Steering Committee Meeting
Carbon Fixing Management Project
FORDA – MOF and JICA

Activities of the Project

Jakarta, May 2001

Activities of the Project

I . Activities of the project

1 . Development of methodologies to estimate carbon fixation benefits of plantation forests

1-a. Measurement of biomass in newly established plantations

We are going to establish new plantations and measure the amount of carbon contents in the forest every year.

We will try 3 species in Bogor District (Kabupaten), West Java Province (Propinsi). Species and sites are as follows;

(1) Acacia mangium, Site: BKPH Parungpanjang, RPH Maribaya, 15A (formerly, 9B)

(2) Pinus merkusii, Site: BKPH Leuwiliang, RPH Cianten, 24B

(3) Shorea leprosula, Site: BKPH Jasinga, RPH Ngasuh, 17A

1-b. Measurement of biomass in existing plantations

Data obtained from the experiments in newly established plantation will be not enough, so we are going to collect data in existing plantation forests.

1-c. Measurement of biomass in vegetation of control plots (baseline)

We also plan to set up control plots to measure growth of the original vegetation (shrub or secondary forest) and estimate the amount of local people's forest use. After that, compare the annual increment of fixed carbon in newly established plantation and control plots.

2. Development of new technology for charcoal-applied plantations to maintain and enhance carbon fixation potential

2-a. Measurement of effects of charcoal input into newly established plantations

After clearcutting shrubs or secondary forests, using the biomass, we plan to produce charcoal and put them into the soil (planting holes). Charcoal can be used as soil conditioner, and accelerate growth of trees. Moreover, by application of charcoal into the soil, a certain amount of carbon can be stored in that vegetation. Therefore, we will examine the effects of charcoal application on the growth of plantation trees, and its capacity for carbon sequestration.

3. Development of more effective technology for charcoal production

3-a. Development of cost effective technology for charcoal production

If charcoal of very poor quality is applied to the soil, it could hamper the growth of trees. We need charcoal of better quality. The cost of charcoal production, however, should be low if companies or organizations apply its production method. We will try to develop charcoal production method that is suitable for local condition.

To achieve this purpose, we are going to;

(1) Improve conventional charcoal production (piling process) methods wildly practiced in Bogor District.

(2) Develop simple charcoal kilns made of materials available in Indonesia.

3-b. Quantification of charcoal produced upon land preparation

We will examine how much amount of charcoal can be produced by using biomass from various types of vegetation, including secondary forests, shrubs, grasslands, etc. For this purpose, we will conduct experiments mentioned below;

(1) Using charcoal production method mentioned in 3-a, examine the amount of charcoal produced from leaves, twigs, branches, and stems.

(2) Measure amount of biomass in various types of vegetation, and estimate the amount of charcoal that can be produced from the vegetation.

4. Estimation of cost and revenue of carbon fixing plantations

The carbon fixing forest management is different from the conventional forestry because we have to consider carbon credit (CERs: Certified Emission Reductions) trading, charcoal production (and its application to soil), and various costs accompanying CDM (Clean Development Mechanism). Financial analysis of the carbon fixing forest management has to include those factors.

In this demonstration study, we will collect and analyze those data and information mentioned below;

(1) Silvicultural costs, and costs for charcoal production (and its application) in newly established plantations.

(2) Costs for monitoring changes of carbon contents in newly established plantations and existing plantations

(3) Silvicultural costs in existing plantations, and costs accompanying CDM scheme (monitoring baselines, leakage, risks, transaction costs, etc.)

(4) Other information from various literature, for example, price of CERs.

5. Preparation of manuals for carbon fixing forest management

Finally, we are going to make manuals available for companies and organizations which intend to start forestry projects for CDM.

(See Appendix: Activities of the Project for 5 years)

II. Program for the project activities

Our annual program for the project activities is as follows;

1. Establishment of new plantations

We plan to request Perum Perhutani to conduct these works mentioned below (but except building sheds and a watchtower).

① Measuring the boundary around experimental sites

We need about 15ha for each species (total: about 45ha), and will establish 5 ha plantation (total: 15ha). Table 1 shows the area and number of seedlings needed for newly established plantation.

② Preparation of seedlings

To establish 5 ha plantation, we need 10,000 seedlings for each species.

(2×3m spacing→1,667seedlings/ha + seedlings for beating up).

(1) Acacia mangium: We plan to buy seedlings from Perum Perhutani

(2) Pinus merkusii: We plan to buy seedlings from Perum Perhutani

(3) Shorea leprosula: We plan to buy seedlings from Komatsu Co.

* We are not going to establish nursery by ourselves.

③ Road construction

Forest road that is accessible by car. Width of the road is 3 m.

④ Building sheds and a watchtower

Build a shed and a watchtower in the Acacia mangium site (Location of the shed and watchtower: see Fig. 1). In Pinus merkusii and Shorea leprosula sites, building sheds only (no watchtower).

We plan to employ another contractor to build sheds and a watchtower.

⑤ Land preparation: clearcutting

Clearcut the forest, but no burning.

⑥ Measuring 2m×3m spacing (put sticks) / Making planting holes

(1) Planting spacing: 2m×3m

(2) Size of the hole: 30cm×30cm×30cm

⑦ Planting (See Table 1 for more detailed information)

(1) No charcoal application

(2) With charcoal application: After mixing crushed charcoal with soil, put them into the planting holes.

* Amount of charcoal: (on volume basis) 5%, 10%, 15% and 20% for Acacia mangium
5%, 10% and 15% for Pinus merkusii
5% and 10% for Shorea leprosula
(Still under consideration)

⑧ Beating up

⑨ Weeding

2. Charcoal production and its application to soil

① Charcoal production

Compare the capacity, quality of charcoal produced and costs of each kiln.

(1) Improved open-hearth kiln: A simple type of kiln made of ordinary bricks and cement

We still do not know exact data regarding the capacity of this kiln, but it seems to be able to produce several hundred kilograms of charcoal at one time.

(2) Conventional charcoal production method widely used in Bogor District: piling process

Capacity: about 100kg (or more)/3～4days

(3) Movable kiln

Capacity: about 200kg/one time

(4) Oil drum kiln

Capacity: about 12kg/1day

② Application of charcoal into the soil of plantation

We will determine optimum amount of charcoal by examining relationship between amount of applied charcoal and tree growth. Charcoal is crushed, mixed with soil, and put into the planting holes. The maximum area under charcoal application is 2.7 ha (0.675ha × 4treatment) for one species (Table 2).

As the size of planting hole is 30cm × 30cm × 30cm (= 27 liter), amount of charcoal input is;

(1) 5% → 1.35 liter/hole

(2) 10% → 2.70 liter/hole

(3) 15% → 4.05 liter/hole

(4) 20% → 5.40 liter/hole

We also plan to conduct supplementary experiments as follows;

(1) Testing several other ways to apply charcoal

(2) Examining the relationship between the charcoal quality and the tree growth.

3. Carbon measurement

We expect participation of IPB (Institut Pertanian Bogor) students as surveyor.

① Newly established plantation (Fig.1 shows plot setting for newly established plantation)

We are going to measure;

(1) Changes of carbon contents in newly established plantation

Compare the amount of carbon fixed in the plantation (with and without charcoal application), and control plot (baseline = without project).

(2) Changes of carbon contents in control plots

a. Plots without local use: Exclude local use and measure the growth of the trees.

b. Plots under local use: Let people enter the forest and examine the amount of local usage.

c. Sample trees for estimating local use: choose about 200 trees and check how many trees are felled by local people every year.

② Existing plantation (Table 2 shows how many area and how many sample trees are necessary for carbon measurement.)

(1) Acacia mangium

a. Setting permanent plots (for 5 years) in 2 and 6 years old stands (Fig.2)

b. Setting temporary plots in 4, 8 and 10 years old stands (Fig.3)

(2) Pinus merkusii

Setting temporary plots in 5, 10, 15, 20 and 25 years old stands (Fig.3)

(3) Shorea leprosula

Setting temporary plots in 5 and 10 years old stands (Fig.3)

③ Permanent plots and sampling plots

(1) Permanent plots (and also Temporary plots) in newly established and existing plantation

Do not cut trees. Conduct every tree census for DBH and height. Also measure amount of carbon contents in undergrowth and soil.

(2) Sampling plots

Extract 10~20 trees from the plots, and measure DBH, height, weight and so on.

※ Using samples extracted from sampling plots, we will formulate relationships between DBH, height, and weight of stems, roots, and so on. After knowing those relationships, we will estimate the amount of biomass and carbon in Permanent plots.

Table 1 Area and number of seedlings needed for newly established plantation (for one species)

1. Area

	Area (ha)
Area inside bamboo fence (includes forest road, shed, parking and place for charcoal kiln)	
Planting area No Charcoal (0%) (including buffer zone)	2.385*
With charcoal application**	
5%	0.675
10%	0.675
15%	0.675
20%	0.675
Planting area total	5.085*
Control plots (1) Exclude local use	2.320*
Total area inside bamboo fence	7.800*
Control plots (2) Let local people use →examine amount of local usage	About 7*
Total area	About 15*

* These figures could be changed slightly according to topography in the experimental sites.

** For Pinus merkusii, we plan to conduct experiments of 5%, 10% and 15% treatment only. For Shorea leprosula, 5% and 10% only (but, still under consideration). We also keep small area to conduct other experiments mentioned in 2.②.

2. Seedlings needed

1,667seedlings/ha × 5.085ha = 8,477seedlings

We need about 10,000 seedlings. (include seedlings for beating up)

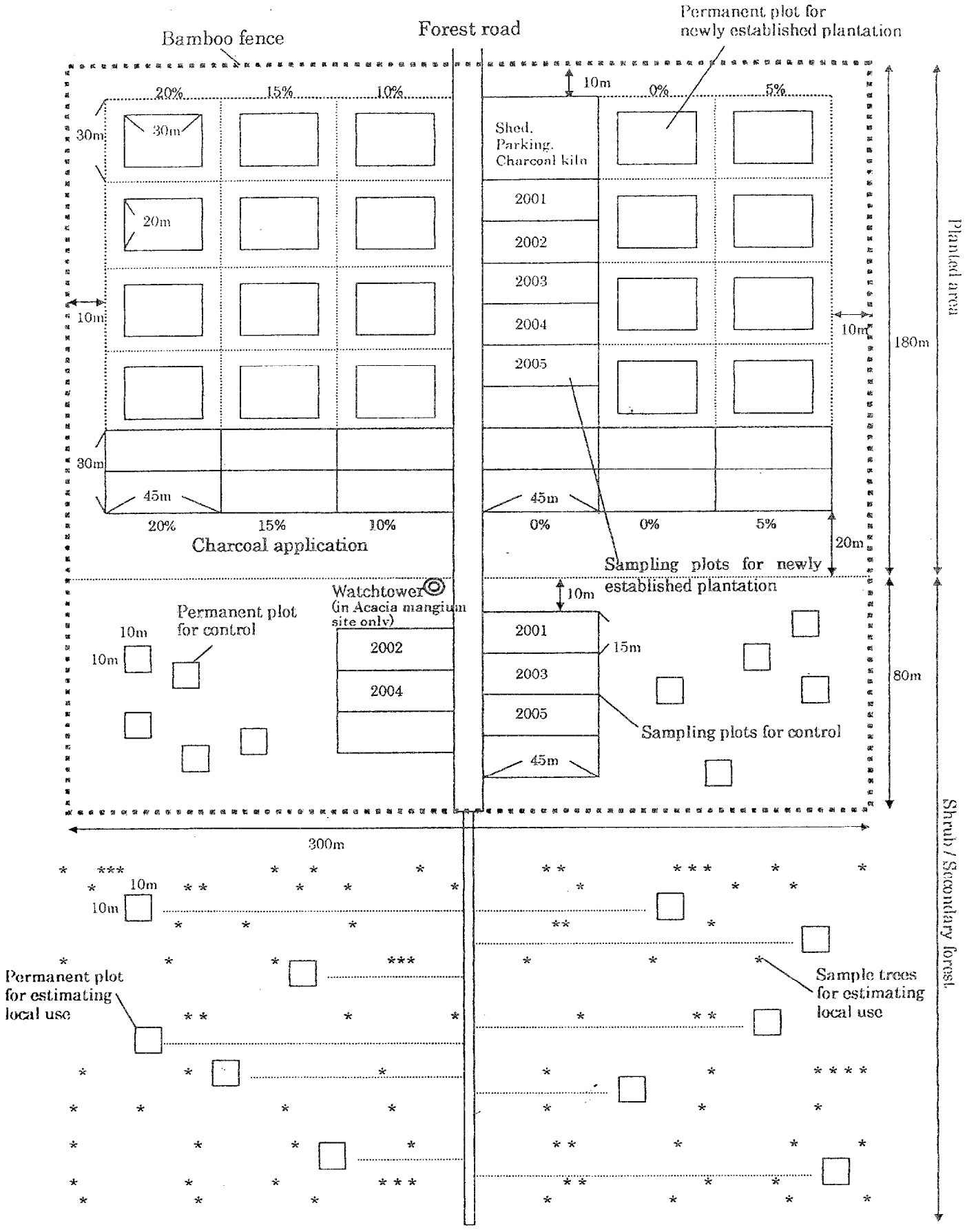


Fig.1 Plot setting for newly established Plantation (for one species)

<About Fig.1>

- In Fig.1, permanent plots are indicated in yellow color, and sampling plots in blue color.
- 20 permanent plots (30m×20m) for newly established plantation.
- For control, 10 plots without local use and also 10 plots under local use. The size of the plot is 10m×10m.
- The size of the sampling plot is 45m×15m. Every year, choose one plot for newly established plantation, and one for control plots.
- Sample trees for estimating local use: choose about 200 trees and check how many trees are felled by local people every year.

Table 2 Area needed for measurement of existing plantation

1. For Acacia mangium; 2 and 6 years old stands: See Fig.2

	Permanent plots	Sampling plots
2 year old	0.24ha	0.34ha
6 years old	0.24ha	0.34ha
Total area	0.48ha	0.68ha

2. Others: See Fig.3

	Temporary plots	Sampling trees
<Acacia mangium; 4, 8 and 10 years old stands>		
4 years old	0.24ha	10~20 trees
8 years old	0.24ha	10~20 trees
10 years old	0.24ha	10~20 trees
Sub total	0.72ha	30~60 trees
<Pinus merkusii; 5, 10, 15, 20and 25 years old stands>		
5 years old	0.24ha	10~20 trees
10 years old	0.24ha	10~20 trees
15 years old	0.24ha	10~20 trees
20 years old	0.24ha	10~20 trees
25 years old	0.24ha	10~20 trees
Sub total	1.20ha	50~100 trees
<Shorea leprosula; 5 and 10 years old stands>		
5 years old	0.24ha	10~20 trees
10 years old	0.24ha	10~20 trees
Sub total	0.48ga	20~40 trees
Total	2.40ha	100~200 trees

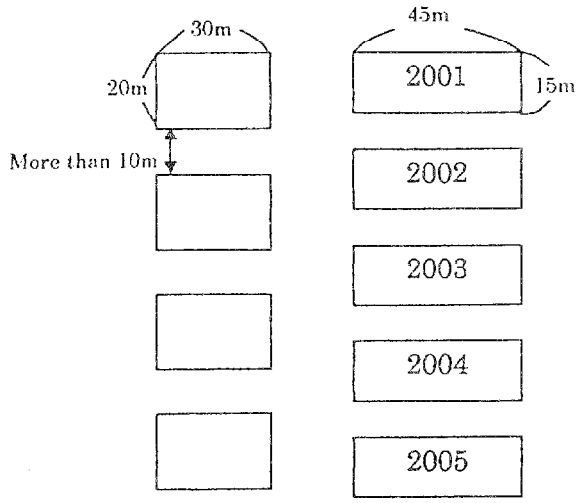
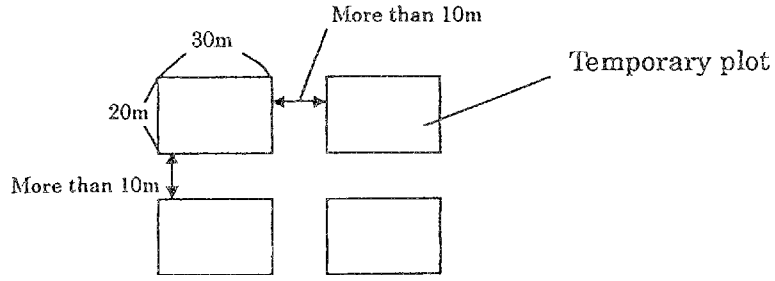


Fig.2 Plot setting for existing plantation
(for Acacia mangium: 2 years old stand, and 6 years old stand)



Setting 4 temporary plots for all tree census
For destructive sampling, choose 10~20 trees around these temporary plots.

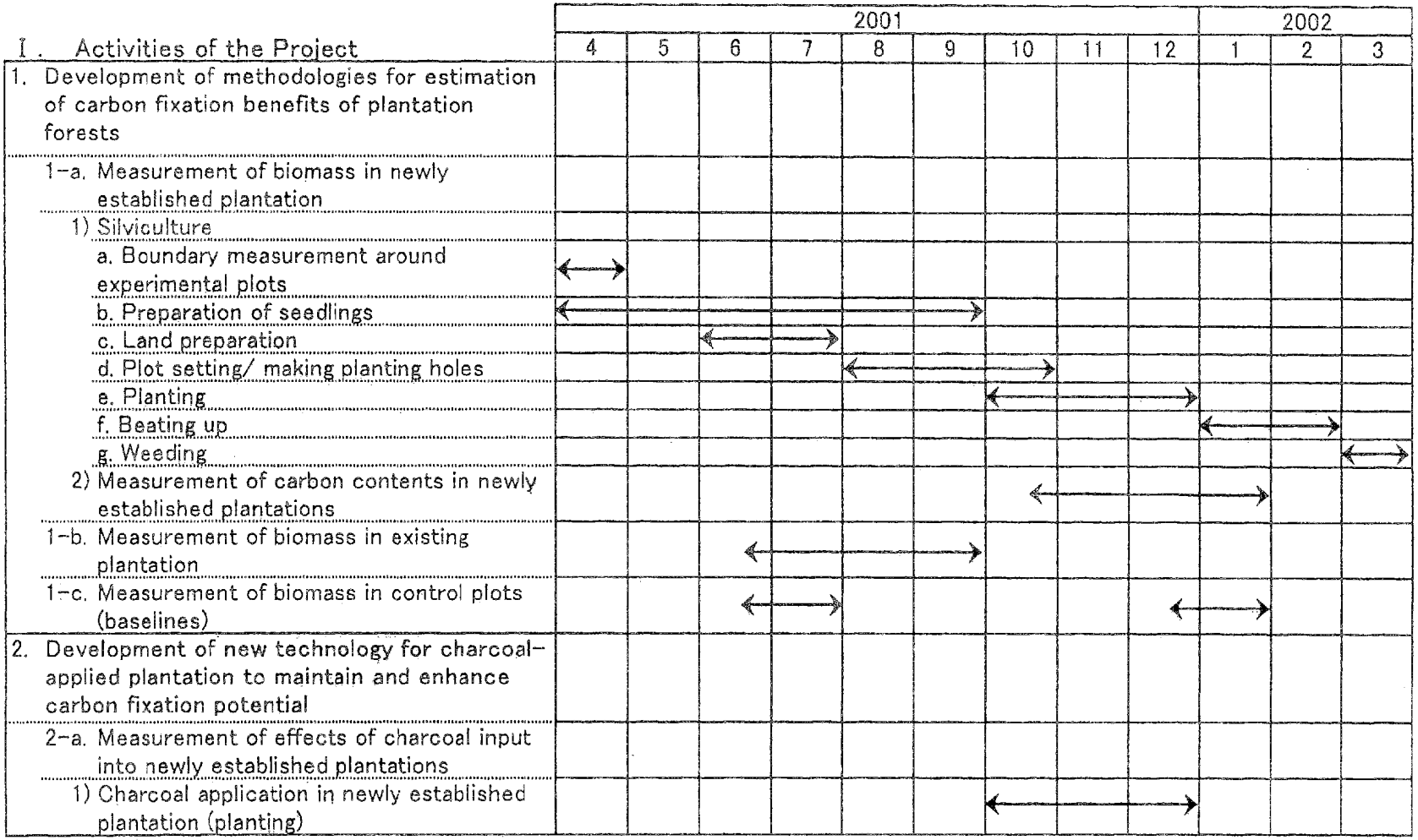
Fig.3 Plot setting for existing plantation
For Acacia mangium: 4 , 8 and 10 years old stands
For Pinus merkusii: 5, 10, 15, 20 and 25 years old stands
For Shorea leprosula: 5 and 10 years old stands

Appendix: Activities of the Project for 5 years

	2001	2002	2003	2004	2005
1. Development of methodologies for estimation of carbon fixation benefits of plantation forests					
1-a. Measurement of biomass in newly established plantation					
1) Establishment of new plantation in West Java	← →				
2) Measurement of biomass and carbon contents in newly established plantations in West Java	←	→	→	→	→
3) Measurement of biomass and carbon contents in newly established plantations outside West Java (Kalimantan, Sumatera, etc.)		←	→	→	→
1-b. Measurement of biomass in existing plantation					
1) Measurement of biomass and carbon contents in existing plantations in West Java	←	→	→	→	→
2) Measurement of biomass and carbon contents in existing plantations outside West Java		←	→	→	→
1-c. Measurement of biomass in control plots (baselines)					
1) Establishment of baselines in West Java	← →				
2) Measurement of biomass and carbon contents of baselines in West Java	←	→	→	→	→
3) Measurement of biomass and carbon contents of baselines outside West Java		←	→	→	→
1-d. Data analysis and development of methodologies to estimate carbon contents in forests (plantations and baselines)		←	→	→	→
2. Development of new technology for charcoal-applied plantation to maintain and enhance carbon fixation potential					
2-a. Measurement of effects of charcoal input into newly established plantations					
1) Establishment of experimental plots in West Java	← →				
2) Measurement of effects of charcoal input into newly established plantations in West Java	←	→	→	→	→
3) Establishment of experimental plots outside West Java		←	→	→	→
4) Measurement of effects of charcoal input into newly established plantations outside West Java		←	→	→	→
2-b. Data analysis and development of techniques for charcoal-applied plantation		←	→	→	→

3. Development of more effective technology for charcoal production					
3-a. Development of cost effective technology for charcoal production					
1) Data collection of conventional charcoal production	←	→			
2) Modification of conventional method for charcoal production (piling process)	←	→			
3) Development of modified open-hearth kiln	←	→			
4) Development (or improvement) of other types of kiln		←	→	→	
3-b. Quantification of charcoal production upon land preparation					
1) Data collection in newly established plantations in West Java	↔				
2) Data collection outside West Java		←	→	→	
4. Estimation of cost and revenue of carbon fixing					
1) Collection of existing data and information	←	→	→	→	
2) Data collection and analysis in newly established plantations in West Java	←	→	→	→	
3) Establishment of models for carbon fixing forest management				←	→
5. Preparation of a manual for carbon fixing plantation management				←	→

ANNUAL WORK PLAN



	2001									2002		
	4	5	6	7	8	9	10	11	12	1	2	3
3. Development of more effective technology for charcoal production												
3-a. Development of cost effective technology for charcoal production												
1) Collecting raw material				←	→							
2) Charcoal production: testing several types of charcoal kiln and collecting data				←			→					
3) Crushing charcoal					←			→				
3-b. Quantification of charcoal production upon land preparation												
1) Measuring amount of biomass in control plots			←	→						←	→	
2) Measuring amount of charcoal produced (Charcoal production) from each type of kiln				←			→					
4. Estimation of cost and revenue of carbon fixing plantations												
1) Data collection for financial analysis			←									→
5. Preparation of manuals for carbon fixing plantation management												

Ⅱ. Provision by Japan	2001									2002		
	4	5	6	7	8	9	10	11	12	1	2	3
1. Dispatch of Japanese Experts												
1-a. Long term expert												
1) Chief Advisor	←	—	—	—	—	—	—	—	—	—	—	→
2) Silviculture	←	—	—	—	—	—	—	—	—	—	—	→
3) Forest management	←	—	—	—	—	—	—	—	—	—	—	→
4) Coordinator	←	—	—	—	—	—	—	—	—	—	—	→
1-b. Short term Expert												
1) Biomass survey method			↔	↔								
2) Forest soil				↔	↔							
3) Charcoal production method					↔	↔						
4) Charcoal application technique						↔						
2. Training of counterpart personnel							↔					
3. Equipment												
1) Road construction (in newly established plantations)			←	—	—	→						
2) Building sheds and a watchtower (in newly established plantations)			←	→								
3) Supply of equipments *)	←	—	—	—	—	—	—	—	—	—	—	→

*) Include equipments indicated below;

1. Land cruiser, Constant temperature oven, Banch circular oven, Ultrasonic hypsometer, Distance meter, etc. (Equipments purchased in the 2000 Japanese fiscal year)
2. NC analyzer (Equipments purchased in the 2001Japanese fiscal year)

Ⅲ. Provision by Indonesia	2001									2002		
	4	5	6	7	8	9	10	11	12	1	2	3
1. Project Manager	←											→
2. Coordinator	←											→
3. Field manager	←											→
4. Counterpart personnel												
1) Silviculture	←											→
2) Forest management	←											→
3) Charcoal	←											→
5. Administrative personnel	←											→
6. Building and facilities	←											→