

## **Feasibility study of a participatory reforestation project on Lombok Island, Indonesia**

**(Japan International Forestry Promotion & Cooperation Center (JIFPRO))**

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### **Executive Summary**

1. It is not yet decided whether the re-afforestation project would be included in the Clean Development Mechanism under the Kyoto Protocol. But if it is included, it could be of great help for promoting the rehabilitation of deforested and degraded areas in the developing countries.

2. This feasibility study was made on the Lombok Island, Nusa Tenggara Barat. The site of field survey was chosen in the southeastern part of the island, where the Japan International Forestry Promotion and Cooperation Center (JIFPRO) had established a 350 ha of mixed broad leaf forest (Friendship Forest) in cooperation with the Ministry of Forestry of Indonesian Government and the donor companies in Japan since 1997.

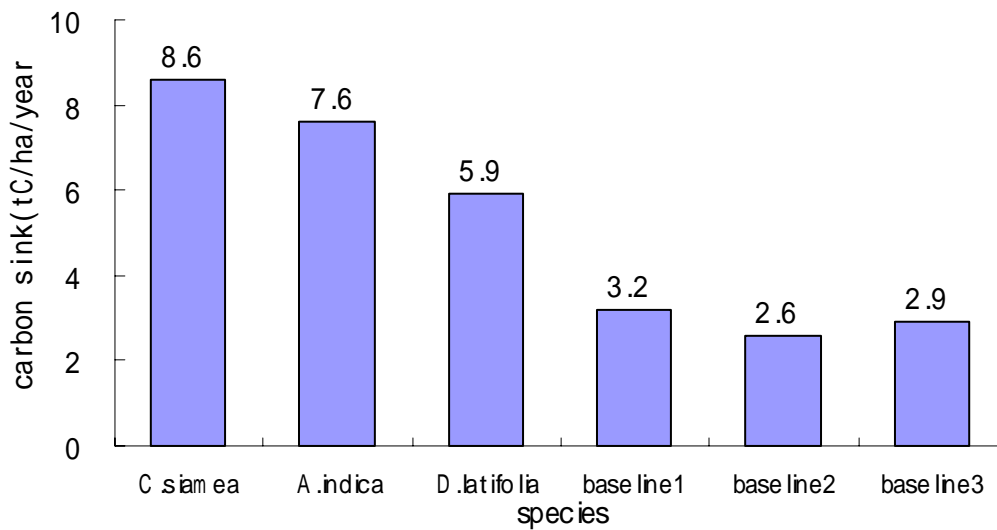
3. The main aims of the study are to examine the possibility of a Participatory Re-afforestation Project for Reinforcement of the Sink of Carbon Dioxide as well as to evaluate the cost and benefit of the Project, i.e. the expenditure for establishing and maintaining forests and the amount of carbon dioxide gas sequestered by them.

4. In addition, the possible effects of the project on the surrounding area were studied to ensure the positive influence on the living standard and natural environment of the region and to promote green product standard.

5. A field survey was made, from September 5<sup>th</sup> to 9<sup>th</sup>, 2000, to estimate the amount of carbon dioxide gas sequestered at the Friendship Forest. Some sample trees of three local species with the forest canopy closed were felled for analyzing the actual growth and the amount of CO<sub>2</sub> sequestered under the semi-arid conditions.

( Please see the photographs attached)

6. The baseline level of the carbon dioxide gas sequestered was also estimated by a project-specific method and it was found that the net sequestration rate of CO<sub>2</sub> by the forest trees are as the following figure and table:



### Carbon Sequestration of the Lombok Friendship Forest

| Species                            | Carbon sink (net) ( tC/ ha/ yr ) |
|------------------------------------|----------------------------------|
| Imba ( Azadirachta indica )        | 4.7                              |
| Johar (Cassia siamea )             | 5.7                              |
| Sonokeling ( Dalbergia latifolia ) | 3.0                              |

7.The estimation was made for the expenditure on the establishment of the large-scale participatory re-forestation in the vicinity of the Friendship Forest, taking due consideration on the relationship of the project with the local people and natural environment.

8.It was proposed that

- (1)the size of the annual planting area should be moderate in order to sustain the same level of the employment for a long period,
- (2)the various species should be planted to diversify the new forest ecosystem, and
- (3)some fruit trees should be included for the local people to get some cash crops as they get less harvest from agro-forestry due to negative impacts of trees.

9.A tentative 5 year plan of the participatory re-forestation was formulated for a further evaluation as the following table:

### Planting Program for the First Five Years

( Unit: ha )

|                                | <b>1</b>   | <b>2</b>   | <b>3</b>   | <b>4</b>   | <b>5</b>   | <b>Total</b> |
|--------------------------------|------------|------------|------------|------------|------------|--------------|
| Imba<br>(A. indica )           | <b>30</b>  | <b>90</b>  | <b>110</b> | <b>110</b> | <b>110</b> | <b>450</b>   |
| Johar<br>(Cassia siamea )      | <b>30</b>  | <b>90</b>  | <b>110</b> | <b>110</b> | <b>110</b> | <b>450</b>   |
| Sonokeling<br>( D. latifolia ) | <b>30</b>  | <b>90</b>  | <b>110</b> | <b>110</b> | <b>110</b> | <b>450</b>   |
| Fruit trees                    | <b>20</b>  | <b>60</b>  | <b>30</b>  | <b>20</b>  | <b>20</b>  | <b>150</b>   |
| <b>Total</b>                   | <b>110</b> | <b>330</b> | <b>360</b> | <b>350</b> | <b>350</b> | <b>1500</b>  |

10. Based on the planting program, a comprehensive plan of the participatory re-forestation project for reinforcement of the sink of carbon dioxide was formulated for a period of ten years as shown in the table on the next page.

11. The followings were found from the comprehensive plan :

- (1) The total area to be planted during the project period is 3,440 ha, of which 380 ha will be planted by fruit trees.
- (2) The total amount of the project cost is about 20 thousand million Rp., of which 12.5 thousand million Rp. will be a direct cost for planting activities.  
(The average annual expenditure for the project will be around 2,000 million Rp.)
- (3) The amount of carbon dioxide sequestered through the project in ten years' period will be about 75,500 tC(carbon equivalent tons) or 277,000 tCO<sub>2</sub>.
- (4) The total cost for one ton of carbon sequestered is therefore about 265 thousand Rp., while the cost for CO<sub>2</sub> sequestration is decreasing as the forest grows.

12. The importance of monitoring the achievements and various effects of the project was strongly emphasized in order to ensure the amount of carbon sequestered and to observe the natural and socio-economic effects of the project on the surrounding area.

**Ten year plan of a participatory re-forestation project  
for reinforcement of the sink of carbon dioxide**

| Year   |                           | total in 10 years |                   |       |       |       |       |       |       |       |        |        |        |
|--|---------------------------|-------------------|-------------------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
|  |                           |                   | 1                 | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9      | 10     |        |
| Items  |                           |                   |                   |       |       |       |       |       |       |       |        |        |        |
| Planting Area<br>( HA )                          | total                     | 3,440             | 110               | 330   | 360   | 350   | 460   | 330   | 360   | 350   | 460    | 330    |        |
|  | Irmba (A. indica)         | 1,020             | 30                | 90    | 110   | 110   | 140   | 90    | 110   | 110   | 140    | 90     |        |
|  | Johar (C. siamea)         | 1,020             | 30                | 90    | 110   | 110   | 140   | 90    | 110   | 110   | 140    | 90     |        |
|  | Sonokeling (D. latifolia) | 1,020             | 30                | 90    | 110   | 110   | 140   | 90    | 110   | 110   | 140    | 90     |        |
|  | Fruit trees               | 380               | 20                | 60    | 30    | 20    | 40    | 60    | 30    | 20    | 40     | 60     |        |
| Carbon sink<br>( tC )                            | total                     | 75,486            | <i>(tC/ha/yr)</i> | 462   | 1,848 | 3,412 | 4,946 | 6,942 | 8,328 | 9,892 | 11,426 | 13,422 | 14,808 |
|  | Irmba (A. indica)         |                   | <i>5.7</i>        | 171   | 513   | 627   | 627   | 798   | 513   | 627   | 627    | 798    | 513    |
|  | Johar (C. siamea)         |                   | <i>4.7</i>        | 141   | 423   | 517   | 517   | 658   | 423   | 517   | 517    | 658    | 423    |
|  | Sonokeling (D. latifolia) |                   | <i>3.0</i>        | 90    | 270   | 330   | 330   | 420   | 270   | 330   | 330    | 420    | 270    |
|  | Fruit trees               |                   | <i>3.0</i>        | 60    | 180   | 90    | 60    | 120   | 180   | 90    | 60     | 120    | 180    |
| Direct Planting Cost<br>(Million Rp)             | total                     | 12,459            |                   |       |       |       |       |       |       |       |        |        |        |
|  | First 5 year              | 5,433             | 398               | 1,195 | 1,304 | 1,268 | 1,268 |       |       |       |        |        |        |
|  | Second 5 year             | 5,433             |                   |       |       |       | 398   | 1,195 | 1,304 | 1,268 | 1,268  |        |        |
|  | Third 5 year              | 1,593             |                   |       |       |       |       |       |       | 398   | 1,195  |        |        |
| Maintenance and<br>Related Costs<br>(Million Rp) | total                     | 7,525             |                   |       |       |       |       |       |       |       |        |        |        |
|  | First 5 year              | 3,791             | 759               | 498   | 549   | 498   | 549   | 125   | 177   | 125   | 177    | 334    |        |
|  | Second 5 year             | 2,477             |                   |       |       |       | 258   | 498   | 549   | 498   | 549    | 125    |        |
|  | Third 5 year              | 1,257             |                   |       |       |       |       |       |       | 759   | 498    |        |        |
| Total Cost                                       | (Million Rp)              | 19,984            | 1,157             | 1,693 | 1,853 | 1,766 | 2,473 | 1,818 | 2,030 | 1,891 | 3,151  | 2,152  |        |
| Cost per Carbon sink                             | (Thousand Rp/tC)          | 265               | 2,504             | 916   | 543   | 357   | 356   | 218   | 205   | 165   | 235    | 145    |        |

13. The sustainability of the project is also examined and the following recommendations were made:

- (1) More research/study should be made on how villagers can coexist with forests without degrading their capacity of carbon sequestration for a long period.  
(Trial production of biomass charcoal and marketing research on tree fruits etc.)
- (2) Cooperative activities should be made for the capacity building of human resources for the effective monitoring and management of the project.  
(Development of OJT in the project and international training programs)

14. Regarding the feasibility of the project, some discussions were made as follows:

- (1) Since the framework and rules of the Clean Development Mechanism are not decided yet, and therefore there is no price put on the emission rights of carbon dioxide, it is very difficult to judge the feasibility of the project at this moment.
- (2) However, if the price is set above the cost of this project, there is a possibility of realizing the re-forestation plan, on the condition that the governments concerned are willing to recognize the project as a CDM project.

15. In view of the environmental and social implication of this project, the following comments and recommendations were made by the Japanese experts concerned:

- (1) The re-forestation project for the environment tends to be less efficient in terms of carbon sequestration, because it is planned in the area where natural conditions are not so favorable as compared with the industrial plantations.
- (2) However, in the case of the environmental plantation, felling will be restricted and carbon sink will be increasing continuously. Therefore this project may have more sustainability than the industrial plantation.
- (3) We should take due consideration on such characteristics when the environmental plantation projects are compared with the industrial plantation.
- (4) One of the key issues for the success of the project is how the carbon sink forests can merit the local people near the forest, especially after the forests are established to reduce the opportunities of employment for the project activities.
- (5) Accordingly it will be of great importance for us to study, in cooperation with the Indonesian counterparts, how the environmental forest plantations can contribute in a sustainable manner to the livelihood of the people around them.

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