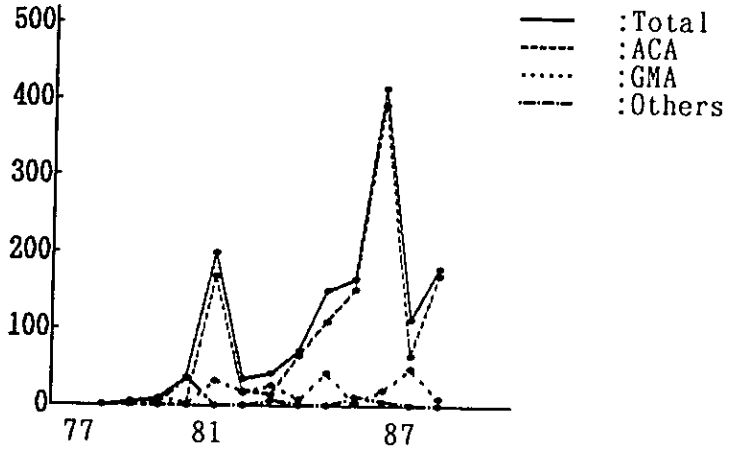


Table II-1-4 MAN MADE FOREST AREA (ha). 「 」%

Block		New Data	Crown Density			
			Less than 50%		50% on and more	
P-I	33	356.06	「16」	58.67	「84」	297.39
	54	171.38	「6」	10.39	「94」	160.99
	55	284.68	「3」	7.84	「97」	276.84
	56	178.68	「8」	13.84	「92」	164.84
	57	320.71	「14」	46.05	「86」	274.66
Sub-Total		1311.51	「10」	136.79	「90」	1,174.72
P-IIB	81	-		-		-
	82	7.85		-	「100」	7.85
	83	165.93	「34」	57.03	「66」	108.90
	84	181.82	「2」	3.82	「98」	178.00
	85	101.75	「1」	1.30	「99」	100.45
	86	132.21	「9」	12.22	「91」	119.99
Sub-Total		589.56	「13」	61.55	「87」	515.19
P-II-A	87	36.07			「100」	36.07
	89	126.52			「100」	126.52
	90	254.73	「24」	61.55	「76」	193.18
	91	320.62			「100」	320.62
Sub-Total		737.94	「8」	61.55	「92」	676.39
P-III	101	204.17	「8」	16.86	「92」	187.31
	102	17.58	「28」	4.93	「72」	12.65
	103	91.62	「43」	39.82	「57」	51.8
	107	119.35	「24」	28.38	「76」	90.97
	108	166.37	「1」	2.23	「99」	164.14
	109	93.42	「18」	16.69	「82」	76.73
	110	201.78	「6」	11.51	「94」	190.27
	111	230.22		-	「100」	230.22
		284.72		-	「100」	284.72
Sub-Total		1,409.23	「9」	120.42	「91」	1,288.81
Total		4,048.24	「10」	393.13	「90」	3,655.11

II-2 The Contents of the Left Over Areas

The details of the left over areas are as follows (refer to the Table II-2).

1. General Matters

The rate of agricultural land use areas is less than 60% and roads is more than 10%. The former includes grass land (GL), paddy field (PF) and farm land (FL) ranging from 29%, 26% and 3% totaling to 58%. The latter includes 13% of forest roads.

2. Specific Matters

A. Parcel I

The Parcel has facilities like Nursery (NU), Demo-Farm (DF), and Seed Orchard (SO) of which rates of areas, 16% is higher than the total average rate of 5%. And also the areas of "Others" (OT) including Training Center for forest conservation is larger than the others because it is sited conveniently along the provincial roads and for its being the birth place of the Project.

B. Parcel II-B

The Parcel has high rate of Paddy Fields (PF), 58%, wherein the parcel composed of Block 81 to 85 with the total area of 59.14 ha..

C. Parcel II-A

The Parcel is famous for its large grass land of which rate is 67% wherein Block 90 has an area of 137.23 ha..

D. Parcel III

The Parcel has little to be seen conspicuously because of low rate of forest roads as compared to the others.

TABLE II-2 - Left Over Area

No.1

	PI						PII-B						
	33	54	55	56	57	SUB TOTAL	81	82	83	84	85	86	SUB TOTAL
						(6)							
DF	9.00	-	-	-	-	9.00	-	-	-	-	-	-	-
						(3)							(3)
FB	1.26	1.54	-	0.98	1.66	5.44				1.37	1.82		3.19
						(3)							(3)
FL	2.40	-	1.74	-	1.04	5.18		3.24	0.31	-	-		3.55
						(14)							(14)
FR	6.23	3.74	3.02	2.93	6.39	22.31	0.86	2.07	3.20	3.35	2.70	2.30	14.48
						(5)							(9)
GL	-	-	-		7.62	7.62			9.11	-	-		9.11
						(6)							
NU	7.95	-	-		1.78	9.73				-	-		0
						(34)							(12)
OT	4.07	-	-		50.56	54.63		2.18	2.05	8.36	-		12.59
						(24)							(58)
PF	29.76	1.30	8.33		-	39.39	17.96	15.95	8.80	15.56	0.87		59.14
						(1)							
PR	0.21	-	-		1.65	1.86							-
						(5)							
SO	7.58	-	-		-	7.58							-
						(100)							(100)
TOTAL	68.46	6.58	13.09	3.91	70.70	162.74	18.82	23.44	23.47	28.64	5.39	2.30	102.06
						(31)							(19)

PII-A

ha. ( )%

	87	89	90	91	SUB TOTAL
DF		-	-	-	-
					(2)
FB		0.81	-	2.94	3.75
					(2)
FL		1.37	1.99	1.35	4.71
					(8)
FR	2.79	1.44	6.71	4.59	15.53
					(67)
GL		-	137.23	-	137.23
					(-)
HU		0.62	-	-	0.62
					(7)
OT		-	-	14.52	14.52
					(13)
PI	8.12	8.85	10.31		27.28
PR					
SO					
					(100)
TOTAL	10.91	13.09	156.24	23.40	203.64
					(38)

PIII

ha. ( )%

	100	101	102	103	107	108	109	110	111	SUB TOTAL	TOTAL		
											(2)		
DF	-		-	-		-	-	-	-	-	9.00		
										(5)	(3)		
FB	-		0.32	-		0.32	0.81	2.00	-	3.45	15.83		
										(4)	(3)		
FL	0.43		-	-		-	-	-	2.11	2.54	15.98		
										(25)	(13)		
FR	3.29	0.50	1.62	2.39	2.97	1.89	0.59	0.68	2.25	16.18	68.50		
											(29)		
GL	-			-	-	-				-	153.96		
										(3)	(2)		
NU	-			-	-	1.92				1.92	12.27		
										(41)	(20)		
OT	18.22			7.81	-					26.03	107.77		
										(21)	(26)		
PF	4.46	2.06		5.46	1.49					13.47	139.28		
											-		
PR											1.86		
											(1)		
SO											7.58		
										(100)	(100)		
TOTAL	26.46	2.56	1.94	15.66	4.46	4.13	1.40	2.68	4.36	63.59	532.03		
										(12)	(100)		

Remark

ITEM	NAMES	ABBREVIATION
Left Over Kind	Paddy Field	PF
	Demo-Farm	DF
	Seed orchard	SO
	Farm Land	FL
	Nursery	NU
	Province Road	PR
	Forest Road	FR
	Fire Break	FB
	Grass Land	GL
	Other	OT

II-3 Socio-Economic Environment in the Project Area

1. Outline of the Project Area

RP-Japan Forestry Development Project is located in the watershed area of the Pantabangan dam, northern tip of the Province of Nueva Ecija, Luzon Island. The dam was built in 1974 and became "critical watershed" when it reaches its upper basin and causes the banning of timber cutting and land lease for pasture. To prevent erosion, government agencies: National Irrigation Administration (NIA), Community Environmental & Natural Resources Office (CENRO) and RP-Japan Project reforested the area.

The area is about 11,000 ha., approximately 70% covers the Municipality of Carranglan and 30% of the Municipality of Pantabangan. The Project is divided into four Parcels: Parcel I (2,900 ha.), Parcel II-A (2,500 ha.), Parcel II-B (2,500 ha.) and Parcel III (2,800 ha.). It is a national forest managed by Bureau of Forest Development (BFD), Carranglan District Office in the past and at present by CENR San Jose and Talavera office.

The watershed might had been covered with trees in the past, now it suffers from destruction: a long term cutting for saw wood and fuel wood, pasture leased-based burning, wherein soil erodes and turns to be poorer and deteriorated. Such practiced cannot bring natural revegetation.

Cultivated paddy fields illegally developed by occupants are scattered in a relatively gentle slope areas where water is readily available from the small streams. The occupants within the national forest and municipality have developed woodland and been engaged in agriculture. The government, in general, formally ratifies their existence to stabilized living conditions, makes them contribute to woodland establishment, maintenace, and management, and help them realize the importance of social forestry.

2. Outline of Carranglan Town

The municipality of Carranglan which is divided into 17 barangays (Table II-3-1) and further subdivided into so-called sitios has a total area of 78,000 ha.. In 1980, national forest consisting of farmland mainly paddy field of 8,000 ha., pasture land is 11,000 ha., forest and grassland is 58,000 ha., and 1,000 ha. is being used as housing and others. Other farmland and pasture is private ly owned. This critical watershed area still faces illegal burning which poses a major problem in the project aimed at woodland establishment and erosion control.

(1) Population

Figure II-3-1 shows the flow of population in Carranglan Municipality. In spite of economically poor condition in the area, the population increased in 1987 and stoped in 1988. It can be sad that this had never decreased but increased the pressure on human population in the forest.

(2) Industry and standard income

Farming dominates the population of approximately 80% and the others consists of blue collar job wherein few are employed through the year, school teachers, public service personnel, store owners. These statistic is thought to be incomplete (Table II-3-1).

How much they earn from these industries? A report of land evaluation by the Department of Geography, University of the Philippines (U.P.), 1988 estimated that an average annual income in rice production is 12,950 pesos (one peso = 6 yen), 5,500 for corns, and 8,500 for vegetables. For daily wage, the corresponding figures are: 49.05, 23.83, 37.88 pesos. For agricultural workers, their daily wage is 20, 60 for drivers and 64 pesos for RP-Japan or NIA project workers (minimum wage as of November 1990 is 91 pesos), and 80~102 pesos for school teachers or public personnel.

According to the Department of Geography, U.P., 20 pesos per day was sufficient for one household since they can avail, for example, some vegetables in the field. Standard income is oftenly seen on farmers. The income lower than the standard covered 15-20% of the population.

Agriculture is the main industry, especially rice production wherein demand reaches to 2,948.4 tons in 1987. The production is five times higher than the demand, 14,144.7 tons. The so-called labor market, a relatively large-scale agriculture generating income for laborers makes a constant labor flow in other districts. Small scale domestic industry includes charcoal production, rattan craft, bamboo weaving, brick and white clay making.

Under such economic condition, an effective use of land resources including forest must be given consideration.

3. Observation of forest occupants in the Project area

Table II-3-2 shows the first sensus in March to April, 1988. The total number of occupants were 70 families (Parcel I: 19 families, Parcel II-A: 18 families Parcel II-B: 23 families & Parcel III: 10 families) of which some members are temporarily employed in the Project. The location have been occupied (1.9/0.25~10.5 ha/family) by families scattered in different parcels without official certi-

fication.

The second survey "Average Income of Forest Occupants" (Table II-3-3) done by Dr. Haruyuki Mochida indicates the average income per household of 8,352 pesos, approximately half of which is derived from agriculture, one third from hired work in agriculture and other jobs. Parcel II-B is the only district where agriculture can make a livelihood.

In response to the questionnaire answered by occupants in Carranglan municipality, 50% had increased income, 40% unchanged, the remaining 10% decreased. Livelihood is likely maintained by wage from both agriculture and hired works.

As a reference, see Table II-3-4 for "Native place of forest occupants" and Table II-3-5 for "Time of settlement".

4. Employment effect of the RP-Japan Project

There was a report that one hundred percent increase in annual income of households between the two period (1980 and 1989) was extrapolated.

The opportunity to be employed in the Project is of great value from the economic point of view. But in 1992, the termination of the Project, 131 thousand laborers (man-days) employed in 1990 will be affected. In case of loosing the opportunity of employment after the project, agro-forestry based on the Forestry Policy including Social Forestry Program is, first of all, considered to be the replacement. To maintain economic, management stability, occupants should be given notice letter to protect the forest including planted trees from destruction like forest fire.

The state of household income of occupants engaged in social forestry are as follows:

a. Execution of Upland Family Based Program (UFBP)

UFBP had been done in 30 ha. with 30 families in 1989. At present 28 ha. and 28 families remains because it had been destroyed by fire and one family gave up the contract.

A comparison of the Average Annual Income (1988 and 1989) of participants which was made by Dr. Takashi Kato (short term expert, April to June 1990) shows the increased in wage and other items (Table II-3-6).

b. Execution of Community Based Reforestation Program (CBRP)

CBRP covers 150 ha. and 150 families in 1990.

Refer to Table II-3-7 for the average income of CBRP participants which is considerably lower than the UFBP largely because of limited employment opportunities including hired work for lowland rice cultivation.

(NOTE)

1. A comparison of figures in the Tables and Figures done by different authors is better to be used only as reference because of possibilities that figures are in different conditions.

2. CBRP (II) executed in 1991 covers 75 has. and 75 families based and nearly the same as that of CBRP in 1990 which was called CBRP (I).

Literature

(1) "An Interim Report on Social Forestry Program of RP-Japan Forestry Development Project-Watershed Management Phase II" by N. Miyazaki. (October, 1989). in the Progress Report on Technical Development Activities in 1989 (Vol. 4).

(2) "Progress Report for Social Forestry Program" by J. F. Natibo-oc and Murasawa (April, 1990). in the Progress Report on Technical Development Activities in 1989 (Vol. 4).

(3) "Report on a Framework of Site Specific Monitoring and Evaluation System for two Pilot Social Forestry Programs" by T. Kato (June, 1990) in the Progress Report on Technical Development Activities in 1989 (Vol. 4).

(4) "RP-Japan Forestry Development Project" (pamphlet) by Bureau of Forest Development and JICA (March, 1984).

(5) "RP-Japan Forestry Development Project-Watershed Management, Carranglan, Nueva Ecija (Phase II)" (pamphlet) by DENR and JICA (August, 1990).

(6) Free translation of the "Fundamental research for the development plan of the Social Forestry Program of the RP-Japan Forestry Development Project-Watershed Management in Carranglan, Nueva Ecija, Philippines" by H. Mochida (short-term expert - 1988.11.15 ~ 1989.1.14).

NOTE: Free translation from the report written in Japanese to English.

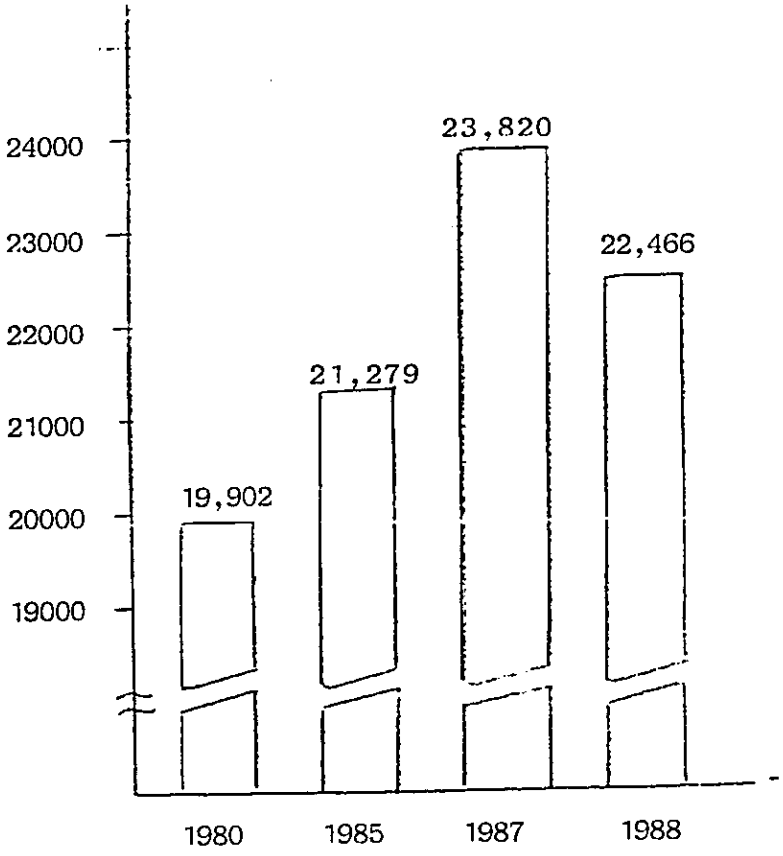


Fig. II-3-1 Trend of Population in Carranglan

Source: Carranglan Rural Health Unit

TABLE - II-3-1 POPULATION, HOUSEHOLD AND HOUSEHOLDER'S OCCUPATION IN CARRANGLAN (1988)

Unit: head/house

Name of Barangay	Population	House-hold Number	Householder's Occupation							
			Agri.	Laborer	Teacher	Merchant	Driver	Police	Housewife	etc.
General Luna	1,185	207	147	29	18	-	-	1	?	5
Bantug	829	123	?	7	8	-	5	4	5	1
District I	807	100	57	24	-	1	4	2	7	-
District II	837	111	?	28	15	-	8	-	7	2
District III	1,050	167	?	8	11	1	5	3	6	-
District IV	867	126.	90	10	9	-	-	2	-	5
Poncan	2,491	297	86	88	69	8	19	-	-	4
Digdig	1,671	279	136	38	44	13	23	1	-	6
Plut	1,037	84	12	36	1	7	4	-	-	3
Putlan	677	130	82	21	3	7	4	-	-	-
Minuli	898	138	65	35	2	9	12	-	-	-
Capintalan	953	148	60	19	1	6	8	-	-	-
Ponga	2,485	300	120	30	23	-	5	-	10	3
San Agustin	1,584	160	100	25	-	-	3	-	5	5
Talatalan	711	82	25	30	-	-	-	-	5	2
Valuarte	1,492	169	?	45	5	2	5	2	?	5
Burgos	2,892	343	225	95	9	4	5	-	?	5
TOTAL	22,466	2,964	?	568	218	58	110	15	?	46

Carranglan Rural Health Unit

Agri - Agriculture

Table II-3-2 LIST OF FOREST OCCUPANTS ADJACENT AND WITHIN THE PROJECT AREA

Parcel/ Block	NAME	No. of Dependent	Occupied Area (Ha)	Date Occupied	Occupation	REMARKS
I-33	ANTONIO CORPUZ	5	4	1971	(1((4)	-Security Guard at MIFN. The occupied area was planted w/ Mango, Banana & Palay.
I-54	ROMEO JOHNSON	7	2	1972	(3)(4)	-NIA Worker. Participant in UPLAND FAMILY BASE Program of the PROJECT- (Orchard Estab.)
I-33	ROGELIO OLIVETI	5	7	1978	(4)	Area planted with Fruit trees and upland crops
I-33	FERNANDO CORPUZ	7	3	1981	(4)	-1 Ha. of the area was ricefield adjacent to the project.
I-32	RODOLFO RIVERA	4	0.5	1986	(4)	-Participant in UPLAND FAMILY BASE PROGRAM (GOAT RAISING). Planting veg. as a source of inc.
I-33	ROBERTO CORPUZ	5	3	1981	(1)(4)	-Participant in UFBP (goat raising)
I-33	ROMEO CORPUZ	2	2	1981	(1)(4)	-Participant in UFBP (orchard & woodlot estab.)
I-56	LUCENA URSUDAN	1	10.5	1971	-	-Only 0.5 Ha. was utilize for fruit trees plantation.
I-33	ROGER CORPUZ	4	1	1981	(1)(4)	-
I-54	BRUNO QUITORIAS	6	1	1976	(4)	-Upland farmer
I-32	MELCHOR PIEDAL	3	5	1981	(1)(4)	-Participant in UFBP (orchard and woodlot estab.)
I-33	NEMICIO QUITOLA	5	1.5	1981	(3 (4	-NIA Worker. Upland farmer.
I-57	TERESITA CARANTO	4	2.5	1979	(1)	-
I-57	RIC VEDANA	2	1	1986	(1)	
I-55	MATEO ALVANO	5	5	1975	(1)(4)	-Participant in UFBP (orchard and woodlot estab.)
I-33	AUGUSTO DANG-GUL	3	1	1975	(4)	-
I-33	RUBEN SINAKAY	2	1	1987	(1)(4)	-Participant in UFBP (orchard and woodlot establishment)
I-33	DOMINADOR CATACUTAN	2	1.5	1985	(4)(2)	'
I-33	MARCELO MARTINEZ	4	2	1981	(4)	-

(1) RP-JAPAN WORKER
(2) CHARCOAL MAKER
(3) OTHER EMPLOYMENT
(4) FARMING
(5) OTHER

LIST OF FOREST OCCUPANTS ADJACENT AND WITHIN THE PROJECT AREA

cont.

Parcel/ Block	NAME	No. of Dependent	Occupied Area (Ha.)	Date Occupied (Yr.)	Occupation	REMARKS
IIA-87	ANTONIO BANTAWAN	7	3	1972	(1)(4)(5)	- (5) Monthly pension (Veteran's)
IIA-87	JOSE BALTAZAR	6	2.5	1979	(4)	- Participant in UFBP (woodlot estab.)
IIA-90	AFISIO CIPRIANO	4	2	1978	(1)	-
IIA-91	MARIA SALGADO	3	1	1978	(4)	- Upland farmer. Participant in UFBP (orchard and woodlot establishment)
IIA-89	RONNIE AMANTE	3	1	1987	(4)	- Participant in UFBP (orchard and woodlot estab
IIA-89	LOLITA CASAMAYOR	4	0.4	1987	(4)(5)	- Upland farmer, hired laborer in farming
IIA-89	MELECIO DAMIAN	4	0.5	1987	(4)(5)	- Upland farmer, hired laborer in farming
IIA-89	LEONARDO GANTE	3	2	1983	(1)(4)	- Participant in UFBP (orchard & woodlot estab)
IIA-90	ALFREDO ARON	2	1	1976	(4)	- Upland farmer
IIA-87	ROBERTO BUSTAMANTE	3	1	1980	(1)	- Participant in UFBP (orchard & woodlot estab)
IIA-87	RIC DIEGO	1	1	1980		- Participant in UFBP (orchard & woodlot estab)
IIA-91	CIRILO DOMINGO	3	1.5	1986	(4)	- Participant in UFBP (orchard & woodlot estab)
IIA-91	FRANCISCO TAMONDONG	4	1	1988	(4)	- Participant in UFBP (orchard & woodlot estab)
IIA-91	MEDARDO VALMONTE	2	1	1988		- Participant in UFBP (orchard & woodlot estab)
IIA-91	LEONARDO MIRANDA	4	1	1977	(4)	- Participant in UFBP (orchard & woodlot estab)
IIA-91	PERIANO MIRANDA	2	1	1977	(4)	- Participant in UFBP (orchard & woodlot estab)
IIA-90	DIOSDADO SOLOMON	3	1.5	1982	(4)	-
IIA-90	BERNARDO SOLOMON	4	2	1982	(4)	-

(1) RP-JAPAN PROJECT
(2) CHARCOAL MAKER
(3) OTHER EMPLOYMENT
(4) FARMING
(5) OTHER

Cont'd.

LIST OF FOREST OCCUPANTS ADJACENT AND WITHIN THE PROJECT AREA

Parcel/ Block	NAME	No. of Dependent	Occupied Area (ha.)	Date Occupied (Yr.)	Occupation	REMARKS
IIB-83	REYNALDO CALDITO	3	1.5	1973	(4)	- Participant UFBP (orchard & woodlot estab.)
IIB-83	ANDRES DE GUZMAN	2	1	1985	(4)	- Participant in UFBP (orchard and woodlot estab.)
IIB-85	PATRICIA CANLAS	3	5	1986	(3)(4)	- -do- NIA Worker
IIB-85	MELCHOR CIA	2	1	1986	(5)	- -do- Hired laborer in farming
IIB-86	CARLO MIRANDA	2	2	1985	(4)	- -do-
IIB-86	JIRENEO RAMOS	3	1	1970	(4)	- -do-
IIB-86	DIONISIO VALDEZ	6	2	1980	(4)	- -do-
IIB-86	ROLLY GABANIT	3	1	1987	-	- -do-
IIB-86	RUDY SALAZAR	2	4	1979	(4)	- -do-
IIB-82	RICHARD AGUASIL	3	1.5	1975	(1)(4)	-
IIB-83	JUAN DELA CRUZ	2	3	1984	(1)(4)	- Security guard, Talatalan Nursery
IIB-82	DANILO BELLO	3	0.5	1978	(5)	- Hired laborer in farming
IIB-83	ALFONSO REYURBAN	5	1	1976	(4)	-
IIB-82	NICASIO DOMINGO	7	0.25	1972	(4)	
IIB-83	ALFONSO MENDOZA	4	0.75	1975	(5)	- Hired laborer in farming
IIB-86	RODRIGO DARIANO	6	1	1987	(1)(4)	
IIB-86	RODRIGO DALITE	8	1	1986	(4)	
IIB-86	BERNARDO LARGO	4	1.5	1986	(1)(4)	
IIB-86	CIRILO RODRIGUEZ	4	1.5	1986	(4)	
IIB-85	JOSE CASIRO	4	1.5	1971	(1)	
IIB-86	FELIMON BALIOVAR	7	3	1980	(4)	- Upland farmer
IIB-86	TEODESTO JARDUELA	2	1	1984	(4)	
IIB-85	MANUEL CARLAGA	4	0.5	1986	(1)	

cont.

LIST OF FOREST OCCUPANTS ADJACENT AND WITHIN THE PROJECT AREA

Parcel/ Block	NAME	No. of Dependent	Occupied Area (Ha.)	Date Occupied (Yr.)	Occupation	REMARKS
III-108	HONORIO MIRANDA	4	1	1978	(1)(4)	- Nursery worker
III-108	GAVINO BORJA	2	0.5	1975	(4)	
III-102	SOTERO BALDERES	2	0.5	1985	(1)(4)	- Nursery worker
III-102	BOY ALMAZAN	2	1	1982	(1)(4)	
III-108	MANUEL JUGUILON	8	0.5	1983	(1)(40	
III-108	ERNESTO LUMIBAO	6	1	1979	(4)	
III-101	JACINTO BACALES	7	2	1964	(4)	
III-102	CRISANTO MIRANDA	6	3	1968	(4)	
III-102	RICARDO BALDERES	4	4	1977	(4)	
III-102	INOCENCIO MANTILE	4	1	1985	(4)	

(1) RP-JAPAN WORKER
(2) CHARCOAL MAKER
(3) OTHER EMPLOYMENT
(4) FARMING
(5) OTHER

Table II-3-3
Average Income of Forest Occupants

parcel		agricultur	agricultural hired work	other hired work	others	total
P. I	pesos	4,616	44	5,975	781	11,416
	%	40.4	0.4	52.3	6.9	100.0
P. IIA	pesos	2,059	1,973	1,425	0	5,452
	%	37.8	36.2	26.0	0.0	100.0
P. IIB	pesos	6,016	764	132	2,210	9,122
	%	66.0	3.4	1.4	24.2	100.0
Average	pesos	4,421	1,025	1,715	1,191	8,352
	%	52.9	12.3	20.5	14.3	100.0

source: field survey

Table II-3-4
Native Place of Forest Occupants

unit: No. of families

Parcel	inside of Barangay	inside of Municipality	inside of Province	outside of Province	Total
P. I	7	1	-	8	16
P. IIA	11	5	1	9	26
P. IIB	15	7	6	11	38
Total	33	12	7	27	80 (anl)

source: fild survey

Table II-3-5
Time of Settlement

unit: No. of families

Parcel	before 20 years	from 20 to 19 years	before 1981	after 1982	unknown	total
P. I	1	3	3	9	-	16
P. IIA	3	7	0	8	9	27
P. IIB	5	12	2	9	10	38
Total	9	22	5	26	19	81

source: field survey

Table II-3-6 Annual Income (1988 - 1989)

	Income class based on 1988 income	Number of Fam.	1988 Farming Ecep.rent	Hiredwork for farming	Wage work	Others	Total	1989 Farming Ecep.rent	Hiredwork FOR farm.	Wage Work	Others	Total
Parcel I	0 - 5,000	1	1400	-	2600	-	4000	2200	-	16128	4905	23,232
	5,000 - 10,000	1	2700	-	2648	-	5348	3250	-	2000	4805	10,055
	10,000 - 20,000	2	4375	656	12164	-	17195	6500	753	12754	4855	24,863
	20,000 -	4	9894	6970	8142	5534	30540	10928	60	25554	4634	41,178
	Average	8	6553	3669	7768	2767	20737	7770	219	18232	4745	30,965
Parcel II-A	0 - 5,000	5	806	1508	300	540	3150	4376	1699	556	5565	12,195
	5,000 - 10,000	3	4300	1645	1049	67	7061	5792	1737	674	4872	13,074
	10,000 - 20,000	3	3325	1133	12098	1000	17557	8000	1333	5589	6955	21,878
	20,000 -	1	24650	-	-	4000	28650	35400	-	-	9805	45,205
	Average	12	4296	1323	3812	825	9854	8221	1175	1798	6092	17,506
Parcel II-B	0 - 5,000	1	-	2200	-	-	2200	-	3950	7106	4908	15,964
	5,000 - 10,000	3	7292	157	-	67	7516	9375	147	-	4975	14,496
	10,000 - 20,000	3	11267	-	4200	-	15467	18967	333	-	5575	24,875
	20,000 -	1	61000	2120	-	1250	64370	78750	4500	-	7233	90,483
	Average	8	11584	599	1575	181	16940	20472	1236	888	5474	28,070
TOTAL	0 - 5,000	7	776	1391	586	386	3136	3440	1779	3716	5377	14,310
	5,000 - 10,000	7	5354	772	828	57	7011	6964	807	575	4907	13,252
	10,000 - 20,000	8	6567	589	9153	375	16683	11738	813	5284	5913	23,768
	20,000 -	6	20972	5000	5428	4564	35863	26310	790	17036	5929	50,067
	AVERAGE	28	7881	1781	4131	1196	14988	11593	1048	6233	5531	24,404

Table II-3-7 Annual Income (1989)

	Income class based on 1988 income	Number of Families	1989 Farming Ecep. rent	Hired work for Farming	Wagework	Others	TOTAL
Parcel I	0 - 5,000	15	266	1111	520	184	2081
	5,000 - 10,000	2	2375	1495	1408	172	5450
	10,000 - 20,000	11	6352	1566	4880	2526	15324
	20,000 -	4	15063	1364	8241	5012	29680
	Average	(32)	4340	1323	3040	1592	10294
Parcel II	0 - 5,000	13	519	2227	103	301	3150
	5,000 - 10,000	11	1594	2450	524	2365	6933
	10,000 - 20,000	14	7925	2390	575	2393	13283
	20,000 -	7	10921	1478	9718	2371	24439
	Average	(45)	4704	2216	1848	1778	10547
Parcel III	0 - 5,000	8	306	2000	710	575	3590
	5,000 - 10,000	19	2104	3209	1696	289	7298
	10,000 - 20,000	10	7618	2457	3108	2100	15282
	20,000 -	8	41363	3374	661	2000	47398
	Average	(45)	9989	2856	1650	1047	15542
Parcel IV	0 - 5,000	3	1000	567	798	1233	3598
	5,000 - 10,000	8	1659	2821	2500	850	7829
	10,000 - 20,000	6	5667	2566	2566	1400	12199
	20,000 -	6	20267	966	6981	1517	29730
	Average	(23)	7473	1977	3464	1217	14131
All	0 - 5,000	39	415	1623	441	384	2864
	5,000 - 10,000	40	1888	2837	1520	966	7212
	10,000 - 20,000	41	7097	2211	2639	2212	14160
	20,000 -	25	23568	1944	5927	2470	33908
	AVERAGE	(145)	6703	2180	2306	1421	12610

II-4 Forest Management System

The RP-Japan Forestry Development Project-Watershed Management had two systems which are under the control of different superior offices. One is the training division which is under the Foreign Assisted Special Projects Office (FASPO). Another division is under Region III in the Department of Environment and Natural Resources (DENR).

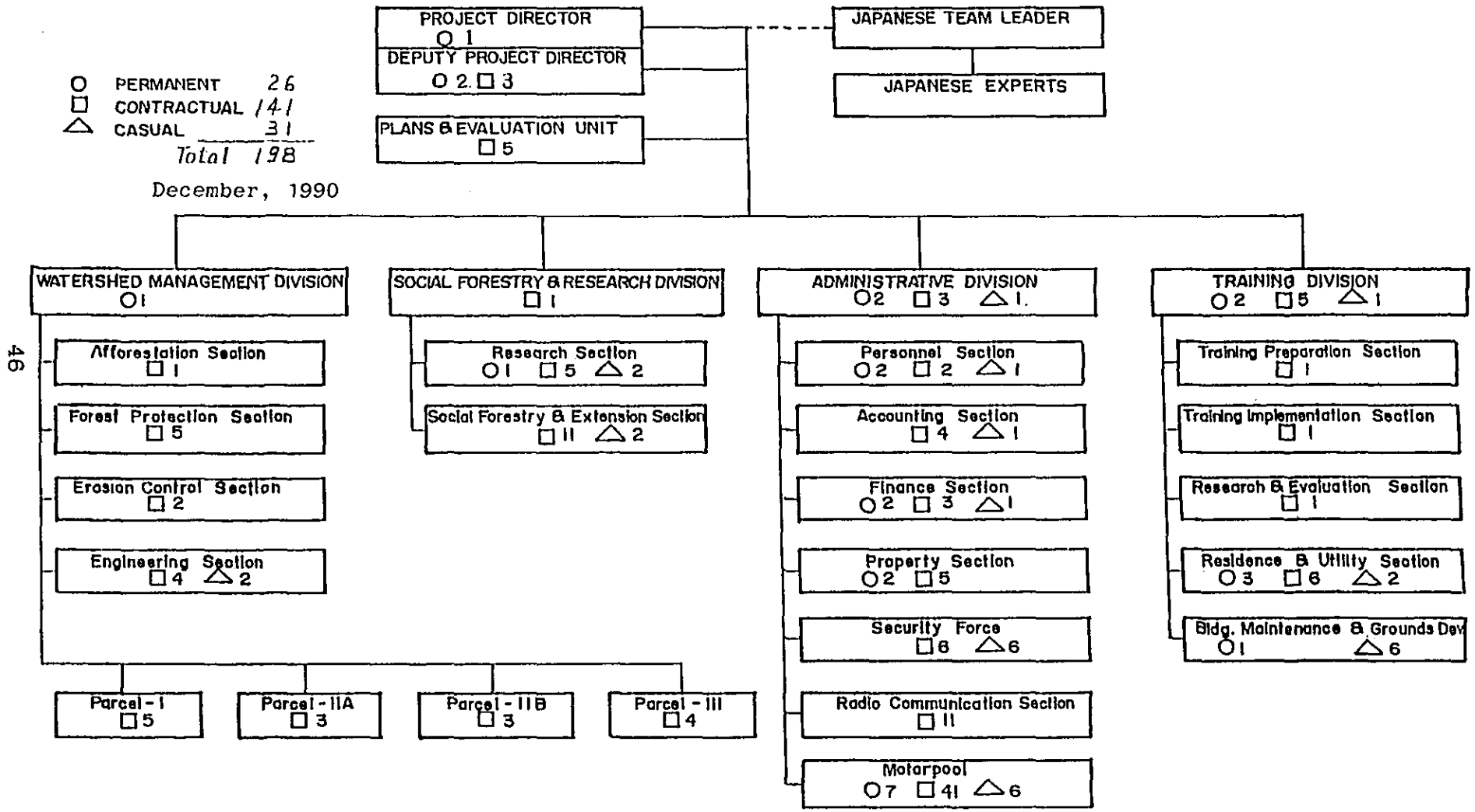
The RP-Japan Project organization is composed fundamentally of five divisions: Research, Watershed Management, Social Forestry, Training, and Administration division. This divisions should work together to accomplish the Project's aims in general.

As a matter of fact, components or details of the Project organization had changed according to not only the aim of the management but also some circumstances sorrounding the Project site such as the scale of budget in each year, government policies, social demands to the Project and the like. At present (as of the end of 1990) actual organization of the Project is shown in Figure II-4.

Seeing the history of the Project, about a decade now, the two main themes, which are the training and social forestry section, are thought to be the keys of a changing organization and also to the future. The training section had a lot of precious information and technical know-how concerning rehabilitation, afforestation knowledges and skills acquired/accumulated thru Project activities. Also, the social forestry section in which the activities are implemented since the beginning of Phase II based on the Record of Discussion (R/D) under the Philippine government Policy of Integrated Social Forestry (ISF) had been generated for the necessity of developing a system of participation of rural communities in afforesting the watershed area of Pantabangan dam.

Figure II-4

RP-JAPAN FORESTRY DEVELOPMENT PROJECT - WATERSHED MANAGEMENT ORGANIZATIONAL CHART



III The Forest Management Policy in doing the Forest Works

At present, the forest management policy is thinkably derived from desirable figures by studying the results of the Project activities in Phase I and II which have been operating for sixteen (16) years, a long history and tradition.

1. General Matters

(1) To push thru the afforestation of denuded grass land of the Pantabangan dam watershed area.

(2) To raise planted trees to a good grown-up forests.

a. To do afforestation based on the positive concerned techniques.
b. To tend and protect planted trees for them to grow.
c. To develop and improve the concerned techniques of forestry together with gathering the concerned information continuously.

(3) To encourage the dwellers who are thought to be indespensable in accomplishing the project activities like keeping/maintaining planted trees and to participate in afforestation.

(4) The forest management should go on continuously through accomplishment of the above mentioned.

2. Specific Matters

(1) To do afforestation according to the site conditions

a. Afforestation according to the natural condition

e.g. Right species on the right site condition based on the forest land use classification maps which show the order of priority in utilizing the forest land.

b. Afforestation according to the socio-economic conditions

e.g. Supplying forest lands which are thought to be suitable to the social forestry program for the agroforestry activities of the dwellers. It is sometimes thought that this can be shown in "the forest land use classification maps" for utilizing forest land from the view point of advancing a social forestry program.

(2) To show the standard forest works suitable to the site conditions including forest land use classification of the project area. Such works concerns the following: how to plant, tend, yield and regenerate trees.

(3) To make maps showing the forest land use classification from the view point of afforestation, forest conservation, social forestry, and the like which concerns the project activities wherein the locations should be declared in order to advance such activities.

(4) To write down other things necessary to the forest management like organization administration, extension, and the like.

IV Forest Land Use Classification

1. Items for the forest land use classification

The next items are the forest land usages for, to wit;

a. Rehabilitation Afforestation area

The place where afforestation is recommended to be advanced. Practically the place is exclusive of the next items from "b" to "d".

b. Conservation Afforestation area

The place where highly erodible forest works is recommended to be advanced. Practically the places are ones ranked high and middle comparatively by means of the "Manual for forest land use classification" (Annex IV-1).

c. Social Forestry area

The place where social forestry policy/program is recommended to be advanced. Practically, the methodology is the same as the item above mentioned (b) except those ranked as middle level.

d. Other/protection area

The place like natural forest and experimental forest is recommended to be excluded from forest works.

2. Matters to be considered

In case of being competitive among items to be advanced in function, it should be chosen under the consideration of attaining the project objectives, especially rehabilitation in the Pantabangan dam watershed area, whether the item be given priority. Or complex forest works harmonizing among functions should be chosen by, e.g. debating among persons who are men of knowledge and experience. Generally speaking, the order of priority would be, firstly, "conservation afforestation area", secondly, "social forestry area" and lastly "rehabilitation area".

3. Conclusion/recommendation

(1) The land use classification map is accomplished based on the "Manual for the Land use Classification" (Appendix IV-1). See Table IV-1 and Figure IV-1-4.

(2) The formulas can be said to be perfectly obtained from the correlation ratio (r) ("r" for the "Social Forestry area" = 0.771, "r" for the "Conservation Afforestation area" = 0.727).

(3) It is recommended to try to find out the items/components which can show closer relationship to the "y" mentioned in II-3 in the "Manual" (Appendix IV-1) than the present in order to upgrade the method, and to reflect them to the next zoning.

(4) To input the concerned data given from the Figure (IV-1-4) into the "Forest Registration Book" is under study. Because it is thought better to have conclusion about the "Land Use Classification" after researching the concerned data of conditions like its topography on an actual spot in scale like a unit of sub-Block with consideration of the fruits shown in the Figure which can be useful for understanding roughly the land situation.

4. Literature

NOTE: Free translation, "Theory of Quantification Methods" by T. Komazawa, Asakura Shoten, (September, 1981).

Table IV-1 "The result of the "Forest Land Use Classification"

ITEMS	PARCEL I	PARCEL IIA	PARCEL IIB	PARCEL III	TOTAL
1. Rehabilitation afforestation area	40 (34)	16 (16)	35 (35)	76 (63)	167 (38)
2. Conservation afforestation area	33 (28)	29 (30)	31 (31)	16 (13)	109 (25)
(1) High grade	8 (7)	15 (15)	4 (4)	0	27 (6)
(2) Middle grade	25 (22)	14 (14)	27 (27)	16 (13)	82 (19)
3. Social Forestry area	38 (33)	30 (31)	33 (33)	14 (12)	115 (26)
4. Protection area	5 (4)	23 (23)	2 (2)	15 (12)	45 (10)
Total	116 (100) /(27)	98 (100) /(22)	101 (100) /(23)	121 (100) /(28)	436 (100) /(100)

NOTE: 1. The above figure is the number of meshes. Parenthesis ( ), show the rate of round number. Details are referred to the Figures IV-1-3 to IV-4-3.

2. Only 10% were occupied by "Protection area", which means almost equal to 20% Natural Forest's existing in the Project areas as shown in Table II-1. The reason is that mesh can not indicate natural forest which are scattered in small/strip of lands.

3. For details of "x", explanatory variate, and "y", response variate, refer to Table IV-2-1 and Table IV-2-2.

Fig. IV-1-1-1 "Social Forestry area" - Original data - (Parcel I)

(note)
1: A: (High) 32 Meshes
B: (Middle) 48
C: (Low) 36
(Total): 116

2: Mesh (500 m x 500 m)

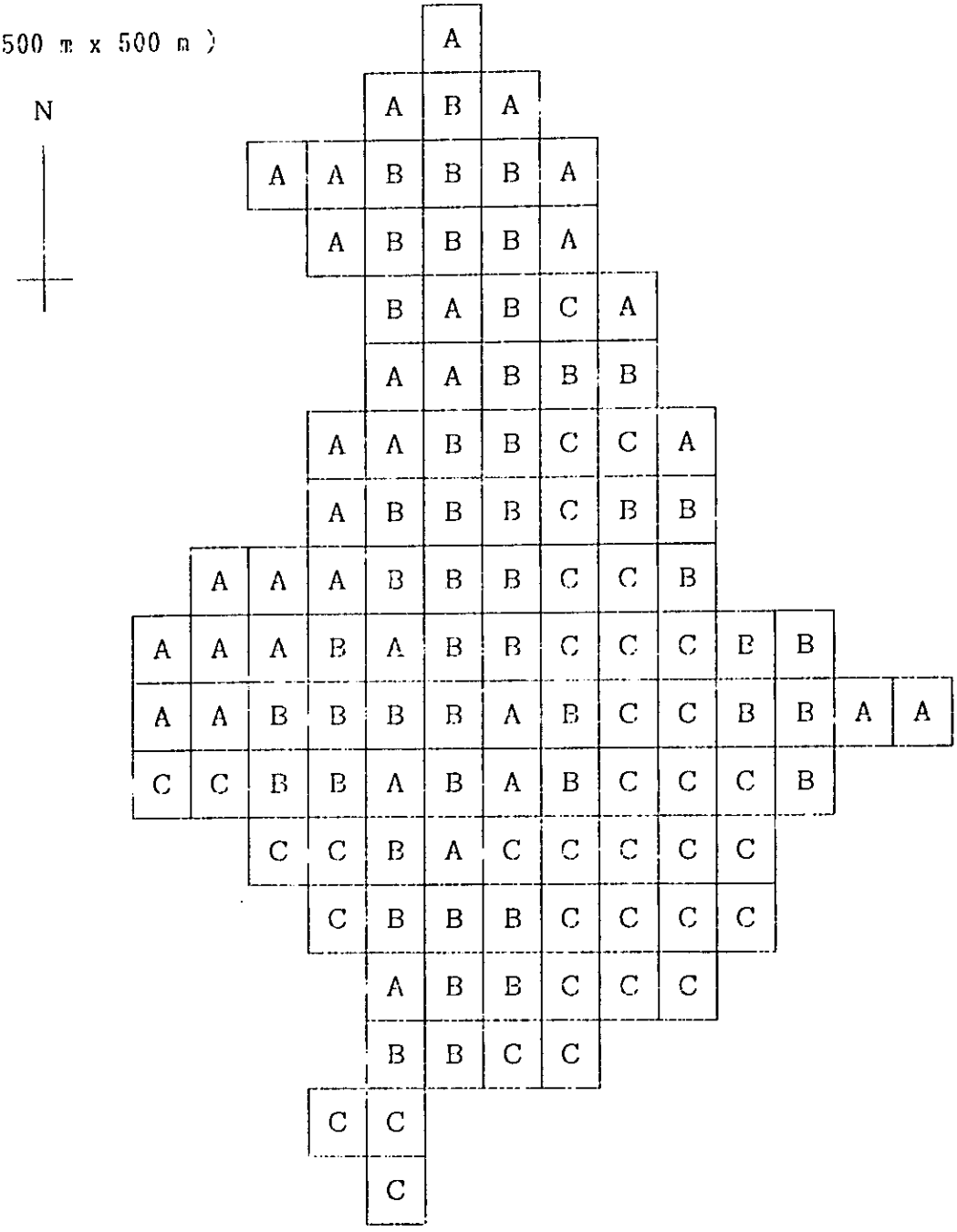


Fig. IV-1-1-2 "Social Forestry area" - Computerized - Parcel I

(note)
1: ▒ shows changing place with "Original", which is same as bollows.
2: A: 37 Meshes
B: 47
C: 32
Total: 116

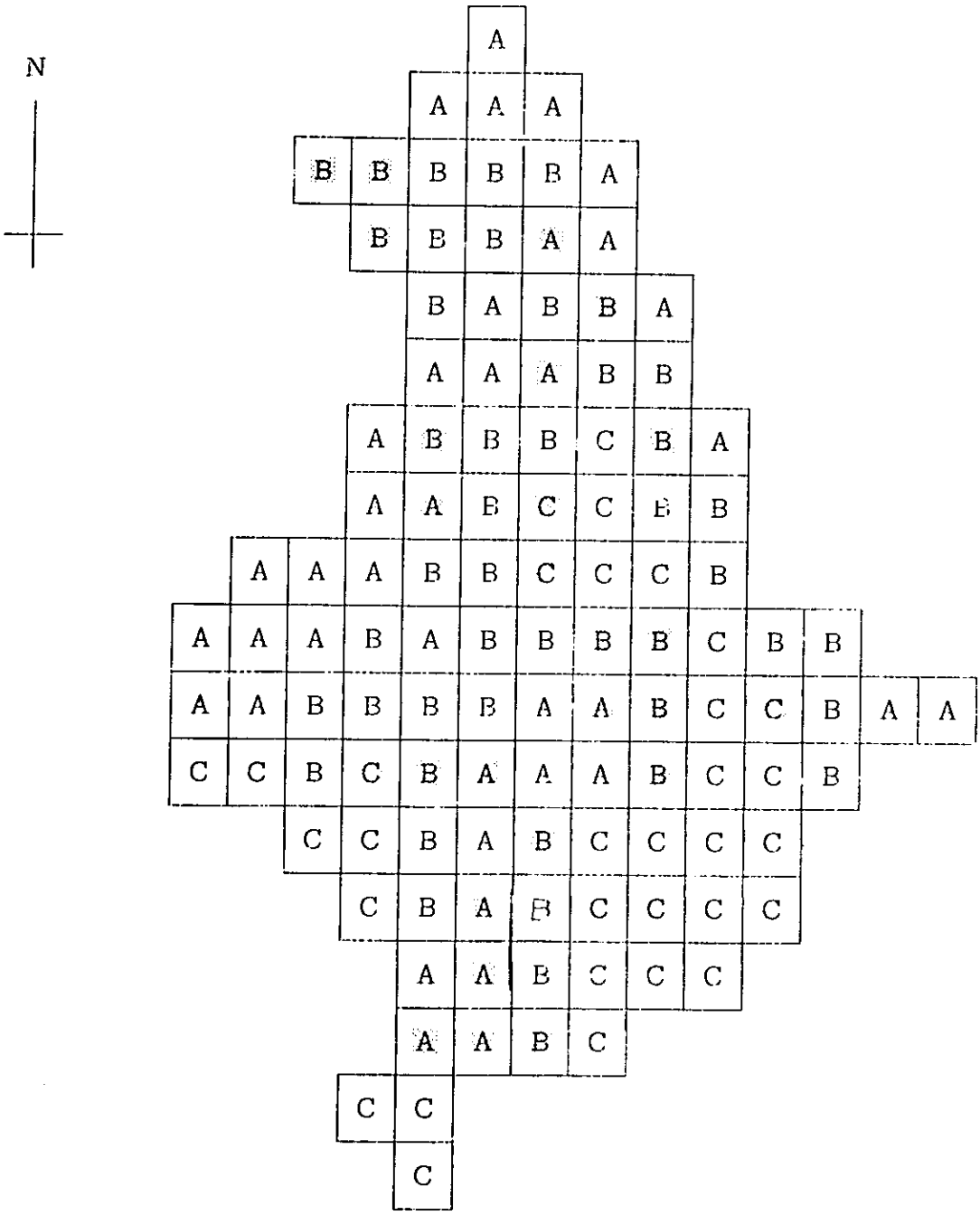


Fig. IV-1-2-1 "Conservation afforestation area" - Original data - Parcel I

(note)
1: A: 7 Meshes
B: 9
C: 100
(Total): 116

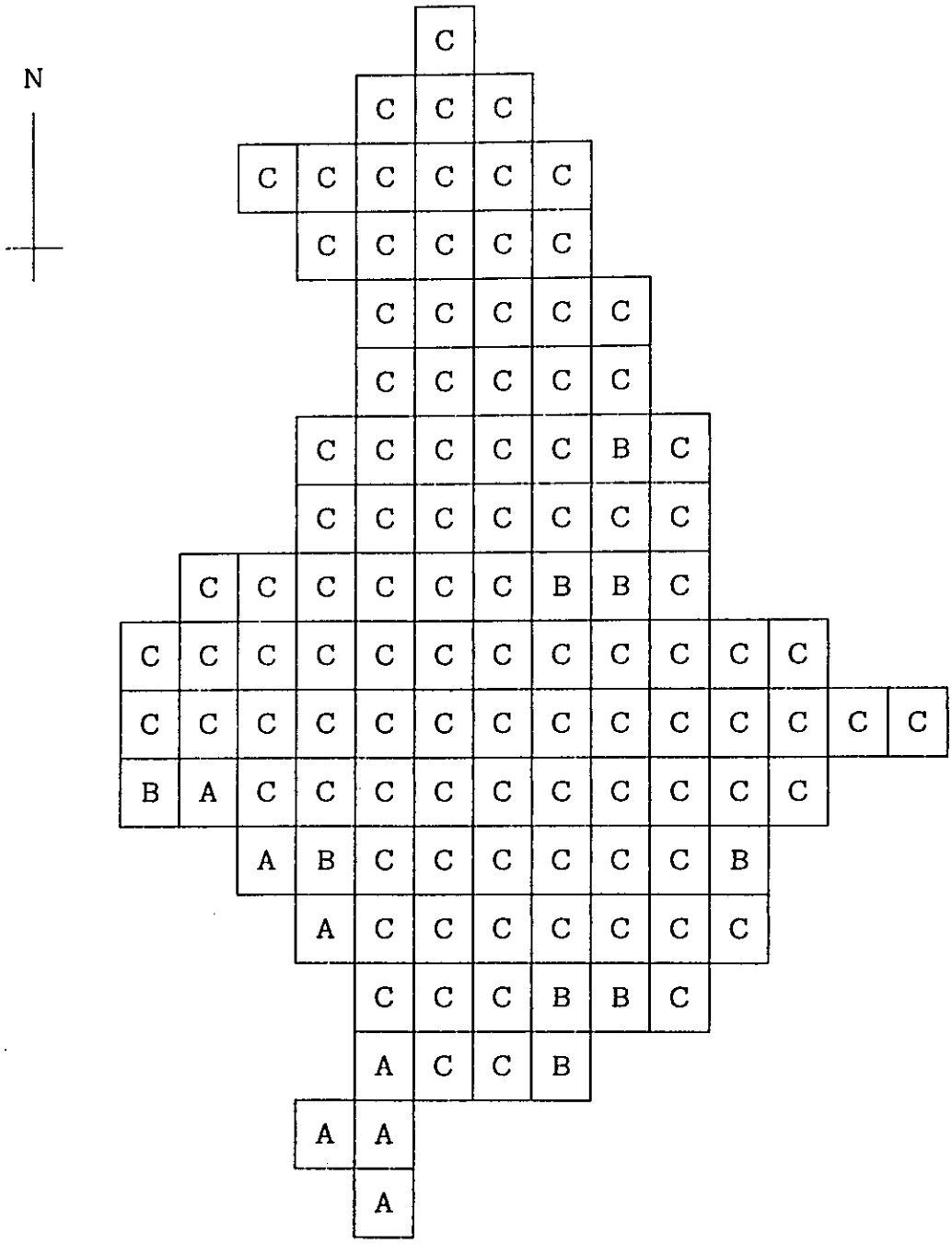


Fig. IV-1-2-2 'Conservation afforestation area' - Computerized - Parcel I

(note)
1: A: 7 Meshes
B: 39
C: 70
(Total): 116

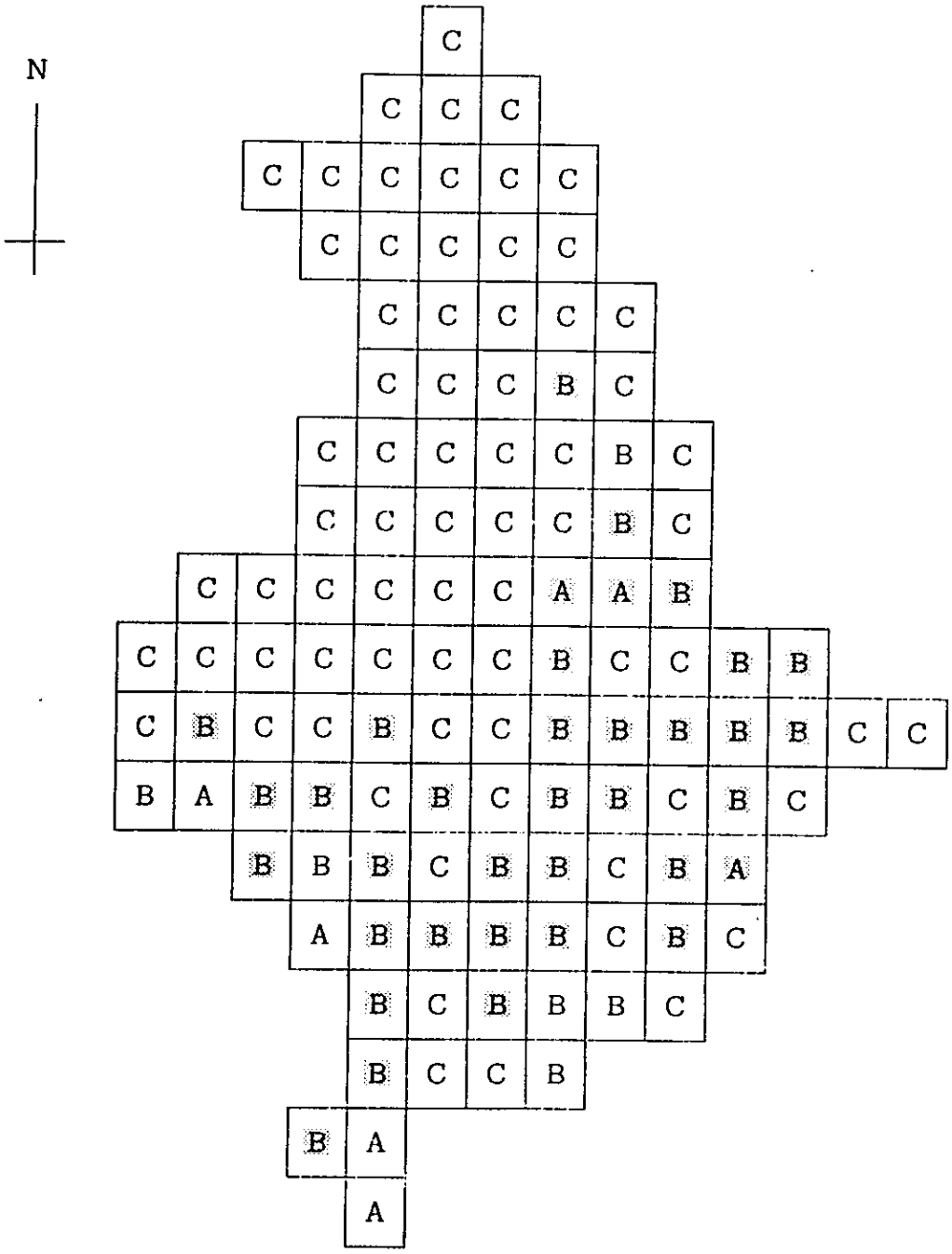


Fig. IV-1-3 "Forest land use classification" (Parcel I)

(note)
1:"R", "S", "C" and "P" are abbreviation for "Rehabilitation afforestation are", "Social forest area", "Conservation afforestation area" and "Protection area".

2: R: 40 Meshes
S: 38
C: 33 (A (High):8, B (Middle):25)
P: 5
(Total) 116

3: Mark is printed only for emphasizing.

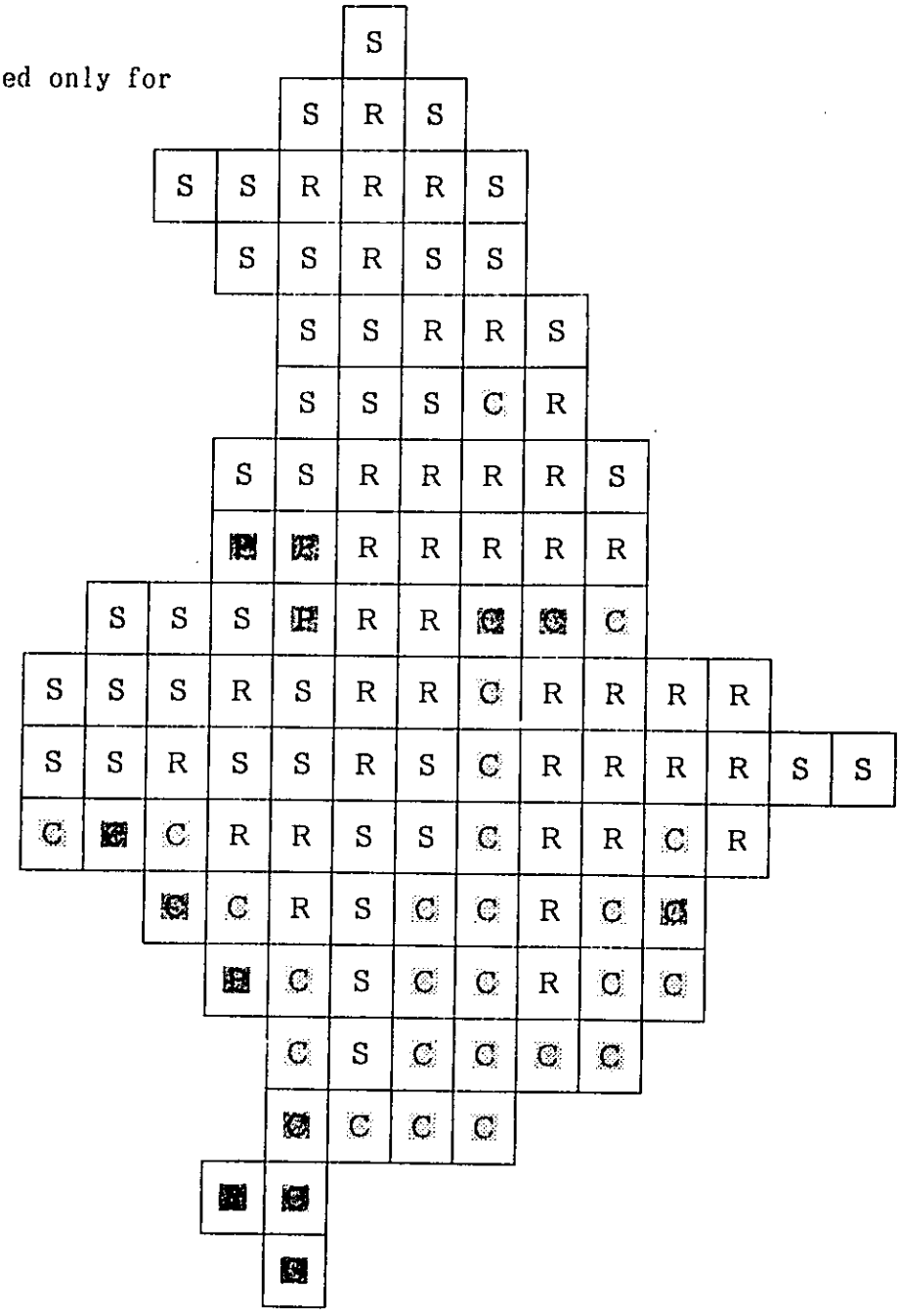


Fig. IV-2-1 -1 "Social forestry area" - Original data - (Parcel IIA)

(note)
1. A: 26 Meshes
   B: 32
   C: 40
(Total) 98

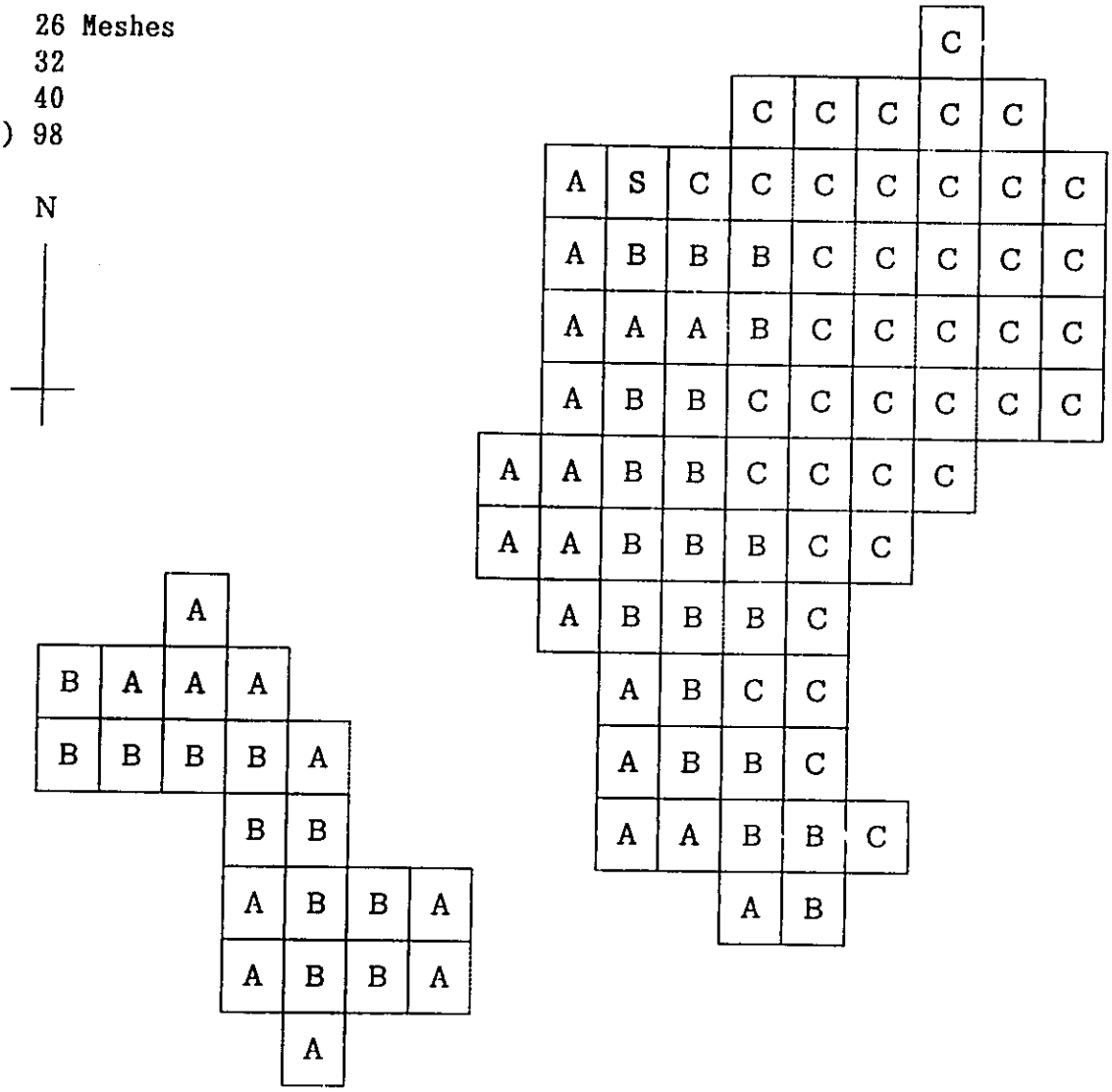


Fig. IV-2-1 -2 "Social forestry area" - Computerized - (Parcel IIA)

(note)
1. A: 32 Meshes
   B: 28
   C: 38
(Total) 93

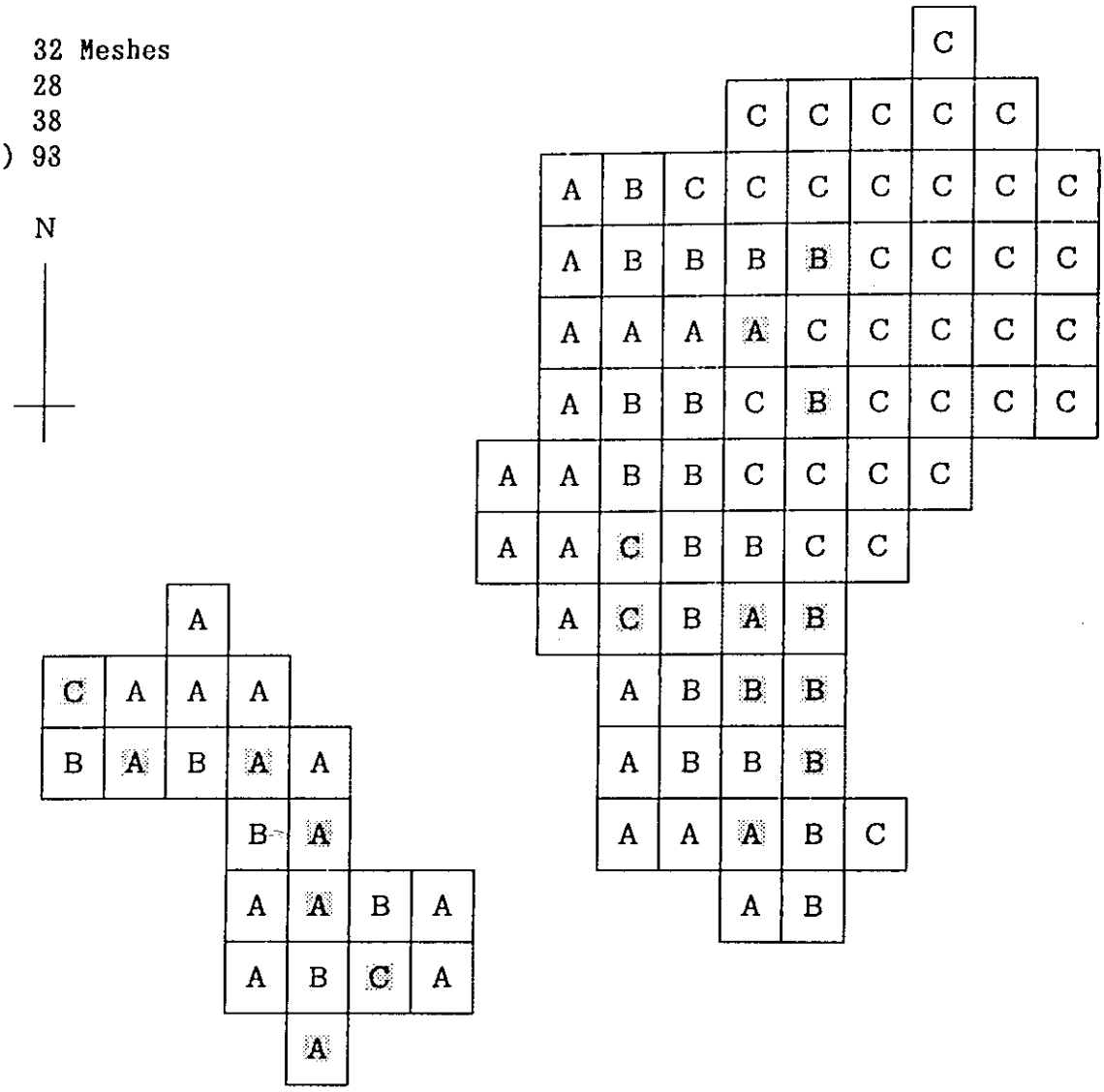
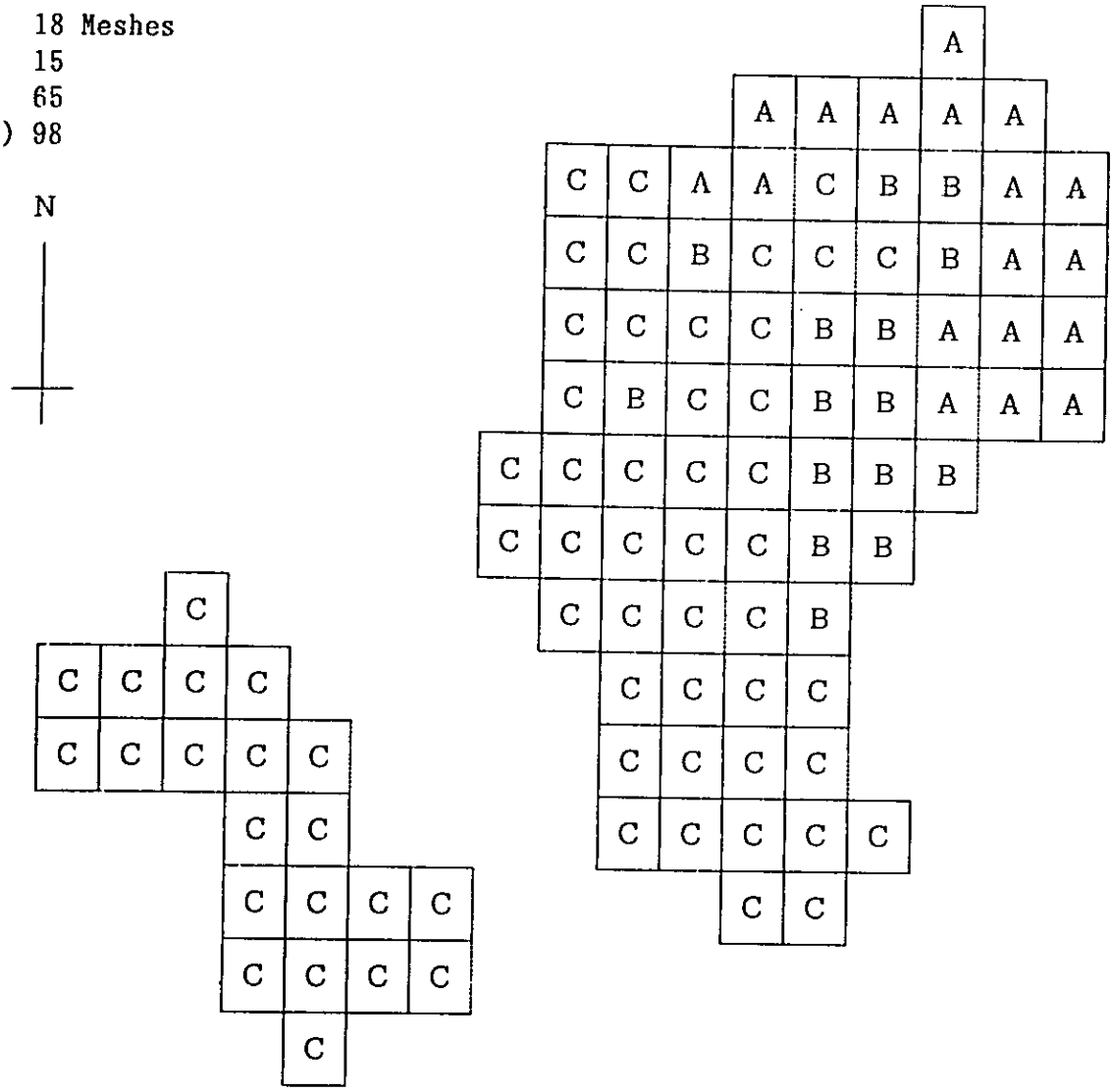


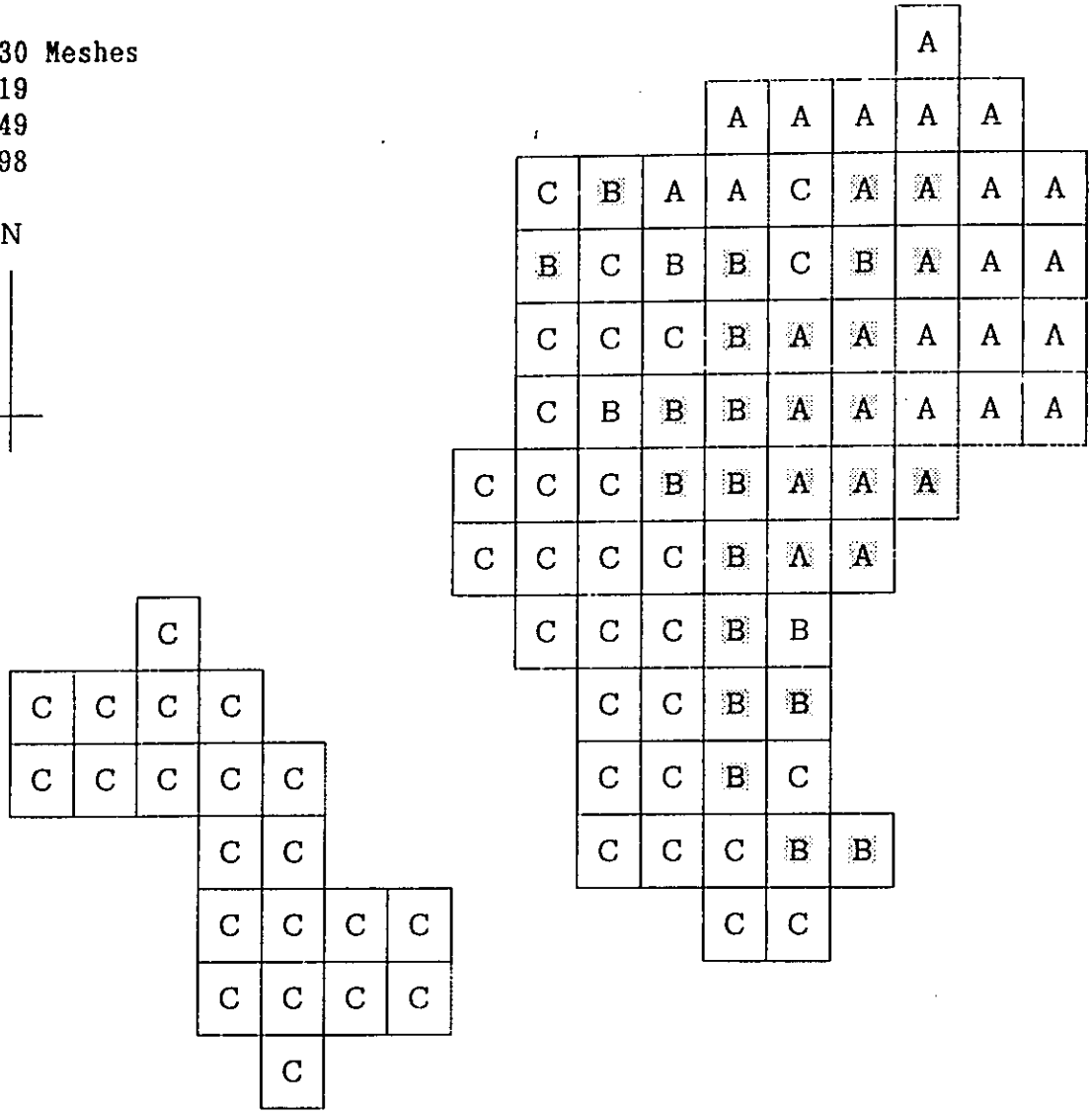
Fig. IV-2-2-1 "Conservation afforestation area" - Original data - (Parcel IIA)

(note)
1. A: 18 Meshes
   B: 15
   C: 65
(Total) 98



IV-2-2-2 'Conservation afforestation area' - Computerized - (Parcel IIA)

(note)
1. A: 30 Meshes
B: 19
C: 49
(Total) 98



IV-2-3 "Forest land use classification" (Parcel IIA)

(note)
1. R: 16 Meshes
S: 30
C: 29 (A (High) : 15, B (Middle): 14)
P: 23
(Total) 98

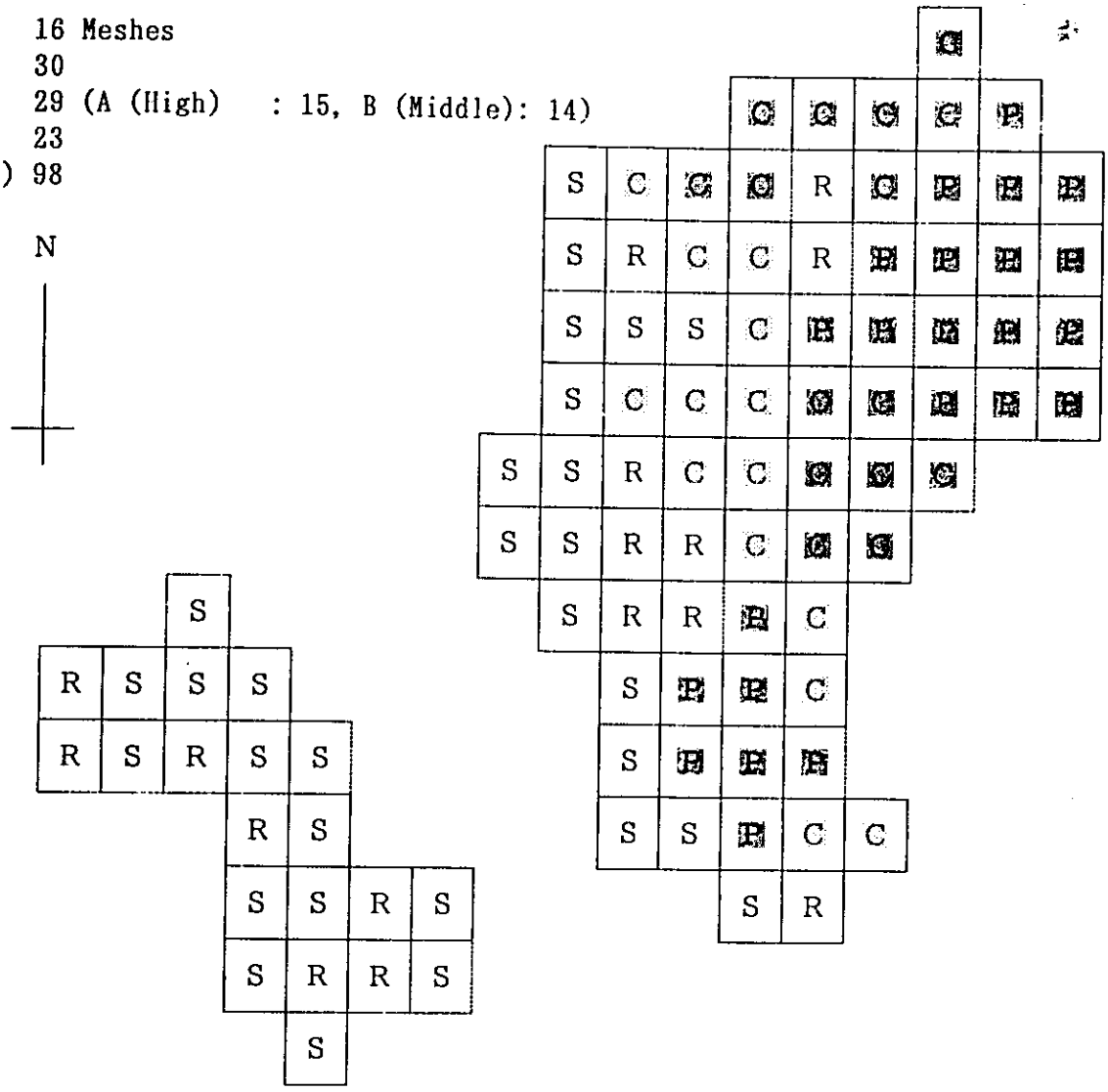


Fig. IV-3-1-1 "Social forestry area" - Original data - (Parcel IIB)

(note)
1: A: 35 Meshes
2: B: 33
3: C: 33
(Total) 101

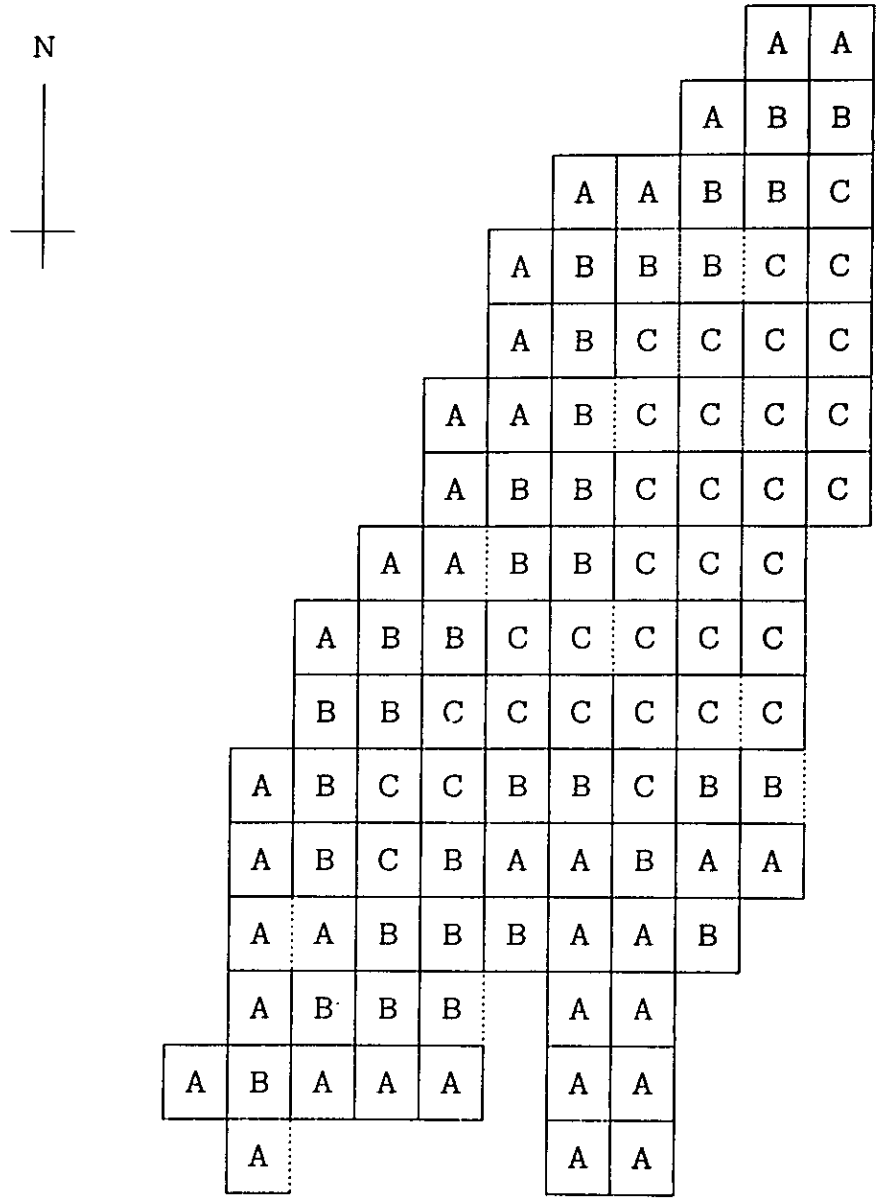


fig. IV-3-1-2 "Social forestry area" - Computerized - (Parcel IIB)

(note)
1: A: 35 Meshes
2: B: 32
3: C: 34
(Total) 101

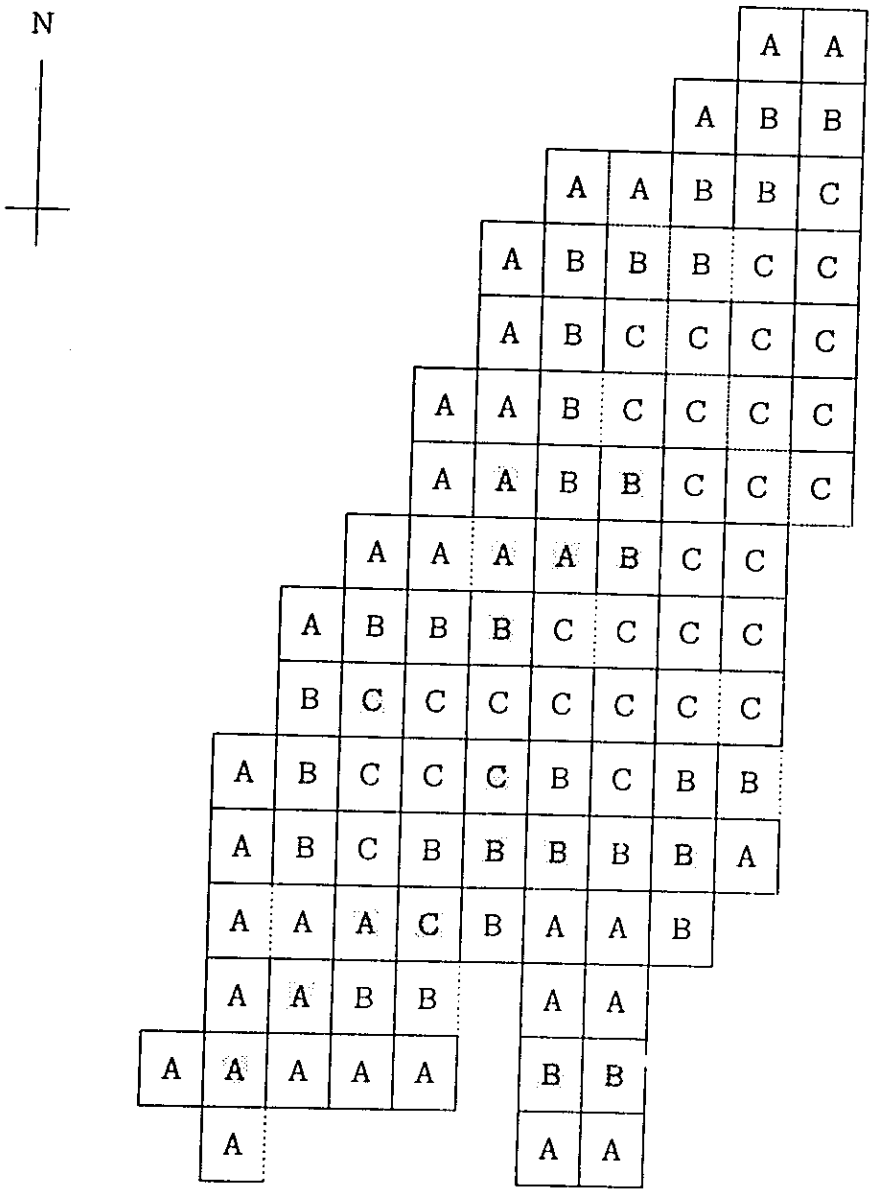


Fig. IV-3-2-1 "Conservation afforestation area" - Original data - (Parcel IIB)

(note)
1: A: 5 Meshes
2: B: 8
3: C: 88
(Total) 101

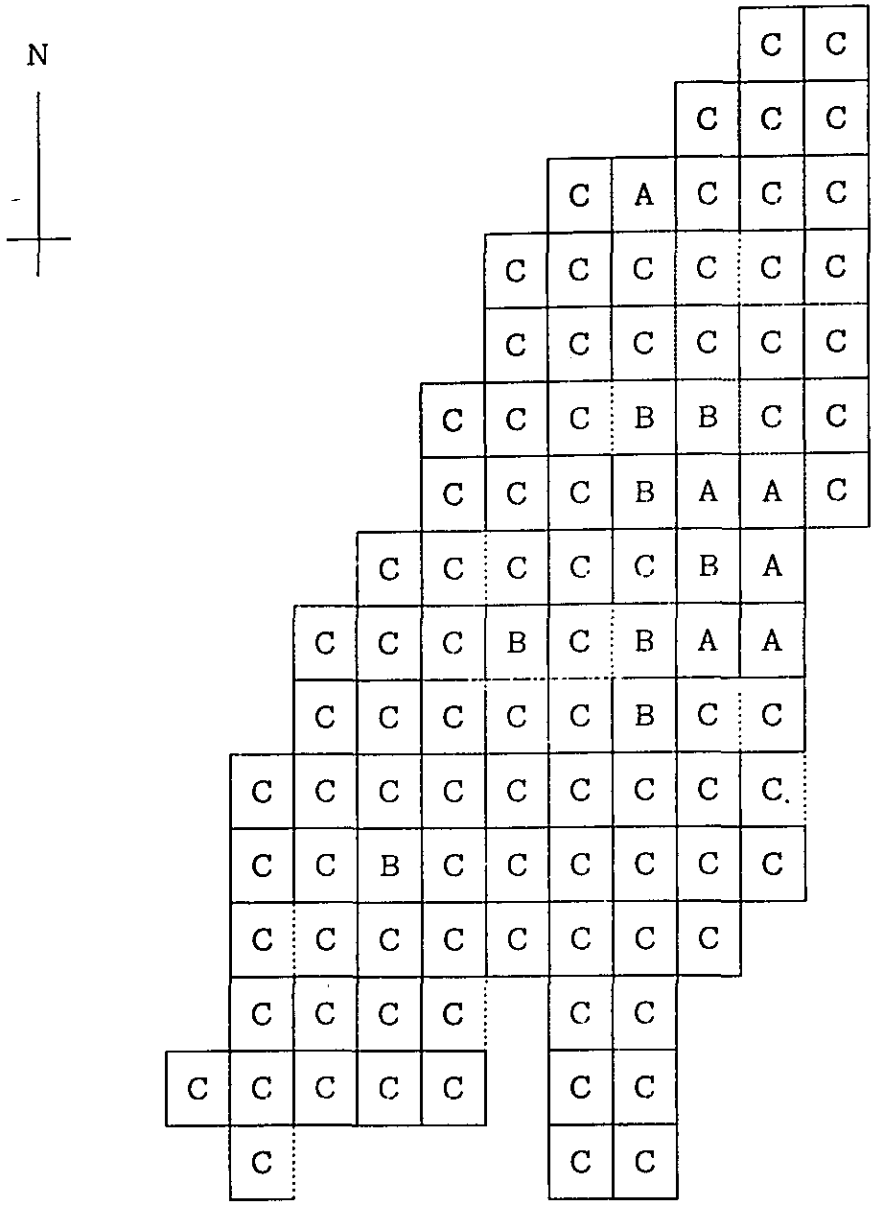


Fig. IV-3-2-2 "Conservation afforestation area" - Computerized - (Parcel IIB)

(note)
1: A: 4 Meshes
2: B: 28
3: C: 69
(Total) 101

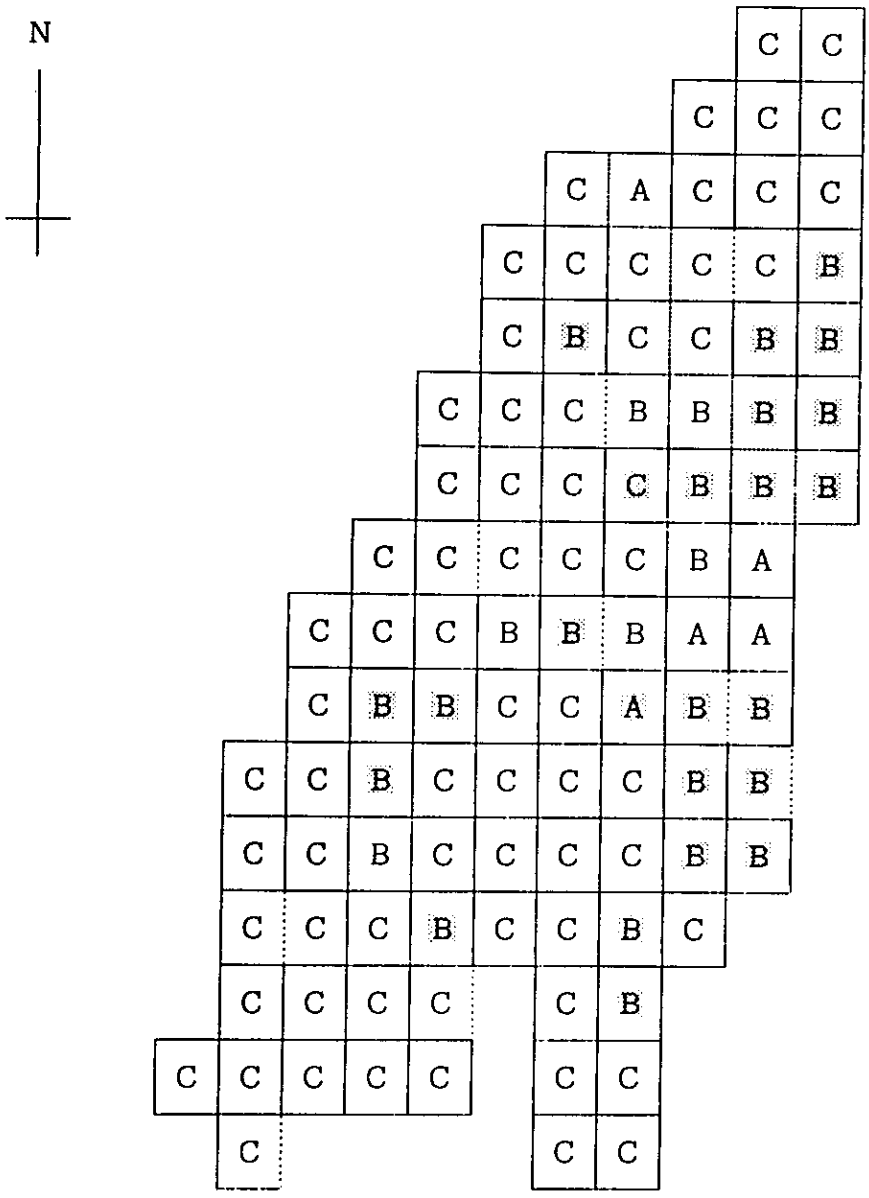


Table IV-3-3 'Forest land use classification' (Parcel IIB)

(note)
1: R: 35 Meshes
2: S: 36
3: C: 31 (A (High) :4, B (Middle) :27)
4: P: 2
(Total) 101

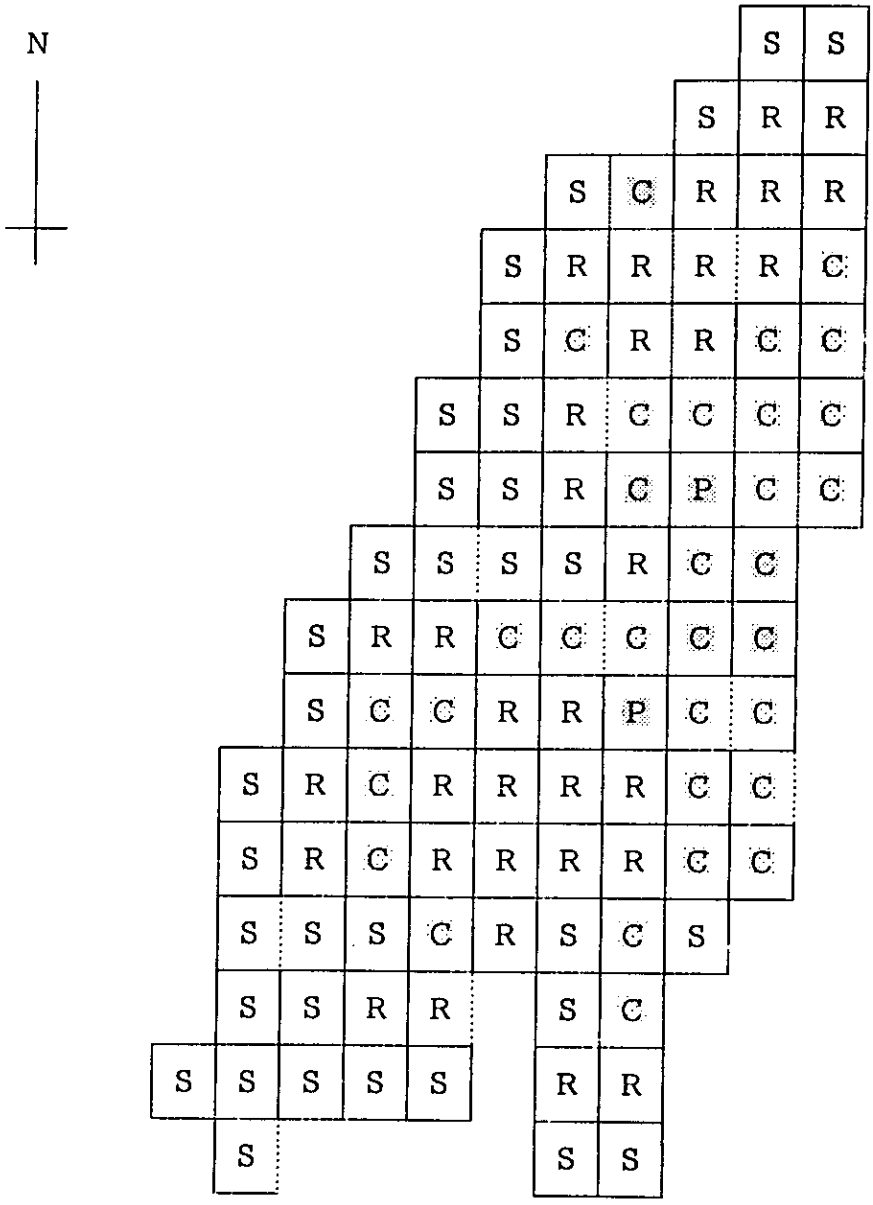


Fig.IV-4-1-1 " Social Forestry area" - Original data - (Parcel III)

(note)
1: A: 16 Meshes
B: 47
C: 58
(Total) 121

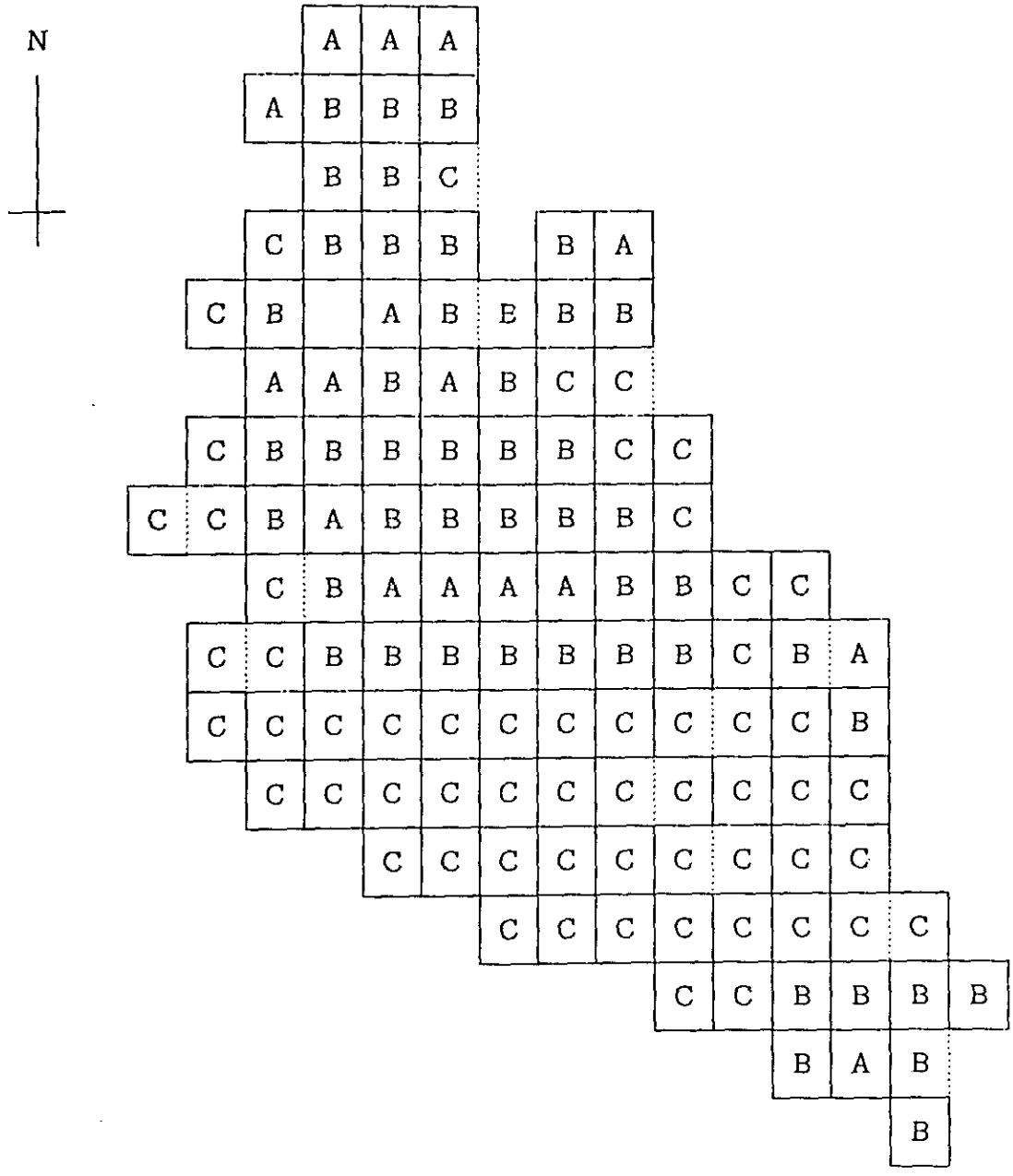


Fig.IV-4-1-2 ' Social Forestry area' - Computerized - (Parcel III)

(note)
1: A: 15 Meshes
B: 46
C: 60
(Total) 121

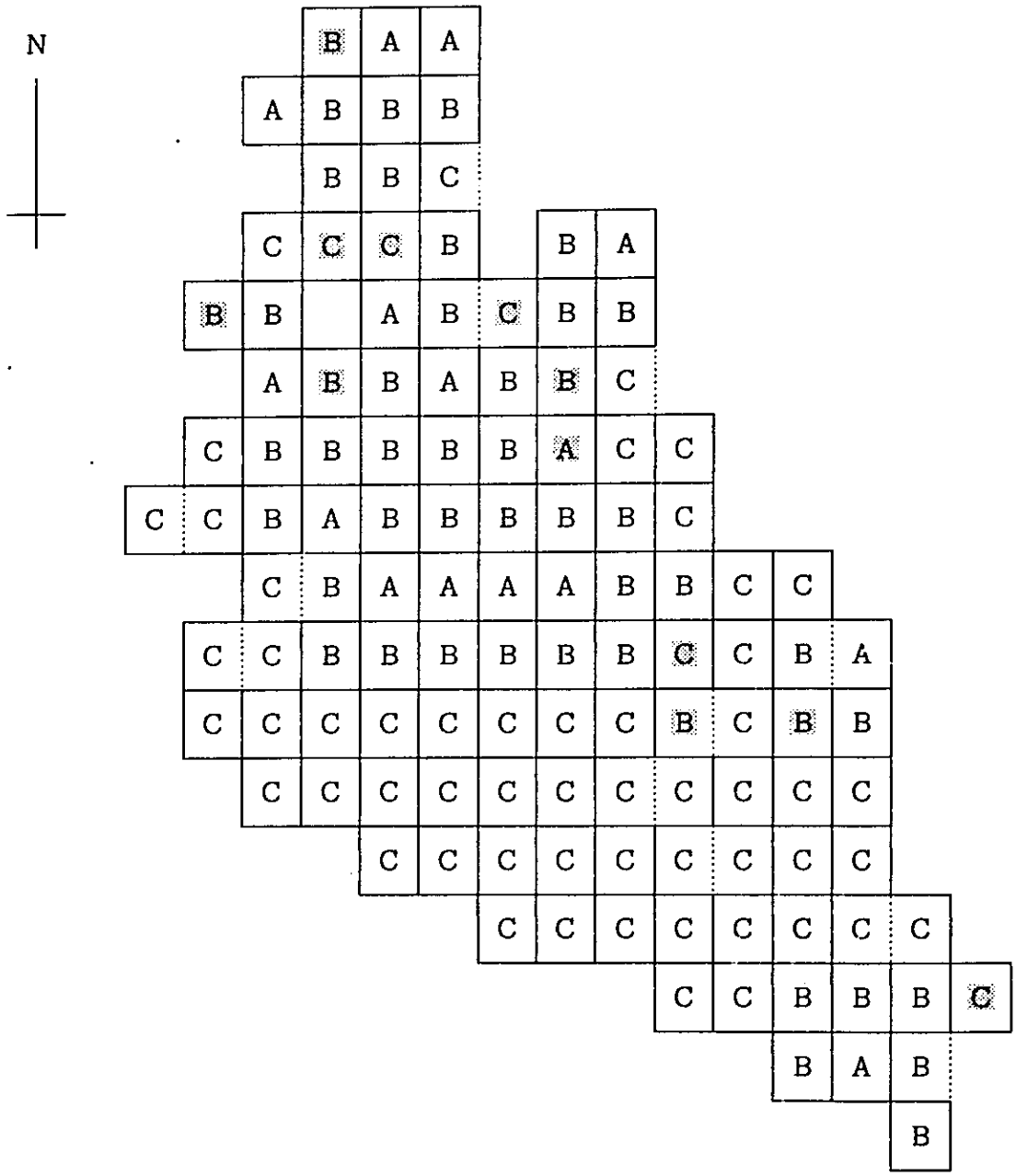


Fig.IV-4-2-1 "Conservation afforestation area" - Original data - (Parcel III)

(note)
1: A: 0 Meshes
B: 11
C:110
(Total) 121

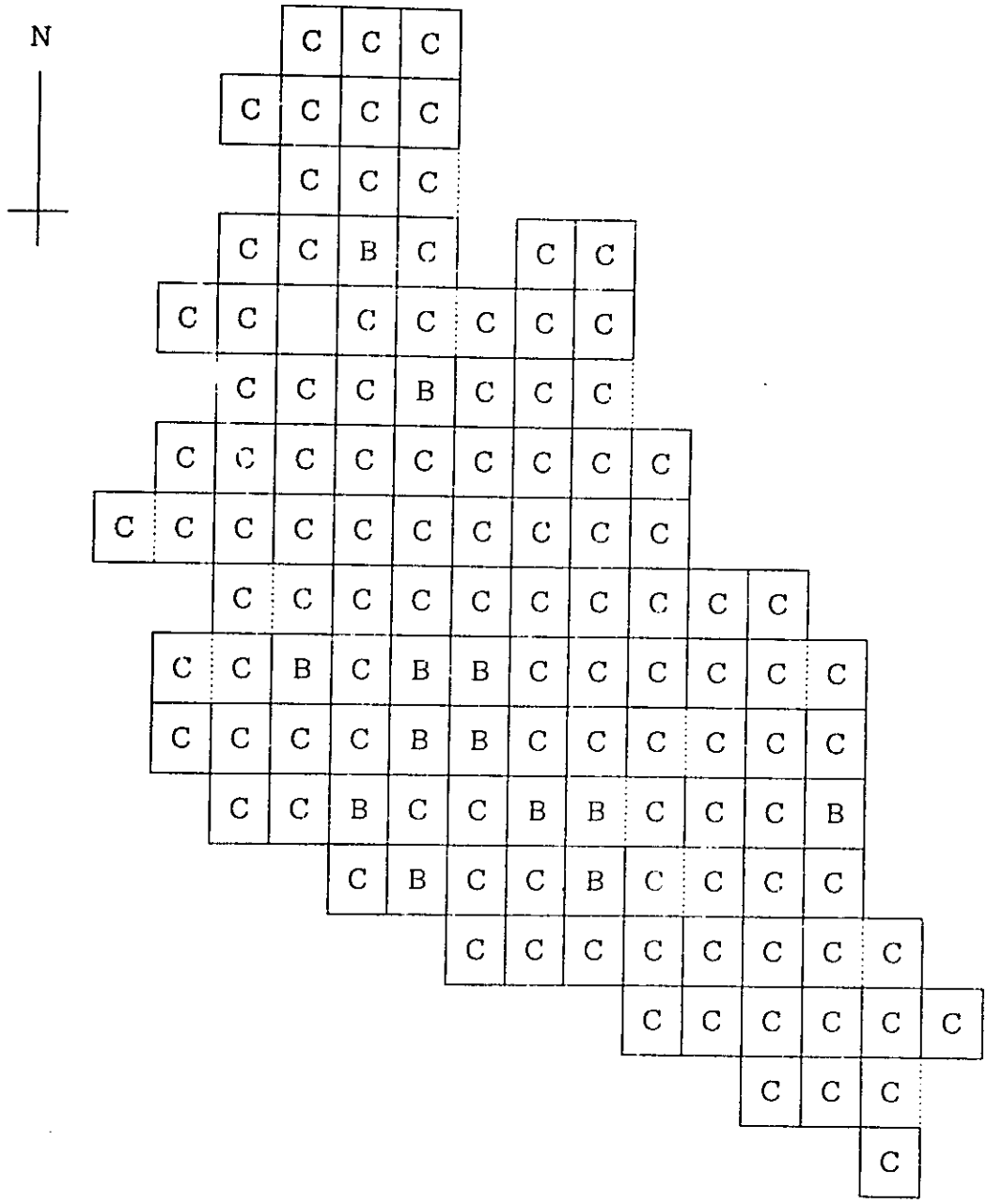


Fig.IV-4-2-2 "Conservation afforestation area" - Computerized - (Parcel III)

(note)
1: A: 0 Meshes
B: 20
C:101
(Total) 121

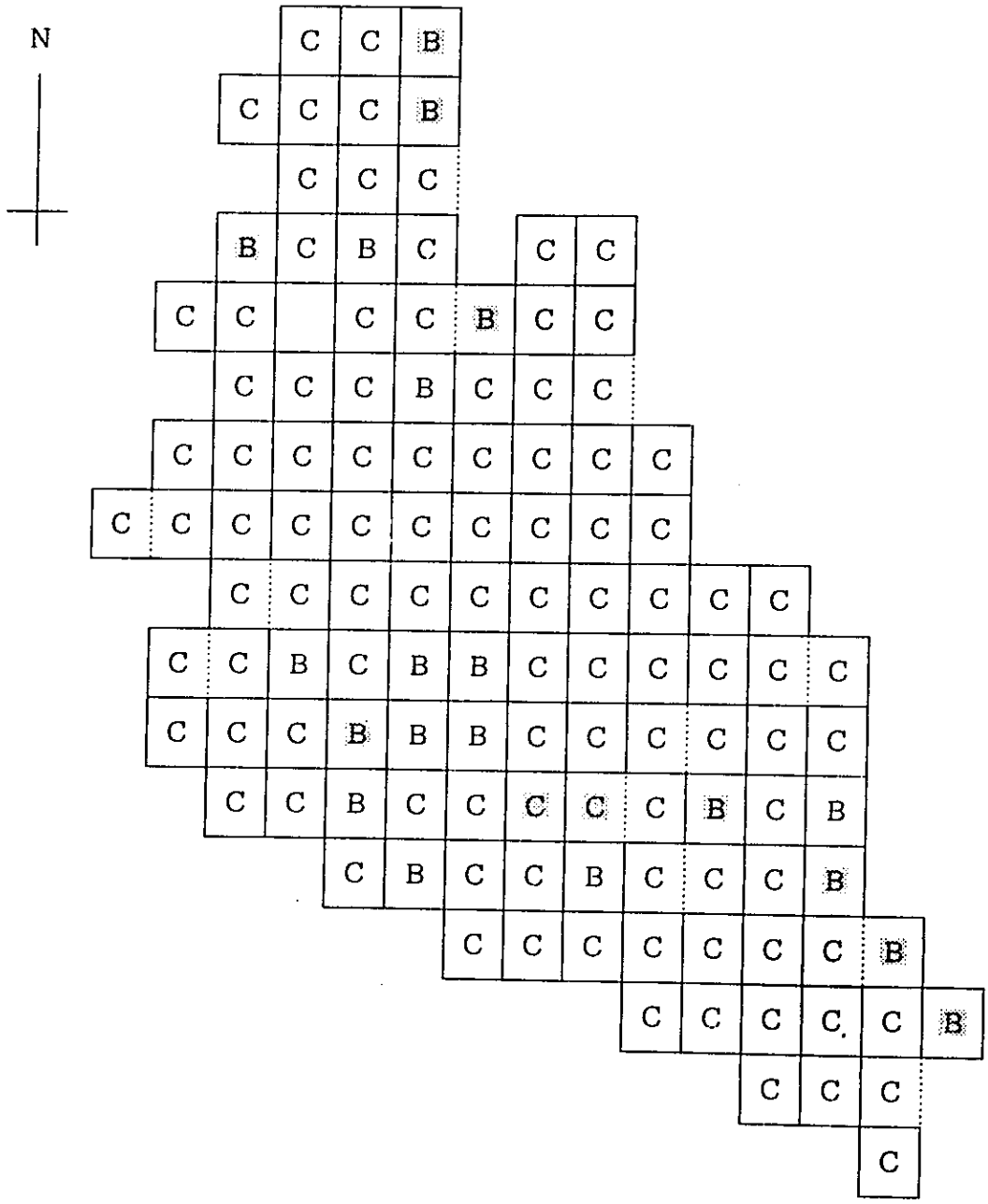


Fig.IV-3-3 "Forest land use classification" (Parcel III)

(note)
1: R: 76 Meshes
S: 14
C: 16 (B (Middle))
P: 15
(Total) 121

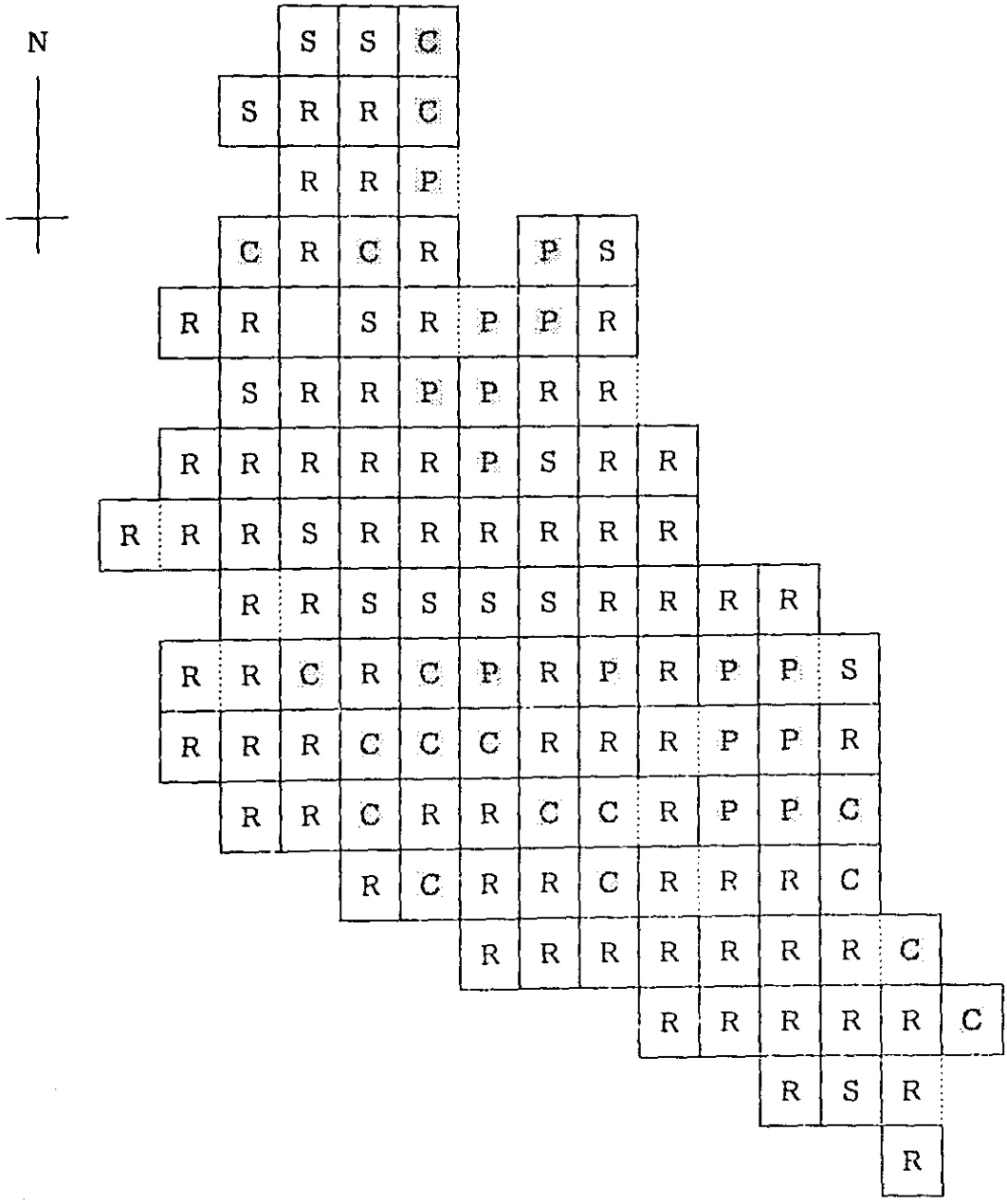


Table IV-2-1 "The results of reading/collecting data "x" ".

92.4.3

Item	Sub-Item	PI	P-IIA	P-IIB	P-III	TOTAL
1. Village	1	(29) 34	(24) 24	(32) 32	(12) 15	(24) 105
	2	(44) 51	(37) 36	(34) 34	(37) 45	(38) 166
	3	(27) 31	(39) 38	(35) 35	(50) 61	(38) 165
	TOTAL	(100) 116	(100) 98	(100) 101	(100) 121	(100) 436
2. The place that suffered forest fire in the past.	1	-	(21) 21	(18) 18	(39) 47	(20) 86
	2	-	(78) 77	(55) 56	(61) 74	(47) 207
	3	(79) 92	-	-	-	(21) 92
	4	(21) 24	-	(27) 27	-	(12) 51
	TOTAL	(100) 116	(100) 98	(100) 101	(100) 121	(100) 436
3. Road	1	(67) 78	(50) 49	(52) 53	(53) 64	(56) 244
	2	(28) 33	(28) 27	(27) 27	(36) 43	(30) 130
	3	(4) 5	(22) 22	(21) 21	(12) 14	(14) 62
	TOTAL	(100) 116	(100) 98	(100) 101	(100) 121	(100) 436
4. Elevation	1	(33) 38	(21) 21	(04) 4	(54) 65	(29) 128
	2	(59) 68	(20) 20	(39) 39	(41) 50	(41) 177
	3	(05) 6	(16) 16	(27) 27	(05) 6	(13) 55
	4	(02) 3	(11) 11	(15) 15	-	(07) 29
	5	(01) 1	(31) 30	(16) 16	-	(11) 47
	TOTAL	(100) 116	(100) 98	(100) 101	(100) 121	(100) 436
5. Slope	1	(07) 8	(09) 9	(04) 4	(02) 2	07) 29
	2	(49) 57	(46) 45	(74) 75	(45) 54	(91) 398
	3	(38) 44	(32) 31	(22) 22	(44) 53	(60) 264
	4	(06) 7	(13) 13	-	(09) 12	(14) 61
	TOTAL	(100) 116	(100) 98	(100) 101	(100) 121	(100) 436

6. Parcel	ommision					
7. Direction	1	(24) 28	(04) 4	(11) 11	(14) 17	(14) 60
	2	(25) 29	(05) 5	(05) 5	(09) 11	(11) 50
	3	(15) 18	(05) 5	(07) 7	(09) 11	(09) 41
	4	(08) 9	(08) 8	(11) 11	(05) 6	(08) 34
	5	(07) 8	(12) 12	(06) 6	(20) 24	(11) 50
	6	(04) 5	(31) 30	(13) 13	(21) 25	(17) 73
	7	(07) 8	(17) 17	(23) 23	(11) 13	(14) 61
	8	(09) 11	(17) 17	(25) 25	(11) 14	(15) 67
	TOTAL	(100) 116	(100) 98	(100) 101	(100) 121	(100) 436

Note: 1 For "details of "Item " and "sub-item " refer to "III" in Annex IV-1

2 "P" is abbreviation for Parcel

Table IV-2-2 "The results of ranking the mesh "y" ".

Name of mesh			P I	PII-A	PII-B	PIII	TOTAL
1. Re/Af.	A	Result	(34) 40	(16) 16	(35) 35	(63) 76	(38) 167
2. Conser.	A	Origi.	(06) 7	(18) 18	(05) 5	-	(07) 30
		Comput.	(06) 7	(26) 30	(04) 4	-	(09) 41
		Result	(07) 8	(15) 15	(04) 4	-	(06) 27
	B	Origi.	(08) 9	(15) 15	(08) 8	(09) 11	(10) 43
		Comput.	(34) 39	(19) 19	(28) 28	(16) 20	(24) 106
		Result	(21) 25	(14) 14	(23) 27	(13) 16	(19) 82
	C	Origi.	(86) 100	(66) 65	(87) 88	(91) 110	(83) 363
		Comput.	(60) 70	(10) 98	(68) 69	(83) 101	(77) 338
		Result.	*	*	*	*	-
3. Social F.	A	Origi.	(27) 32	(26) 26	(35) 35	(13) 16	(25) 109
		Comput.	(32) 37	(33) 32	(35) 35	(12) 15	(27) 119
		Result.	(33) 38	(26) 30	(33) 33	(11) 14	(26) 115
	B	Origi.	(41) 48	(33) 32	(33) 33	(39) 47	(37) 160
		Comput.	(40) 47	(28) 28	(32) 32	(38) 46	(35) 153
		Result.	*	*	*	*	-
	C	Origi.	(31) 36	(41) 40	(33) 33	(48) 58	(38) 167
		Comput.	(27) 32	(39) 38	(34) 34	(49) 60	(38) 164
		Result.	*	*	*	*	-
4. Prot.	A	Result.	(04) 5	(23) 23	(02) 2	(12) 15	(10) 45
TOTAL			(100) 116	(100) 98	(100) 101	(100) 121	(100) 436

Note :

1. Re/Af, Conser., Social F., and Prot. are abbreviation for Rehabilitation afforestation area, conservation afforestation area, social forestry area and other/protected area.

2. A, B, C, show High, Middle and low rank.

3. "Origi." and "Comput". are abbreviation for original data and computerized.

4. * shows omission.

Annex IV-1

Manual for the Land Use Classification in the RP-Japan Project area

By: Masaru Murasawa, Yuzuru Kimura
(Feb. 20, 1991)

I Aim

To have objective data in making a plan for the land use classification of the RP-Japan Project area by means of statistic method.

II Methodology

The following are ways of making a plan for the land use classification.

1. Writing down the mesh (500 m x 500m) on the basic map (scale 1/5,000) or the forest management map (scale 1/20,000).

2. Reading and collecting concerned data ("explanatory variate "=" x") from the mesh in the map.

3. Ranking the mesh ("response variate"="y") in the point of view of the following:

   (1) Items

   a. The Social Forestry area where the "Social Forestry Program" is recommended to be advanced.

   b. The Conservation Afforestation area where the "Highly erodible forest work" is recommended to be advanced.

   (2) Ranking each item of the above mentioned.

   I: High rank, II: Middle rank, III: Low rank in comparative.

NOTE: The said ranking is to be done by experienced and knowledgeable men and those who knows the concerned condition of the Project site area.

4. Using the "Quantification method II" which is commonly adopted in distinguishing the quality relationship between "x" and "y" and of which computer program is available in the market, and gaining the result of relationshp between "x" and "y".

5. Adjustment of the initial information "3" and the computerized results of the above mentioned "4".

6. Application of "5" to the specific forest land.

III The items "x" mentioned in II-2 and the concerned matters are as follows:

1. Village

   1: Village is in the mesh, 2: next to the mesh, 3: other

   NOTE: The village includes illegal occupants' place like rice field and a contract planting area like UFBP and CBRP.

2. The place that suffered forest fire in the past:

   1: no fire occurrence, 2: 2-4 times, 3: 5-7 times 4: more than 7 times

   NOTE: The categories are actually decided based on the Figure 8-3-5 "Frequency of Fire Occurrence by Block" in page 258 of "Technical Reports on Afforestation".

3. Road

   1: Road is in the mesh, 2: next to the mesh, 3: Other

   NOTE: Forest road is a component of roads.

4. Elevation

   1: 200's meters on or less, 2: 300's meters, 3: 400's meters, 4: 500's meters, 5: 600's meters on or more

   NOTE: Reading the elevation at the center in the mesh.

5. Slope

   1: Contour lines are 2 on or less, 2: 3-6, 3: 7-9, 4: 10 on or more

NOTE: Counting the contour line crossing diagonally in the mesh.

6. Parcel

   1: Parcel I, 2: II-A, 3: II-B, 4: III

   NOTE: In case of two Parcels in a mesh, it belongs to the larger one.

7. Direction

   1: N, 2: NE, 3: E, 4: SE, 5: S, 6: SW, 7: W, 8: NW

   NOTE: Direction is determined with consideration of the occupied area larger than any in the mesh.

IV The results of "x" and "y" is to be recorded and inputted in the computer. Refer to the concerned item of the original data in the seperate Volume IV-1 named "Quantification Method II", and the "Initial Land Use Classification "y", shown in the map (refer to the Fig. IV (1~4) - (1~2) - 1).

V The results of computerized "y" are refered to the concerned item in the, also, separate Volume IV-1, and the computerized "y" shown in the map (refer to the fig. IV (1~4) - (1~2) - 2).

VI The adjustment between the "y" in "IV" and "V" is done by consulting the concerned personnel, as it were called, men of knowledge and experienced to the Project, and the fruits are shown in the map (refer to the Fig. IV (1~4) - 3).

V The Standard of Forest Work

V-1 Planting, Tending and Regeneration

The standard of forest works are to be made in every unit of forest which are thought to be treated uniformly for the rationalization of forest management.

Every unit of forest which have been gathered in the view point of "Forest Land Use Classification", of which details are already explained in Chapter IV, and the forest stands especially the states of growing man-made forests, forest works should be uniformly treated with the same kind of forest works.

The standard of forest works for every unit of the forest are shown in Table V-1-1.

Other forest works like forest protection including forest fire prevention are explained later because they are common matters all over the Project areas which contents according to their sorrounding conditions are not necessary to change like the differences in the "Forest Land Use Classifications" conditions.

Table V-1-1 "An outline of forest works such as planting, tending and regeneration"

No.	Forest land use classification	Planting			Tending			Under planting	Regeneration
		No plantation / denuded place / grass land	Man-made forest		Weeding	Thinning			
			Crown insufficient	Crown closer		Crown insufficient	Crown closer		
1	Rehabilitation afforestation area	"Standard of planting" (SP) (Annexed (Ann.)V -1-1)	If necessary, supplement planting with large seedling additional to "SP" is to be done.	Nothing to be done especially.	The same as the concerned item in "SP".	No thinning to be done but preventing trees from growing well by competition among them.	"Standard of thinning" (ST) (Ann. V-1-2)	"Standard of under planting" (SU) (Ann. V-1-4)	"Standard of Regeneration " (SR) (Ann. V-1-3)
2	Conservation afforestation area	The contents of way of close planting additional to "SP".	Planting is not to be done but necessity of soil / water conservation arises.	do	do	Thinning is not to be done.	Thinning is not be done but preventing forest from growing well by competition among trees.	It is not to be done in positive	Avoiding clear cutting in established man-made forest once. Selective cutting in principle. (see 2(2) of Ann. V-1-3)
3	Social forestry area	The contents of way of fruit tree planting additional to "SP".	If necessary, supplement planting with fast growing species, fruit trees additional to "SP" is to be done.	do	do	The same as No.1's item including meaning of fruit trees additionally.	Thinning is to be done in positive according to the "ST".	It can be done with careful thinking about site quality and getting seedling.	The same as No. 1's item.
4	Protection area	Any forest work are not to be done generally. (No forest work area like natural forest)							

(note)1: "Crown insufficient" and "Crown closer" mean "1 (10%)- 4 (40%)" and "5 (50%) on or more" for the crown density of man-made forest. Specifically it is indicated in the concerned item of the Forest registration book.

Annex V-1-1

The Criterion of Planting

1. Selection of Planting Species

a. General matters

Acacia auriculiformis (A. auri. (ACA)), Gmelina arborea (Yemane (GMA)), and Pinus kesiya (Benguet pine (PIK)) are recommended basically to be planted in woodlot.

ACA is planted generally on low altitudes about less than 600 m and not on so steep slope (less than 28 degree) comparatively.

GMA might be planted in swamp low land near or around the river, valley, lake and the like.

PIK can be planted on comparatively high land (about more than 600 m in elevation).

In case of planting other trees, the decision should be done carefully considering the results in survival rate, the growing state and others which is concerned with the growing condition in the past.

The relationship between right species on sites and the location of land, soils and vegetation should be referred to "a" and "b" of "5. Literatures" as explained later.

b. Specific matters

b.1 Orchard as planted in a Social Forestry activity

Mangifera indica (Mango), Psidium guajava (Guaba), Artocarpus heterohyllus (Jack fruit) are recommended to be planted in the orchard. In selecting other species except the above mentioned trees we must consider the planting techniques and the demands of market and producer.

b.2 In the place where forest fire frequently occured, fire resistant trees like GMA should be planted preferably. As to fire resistant trees, refer to "a" in the "5. Literature".

3. The Number of Seedling

a. General matters

In a standard woodlot, seedling planted is 1,100-1,600 per hectare with a spacing of 3 m x 3 m, 2 m x 3 m. In good quality soil as found in the "Growth Prediction Table of A. auri.", seedlings are planted comparatively in low density. As to poor soil, it is planted in high density plots.

b. Specific matters

b.1 Woodlot

The necessity arises in case to reforest the mountains rapidly, for the purpose of soil and water conservation like in highly erodible forests or to make green belt like forest prevention work or to yield trees that fits the forest management, then seedling number should be based according to its necessity, its efficiency and effectiveness, e.g., seedling number is 2,500 per hectare with a spacing of 2 m x 2 m.

b.2 Orchard

1. Number of fruit trees

The number of fruit trees planted and its spacing, e.g. in the "Social Forestry Program" should be determined when it has grown up and it has yielded. For example, in the Community Based Reforestation Program (CBRP), Project site, Mango is 10 m x 10 m in spacing, Guava and Jack fruit are 5 m x 5 m.

2. Planting design

In planting design, mixed woodlot trees and fruit trees related to the "Social Forestry Program" is as follows:

In mixing fruit trees with woodlot trees the number of seedling to be planted is based on the spacing fit for the standard number of seedling obtained per hectare for the remaining planting area from the total area less the reduced fruit tree area. In this case, the number of seedlings in woodlot (N) is computed as follows:

$$N = N1 \times (1-A)$$

whereas N1 = 1,100~1,600 seedlings /hectare

A = fruit tree areas

A = N2 x A1

whereas

N2 = fruit trees number (seedling/hectare)

A1 = area occupied by fruit tree

(hectare/seedling)

e.g. spacing 10m x 10m

then A1 = 10 x 10 / 10,000 (hectare/seedling)

(practice)

N1 = 1,100, N2 = 10,

spacing of a fruit tree is 10m x 10m

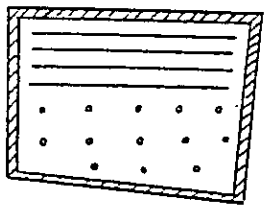
A1 = 10m x 10m / 10,000 = 1/100 (hectare/seedling)

A = 1/100 x 10 = 1/10

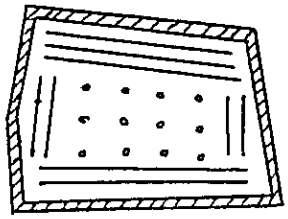
N = 1,100 x (1 - 1/10) = 990

2.a In a small scale planting area, one or two hectares per unit are covered by few families or a group/organization.

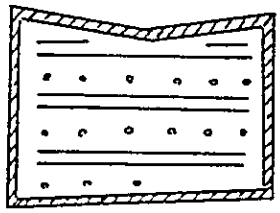
See the following Figure taken in the Upland Family Based Program (UFBP).



Adjoined planting



Encircled planting



Alternate planting

Remarks:

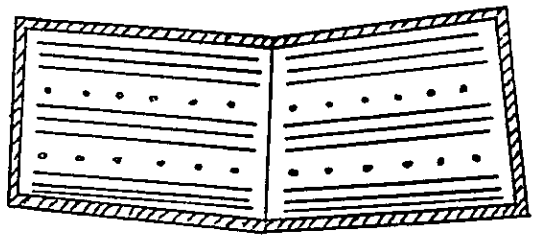
——————— Forest trees

o o o o o o Fruit trees

═══════ Firebreak

2.b In comparatively large scale planting area, the families concerned is larger than small scale.

Planting design should be uniform for efficient forest works such as the tending, protection and the like. See the following figure taken in the CBRP.



Alternate Planting

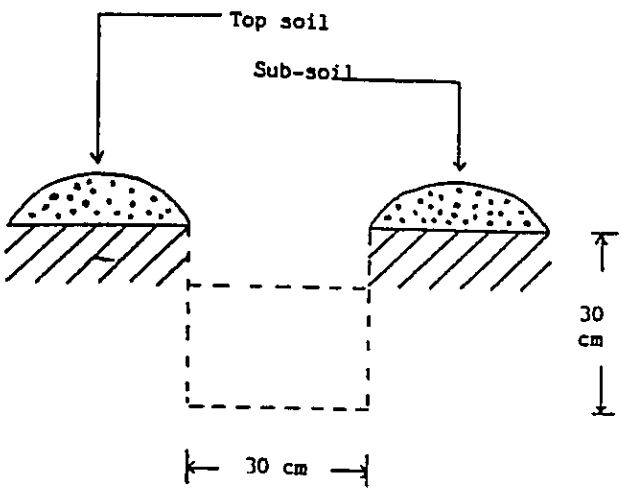
3. Planting Hole Size and Fertilization

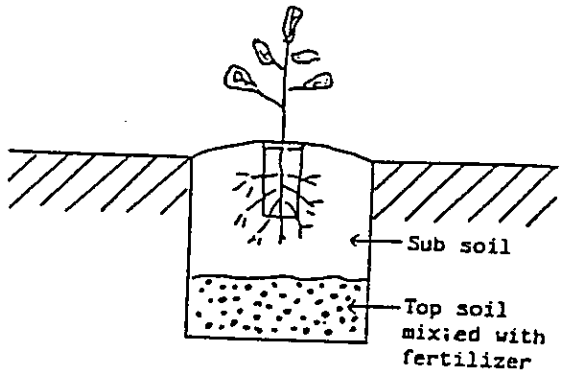
A 30 cm x 30 cm x 30 cm is a standard size with a 25 grams (g.) of chemical fertilizer plus 100 g. of organic fertilizer per planting hole. See the following figure as a reference.

a. After planting, make the surface of the filled up soil sticky, and should be on the same level as the ground and then mulch to prevent draught of seedling roots.

b. If necessities such as planting large scale seedling, fruit trees and the like arise, the suitable planting hole size should be determined based on the results of research from similar activities or literatures.

In such case where the amount of fertilizer needs to be increased, the treatment should be done same as the above mentioned.





4. Other Matters with Consideration

a. Site preparation is to be done as follows

a.1 Site preparation work should be finished by the end of the dry season.

a.2 Mechanized cultivation

A three ripper blade bulldozer used in cultivation has a good influence to growth of planted trees, so it is recommended to be utilized positively less than 15 degree in slopes.

a.3 Manual site preparation

Manual site preparation is to be done generally by spot clearing with a radius of about 1.5 m, or 1.5 times of the vegetation height of a seedling.

b. Seedling in woodlot and orchard is to be planted according to a contour considering the view point of soil and water conservation.

c. Treatment for seedling when planted

As survival of planted seedlings will be affected by treatments such as hauling and planting, supervisor who is a man of ability should be dispatched in the project site in order to guide a laborer in doing the work.

c.1 Seedling carried near planting site should be kept healthy in a wet shaded place considering of not being injured or die by bad treatments like draught. Seedling hauled should be planted as soon as possible.
c.2 Planting size is likely to become smaller when

laborer is getting tired, so the supervisor should see to it that laborer is given necessary instruction for planting.

d. Planting near the site of natural forest

When planting in places near the natural forest, natural seedling like Palosapis found growing in the area should be utilized by means of weeding for half length wide of natural forest trees height from the hedge of natural forest. And natural seedling and planted trees that remains shouldn't be cut.

e. Supplemental planting and replanting

In April, the surveyed survival rate of man made forest planted during the rainy season range from 50-80%, then supplemental planting should be planned, and if survival rate is less than 50%, then replanting should be planned. Before planting, investigation of mortality results is needed for selecting the suitable species to be planted next.

Supplemental planting is recommended to be done in the man-made forest of which crown density is less than 5 degree and also in a trial experiment on forest in improving planting. In such case natural seedling, and remaining planting trees should also be kept. Large size seedling is better to be used.

f. Weeding

Weeding operation should be continuously carried out until seedling overtopped the vegetation such as Samon (Themeda triandra), Cogon (Imperata cylindrica). Weeding takes 1-2 years operation during rainy season except site prepared by mechanized cultivation.

Ring weeding is common in the Project, but ways of weeding, clear, strip and ring weeding are selected according to site condition, budged and equipments available to use.

Specific matters such as how many time work be needed in operation, what kind of tools used and the concerned things are listed in the literatures.

5. Literature

a. "Technical Report on Afforestation" in RP-Japan Forestry Development Project of Pantabangan by DENR and JICA (July 1987).

b. "Re-Afforestation Manual for Grassland Plantation

Establishment" in RP-Japan Forestry Development Project of Pantabangan by DENR and JICA (July 1987).

c. "Report on a Framework of Site Specific Monitoring and Evaluation System for Two Pilot Social Forestry Programs" by Takashi Kato (June 1990) in the Progress Report on Technical Development Activities in 1989 (Vol. 4).

Annex V-1-2

The Criterion of Thinning

1. A. auri.

(1) A stand age of thinning

Thinning can be started after it reaches the stand age/time when almost all trees become suitable and available for the target production in the forest management as charcoal, fuel wood or pole making, etc.

(2) The number of stems to be thinned

It depends on "The way of thinning" attached in the Annex V-1-2-1.

(3) Selection of thinning trees

Thinning trees are to be selected evenly from all over the stand according to stand conditions.

However, in case necessities arise such as limitation of logging or protecting young growth trees of underplanting of natural regeneration and the like line thinning would be adapted.

(4) Making a mark on the stump selected as a thinning tree

All selected thinning trees are marked by paint such as white color or injured hatched to identify as thinning tree and to avoid mis-cutting. The mark is signed on the stump of the tree which is in the range of about 20 cm height from the ground, and of which marked park should remain when the tree is cut to identify as thinning tree.

2. Other planting species (they are species not having, so to speak, the Prediction Table)

When doing the thinning, the recommendations are as follows:

(1) Examination of a stand expected as a thinning

It is necessary to survey a forest condition such as mean height, diameter of the breast height (DBH), number of trees and the like, by means of, for example, sampling method. All trees in the stand are measured in order to obtain datas which are used in decision making if the stand is suitable for thinning or not. And in case of doing a thinning, what kind of trees are to be selected, and how many trees can be yielded.

If thinninng are available after surveying, it can be used as a reference and also the following items.

(2) In case of close stand (crown density is round, 50% on or more).

The number of stems to be thinned are determined by estimating the number of trees needed for recovering the same crown density five years after thinning. An example of the methods are:

a. Estimating a relationship between DBH and crown density areas five years later after thinning based on the actual relationship between DBH and crown density areas of each tree resulting from surveying the stand.

b. Estimating the number of remaining trees necessary for recovering the same density as what it is, and

c. The balance of thinning is derived by reducing the remaining number of trees from the present.

The other thinning works except above mentioned should be done according to "A.auri's", this would be adopted to next item.

(3) In case of not close stand (crown density is round less than 50%)

The thinning should be done with the policy that original trees should remain with a main stem branch but utilizing sub-branches for yielding for the accomplishment of the purpose.

(4) In case of thinning domestic species for underplanting Dipterocarpaceae including Anisoptera thurifera (Palosapis).

It might not be done for the time being.

3. Literature

"The report on the application of "The Growth prediction Table for Acacia auriculiformis" to thinning and on how to amend the Table" by M. Murasawa and E. J. Aragon (December, 1990)

Annex V-1-2-1

The Way of Thinning

1. Species: Acacia auriculiformis

2. The number of stems to be thinned

Fix the number of stems to be thinned (NT) according to the following steps:

1. Start
   !
2. Grasp the site condition (Mean diameter of breast height (D 1) Number of stems/ha (N 1) Mean height (H1))
   !
3. N1>N2 -no- 5

   (Note) 1 'N2' can be obtained from 'N' in accordance with D = D1 or H=H1 in the table below.

   ! Yes

4. NT=N1-N2 (In case of thinning plan made once per five (5) years, N2 can be changed to one whose figures are obtained from (5) years later than that of N1. (* 1))

   !
   END

5. N1>1,100 seedling / ha (*2) -no- Do not do thinning

   ! Yes ! No

6. Is it necessary to do thinning in the view point of Social Forestry or any other purpose ? -no- END

   ! Yes

7. NT=N1-1,100 (*3)

   !
   END

(Note)

*1. :N can be given with referecne of the yield tables.

*2. :The ground of 1,100 sld. was introduced only by spacing of 3mx3m planting.

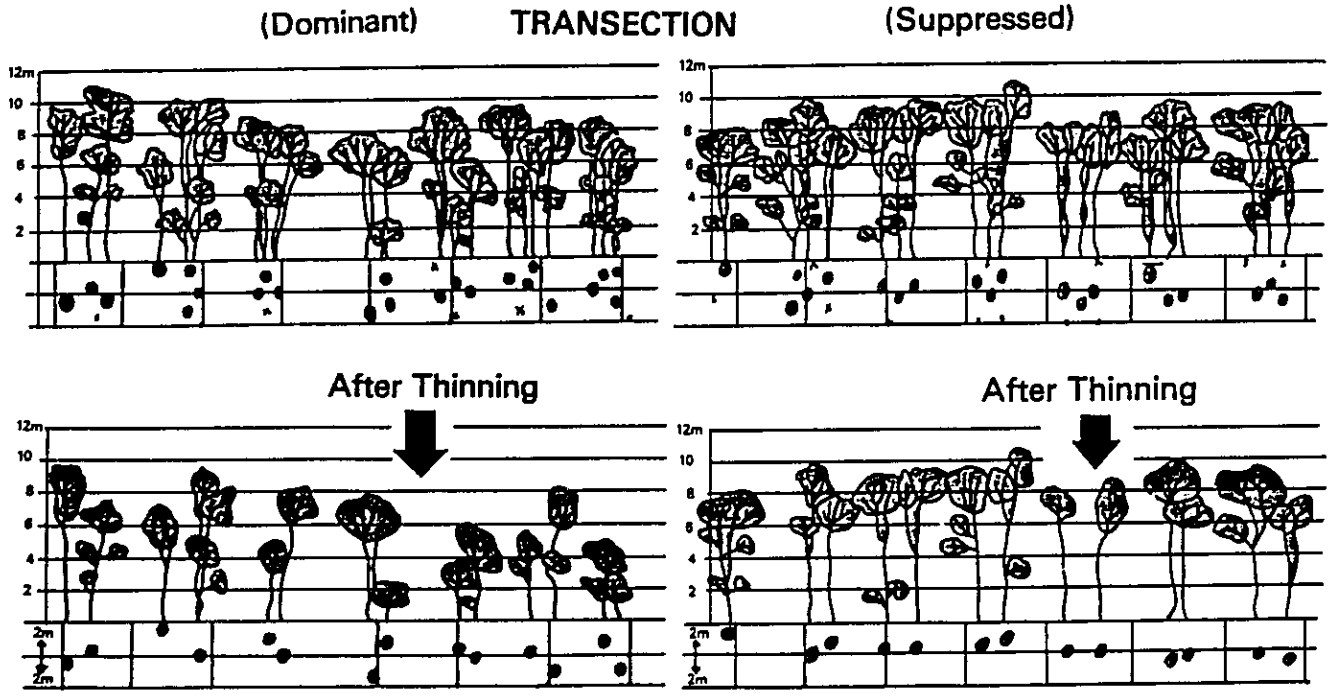
*3. :The ground for the formula have been thought that number of seedlings planted should be maintained.

3. The way of selecting trees in thinning work

To select thinning trees refer to the next table.

no	Items	Detail	Note (Objective)
1	Upper story thinning	Select Dominant/ Predominant trees. Dimension felling	The aim of thinning trees fits for products /forest management purpose e.g..Social Forestry or get early income etc.
2	Low thinning	Select lower story or oppressed overtopped trees . Leaved trees in good qualities ,growth..	Improve stand qualities
3	Others	Above 1 and 2 mixed	Above 1 and 2 mixed

Refer to the following fig.



(Note)

'Figure Examples' are way of thinning for No.1 & 2 of the above Table.

Table The relationship of D, H and N

D	H	N
4	6.0	6,900
6	8.0	3,150
8	10.0	2,000
10	12.5	1,500
12	14.5	1,200
14	17.0	1,000
16	19.0	850
18	21.0	750
20	23.5	650

(note)
1. D: mean diameter (cm)
2. H: mean height of dominant trees (m)
3. N: number of stems (/ha)
4. Unit :D .2 cm rounding .H round figure a 0.5 m. N round number a 50 stems.

5. "H" is obtained from the next formula.

$$H = 1.4 + 1.1\ D$$

$$r = 0.992 \quad \sigma = 4.226$$

6. References

"Growth Prediction Table" and "Stand Volume Table" for Acacia auriculiformis are referred to Table V-1-2 and Table V-1-3.

Table V-1-2

Growth Prediction Table for Acacia auriculiformis Stands on Good Site

A	H	D	N	B	V	TV	MI	CI
1	2.2							
2	5.2	3.3	1001.	1.0	2.3	0.0	1.14	2.17
3	7.6	5.2	1186.	2.9	9.1	0.0	3.03	6.79
4	9.5	6.7	1346.	5.5	21.1	0.0	5.28	12.03
5	11.0	8.0	1485.	8.5	37.5	0.0	7.49	16.37
6	12.3	9.0	1604.	11.6	56.6	0.0	9.44	19.16
7	13.3	10.1	1422.	12.8	67.3	5.1	10.34	15.72
8	14.1	11.1	1266.	13.7	75.8	11.1	10.87	14.56
9	14.7	11.9	1160.	14.4	83.2	16.7	11.10	13.01
10	15.2	12.6	1083.	15.0	89.6	21.7	11.13	11.33
11	15.6	13.2	1028.	15.5	95.0	26.0	10.99	9.68
12	15.9	13.7	986.	15.9	99.5	29.6	10.76	8.15
13	16.2	14.1	955.	16.3	103.2	32.6	10.45	6.79
14	16.4	14.4	931.	16.5	106.3	35.2	10.11	5.61
15	16.6	14.6	912.	16.8	108.8	37.2	9.74	4.60
16	16.7	14.8	898.	17.0	110.9	38.9	9.36	3.75
17	16.8	15.0	886.	17.1	112.6	40.3	8.99	3.05
18	16.9	15.2	878.	17.2	113.9	41.4	8.63	2.47
19	16.9	15.3	870.	17.3	115.0	42.3	8.28	2.00
20	17.0	15.3	865.	17.4	115.9	43.0	7.95	1.61

NOTE:
1

A : stand age(yrs) H : mean height of dominant trees(m)
D : mean diameter(cm) N : number of stems(/ha)
B : basal area(m^2/ha) V : volume of stocking(m^3/ha)
TV : volume of thinnings(m^3/ha)
MI : mean annual increment of total volume(m^3/ha)
CI : current annual increment of total volume(m^3/ha)
* These items are common to the following tables.

2. Literature

"Report on Development of Growth Prediction Table for Acacia auriculiformis Stands in Carranglan, Nueva Ecija" by N. Miyazaki, E. Aragon. (October, 1989)

Growth Prediction Table for Acacia auriculiformis Stands on Medium Site

A	H	D	N	B	V	TV	MI	CI
1	1.5							
2	3.6	2.3	1000.	0.5	0.8	0.0	0.41	0.78
3	5.3	3.6	1149.	1.4	3.2	0.0	1.06	2.35
4	6.7	4.7	1280.	2.6	7.3	0.0	1.81	4.08
5	7.8	5.6	1397.	4.0	12.7	0.0	2.55	5.49
6	8.7	6.3	1499.	5.5	19.1	0.0	3.19	6.39
7	9.4	6.9	1590.	6.9	25.9	0.0	3.70	6.79
8	9.9	7.4	1670.	8.2	32.7	0.0	4.09	6.78
9	10.4	7.8	1741.	9.4	39.2	0.0	4.35	6.49
10	10.7	8.1	1803.	10.5	45.2	0.0	4.52	6.01
11	11.0	8.3	1859.	11.5	50.6	0.0	4.60	5.44
12	11.2	8.6	1796.	11.8	52.9	1.1	4.50	3.41
13	11.4	8.8	1739.	12.0	54.6	2.3	4.38	2.84
14	11.6	9.0	1695.	12.2	56.0	3.2	4.23	2.35
15	11.7	9.1	1661.	12.3	57.2	4.0	4.08	1.93
16	11.8	9.2	1634.	12.4	58.1	4.6	3.92	1.57
17	11.9	9.3	1614.	12.5	58.9	5.2	3.77	1.28
18	11.9	9.4	1597.	12.6	59.5	5.6	3.61	1.04
19	12.0	9.5	1585.	12.6	60.0	5.9	3.47	0.84
20	12.0	9.5	1574.	12.7	60.3	6.2	3.33	0.68

Growth Prediction Table for Acacia auriculiformis Stands on Poor Site

A	H	D	N	B	V	TV	MI	CI
1	0.9							
2	2.1	1.4	999.	0.2	0.2	0.0	0.09	0.16
3	3.1	2.1	1084.	0.5	0.6	0.0	0.21	0.45
4	3.9	2.7	1162.	0.8	1.4	0.0	0.34	0.75
5	4.5	3.2	1233.	1.2	2.3	0.0	0.47	0.97
6	5.1	3.7	1298.	1.6	3.5	0.0	0.58	1.11
7	5.5	4.0	1357.	2.0	4.6	0.0	0.66	1.16
8	5.8	4.3	1411.	2.4	5.8	0.0	0.72	1.15
9	6.0	4.5	1460.	2.7	6.9	0.0	0.76	1.09
10	6.3	4.7	1505.	3.0	7.9	0.0	0.79	1.01
11	6.4	4.8	1546.	3.3	8.8	0.0	0.80	0.92
12	6.6	4.9	1584.	3.6	9.6	0.0	0.80	0.82
13	6.7	5.0	1618.	3.8	10.3	0.0	0.79	0.72
14	6.7	5.1	1650.	4.0	11.0	0.0	0.78	0.63
15	6.8	5.2	1678.	4.1	11.5	0.0	0.77	0.55
16	6.9	5.2	1704.	4.3	12.0	0.0	0.75	0.48
17	6.9	5.2	1728.	4.4	12.4	0.0	0.73	0.42
18	7.0	5.3	1750.	4.5	12.8	0.0	0.71	0.36
19	7.0	5.3	1770.	4.6	13.1	0.0	0.69	0.31
20	7.0	5.3	1788.	4.7	13.4	0.0	0.67	0.27

Table V-1-3

Acacia auriculiformis Stand Volume Table

D/H	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m
1cm	.00006	.00012	.00019	.00026	.00033	.00041	.00048	.00056	.00064	.00071
2cm	.00019	.00041	.00064	.00088	.00112	.00137	.00162	.00188	.00214	.00241
3cm	.00039	.00083	.00130	.00178	.00228	.00278	.00330	.00383	.00436	.00489
4cm	.00064	.00137	.00214	.00295	.00377	.00461	.00546	.00633	.00721	.00810
5cm	.00094	.00203	.00317	.00435	.00557	.00681	.00807	.00936	.01065	.01197
6cm	.00130	.00279	.00436	.00599	.00766	.00937	.01111	.01288	.01466	.01647
7cm	.00170	.00365	.00571	.00785	.01004	.01228	.01455	.01686	.01921	.02157
8cm	.00215	.00461	.00722	.00992	.01268	.01551	.01839	.02131	.02426	.02726
9cm	.00264	.00567	.00887	.01219	.01559	.01906	.02260	.02619	.02982	.03350
10cm	.00317	.00682	.01067	.01466	.01875	.02293	.02718	.03149	.03586	.04029
11cm	.00375	.00806	.01261	.01732	.02215	.02709	.03211	.03721	.04238	.04760
12cm	.00437	.00939	.01468	.02017	.02580	.03155	.03740	.04334	.04935	.05544
13cm	.00503	.01080	.01689	.02320	.02968	.03630	.04303	.04986	.05678	.06378
14cm	.00572	.01229	.01923	.02642	.03379	.04133	.04899	.05677	.06465	.07262
15cm	.00646	.01387	.02170	.02981	.03813	.04663	.05528	.06406	.07295	.08194
16cm	.00723	.01553	.02430	.03338	.04270	.05221	.06189	.07172	.08167	.09174
17cm	.00804	.01727	.02702	.03711	.04748	.05806	.06882	.07975	.09082	.10202
18cm	.00888	.01909	.02986	.04102	.05247	.06417	.07607	.08815	.10038	.11276
19cm	.00977	.02099	.03283	.04509	.05769	.07054	.08362	.09690	.11035	.12396
20cm	.01068	.02296	.03591	.04933	.06311	.07717	.09148	.10601	.12072	.13560

Acacia auriculiformis Stand Volume Table

D/H	11 m	12 m	13 m	14 m	15 m	16 m	17 m	18 m	19 m	20 m
1cm	.00079	.00087	.00095	.00104	.00112	.00120	.00128	.00137	.00145	.00154
2cm	.00267	.00294	.00321	.00349	.00376	.00404	.00432	.00460	.00488	.00517
3cm	.00544	.00598	.00654	.00709	.00765	.00822	.00879	.00936	.00994	.01051
4cm	.00900	.00990	.01082	.01174	.01267	.01360	.01454	.01549	.01644	.01740
5cm	.01330	.01464	.01599	.01735	.01872	.02010	.02150	.02290	.02430	.02572
6cm	.01830	.02014	.02200	.02388	.02576	.02767	.02958	.03151	.03344	.03539
7cm	.02397	.02638	.02882	.03127	.03375	.03624	.03875	.04127	.04381	.04636
8cm	.03028	.03333	.03641	.03951	.04264	.04578	.04895	.05214	.05535	.05857
9cm	.03721	.04097	.04475	.04856	.05240	.05627	.06017	.06408	.06802	.07198
10cm	.04475	.04927	.05381	.05840	.06302	.06767	.07236	.07707	.08180	.08657
11cm	.05288	.05821	.06359	.06901	.07447	.07996	.08550	.09106	.09666	.10229
12cm	.06159	.06779	.07405	.08036	.08672	.09312	.09957	.10605	.11257	.11913
13cm	.07085	.07799	.08520	.09246	.09977	.10714	.11455	.12201	.12951	.13705
14cm	.08067	.08880	.09700	.10527	.11360	.12198	.13042	.13891	.14745	.15604
15cm	.09103	.10020	.10946	.11878	.12818	.13764	.14717	.15675	.16639	.17608
16cm	.10192	.11219	.12255	.13300	.14352	.15411	.16477	.17550	.18629	.19714
17cm	.11333	.12476	.13628	.14789	.15959	.17137	.18323	.19516	.20716	.21922
18cm	.12526	.13789	.15062	.16346	.17639	.18941	.20252	.21570	.22896	.24230
19cm	.13770	.15158	.16558	.17969	.19391	.20822	.22263	.23712	.25170	.26636
20cm	.15064	.16583	.18114	.19658	.21213	.22779	.24355	.25940	.27535	.29139

Acacia auriculiformis Stand Volume Table

D/H	21 m	22 m	23 m	24 m	25 m	26 m	27 m	28 m	29 m	30 m
1cm	.00162	.00171	.00179	.00188						
2cm	.00546	.00574	.00603	.00632						
3cm	.01110	.01168	.01227	.01286						
4cm	.01836	.01933	.02030	.02128						
5cm	.02714	.02857	.03001	.03145						
6cm	.03735	.03932	.04129	.04328						
7cm	.04892	.05150	.05409	.05669						
8cm	.06181	.06506	.06834	.07162						
9cm	.07597	.07997	.08399	.08803						
10cm	.09136	.09617	.10100	.10586						
11cm	.10795	.11364	.11935	.12509						
12cm	.12572	.13234	.13899	.14568						
13cm	.14463	.15225	.15990	.16759						
14cm	.16467	.17335	.18206	.19082						
15cm	.18582	.19560	.20544	.21532						
16cm	.20805	.21901	.23002	.24108						
17cm	.23135	.24353	.25578	.26808						
18cm	.25570	.26917	.28270	.29630						
19cm	.28109	.29590	.31078	.32572						
20cm	.30751	.32370	.33998	.35633						

NOTE:

"Report on Volume Table for Acacia auriculiformis stand in Carranglan, Nueva Ecija" by T. Ishitani, N. Miyazaki and E. J. Aragon (1989)

Annex V-1-3

The Criterion of Regeneration

1. The way of regeneration has two (2) compositions: regeneration by underplanting (alternation from exotic growing species to indigenous premium species) which is referred to "The Criterion of Underplanting", and the other is, ones by the other than the former, underplanting. The latter is described herein mainly in the field of clear cutting.

2. Regeneration under clear cutting

(1) There are things to be solved in selecting the way of clear cutting. The reasons are as follows:

a. In the Project area, cutting/yielding are prohibited generally because the area is designated as a critical watershed area for the Pantabangan dam.

b. It is not declared hen final cutting ages for species should be from the forest management.

c. The planting history of man made forest even A. auri. which covers the majority of the planted areas in the Project is about ten years or more which is thought to be short in identifying the characters of the species.

And maybe such issues are recognizable or can be counted up easily by any one.

d. The standard cutting ages by species should be set up for the purpose of using it when emergency cases happens. In general, the standard cutting age is to be determined as a reference based on the maximum of final mean annual increment (m /ha.), utilization cutting age and other forest management purposes.

Viewing the point of "the age for maximum", the standard cutting age for A. auri. can be read from "The Growth Prediction Table" as follows:

Good site: 10 years old
Medium site: 11 years old
Poor site: 12 years old

For other species of which Growth Prediction Tables were not yet made, their standard cutting ages

are desirable to be fixed for reference to tree analysis, stand volume surveying or others like market researching for the related wood.

(2) Anyway, what should be given attention to in case of necessity for clear cutting which is considered an emergency case or as changes happens in the sorrounding condition in the forest management including the Project site are as follows:

a. One area for clear cutting should be small, less than five hectares, and each area should be scattered. Each small area should not touched each other for a few years when the tree planted in the area would overtopped the vegetable and be able to live for/by themselves.

Furthermore, total area of clear cutting admitted to be cut annually should be considered from the view point of head water conservation. In general, the following formula is used commonly in other countries as well as domestic country.

$$A = F/U$$

Whereas:

A - Total clear cutting area permitted annually (ha./year)

F - Remaining catchment area after reducing ones except clear cutting areas admitted to be chosen as a regeneration way (ha.) from a total catchment area.

U - Rotation of regeneration of species (year).

b. Such places around or near the mountain ridge, steep place, high elevation place, high erodible area, strong wind beating place, valley or river bank and the like are thought to be difficult for regeneration and should be excluded from clear cutting to be use as a reserve forest including selecting cutting forest, e.g. cutting rate less than 30%, and also a shelter belt, e.g. at least 20 meters in width.

As a reference, the following formula shows the relationship among Selective cutting rate (S (%)), Growth rate (p (% / year)) and Cutting cycle (L (year)).

$$s/100 = ((1+p)^{L}-1) / (1+p)^{L}$$

Annex V-1-4

The Criterion of Underplanting

1. In Case of Underplanting in a Stand of A. auri.

a. State of A. auri. stand for underplanting

A plantation of A. auri. wherein the crown closure or with just the state of crown closure is recommended as nurse trees when underplanting. The good site stand shows 6 years in age, 12.3 m in mean height and 9 cm in mean DBH and a medium site stand reaches 10 years in age, 10.7 m in mean height and 8.1 cm mean DBH.

b. Control of relative light intensity (RLI)

When underplanting the suitable RLI is 30-50%. Practically, such condition is applied to cutting/thinning of A. auri. nurse trees to the level of half the number of trees/stems indicated in the Prediction Table as adopted to a forest used for underplanting.

c. Selection of cutting trees

Cutting trees are to be selected evenly from all over the stand according to stand conditions.

Cut trees are to be used effectively for fuel wood or charcoal making materials, e.g. advancing Social Forestry Program in the view point of effective use of forest resources without abandoning it only for the purpose of underplanting. The reason is that underplanting seedling can survive without thinning as observed in the trial experiment. So it is not late to do thinning of which demands come after underplanting.

In case necessity arises such as limitation of logging or protecting young growth trees of underplanting, line yielding would be adopted.

d. The number of underplanting seedling

Seedling underplanted is 500-800 per hectare with a spacing of 3 m x 6 m, 3 m x 4 m which is about half number of seedling of nurse trees planted initially 1,100-1,600 per hectare with a spacing of 3 m x 3 m, 3 m x 2 m.

For an easy operation of related forest works in the future, spacing of underplanting should be determined based on the nurse trees.

e. Planting hole size and fertilization

It is the same as the items in "The Criterion of Planting".

f: Weeding

Weeding operation should be carried out in case the vegetation affects the seedlings, like preventing light to pass through. It is unnecessary for underplanting tree to overtapped the vegetation more than one third of the seedling height. It is better for weeding to be done before rainy season comes.

g. Others

In case necessity arises, refer to the concerned items in "The Criterion of Planting".

2. Other Planting Species (they are species not having, as it were, the Prediction Table)

At present the underplanting should be done in A. auri. forest. However, if underplanting is to be done in rare case, the recommendation are as follows:

a. Examination of a stand expected for underplanting

In choosing a stand for underplanting, a state of crown closure or with just before the state of crown closure should be considered.

It is necessary to survey a forest condition such as mean height, DBH, number of trees, crown maps, RLI and the like by means of, for example, sampling method. It is used as a basis in decision making if the stand is suitable for underplanting or not and the collected datas can be used as, for example, knowing if what kind of trees are selected, how many trees can be yielded and the like.

b. Other underplanting works such as Control of RLI and the like should be done according to the said "A. auri's".

3. The contents of the above mentioned Standard are described for such indigenous species like Anisoptera thurifera (Palosapis) and Pentacma contorta (White lauan) and derived from the results of the trial, that is "Type A" for "Underplanting Trial". For more details or related matters of underplanting refer to the literatures as listed, especially no. "h" which will be useful to them.

4. Literatures

a. "Technical Report on Afforestation" in RP-Japan Forestry Development Project of the Pantabangan area by DENR and JICA (July 1987).

b. "Re-Afforestation Manual for Grassland Plantation Establishment" in RP-Japan Forestry Development Project of the Pantabangan area by DENR and JICA (July 1987).

c. Progress Report on Underplanting Trial in Carranglan, Nueva Ecija" by Mr. Asaka (March 1989).

d. "Progress Report on Tolerance Test of Light Intensity for Dipterocarps Species (Anisoptera thurifera), Carranglan, Nueva Ecija" by Mr. Asaka (March 1989).

e. "Report on Development of Growth Prediction Table for Acacia Auriculiformis in Carranglan, Nueva Ecija" Mr. S. Miyazaki in Progress Report on Technical Development Activities in 1989 (Vol. 2).

f. "Progress Report on Underplanting Trial" by H. Kusano in Progress Report of Technical Development Activities in 1989 (Vol. 2).

g. NOTE: Free translation "The growth of young trees of Dipterocarpus species in the different light intensities according to stand conditions" by Kenkei Suzuki, The reports of agricultural research in tropics Institute (vol. 65).

h. "Report on Underplanting Trial" by H. Kusano, R.E. Corpuz, N. Peralta, N. Tomas, (September 1991).

V-2 Seedling Production

1. Seedling Production in Nursery

(1) Seedling production by seed

The outline of seed works such as seed collection, seed storage and the like are referred to Table V-2-1.

A. Mother tree selection

A tree from which seeds are collected should be chosen with reference of the following matters so as to get good quality seeds for planting.

(A) Man-made forest/trees for seed collection

a. An object for a mother tree

(a) A mother tree with larger DBH should be selected and the one which grows on good land condition such as along road-side as forest edge be rejected.

(b) Generally, the older a mother tree is, a higher quality seed is obtained.

(c) A mother tree from different site class could be nominated.

b. Physical criteria of mother tree selection

(a) having extremely good growth in:

(a.1) DBH proven by statistic method

A tree expected as a mother tree has the largest DBH among trees of which tree number are measured at least fifteen. It is necessary to be proven by statistic method satisfied with condition that the level of significance is less than five percent.

(a.2) Volume larger than the other three (3) trees' total average

An expected mother tree should have a volume of more than 30% as compared to the other three trees which are second to forth

in rank in volume of all trees measured in a stand.

However, above said criteria can be ignored in case a candidate tree has better height or quality.

(b) Others

(b.1) Little defect as in the case of Curved stem
(b.2) Minimal damaged by disease or pest, and
(b.3) bearing a lot of seeds except trees which are easy for cuttings

(B) Natural forest/trees for seed collection

a. An object for a mother tree

(a.1) A natural forest with even age like man-made forest, a mother tree should be selected the same as the man-made forest above mentioned.

(a.2) Criteria should be made from the view point of its quality instead of growth in case of man-made forest.

(a.3) A mother tree should be selected among predominant trees with more than 25 cm DBH among them from different site classes, not the same as those concerning conditions like stand age, site class and so on.

b. Criteria for mother tree selection

Tree quality other than growth is excellent if satisfied with the following matters:

(b.1) Having full-body and little negative aspect like twisted or extremely rotten stem.

(b.2) Having slim branches, bearing a lot of seeds in case of trees which are hard for cuttings, and with little damaged by disease or pest.

B. The quantity of seeds to be gathered

(A) Seed quantity to be collected

SQC = (SRG/ARG) X SQS

wherein:

SQC - Seed quantity to be collected
SQS - Seed quantity to be sown in a nursery
SRG - Standard rate of germination
ARG - Actual rate of germination

(B) Quantity of pods or fruits

QPF = SQC / RSO

wherein:

QPF - Quantity of pods or fruits
RSO - Rate of seeds obtained from fruit or pod

If the other species except the above mentioned as shown in Table V-2-1 need to be treated, they should be done appropriately based on the results of the Project's activities and the related information contained in the literatures.

Palosapis seed collection needs some special technique. Before starting seed collection such technique is essential to obtain high quality seeds as well as high germination rate. The germination rate strictly depends on the harvesting time.

C. Nursery Practice

The outline of nursery practice are referred to Table V-2-2. Nursery work calendar for A. auri, Yemane, Benguet pine and Palosapis are noted in Table V-2-3-1, V-2-3-2, V-2-3-3 and V-2-3-4. Benguet pine is attached as a reference of "Pinus spp.".

Since the Tables show only the outline of nursery work, it is therefore necessary to refer to the techniques obtained from the previous Project activities, the related literatures and seek the guidance and advice of supervisors and/or extension personnel with expertise on nursery work.

(2) Wildling

Wildling is only available for Palosapis from above mentioned species. Refer to Table V-2-4 for the outline of its treatment. Some details can be obtained from "C. Literature's no. (1), (3) and (12)" as listed below.

(3) Cutting

In cutting, some species are easy to be done and others

are difficult. So refer to the concerned items in the "5. Literature". Literature (1) mainly deals with Narra (Ptetocarpus indicus) and (12) deals with Palosapis.

(4) Seedlings for planting

Hardening off of seedlings is done before outplanting. As a rule, seedlings of better and best sizes are preferable to be outplanted as shown in Table V-2-2 and V-2-4. Seedlings of good quality are useful for the next batch.

A: A good seedling for planting has:

a. Good heredity, meaning the provenance of the product is known
b. Healthy, branching well and thick on top parts of tree
c. Heavy weight seedling compared to a seedling height with thick basal diameter
d. Roots are swelling well all around with comparatively short tap root and with rootlet growing well attached to fibrous root.
e. Top part of tree not developing in length as usual
f. Color or tone keeping in itself, and
g. Not damaged or injured by disease or pest.

B: Examples from the view point of figure indication

a. Balance parts of seedling

1. Seedling height (H) and basal diameter (D)

Good seedling shows H/D less than 50. If more than 70, it is an indication that seedling may die.

2. Seedling gross weight (G) and Seedling height (H)

If the G/H is bigger, the seedling is better. In Japan, it is said that seedling with good G/H is more than 2 in cold districts and more than 1 in warm districts.

b. State of root growing

1. Seedling weight above the ground (T) and seedling weight below the ground, or root weight (R)

The smaller the T/R, the better the seedling and vice versa. In Japan it is said that good seedling with less T/R has 4 in cold districts and 6 in warm districts.

The figures indicated above that fits the Project site is recommended to be researched and

developed including above mentioned indications if suitable or not to the local conditions.

The statistic figures in "1. - (1) - A. - b." also need to be researched/developed adopted to the local conditions.

2. In case of purchasing seedlings

Seedling to be bought should be of good quality based on the reference mentioned in "1 - (4) - A:".

3. Literature

(1) "Technical Report on Afforestation" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July, 1987).

(2) "Re-Afforestation Manual for Grassland Plantation Establishment" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July, 1987).

(3) "Silvics" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July, 1987).

(4) "Re-Afforestation Manual for Grassland Nursery Practice" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July, 1987).

(5) "Progress Report on the Propagation of Palosapis (Anisoptera thurifera) Wildling (Trial)" by F. Asaka (May, 1989)

(6) "Progress Report on the Propagation of Palosapis (Anisoptera thurifera) Wildling (Trial)" by F. Asaka (May, 1989).

(7) "Progress Report on Underplanting Trial in Carranglan, Nueva Ecija" by F. Asaka (March, 1989).

(8) "Progress Report on Tolerance Test of Light Intensity for Dipterocarpus Species (Anisoptera thurifera), Carranglan, Nueva Ecija" by F. Asaka (March, 1989).

(9) "Progress Report on Underplanting Trial" by H. Kusano in Progress Report on Technical Development Activities in 1989 (Vol. 2).

(10) "Report on Underplanting Trial" by H. Kusano in Progress Report on Technical Development Activities in 1990 (Vol.).

(11) "Seedling Propagation Test of Dipterocarpus Species" by

H. Kusano, R. E. Corpuz, N. Peralta, N. Tomas, (September 1991).

(12) "Progress Report for Cutting Trial of Palosapis" by N. Miyazaki & others (March 1989).

(13)

(NOTE: free translation "Handbook of Forest Work Technology" by Forestry Agency in Japan (March 1985).

(14) "The Philippines Recommends for Pine" - RCARRD Technical Bulletin Series No. 54, by The Pine Committee (1984).

Table V-2-1 "An outline of seed collection and the concerned work"

Species Name	Seed collection Time	The resource of seed	Seed treatment such as picked up etc.	Seed storage	Seeds number	
					1 liter	1 kg
A.auri.	December - February	Pods taken from mother tree	After pod dried up 2-3 days, seed taken off from pod.	Seed sealed plastic sack under cold conditions (by refrigerator) retains 1 year.	23,400-29,200	36,200-38,300
Yemane	March - May	Fruit taken from mother tree or on ground	Fruit soaked 1 week, mashed, kernel picked, dried 3 days under sunlight.	Not recommended to be stored. (Experiment report) Under cold / dark condition in cloth sack attains 3 months.	About 1,000. (note) It is a Kernel's number.	700(large) -2,300 (small)
Benget pine	In necessary arises, purchasing seed	Cone taken from fallen tree (purchasing seed)	Nothing to be written due to seed bought.	Seed sealed plastic sack under cold conditions (by refrigerator).	About 22,400	—
Palosapis	End of April - early of June, light green to dark green (embryo)	Seed gathered from mother tree.	Seed dried up 5 days under shade.	As soon as seed taken, then sown principally.	—	800～1,200

(note) Above mentioned species are typical planting trees in the Project site. The first to third trees are fast growing, pioneer species and the last is domestic tree used as underplanting.

Table V-2-2 "An outline of nursery work"

Species Name	Promotion of Germination rate	Pot / Bare root	Pot size	Soil for potting / seed bed	Seedling size for planting	Note
A.auri.	40% S.A., 3 minutes / Hot water 80 ℃, 10 minutes	Pot	4'' x 6''	Potting media: top soil 70%, sand 20%, organic 10%	Seedling height : 25-40cm, Basal diameter : 0.2cm	
Yemane	Hot water 50 ℃, 5 minutes	Bare root	Seed bed : 81sedl. /㎡, After thinning, 40-50 sedl. /㎡ according to seed growing.	Chemical fertilizer : 300g/㎡, Organic : 2,000 ~3,000g/㎡	Seedling length (Stump) 25-40cm (Seedling height) 20-30cm, Basal diameter: 0.7cm on or more	
Benget pine	Hot water 50 ℃, 5 minutes	Pot	3'' x 7''	The same as A.auri.'s	The same as A.auri.'s	
Palosap-is	Soak in tap water for one day & night	Pot	8'' x 10''	The same as A.auri.'s	The same as A.auri.'s	

(note) 1 Above mentioned species are typical planting trees. The first to third trees are first growing, pioneer species and the last is domestic tree used as underplanting.

Table V-2-3-1

NURSERY WORK CALENDAR FOR *Acacia auriculiformis*

Item/Month	OCT.			NOV			DEC.			JAN.			FEB			MAR.			APR.			MAY			JUNE			JULY			AUG.			SEPT.	
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L
Soil Preparation for Potting																																				
Potbed Preparation																																				
Pretreatment of Seeds (Hot water, 80°C)																																				
Direct Sowing to Pots																																				
Seedlings Transplanting																																				
Seedlings Fertilization																																				
Weeding																																				
Watering																																				
Hardening																																				
Hauling																																				

Note:

1. *Kinds of pretreatment: Hot water (HW), Sulphuric Acid (S.A.)
2. E - early part of the month; M - middle part of the month; L - latter part of the month

Table V-2-3-2

NURSERY WORK CALENDAR FOR Yemane (Bareroot)

Item/Month	OCT.		NOV		DEC.		JAN.		FEB		MAR.		APR.		MAY		JUNE		JULY		AUG.		SEPT	
	E	M	L E	M	L E	M	L E	M	L E	M	L E	M	L E	M	L E	M	L E	M	L E	M	L E	M	L E	M
Nursery Area Cultivation			—	—																				
Seedbed Preparation					—	—																		
Pretreatment of Seeds (Running water)						—																		
Soil Treatment				—							-													
Seedbed Direct Sowing						—	—	—																
Seedlings Transplanting								—	—															
Thinning											—	—												
Seedlings Fertilization								—		—		—		—										
Weeding							—		—		—		—											
Watering							—	—	—	—	—	—	—	—	—	—	—							
Cultivation between Seedlings								—		—		—												
Hardening															—	—								
Hauling																	—	—	—	—	—	—		

Table V-2-3-3

NURSERY WORK CALENDAR FOR Pinus spp.

Item/Month	OCT.			NOV			DEC.			JAN.			FEB			MAR.			APR.			MAY			JUNE			JULY			AUG.			SEPT.	
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L
Soil Preparation for Potting																																				
Potbed Preparation																																				
Pretreatment of Seeds (Hot water)																																				
Soil Treatment																																				
Direct Sowing to Pots																																				
Seedbox Sowing																																				
Seedlings Transplanting																																				
Additional Fertilization																																				
Weeding																																				
Hardening																																				
Watering																																				
Hauling																																				

TABLE V-2-3- 4

NURSERY WORK CALENDAR FOR *Palosapis*

Item / Month	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct	Nov.	Dec.	Jan.	Feb.
Phenology Research	—	—	—	—	—	—	—	—	—	—	—	—
Seedbed Preparation	———											——
Soil Preparation		———										
Potbed Preparation		——										
Seed Collection		—	———	——								
Sowing		—	———	——								
Transplanting			———	———								
Fertilization	—				—		—		—		—	
Weeding		- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Watering	———	———	———	———	——		——	———	———	———	———	———
Hardening				———								
Hauling					———	—						

note: The process of seed collection and growing seedlings for planting can take one year or more.

Table V-2-4 "Anoutline of wilding work"

Species Name	Seed collection Time	The resource of wild seedling	Seed treatment such as trimming etc.	Raising treatment	Pot size	Wilding size for planting
Palosap-is	The early time in the rainy season	Wild seedlings are lifted from the natural forest floor	Its leaves are removed to minimize transpiration and roots are trimmed to 1/3 of its original length. Take measures for prevention of wilding from being dried .	As young wilding requires a small amount of light, raising is to be done under the shade	8'' x 10''	Wilding height : 30 cm, Basal diameter : 0.7cm.

(note) Above mentioned species is typical wilding tree and used as underplanting in the Project side.

V-3 Forest Road Construction

1. Introduction

1.1 Role of Forest Roads

Forest road is essential for forect activities such as hauling, planting, tending and protection including forest fire prevention but also for harvesting/yielding forest products, and it plays a vital role in the development of local communities.

1.2 Present Condition

Forest roads that were constructed totalled to 161.3 km. (see Table V-3-1). This figure is a little over the target of constructed forest road of 160 km. which satisfies to hold the route density of 20 m./ha., and walking distance in an average of 200-300 m. (Refer to "Technical Report" page 290 as included in the Literature. And see Table V-3-2 which is derived from the data in making "IV - Forest Land Use Classification" showing the prevailing roads of 86% in the Project site, broken down to 56% for roads existing in the mesh (500 m. x 500 m.) and 30% in the next mesh. In this case average walking distance is less than 250 m. in the mesh and from 250 m. to 500 m in the next mesh.

Specifically the rate of roads existing in both mesh of Parcel (P) I, P-IIA, P-IIB and P-III range from 95%, 78%, 80% and 89% respectively. P-I and P-III have high route density and P-IIA and P-IIB have comparatively low density. A conclusion can not be drawn directly whether to construct forest roads in P-IIA and P-IIB in the future because ample "no plantation area" exists specially P-IIB (refer to Table II-1).

As we can see, a great area of forest roads, 161.3 km., were constructed, the issue now is, how to maintain and keep the roads in shape for forest works.

2. Forest Roads Maintenance

Forest roads should be maintained and repaired before the concerned forest works starts.

Specifically it should be prepared for the purpose of:

(a) Planting activities to be done in the rainy season, so site preparation and hole-digging should be done before the rainy season comes.

(b) Transfer of equipments like fire truck during dry season especially in dangerous months for forest fire

protection from early in January to early in May.

(c) Other concerned activities like maintenance of facilities such as nursery and places set for soil/water conservation works.

Generally, there are two ways of forest road maintenance in the Project. One is to repair the roads for a long span with gravel using machines like motor grader. Another is to temporarily repair the spots where it is difficult to pass thru due to roads becoming muddy caused by poor drainage causing excess water and by vehicles spoiling the road bed during rainy season.

The following are typical roads maintenance work:

(1) Graveling work of the forest road

Forest roads can be rapaired using motor grader to flatten the laid gravel on the forest road bed especially on muddy roads which need thick gravel and if necessity arises, with installation of side ditch or cross drain to flow out excess water from slope or body of forest road. Construction of retaining wall is also necessary like wattling and gabion (stone) to prevent the collapsed of the slope. It should be done with reference on "Forest Road Structural Standard" (Table V-3-3) and "Cross Sectional View/Plan of Forest Road" (Figure V-3-1).

The operation should be done all through-out the dry season but with limitation like when doing construction of fire break line, site preparation and digging holes for planting and the like.

(2) Stability work of slope

The "Cutting slope" and "Banking slope" are maintained in consonance with the concerned items in Table V-3-3 with reference of the Figure V-3-1.

The denuded slope especially banking slope is necessary to be covered early with vegetation to prevent the collapsed of road in rainy season. Fast growing species which can bear severe dry season like A. auri, Kakawate (Gliricidia sepium) including Kakawate cutting are to be planted in close planting compared to ordinary case in order to cover the slope with trees's crown.

(3) Installation of drainage facilities

Muddy places caused by malfunctioned drainage will be difficult for cars to pass thru. Such damage hap-

pens every year so the following temporary measures are taken:

c.1 throwing a lot of ballast into the road bed
c.2 soil conservation works such as wattling, like cogon band and retaining wall with gabion (stone) to prevent the collapsed of road (Figure V-3-2).
c.3 use of "c.1" together with "c.2"

In order to have an excellent measure to avoid muddy place, it is necessary to solve the mechanism of water movement and to install drainage to drain excess water such as waters on the road, and underground water flow out from the slope or gush from the ground going to the road, or a drainage installed to cross the river. Refer to the concerned items on "4. Literature"

And also, consider what kind of drainage work should be chosen which depends on the cost analysis among the concerned methods.

3. General Matters in Construction of Forest Road

Processes in constructing forest road are as follows:

a. making a route plan of forest road construction based on the 1/5,000 topographical map/the base map (preliminary survey/desk work)
b. reconnaisance
c. survey
d. drawing of the plan and other matters for forest road construction

The details are as follows:

(1) Making a route plan (preliminary survey/desk work)

A route of forest road to be constructed is planned using the base map (1/5,000) and the like.

Practically, a route is drawn in trail in the map by connecting points which can be obtained as crossing point between contour and horizontal distance. The horizontal distance is computed from the vertical height between contours in accordance with the "grade limit" / "max. longitudinal grade" of "Forest road structural standard" (Table V-3-3). Simultaneously, other routes except the above-mentioned are to be drawn in trail in the map for comparison with each other.

In case that stereo photogrammetry can be used, the route plan in the map can be revised in details according to the forest land condition.
See Table V-3-4 as a reference in making a route

plan of forest road.

(2) Reconnaisance

Necessary amendments of the route plan are to be done based on reconnaisance resulting from the survey of the site condition plotted on the map from the view point of topography, geology, river, etc.

In this case, see Table V-3-4 also for reference.

(3) Drawing of the plan and other matters for forest road construction

The specific matters in details are referred to the "4. Literature".

4. Literature

(1) "Technical Report on Afforestation" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July, 1987).

(2) "Re-Afforestation for Grassland Forest Road Construction" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July, 1987).

(3) "Progress Report on the Development and Improvement of the Techniques on Erosion Control Works" by For. T. Makino and A. Mendoza (April, 1990), "Progress Report on Technical Development Activities in 1989 (Vol. 3).

(4)

NOTE: free translation "Handbook of Forest Work Technology" by Forestry Agency in Japan (March, 1985).

(5)

NOTE: free translation "Handbook of Forest Civil Engineering" edited by M. Kamiiisaka and another, Chiyoda Syutupan (October, 1984).

(6) "Terminal Report in the RP-Japan Forestry Development Project of the Pantabangan area (1976-1987)" by Kato (March 31, 1988).

Table V-3-1 "Forest Road construction"

:Km

Year	Plan	Done	Note
1977	4.0	4.0	
1978	20.0	26.6	
1979	30.0	23.8	
1980	20.0	19.7	
1981	20.0	24.3	
1982	20.0	20.1	
1983	-	-	
1984	6.0	6.0	
1985	6.0	6.0	
1986	7.0	10.0	
1987	-	12.6	
1988	5.2	5.2	
1989	3.0	3.0	
1990	5.0	-	Budget not release ,no accomplishment
1991	-	-	
Total	146.2	161.3	

Table V-3-2 "Relationship between Mesh and Roads situation"

(%)

Item	P- I	P-IIA	P-IIB	P-III	Total
1:In "M"	67	50	52	53	56
2:Next "M"	28	28	27	36	30
3:Others	4	22	21	12	14
Total	100	100	100	100	100

(note) 1: The table is made quoted from Table IV-2-1.
2: "P" and "M" are abbreviations for "Parcel" and "Mesh".
3: Figures are round numbers.

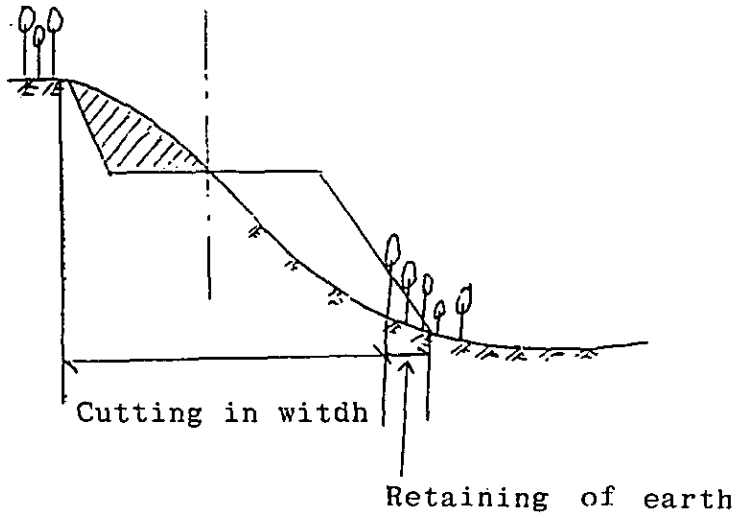
Table V-3-3 Forest Road Structural Standards

Item	Main Road	Spur Road	Remarks
Designed road speed	20 km/h	10 km/h	
Road width	5 m	4 m	shoulder 0.5 m
Interval of turnouts	300 m	500 m	must go along with vehicular wheels' turns conforming to the topography
Minimum radius	20 m	12 m	
Max. longitudinal grade	8%	10% (15%)	figure contained in ( ) refers to cases which cannot be helped
Cant	4% center rise	4% center rise	radius of curve
Super elevation	5%	5%	curved line radius 20 m or less
Safe sight distance	30 m	20 m	
Gravelling	10 - 25 cm	5 - 20 cm	
Cutting slope	1:03-1:06	1:0-1:06	
Banking slope	1:1.2	1:10	

Table V-3-4 Accounts to be taken into consideration in making a route plan

1. Consideration of all the areas based on the afforestation plan
2. Specification based on the "Forest road structural standard"
3. Lessening infrastructures like bridge, masonry, gabion and revetment
4. Lessening the volume of the cutting and banking
5. A route conformed to the geographical features
6. Road throughout the area in ridge line and upper part of hillside which is the valley
7. Avoid land slide areas, damp ground and huge stone areas
8. Consideration of connection to other forest roads in the future
9. For reference of cutting width in constructing forest road

(Slope)	(Cutting in width)
10%	8-10 meters
20	14-17
30	16.20



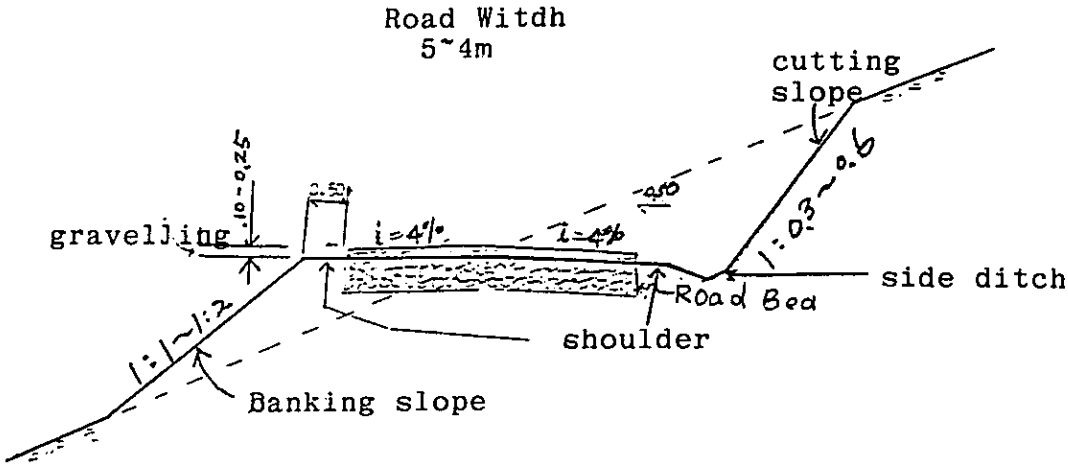


Figure V-3-1 Cross Sectional View of Forest Road

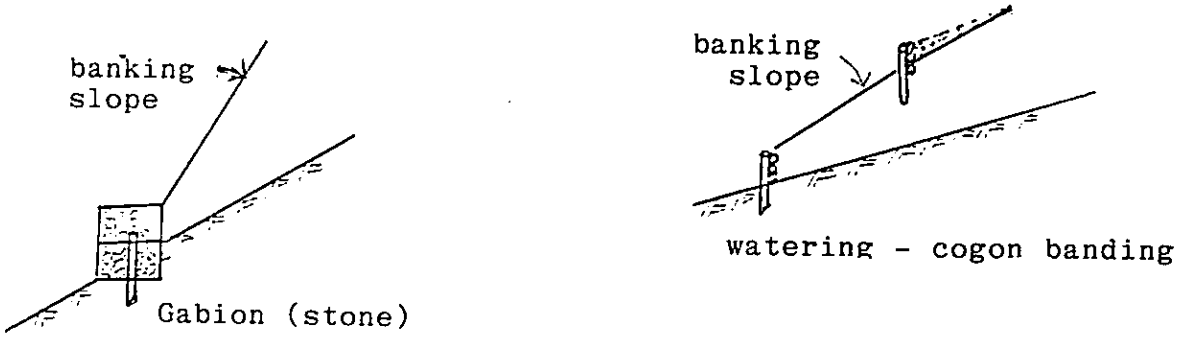


Fig. V-3-2 Stability Work of Slope

V-4 Soil erosion control works with simple methods and materials suitable to the local condition

1. Introduction

The Project has been started for the purpose of keeping intact the durable years of Pantabangan dam by means of planting trees as a source of water, and for land conservation which is effective in preventing soil from eroding which become as sediments in the reservoir.

So it can be said that all the Project site's planted areas is a means of soil erosion control works. Furthermore, in some places, eroded and denuded land really exists which needs some measures for erosion control works like in the following cases:

A. In case of having effective measures with temporary and simple methods and materials suitable for the local conditions for places like gully, landslides and the like in small scale areas.

B. In case where there are necessary measures to be taken for erosion control works in full-scale to protect such facilities like forest roads and nurseries that might suffer damage caused by landslides and the like.

An outline of the above-mentioned measures is shown in Table V-4-1.

The measures applied are operated usually in a spot and they need to be explained/located in the master plan made from the view point of watershed management which is to be controlled in large areas like in a river system other than spots, and composed of erosion control works done individually.

Making the master plan, said to be the "Design/Plan of Watershed Erosion Control" and other concerned matters are referred to the Literature as follows:

2. Literature

(1) "Manual for Erosion Control Works" in RP-Japan Forestry Development Project-Watershed Management by DENR and JICA (August, 1988).

(2) "Handbook for Erosion Control Works" in RP-Japan Forestry Development Project-Watershed Management by DENR

and JICA (August, 1988).

(3) "Progress Report on Erosion Control in Model Area (Design of Watershed Erosion Control)" by For. T. Makino and A. Mendoza (April, 1990) Progress Report on Technical Development Activities in 1989 (Vol. 3).

(4) "Progress Report on the Development and Improvement of the Techniques on Erosion Control Works" by For. T. Makino and A. Mendoza (April, 1990), Progress Report on Technical Development Activities in 1989 (Vol. 3).

(5)

NOTE: free translation "Handbook of Forest Work Technology" by Forestry Agency in Japan (March, 1985).

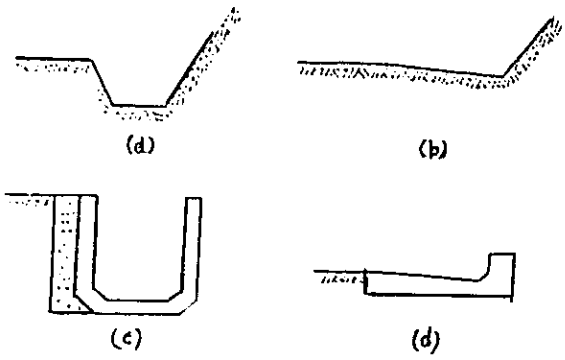
(6)

NOTE: free translation "Handbook of Forest Civil Engineering" edited by M. Kamiiisaka and another, Chiyoda Syutupan (October, 1984).

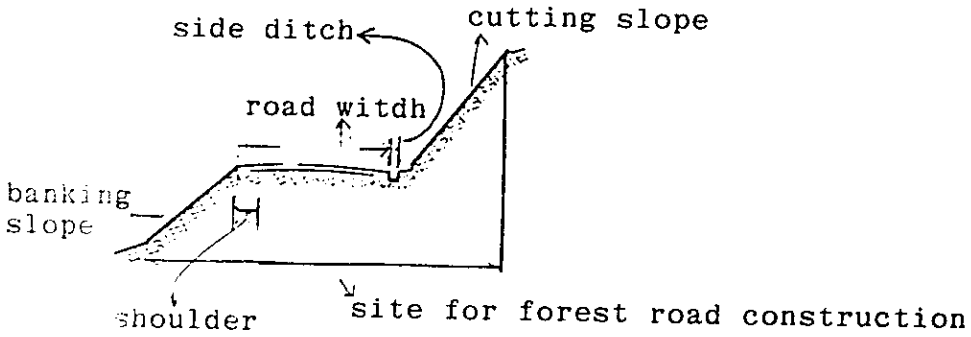
Table V-4-1 "Erosion control works concerned with forest works"

Item	Sub - Item	Measures	Fig. No.	Note
Planting and the concerned	1: Having fears of slipped, denuded lands, etc. might happen.	1: Take care of drainage of excess water. 2:Avoid cutting, banking 3: Plant along a contour 4: Others	1 2 3	See "Water channel works" in the Fig. No.9. Take care in road making See "Planting" in the Fig. No.7.
	2: Being gully, slipped land, etc. Select the concerned works from the right side column.	1: Hillside work (1) Grading work (2) Vegetative work A: Wattling B: Mat covering C: Planting (3) Foundation work A: Retaining work B: Water channel works 2: Stream work (1) Check dam (2) Revetment work	 4 5 6 7 8 9 10 11	 Open / Closed channel
2: Protection of facilities	Select the necessary works from the right side column.	do		

Fig. 1 Drainage/Ditch



a) ditch in shape of trapezoid
b) ditch in shape of "V"
c) concrete ditch in shape of "U"
d) concrete ditch in shape of "L"



Note ; Cross sectional view of forest road
(a rough sketch)

Fig-2 In case of avoiding cutting/banking slope when constructing forest road in places where landslide are expected to occur.

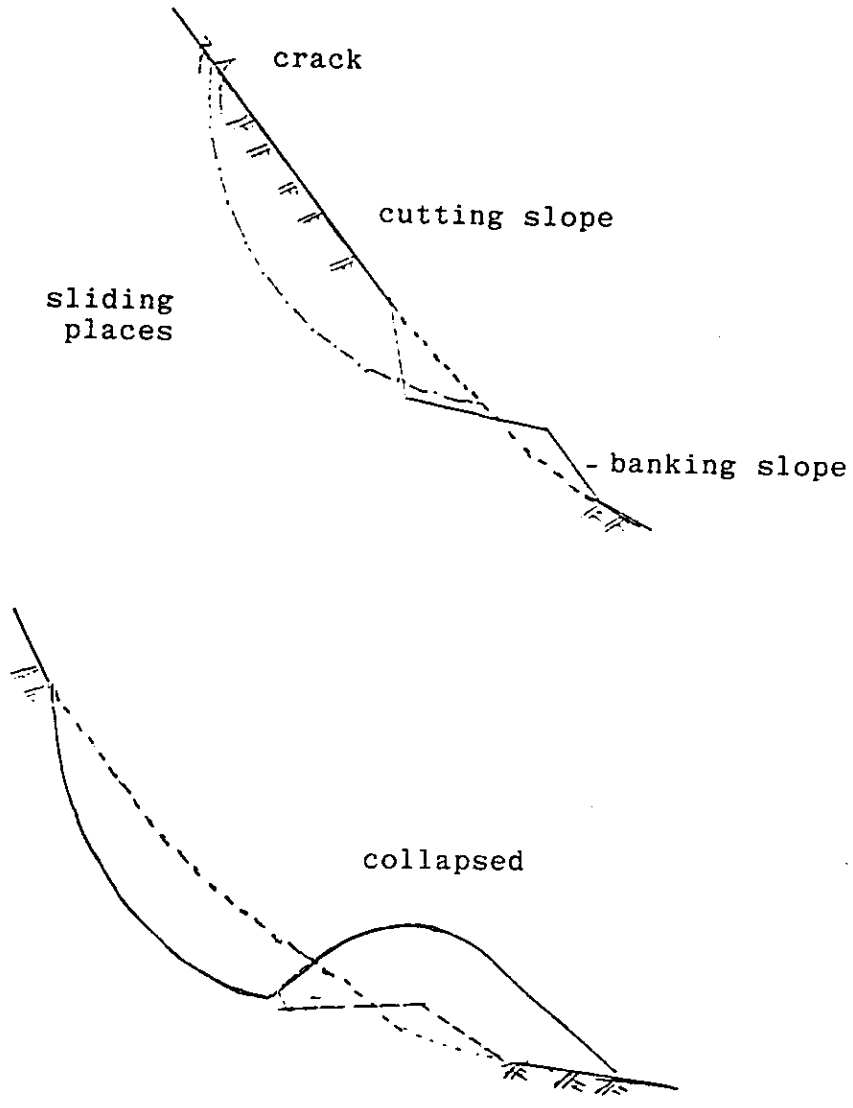
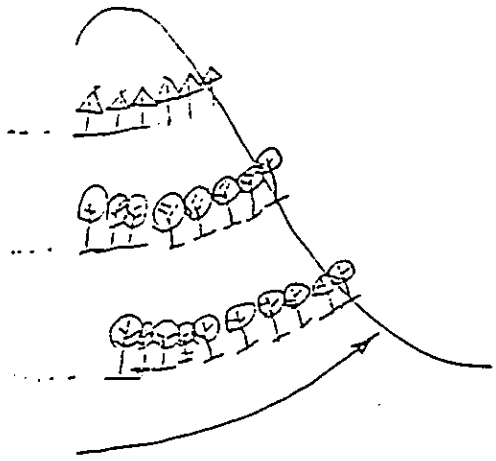


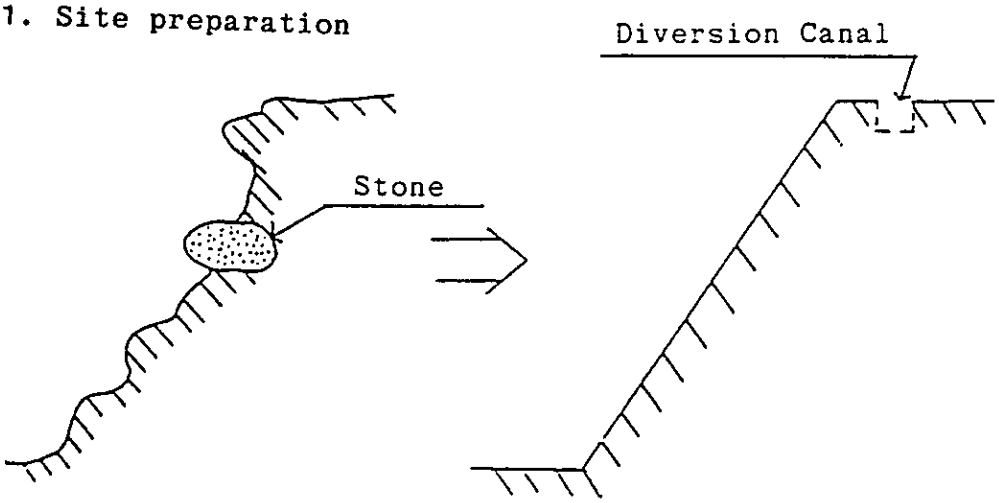
Fig-3 Planting according to a contour



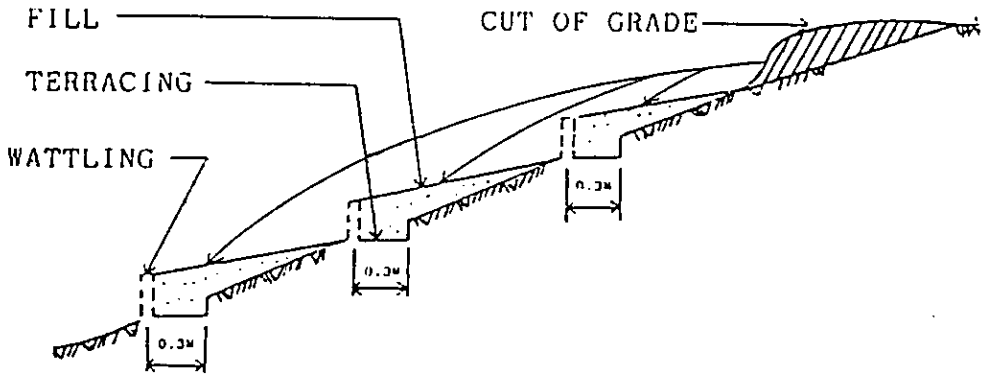
contour line

Fig. 4 Grading Work

1. Site preparation



2. Grading and terracing work



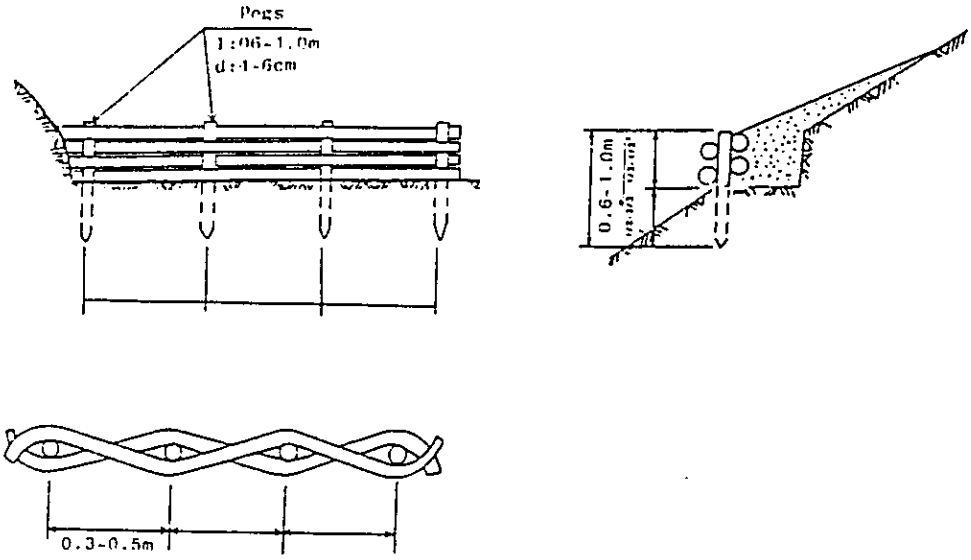
(for refence)

SOIL VARIATIONS AND ANGLES OF REPOSE

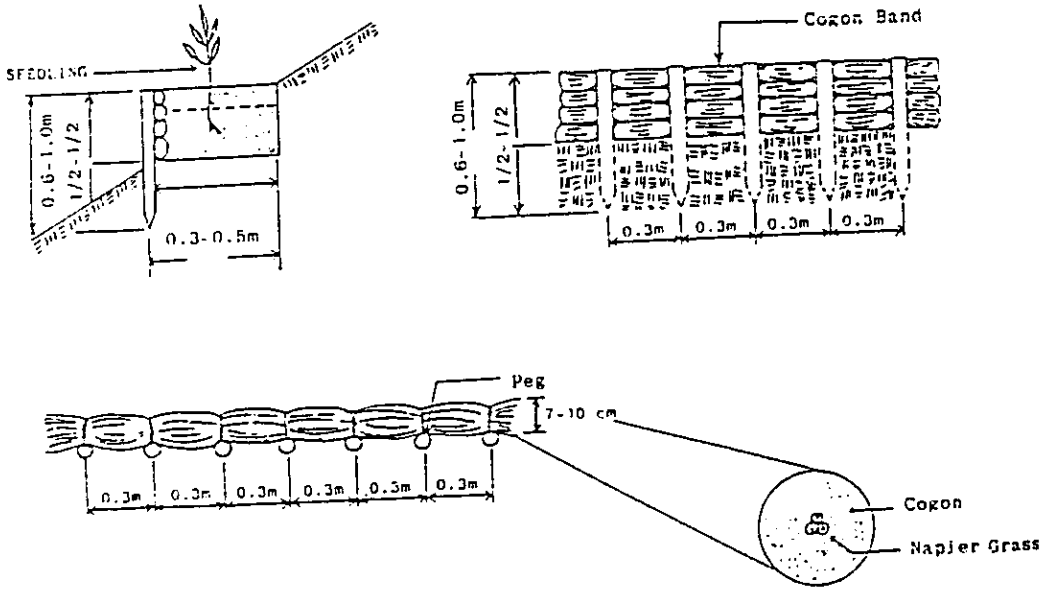
CONDITION / TYPE OF SOIL	DRY	LOW MOISTURE CONTENT	HIGH MOISTURE CONTENT
CLAY	20°-37°	40°-45°	14°-20°
SAND	27°-40°	30°-45°	20°-30°
BALLAST	30°-45°	27°-40°	25°-30°
REGULAR SOIL	20°-40°	30°-45°	14°-27°

Fig-5 Wattling

1. Tree branch



2. Cogon band



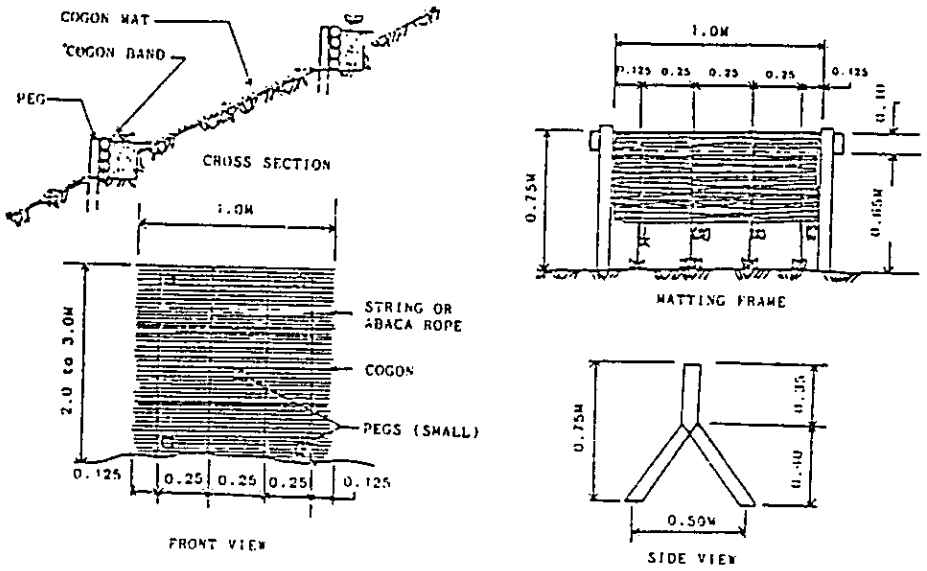
3. Napier band

Material for it is napier instead of cogon.

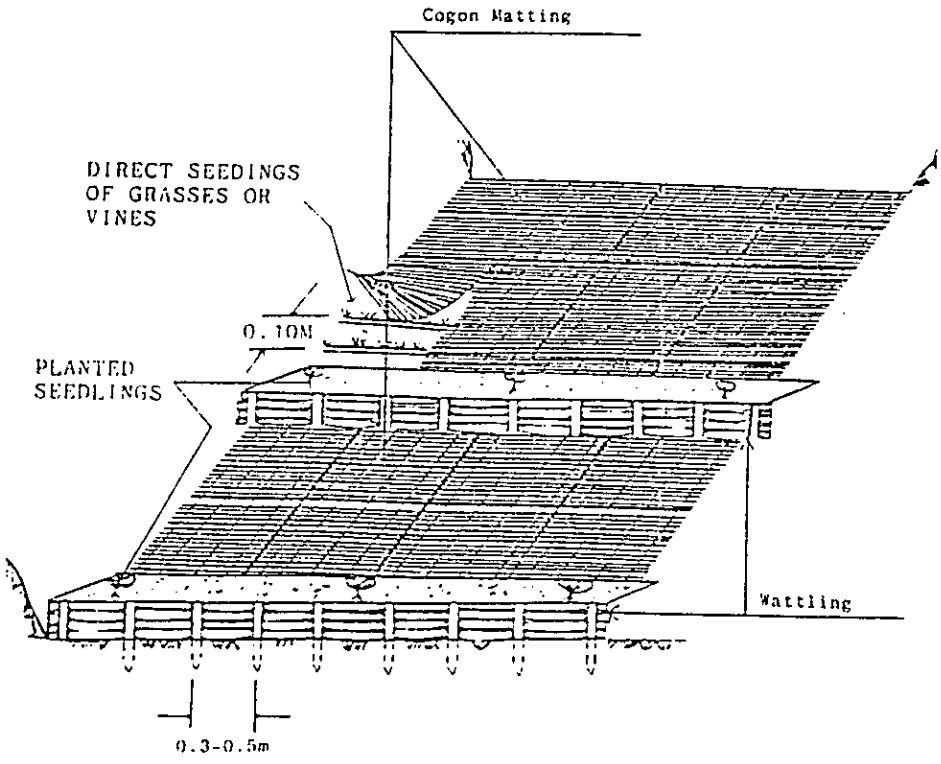
These wattling works are expected to sprout so that the material must be fresh or vivid and they should be constructed in rainy season.

Fig-6 Mat covering

Cogon mat covering

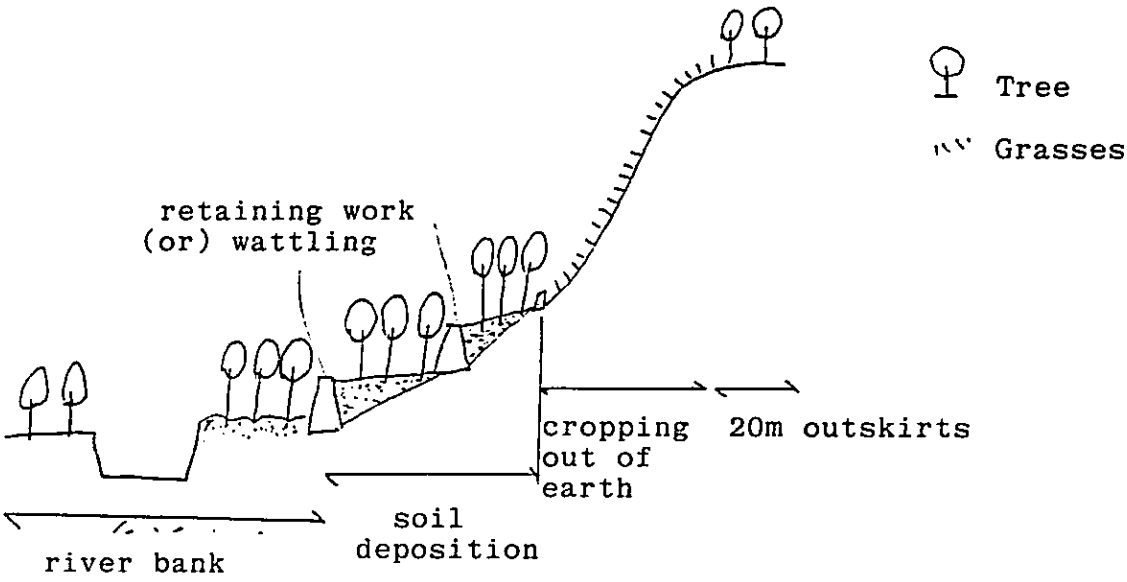


Cogon Matting



Model Hillside Work

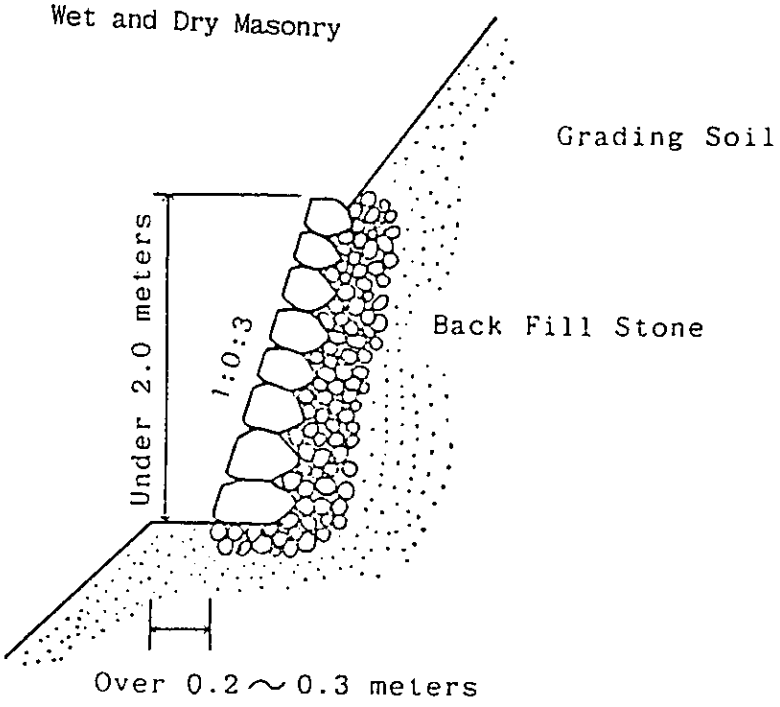
Fig. 7 Planting



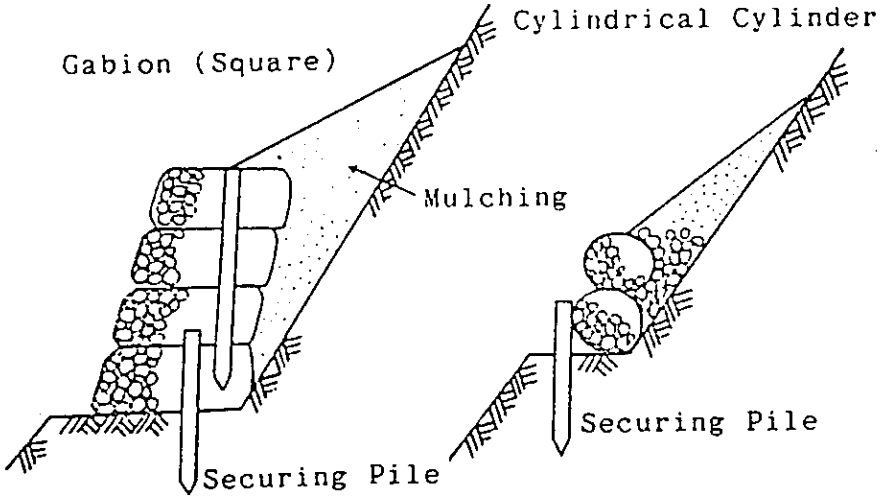
The way of planting is done along a contour

Fig-8 Retaining work

1. Wet and Dry Masonry



2. Gabion

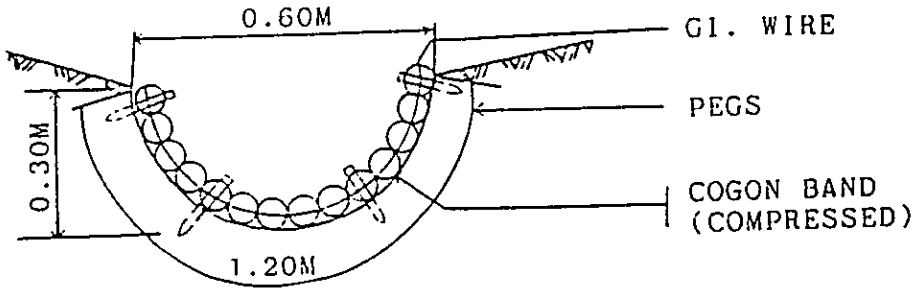


Wire cylinder (Gabion) Retaining Work

Fig-9 Water channel work

1 Open channel work

(1) Cogon band open channel



(2) Napier band open channel

Construction method of napier band open channel is the same as that of cogon band open channel. Material for it is napier instead of cogon.

2. Closed channel work

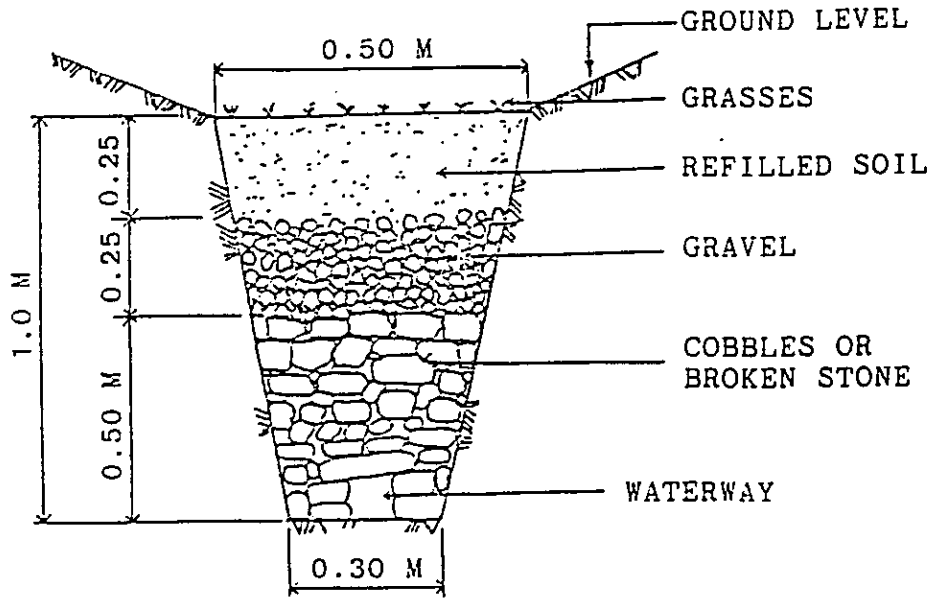
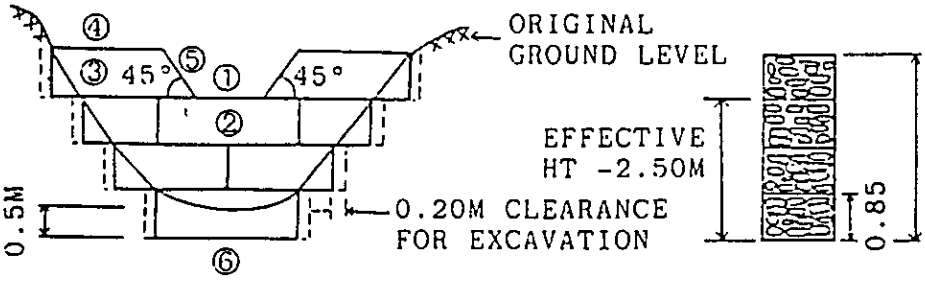
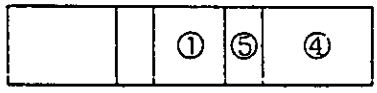


Fig-10 Check dam

1. Gabion



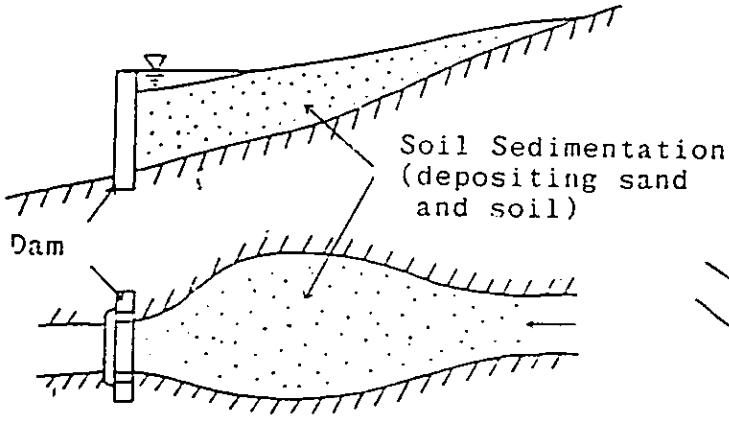
FRONT VIEW SIDE VIEW

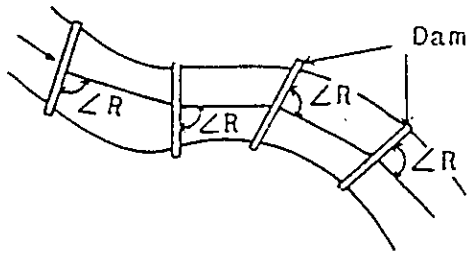


TOP VIEW

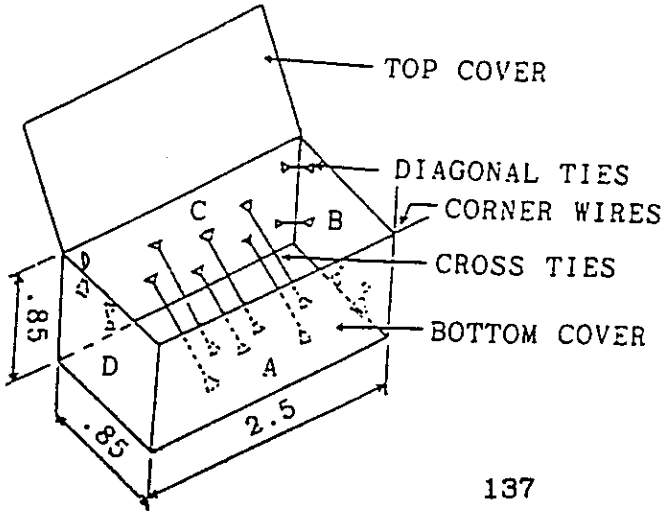
(1) SPIILWAY
(2) SPILLWAY CROWN
(3) WINGS
(4) WING CROWN
(5) SIDE OF SPILLWAY
(6) BASE OF DAM

(Location)



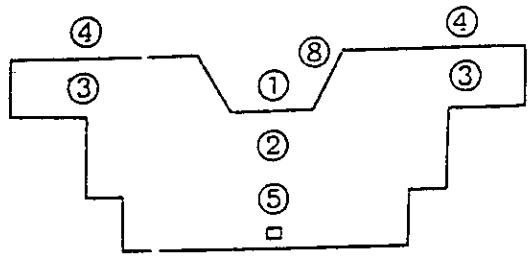


Direction of the Dam

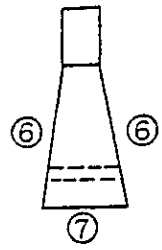


Assembly of Gabion

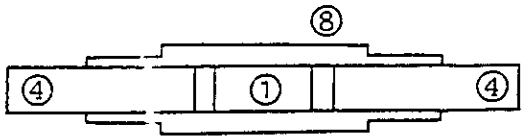
2. Concrete Check Dam



FRONT VIEW



SIDE VIEW



PLANE FIGURE

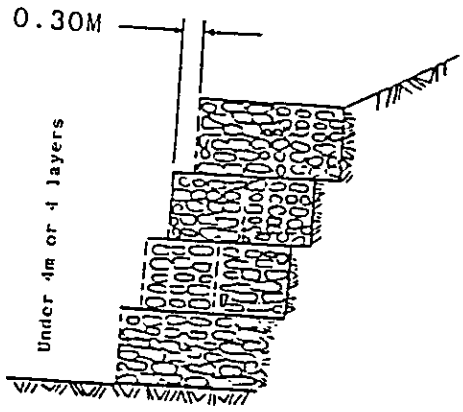
SPACE

(1) SPILLWAY
    (OVERFLOW SECTION)
(2) SPILLWAY CROWN
(3) WING
(4) WING CROWN
(5) DRAINAGE HOLE
(6) UPSTREAM SLOPE
(7) BASE OF DAM
(8) SIDE OF SPILLWAY

Features of a Check Dam

Fig-11 Revetment work

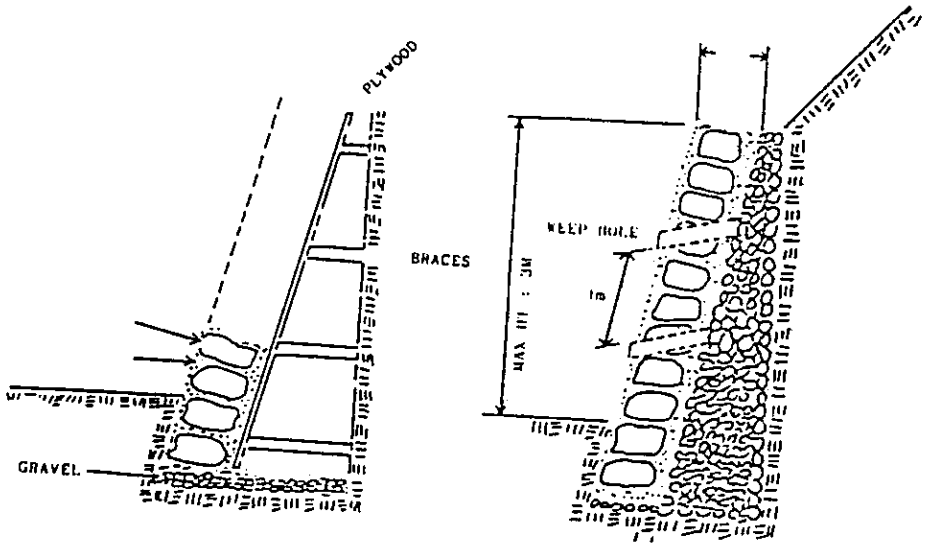
1. Gabion



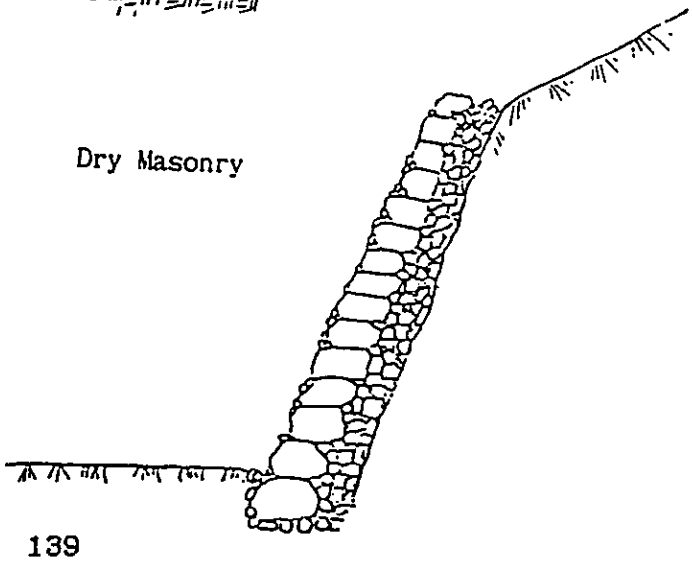
Gabion

2. Masonry

Wet Masonry



Dry Masonry



V-5 Control of Pest and Diseases

1. The Present Conditions

The occurences of typical pests and diseases in the Project site such as damping off of nursery seedlings, shoot moth damaging pines and termites eating roots of seedlings, of which outline are referred to Table V-5, have not caused serious damaged on man-made forest since the start of the Project activities.

However, the present state of man-made forest occupied only 90% by three species: A. auri., Yemane and Benguet pine ranging from 61%, 22% and 7% respectively (refer to Table II-1-3) which shows a figure of uniform and pure man-made forest and described with weak points to be easily attacked and damaged by pest and diseases.

There might be sudden occurences of pest and diseases in the future, so monitoring the movements of such disaster is needed continuously. Monitoring system should be included in routine works and an organization be formed and training be conducted to protect promptly the man-made forests as soon as signs is perceived.

In case of details about pest and diseases is needed, refer to the concerned items of the Literatures listed below because Table V-5 shows only the outlines.

2. Literature

(1) "Technical Report on Afforestation" in Rp-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July 1987).

(2) ""Re-Afforestation Manual for Grassland Nursery Practice" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July 1987).

(3) "Re-Afforestation Manual for Grassland Nursery Practice" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July 1987).

(4)

NOTE: Free translation "Handbook of Forest Work Technology" by Forestry Agency in Japan (March, 1985).

(5)

NOTE: Free translation "Nursery Disease in the Tropics (1) Damping off of seedling" by K. Kobayasi, Tropical Forestry No. 1, 1984.

Table V-5 "Outline of pests and diseases"

Item	Name of disease / Insect	Species infested	Infection status / symptoms	Pathogen	Medicine	Note
Disease	Damping off and root rot	Seedling in nursery	Seed rot, top rot, damping off, root rot, etc.	Rhizoctonia solani Kuhn, Fusarium spp., Cylindrocladium scoparium Morgan, etc.	Seed disinfection: dressing by Thiuram, Soil disinf.: Soil burning, Thiuram, Tachigaren.	Before seedling Before seedling and after germination
Insect pest	Pine shoot and tip moths	Pines	Browsing / infesting of shoot and tip	pine shoot moth (Dioryctria robella), pine tip moth (Rhyacionia cristata)	Sumithion / Sumicidine	
	Termites	Young plantation	Root killed by as a attacker / feeder	Latin names are under examinations.	Clorudem	

V-6 Enforcement of System for Fire Prevention

1. Introduction

One of the important activities in R/D for Phase II is to develop a system of participating rural communities into afforestation in order to protect the forest from fire. This subject was derived from the contents of A and B.

A. Lots of forest fire occured causing ample planting areas to disappear (refer to Table V-6-1).

Areas damaged by forest fire is computed based on annual average about 197 has. which is equivalent to 200% of new plantation area in 1991. Great amount of plantation areas are in vain by fire, that is to say, fruits from planting turned to ashes.

B. The idea of the Evaluation Team (December, 1986) is that mountains can not be covered with forest without participants in rural communities into afforestation activities.

Specific system of participating rural communities into afforestation has been programmed in the Project's Social Forestry activities of which outline is as follows:

A. Aim is to contribute to protect forest from fire by means of participation of rural communities into afforestation activities including not only contract of planting but also participants' attending such forest fire prevention works like fire break line construction, patrol and the like.

B. Specific processes to be done are:

First, participation of rural dwellers into afforestation through contracts to the Project's UFBP (Upland Family Based Program).

Second, having them organize a unit as a cooperative group through a contract known as the CBRP (Community Based Reforestation Program), this contract is made between a family and the Project, same as UFBP. Some informations necessary for implementing CBRP such as: opening of training like orientation and technical guidance, supplement of goods like seedling, fertilizer and insecticide, and the concerned matters like exchanging letters are given to each contractor through a leader or representative selected in a group.

Finally, making the above said cooperative organization composed of contractors, families should be a partner of the contract called FLMA (Forest Land Management Agreement) of which details are going to be

notified in the future. Such cooperative organization is regarded as a legal person/corporation whose rights and duties are written in the contract covering forest protection from fire, how to do thinning and yielding fruits and forest products, and the like.

After such process, participants have to begin protecting their contracted forest lands from fire by/for themselves, and finally the protection will be done by a group/corporation.

Making an additional remark, above mentioned process will be realized in the Social Forestry area shown in "IV - Forest Land Use Classification".

2. Fire Protection Measures

A. Construction of Fire Break Line/Belt

To construct fire break line is an effective method to prevent forest fire from spreading by means of stripping up flammable vegetation in the ground, especially during dry season in the Project site wherein lots of ground surface fires of dead grasses burning usually occurs.

The present status of fire break areas, made from the concerned items of Table II-1-1 totalled to 15.83 has.. The rate of fire break line area in Parcel III is low compared with the ones of Parcel I, II-A and II-B which are in direct proportion to their rates of man-made forests and parcel areas (refer to Table V-6-2). The reason is that fire occurence and burned area has been smaller than the others.

Outline of fire break line construction is shown as a reference in the Table V-6-3. If details need to be known, then see the concerned items on the Literatures listed below.

In case of UFBP and CBRP, plantation area is to be sorrounded by fire break line because the location is set usually in fire prone area. This is the reason why participant's duty prescribed in the contract of afforestation is to protect the forest from fire.

B. Information activities such as enlightenment, extension, patrol, etc.

Preventing man-made forest from fire takes a long time. It is because of the annual rite of destructions such as kaingin, grazing, cleaning paddy fields and bush, etc.

Specific information on activities are as follows:

a. Public relation activity

Tree planting drive, sports festival, poster and composition contest, newspaper and pamphlet publication, seminar or training and so on have been conducted in order to establish a good communication with the people and to enlighten their consciousness about banning and limitation of burning and necessity in protecting trees from fire.

Whereas participants of UFBP and CBRP are encouraged to attend the above-mentioned events and are expected to disseminate informations concerning not only technical but also theoretical matters about forest protection.

b. Enforcement of patrol

Patrol needs to be enforced especially in dangerous months of fire occurence (it's usually from the early month of January to early in May). It is not only to call the attention of mountain inhabitants for fire prevention but also to educate them about forest protection.

Whereas participants of Social Forestry not only patrol his/her contracted area but also disseminate information about limitation and ban or instruct companions when doing burning.

c. Other concerned matters

A plan to do burning should be informed in order to instruct the concerned person so as to prevent fire from spreading. Because a lot of examples where fire spreads caused by cleaning paddy fields, bush fire and so on have been experienced in the past.

So it is necessary to encourage local people to tell their plan of burning to the Project beforehand through local government for the dispatched of FIC/fire fighters to instruct them for such fire preventive measures.

For more details see Table V-6-4.

3. The organization for fire protection and the concerned matters

Figure V-6, "Flow of Command Chart" is the organization map showing the organization for management of fire protection. The characteristics of its organization are as follows:

A. The organization is divided into divisions and sections in the Project including dwellers outside the Project organization who are the contractors and participants for Social Forestry called as the NGO (Non-government Organization).

B. Fire fighters as the SPF (Special Force) works in the head office of the Training Center and does not belong to any other Parcels for the purpose of their flexibility and mobility in fighting fires.

The component of the organization should be flexible in every way according to the sorrounding condition's movement including personnel transfer theory, the right men in the right position for an effective fire prevention campaign which prevailed.

And it is important that alertness is always on the go, equipments like fire truck, jet shooter, smattering and the like, information instruments (radio) should always be ready. Access roads for easy transfer of equipments and fire fighters should be prepared.

4. Consideration/Recommendation on land tenure security

It is perceived by the Joint Evaluation Committee that the fruits/outputs of UFBP and CBRP resulted to good influence on inhabitants in making planted areas free from destruction like forest fire. Extending such perceived result to rural communities will build a positive attitude towards the fast rehabilitation and destruction-free forest.

Therefore, it is necessary that the rural communities must develop a sense of responsibility to the forest land just like in the UFBP and CBRP.

A solution to the issue is that rural communities must get benefit in utilizing the forest land such as getting the fruits from their harvest on planted trees.

But the project area has little clue that it will be the same with the UFBP and CBRP since the watershed area is critical and where harvesting is prohibited.

It is desirable to give the yields of forest products to the rural communities to those engage in "land tenure

security" of UBFP, CBRP and FLMA.

Once the resident in the rural communities develop an attachment to the utilization of forest land, this would make them act as an owner of the land, thus protecting it from destruction would be develop in their heart.

5. Literature

(1) "Technical Report on Afforestation" in RP-Japan Forestry Development Project of the Pantabangan Area by DENR and JICA (July, 1987).

(2)

NOTE: free translation "Handbook of Forest Works Technology" by Forestry Agency in Japan (March 1985).

(3) "Technical Report on the Fire Prevention and Management of the RP-Japan Forestry Development Project-Watershed Management, Carranglan, Nueva Ecija" by For. G.F. Saong and T. Ishitani (December, 1989), Progress Report on Technical Development Activities in 1989 (Vol. 1).

(4) "Progress Report on Greenbelt Establishment in RP-Japan Forestry Development Project-Watershed Management, Carranglan, Nueva Ecija" by For. W. Laza and T. Ishitani (April, 1990), Progress Report on Technical Development Activities in 1989 (Vol. 1).

(5) "Fire Control Manual" by ASEAN - New Zealand Afforestation Project (1985-1987).

(6) "Technical Report on the Forest Fire Prevention Works of the RP-Japan Forestry Development Project-Watershed Management" by K. Oyamada, G. E. Sa-ong, M. R. Paderes and P. A. Gonzales (December, 1991).

Table- V-6-1

FIRE OCCURRENCE

YEAR	Parcel- 1		Parcel- 11A		Parcel- 11B		Parcel- 111		Total	
	Occ	Burnedarea	Occ	Burnedarea	Occ	Burnedarea	Occ	Burnedarea	Occ	Burnedarea
1978					1	30.00			1	30.00
1979	5	16.60							5	16.60
1980	2	10.80			6	406.10			8	406.10
1981	3	24.43	1	22.00	3	43.37	2	3.90	9	93.70
1982					2	65.00			2	65.00
1983	4	480.00	6	21.00	8	206.00	1	19.00	19	726.00
1984	3	3.00	1	60.00	1	20.00	1	20.00	6	103.00
1985	9	19.00	1	0.50	3	37.60	3	8.40	16	65,50
1986	5	27.62	5	17.53	5	2.91	2	20.00	17	68.06
1987	7	27.66	5	17.43			5	14.20	17	59.29
1988	5	19.20	2	0.08	6	497.10	6	10.00	19	526.38
1989	4	0.20	4	69.00	3	3.00	2	3.50	13	75.70
1990	10	105.70	3	110.00	4	211.00	5	14.00	22	440.70
1991	6	17.00	2	18.00	5	242.00	2	4.50	15	281.50
TOTAL	63	751.21	30	335.54	47	1,764.08	29	117.50	169	2,968.33

Remarks: 1.Fire occurrence counted when it did inside plantation area only.

Table V-6-2 "Fire break's position"

(%)

Item	P- I	P-IIA	P-IIB	P-III	Total
Fire break	34	24	20	22	100
Man made forest	32	18	15	35	100
Parcel Area	27	23	23	27	100

(note) 1: "P" is an abbreviation for "Parcel".
2: This table is based on Table II-1-1.

Table V-6-3 "Criterion of fire break line (belt) construction"

Items	Fire break line	Green belt
Location	1: Near / vicinity of borderline of the Project and private land where it is necessary to prevent spreading fire and to keep / management the borderline. 2: Along the road side where fire break line can be narrow and the place where is easy to put out fire. 3: Ridge, valley where topograhically fire power easily becomes weak.	1: Near valley where good growth can be obtained. 2: Along the road side where hauling is easy to be done. 3: Vicinity of natural forest and turning point where it is a good place to prevent fire.
Sorts of construct-ion	1: Fire break line is made a right angle with wind direction in January to May. 2: Man power Fire break line is made by weeding, burning including back fire in emergency case and herbicide. 3: Bulldozer Vegetation is dug up including its roots. But it is available in gentle slope (less than 20 degrees).	1: Close planting needs to be done to diminish / weaken vegetation growth. (e.g.,10,000 seedlings / ha.) 2: Fire resistant species like Yemane is to be planted. 3 : Compound storied forest including mixed planting is better. 4: " The way of planting is the same as "The standard of planting" in chapter V -1.
Width	1: It is at least ten (10) times of height of Summon and other grasses. 2: It can reduce a road width from the fire break line when constructed along the road 3: It can be changeable according to the site conditions, near the borderline of private land.	1: It is ten (10) times of height of Summon and other grasses in standard. In plantation area, it is more than two (2) times of height of the trees. 2: It can be changeable according to the site conditions, e.g., it can be reduced when set along the road side.
Time to be constr-ucted	Before dangerous time for fire (early in January to early in May).	Rainy season

(note) Other methods like mixing two ways of the above mentioned is thought to be constructed.

Table V-6-4 Accounts to be taken into consideration in burning

1. Fire break line is to be constructed in place where spreading fire is likely to occur.

2. Burning is to be done during the conditions wherein little wind and calm weather would occur through listening to weather report in the radio.

3. The burning time is recommended to be done just before rainy season or just the end of dry season.

4. Burning is recommended to be finished by/until noon. The fire should be checked if put out completely by a person in charge, do it after sun sets.

5. Burning is necessary to be started from the ridge or upper part in a burning place.

6. The person who is in charge of burning is to inform his crews of operation plan/method before burning starts.

7. Burning is to be done based on the prescribed laws and concerned regulations.

8. Reference

1. Letter/notification when burning

The main items of a letter which is recommended to be submitted to the Project by a person who has plan of burning are as follows:

a. the place and areas to be burned
b. the purpose of burning
c. date and time of burning
d. the name of person who is in charge of burning
e. other concerned matters needs to be written

2. Main points in putting-out fire

a. How to put-out fire

(a) Stamping

It is used in early stage of occuring fire or in place where flammable substance is little.

(b) Swatting

Extinction is done directly by swatting fire flame with fire swatter, branches with green leaves and the like.

(c) Watering

Directly water the fire. Details are as follows:

c.1 Fire truck is available in places like forest road side or where car can be driven.

c.2 Jet shooter is available in steep slope places where car can not be driven.

b. Points of extinguishing operations

(a) In case of early stage of fire or fire is still weak

The operation is to be done against the burning direction by means of swatting and watering by Jet shooter.

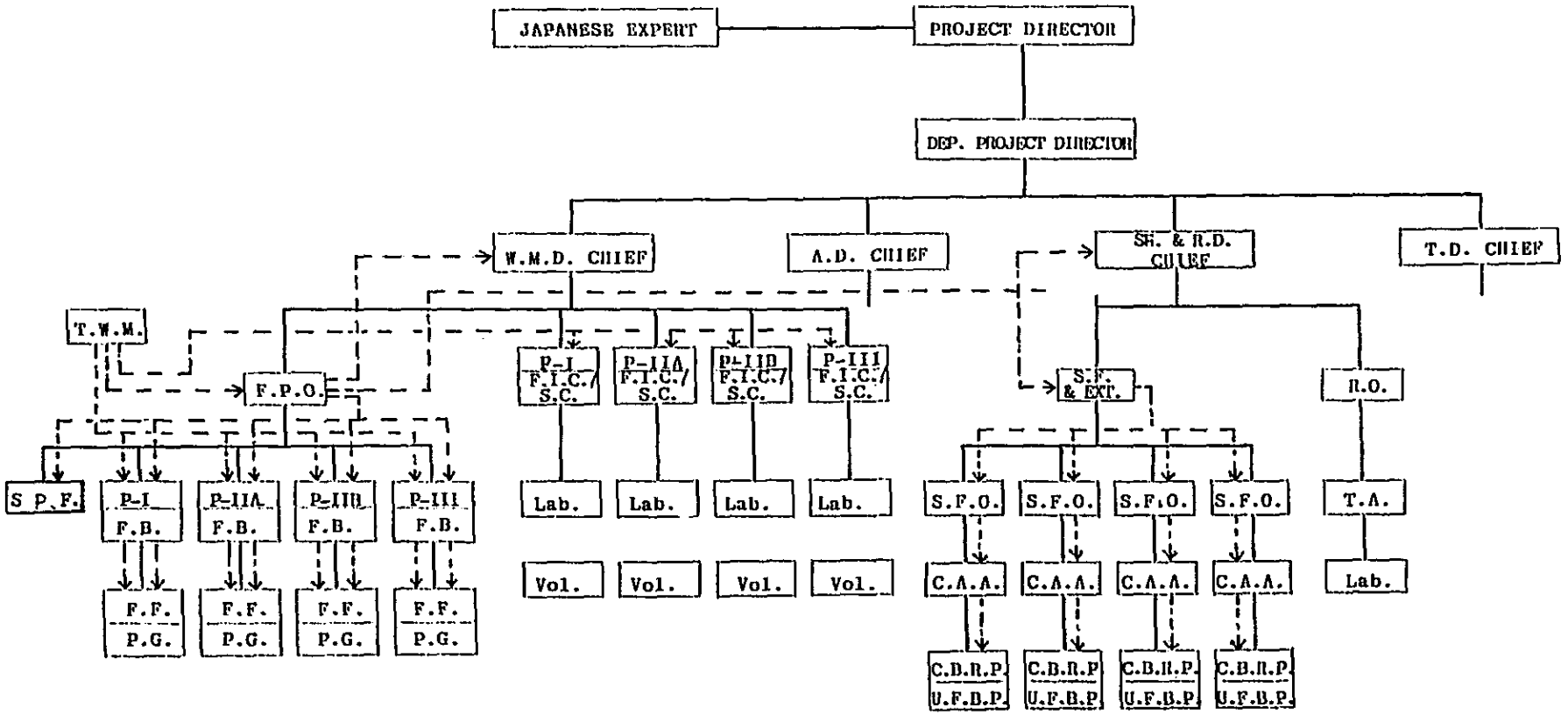
(b) In case of fire becoming strong and spreading widely

The operation is to be done towards the side of burning direction because it is dangerous with consideration of changes of fire movement according to the weather and topographic conditions.

Figure- V-6

FLOW OF COMMAND CHART/

FIRE CONTROL ORGANIZATION CHART



NOTE: F.P.O. - Forest Protection Officer
F.B. - Fire Boss
F.F. - Fire Fighter
P.G. - Plantation Guardman
T.W.M. - Towerman
Lab. - Laborer
S P. F - Special Force
F.I.C. - Forester In-Charge
S.C. - Section Chief
S.F. - Social Forestry
EXT. - Extension Officer
S.F.O. - Social Forestry Officer
R.O. - Research Officer
VOL. - Volunteer
T.A. - Technical Assistant
C.B.R.P. - Community Based Reforestation Program
U.F.B.P. - Upland Family Based Program
- - - - - Information Path
CAA - Community Affairs Assistant

VI Organization of Forest Management

The organization is composed of elements of works necessary for the accomplishment of some objectives. Its contents are flexible according to the movements of the sorrounding circumstances to maintain and survive, as if it were a creature itself.

Main works necessary for accomplishing the Integrated Forest Management Plan can be listed (see Table VI-1).

An organizational chart based on Table VI-1 might be nearly the same as the present (refer to Figure II-2) except that of the "Administration" and "Plan Making" section. Administration section is still the same. Plan making section is newly created to do the process of "plan-do-see" like the "The Integrated Forest Management Plan".

The reason is that the data source were gathered from the results of the Project activities of Phase I and II which includes the on-going activities. If it were different with the present organization, it should be revised.

As far as the Project aim to be achieve is up from the present up to the future, the system of the organization needs to keep the co-existence both of DENR for execution of afforestation in the watershed areas for the Pantabangan dam, and the HRDS for training to disseminate the concerned techniques developed and improved through Project activities.

The above mentioned aim means that tree planting in the watershed areas of Pantabangan dam is necessary as a source of water, and land conservation measure including the measures of less sedimentation in the reservoir. Specifically, it means the development/improvement of techniques for afforestation including fire prevention technique by means of Social Forestry Program, active participation of the rural community in afforestation, and training for dissemination of the concerned techniques developed and improved through project activities.

The meaning of existence of the organization with co-existence both of DENR and HRDS depends on the visual establishment of man-made forest based on the theory and practice for afforestation. It is also said that it depends on the survival and well-grown condition of man-made forest with little disturbances from any damage like forest fires.

(added No. 7)

Table VI-1 - Kinds of Work for the "Integrated Forest Management"

Items	Sub Items/Details	Explanation/Reasons	Section Name	Note
1. Planting and its maintenance	Planting, tending (weeding, additional planting, thinning) Protection (forest fire, pest, & diseases)	Exclude competition with grasses Improve the quality of growth Supplement of materials for charcoal	Afforestation Section	Under co-work with Research, Social Forestry section for charcoal making
2. Maintenance of experiment plots	Maintenance of locations, research continuously, keep data/records	Research and development should be long like tree growing. Data file management.	Research Section	Including pest & diseases, green belt
3. Instruction of Social Forestry	Monitoring & evaluation of the contract, technical instruction, extension, etc.	Carry out the Social Forestry Program (UFBP, CBRP, FLMA, etc.)	Social Forestry (SF) Section, & Extension Section	Under co-work with Forest Protection Section for enlightening of fire protection
4. Training & maintenance of training facilities	Training in plan-do-see, keep data/record/know-how Maintenance of facilities	To keep the training know-how accumulated for a long time is important.	Training Division, Training Section, General Affairs Sec.	
5. Forest protection from fire	Protection of man made forest from fire, Technical instruction for burning, enlightenment, etc.	Necessity for future benefits is to be known.	Fire Prevention & Extension Section	Under co-work with SF Section for enlightening
6. Maintenance of facilities	Maintenance of facilities like forest roads, nursery, check dam, heavy equipment, etc.	No maintenance/repair of facilities makes ruin themselves.	Property Section, Forest Civil Eng'g. Section	
7. Plan making	"Plan-do-see" of plans like the Forest Management Plan.	Forestry needs sustainable management view for a long time	Planning Section	Under co-work with the other section.

VII Periodical revision of "The Integrated Forest Management Plan Book"

It is recommended that the Integrated Forest Management Plan Book (The Management Plan) be revised periodically every five (5) years. One reason is that, fundamental data like the forest registration book and the forest basic map (scale 1/5,000) should be corrected according to the changing conditions such as new occurences of the planted areas or disappearances of manmade forests by forest fires for five (5) years after starting the present plan. Another is the results of differences between the plan/method indicated in the forest management plan and the executed forest works be reflected to the following forest management plan to be upgraded step by step.

The recommended termination of the management plan in the view point of the character of forestry is five (5) years which needs a longer time to see the results of its activities than any industry such as agriculture which can obtain the results in a year.

The preparation in making the next plan is recommended to be done two (2) years before the termination of the present plan because it is necessary that it is steadily and progressively continuous to avoid any gap between the two.

"Listening to the opinion of the concerned"

It is recommended that a responsible officer in making and altering the management plan should listen to the opinion of Forest Council and related Mayors. The responsible officer is the Director of the RP-Japan Forestry Development Project-Watershed Management. Forest Council is thought to be composed of knowledgeable and experienced men and related personnel of superior office.

Forming the contents of the management plan objective, harmonious and adminstrative suggestion/support from the viewpoints of forest technology, forest policy including Social Forestry, extension and others to meet social demands can be done through discussions in Forest council.

The Mayor may take opportunity of enhancing the community resident's desire for the proper utilization of forest land, harvesting of forest fruits, and taking part of infrastructure works like the construction of check dam and forest roads. Considering those works, these will increase chance of employment which will uplift the living condition in the area. The motivating factors will build a sense of unity with the planning officer and finally, they will have a feeling that as if they were the owner of the forest thus building their concern in keeping the forest from destruction or damage like illegal cutting and forest fire.

"Getting the consent of superior office concerned to the Management Plan"

It is recommended that the Management Plan be submitted to the superior office concerned for approval on its publication.

The reason is that superior office concerned should evaluate the planning from the viewpoint of sustainable forest management and other related administrative matters like necessity for knowing of cutting and planting budged beforehand in order to take measures for prevention from destruction like illegal cutting, forest fire and the like.

V-4 Soil erosion control works with simple methods and materials suitable to the local condition

1. Introduction

The Project has been started for the purpose of keeping intact the durable years of Pantabangan dam by means of planting trees as a source of water, and for land conservation which is effective in preventing soil from eroding which become as sediments in the reservoir.

So it can be said that all the Project site's planted areas is a means of soil erosion control works. Furthermore, in some places, eroded and denuded land really exists which needs some measures for erosion control works like in the following cases:

A. In case of having effective measures with temporary and simple methods and materials suitable for the local conditions for places like gully, landslides and the like in small scale areas.

B. In case where there are necessary measures to be taken for erosion control works in full-scale to protect such facilities like forest roads and nurseries that might suffer damage caused by landslides and the like.

An outline of the above-mentioned measures is shown in Table V-4-1.

The measures applied are operated usually in a spot and they need to be explained/located in the master plan made from the view point of watershed management which is to be controlled in large areas like in a river system other than spots, and composed of erosion control works done individually.

Making the master plan, said to be the "Design/Plan of Watershed Erosion Control" and other concerned matters are referred to the Literature as follows:

2. Literature

(1) "Manual for Erosion Control Works" in RP-Japan Forestry Development Project-Watershed Management by DENR and JICA (August, 1988).

(2) "Handbook for Erosion Control Works" in RP-Japan Forestry Development Project-Watershed Management by DENR

and JICA (August, 1988).

(3) "Progress Report on Erosion Control in Model Area (Design of Watershed Erosion Control)" by For. T. Makino and A. Mendoza (April, 1990) Progress Report on Technical Development Activities in 1989 (Vol. 3).

(4) "Progress Report on the Development and Improvement of the Techniques on Erosion Control Works" by For. T. Makino and A. Mendoza (April, 1990), Progress Report on Technical Development Activities in 1989 (Vol. 3).

(5)

NOTE: free translation "Handbook of Forest Work Technology" by Forestry Agency in Japan (March, 1985).

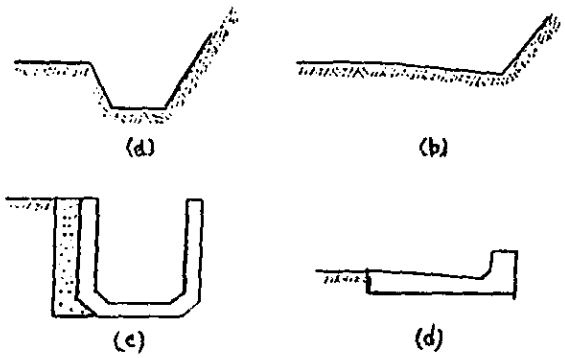
(6)

NOTE: free translation "Handbook of Forest Civil Engineering" edited by M. Kamiiisaka and another, Chiyoda Syutupan (October, 1984).

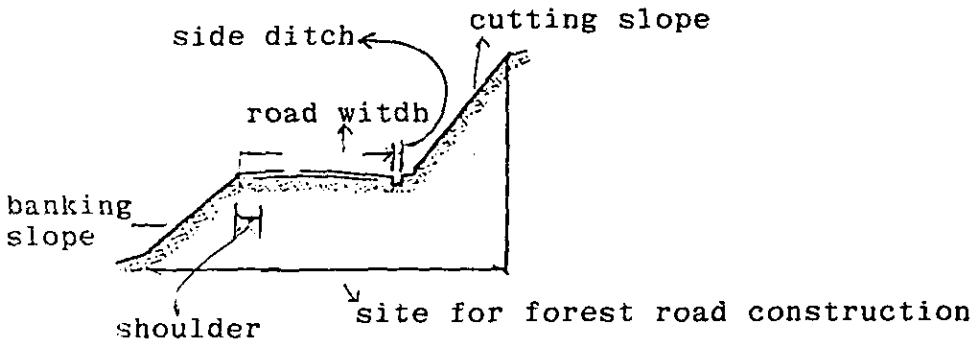
Table V-4-1 "Erosion control works concerned with forest works"

Item	Sub - Item	Measures	Fig. No.	Note
Planting and the concerned	1: Having fears of slipped, denuded lands, etc. might happen.	1: Take care of drainage of excess water. 2:Avoid cutting, banking 3: Plant along a contour 4: Others	1 2 3	See "Water channel works" in the Fig. No.9. Take care in road making See "Planting" in the Fig. No.7.
	2: Being gully, slipped land, etc. Select the concerned works from the right side column.	1: Hillside work (1) Grading work (2) Vegetative work A: Wattling B: Mat covering C: Planting (3) Foundation work A: Retaining work B: Water channel works 2: Stream work (1) Check dam (2) Revetment work	 4 5 6 7 8 9 10 11	 Open / Closed channel
2: Protection of facilities	Select the necessary works from the right side column.	do		

Fig. 1 Drainage/Ditch



a) ditch in shape of trapezoid
b) ditch in shape of "V"
c) concrete ditch in shape of "U"
d) concrete ditch in shape of "L"



Note ; Cross sectional view of forest road
(a rough sketch)

Fig-2 In case of avoiding cutting/banking slope when constructing forest road in places where landslide are expected to occur.

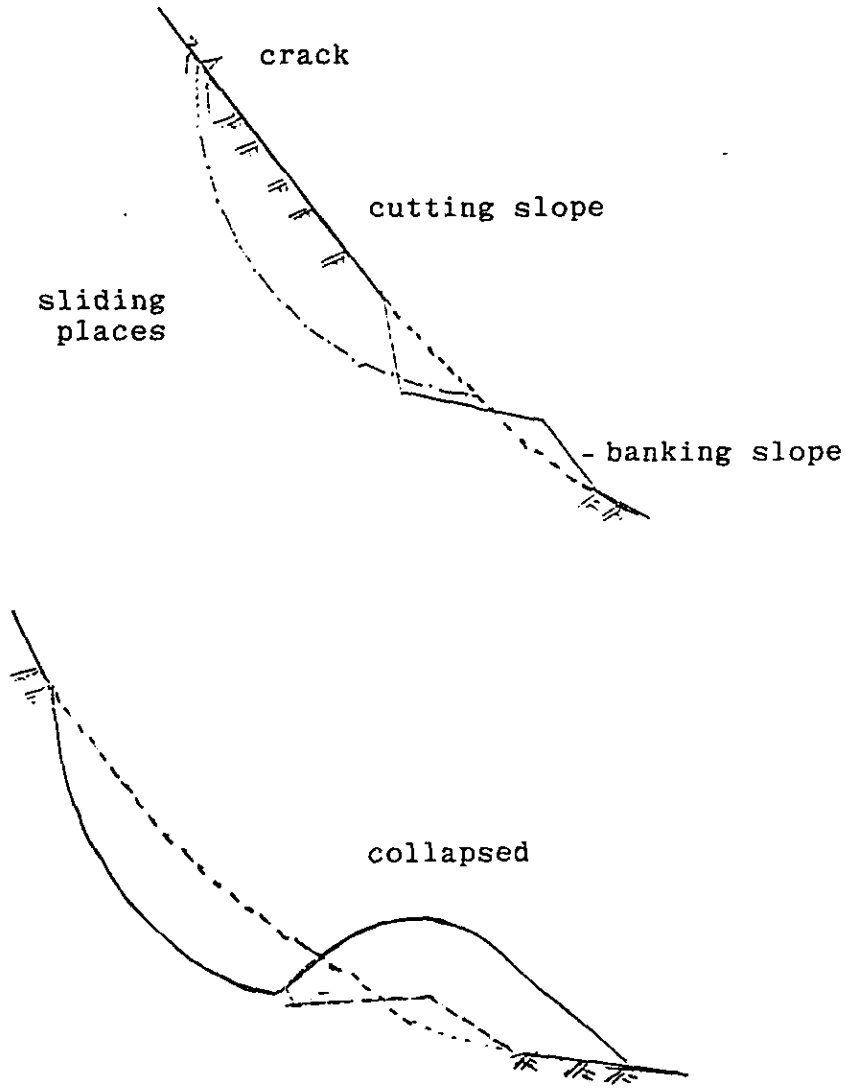
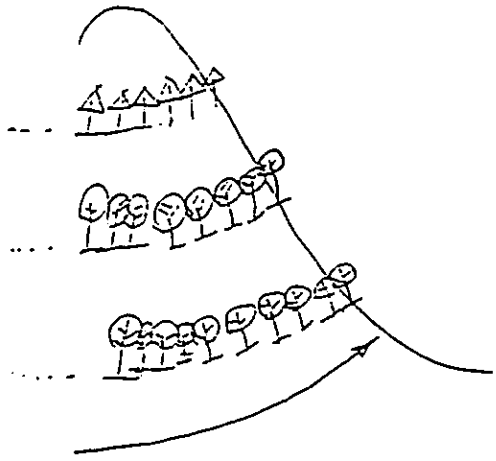


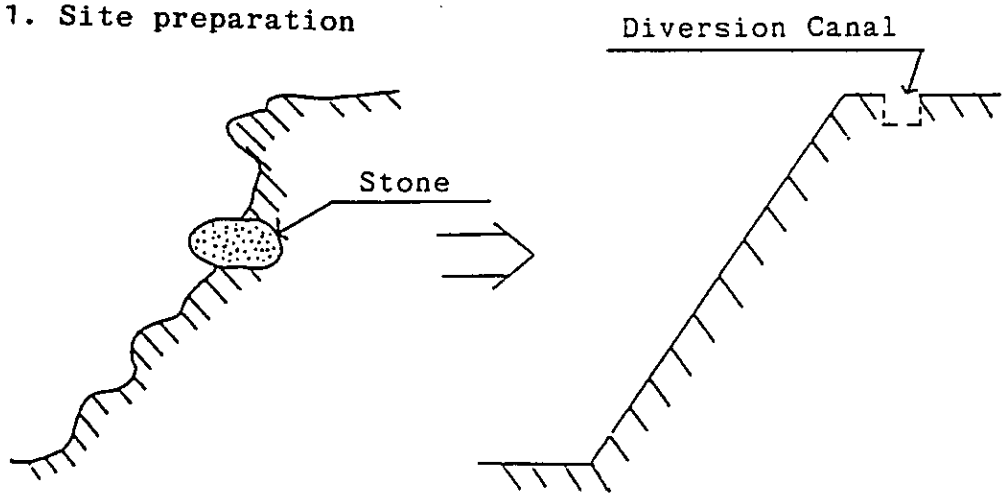
Fig-3 Planting according to a contour



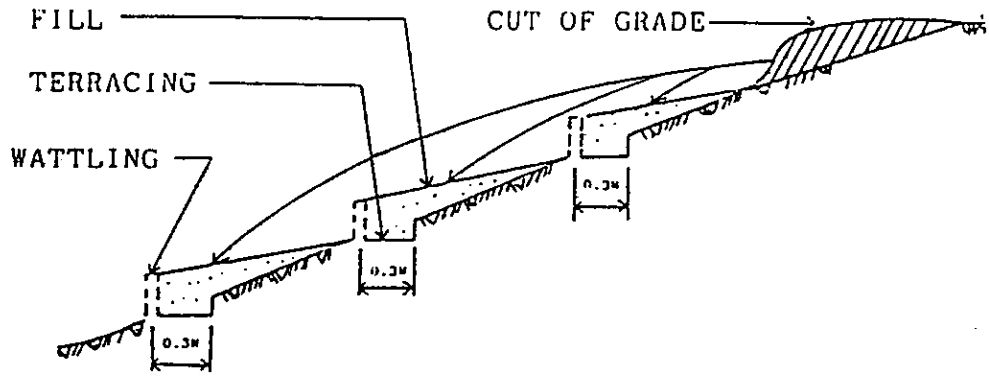
contour line

Fig. 4 Grading Work

1. Site preparation



2. Grading and terracing work



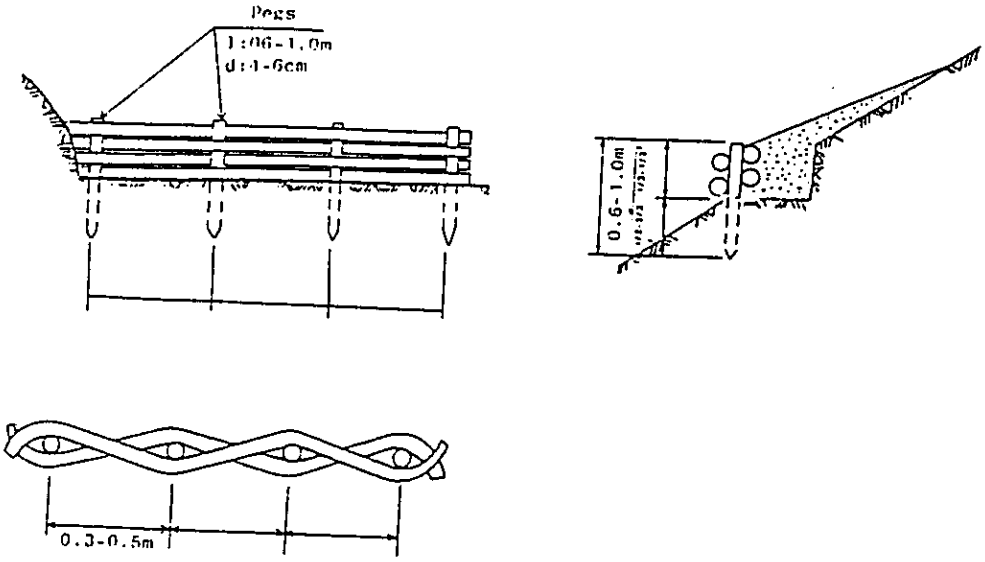
(for refence)

SOIL VARIATIONS AND ANGLES OF REPOSE

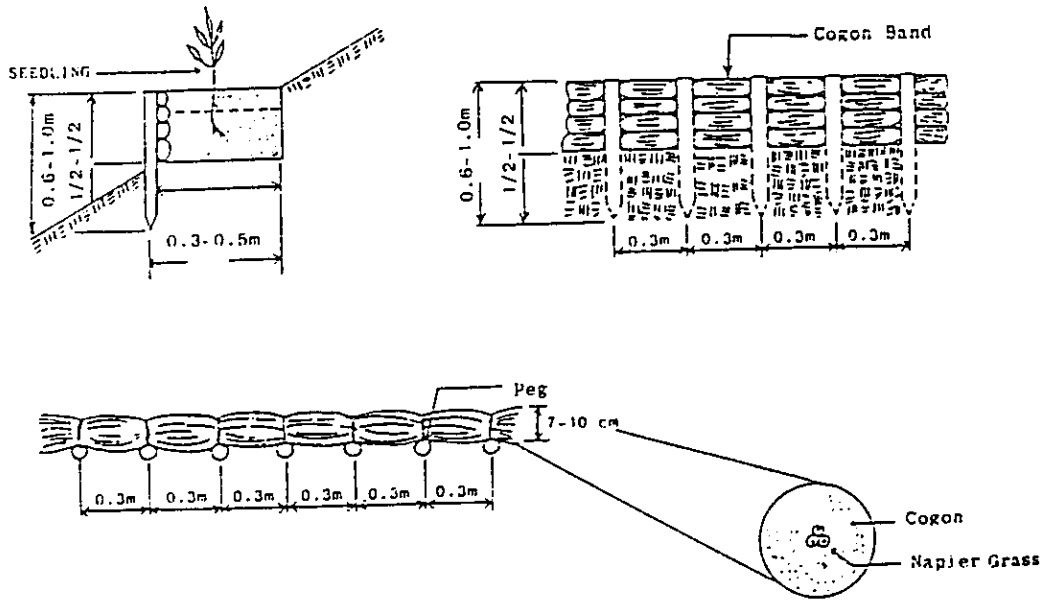
CONDITION / TYPE OF SOIL	DRY	LOW MOISTURE CONTENT	HIGH MOISTURE CONTENT
CLAY	20°-37°	40°-45°	14°-20°
SAND	27°-40°	30°-45°	20°-30°
BALLAST	30°-45°	27°-40°	25°-30°
REGULAR SOIL	20°-40°	30°-45°	14°-27°

Fig-5 Wattling

1. Tree branch



2. Cogon band



3. Napier band

Material for it is napier instead of cogon.

These wattling works are expected to sprout so that the material must be fresh or vivid and they should be constructed in rainy season.

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NO.	NAME OF EXPERIMENTAL AREA	DATE OF ESTAB-LISHMENT	LOCATION		COM. (ha)	AREA OF PLOT	NO. OF PLOT	OBJECTIVE	SUMMARY OF METHODOLOGY
			PARCEL	BLOCK, COM.					
8	Provenance Trial	1985	I	33, M				To observe the growth of Eucalyptus and other species from different origin in relation to the prevailing site condition	Germination and Yemane. Survival of Pigeon Pea. Soil porosity & soil NPK analysis

POSTFACE

The contents of the forest management plan may give the impression to readers that recommendation, suggestion, idea and the like are scattered besides the planned forest works written in it.

The reason might be derived from Forest Management Plan, which is written in compliance with the project activity based on R/D, and which contains the planning item of the standard forest works adapted to the forest land use classification of which similar one is described with strong expectation in the New forestry policy/code which will be treated by the congress in the near future, of which contents include the "land tenure security" that gives the rural communities a chance to utilize forest land and forest products following some conditions where at present forest cutting is banned in critical watershed area of the Project.

As a matter of fact, taking for granted that forest protection from damages like forest fire can not be done well without the participation of rural communities into afforestation and protection activities, then the utilization of forest land and product is inevitable to be developed in the critical watershed area. Promoting and taking oppurtunity of their participation in forest works will be of great help in the rapid cover of denuded grassland and mountains.

However, this kind of problem might be solved when the related procedures will be accumulated during the periodical revision. In every revision, its contents is to be improved and upgraded by means of keeping the management cycle, plan-do-see, and also, step by step it will become suitable to the surrounding condition of the Project site.

Finally, the desirable state is hoped to be achieved soon. This will be brought by the continuous efforts of the persons concerned for getting yield from the point of view of sustainable forest management.

JICA