

PROPOSAL FOR POVERTY AND ENVIRONMENT PROGRAM (PEP)

A. BASIC DATA

1. **Title:** Saving the Tsunami-Affected Trees in the Maldives
2. **ADB Officer:** Ki Hee Ryu, Project Specialist, SAAE
3. **Request Date:** 28 January 2005
4. **Implementing Organization:** Department of Agriculture, Ministry of Fisheries, Agriculture, and Marine Resources (MFARM), Government of Maldives
5. **Types of Interventions:** As a total of 373,000 perennial crops, fruit trees and forest are severely affected and 874,000 trees will be damaged within a short period, the Ministry of Fisheries, Agriculture, and Marine Resources (MFARM) will mobilize selected poor communities in Maldives to conduct participatory rural appraisal and planning to save half of these trees and restore livelihoods of communities. An international tree treatment team will also visit the Maldives to help in assessing the contamination of soil and water, demonstrate treatment of the tsunami-affected trees in the field, provide training on treatment methods for government officials, NGO staff, local government officials, informal farmer group leaders, provide the treatment inputs, and improve public awareness and engagement of agricultural extension services through national TV programs and internet websites.
6. **Amount of Request:** \$250,000 (total budget of \$360,000)
7. **Project Implementation Period:** One year (15 February 2005 – 14 February 2006)
8. **Region/Country:** The Maldives (primarily Outer Atolls)

B. DESCRIPTION OF IMPLEMENTING ORGANIZATION

9. The Ministry of Finance will be the Executing Agency and MFARM the Implementing Agency. Both agencies have good records in implementation of technical assistance. MFARM is well aware of the present problem, and would like to identify solutions through participatory approaches and with the help of experts to handle treatment of the tsunami-affected trees.

C. PROPOSED SUBPROJECT

10. **Background and Rationale:** A strong earthquake was detected on 26 December 2004 near Sumatra, Indonesia, generating huge tsunami waves that hit the coastlines of several countries in southeast Asia, including Maldives. Almost the entire country was affected by the tsunami. Of the 199 inhabited islands in the archipelago, 53 islands suffered severe damage, and 20 islands were totally destroyed. 84 people are known to have died while another 26 are confirmed as missing. About 100,000 people, or 35% of the total population of 290,000, have been severely affected. As the Maldives lie outside of the tropical typhoon/storm surge belt, the natural and man-made water and vegetative systems of the islands lacked resilience to withstand the saline contamination brought on by the tsunami.

11. The tsunami badly hit the major economic sectors of tourism, fisheries and agriculture.

With specific respect to the agriculture sector, while it accounts for a small percentage of the country's GDP (2.6%), there were substantial destruction to standing crops and perennial crops, fruit and timber trees, loss of farming equipment and damage to agriculture infrastructure. This has disproportionately affected the poor, who rely on agricultural and tree products as a major source of their livelihoods, fuel and nutrition. Soil and ground water resources are affected by tsunami waves causing temporary, semi-permanent or even permanent damage. The damages include salinization of many agricultural soils and direct injuries to the leaves of many agricultural crops, including banana, mango, and palm trees. Urgent countermeasures are needed to save the trees and to ameliorate the affected soil. Salinization of soil and ground water is of serious concern to small and marginal subsistence farmers. They also need to replant their annual crops to restore the basis for their livelihoods.

12. As of 18 January 2005, the Government reported that there is almost 30% damage to the field plots of inhabited islands. In addition, field missions and rapid assessments report complete damage to home gardens in several islands. It has been observed that within a week of the tsunami, breadfruit trees were drying up. The breadfruit is among the staples in the Maldivian diet and takes about 15 years to reach fruit-bearing stage. Concerns were expressed about the fresh water table being contaminated by salt-water leading to other fruit trees being similarly impacted. There is no estimate available on the loss to coconut and banana plantations, but significant damage has been reported. In addition, three islands that were completely flooded are engaged mainly in agriculture, i.e. Baara, Kashidoo, and Isdhoo. In terms of direct employment on these islands, over 700 people (16%) were engaged in farming and may now have to look for other sources of income until agricultural activities can be resumed. In islands where flooding reached at least a quarter of the island's area, close to 2,200 residents were directly involved in agriculture and face similar situations.

13. The Maldives Vulnerability and Poverty Assessment Report identified atoll island communities as most disadvantaged and vulnerable and recommended their targeting for poverty alleviation efforts.¹ The report also estimated that two-thirds of the atoll population makes use of firewood as its principal fuel and concluded that deforestation, caused mainly by the unsustainable use of firewood for cooking, is contributing to environmental degradation. It is these poor atoll communities who have been the worst affected by the tsunami, and the treatment of trees will help to meet their immediate needs while reducing their vulnerability and enhancing island environmental quality. MFARM will coordinate the mobilization of farmer groups from the affected areas and supports the targeting of interventions to these areas.

14. A post-tsunami emergency loan is currently in preparation by ADB that will include actions to address the severe freshwater supply shortages as well as other specific measures to restore the basis for livelihoods, especially among the poor. The activity will provide information on water management and agricultural production valuable to this design effort.

14. The Poverty and Environment Program aims to promote targeted environmental interventions that contribute to poverty reduction and environmental improvement and one of its priority areas is the reduction of the poor's vulnerability to natural hazards and disasters. The proposed activity fits the PEP objectives and selection criteria because it directly addresses an obvious link between natural resources degradation as a result of the tsunami and the conditions leading to poverty in the islands. It also will generate useful knowledge on reducing

¹ Ministry of Planning and National Development and United Nations Development Programme, 1999, Vulnerability and Poverty Assessment 1998, Singapore

the vulnerability of poor communities to natural hazards and test new approaches to dealing with the specific problems currently facing the Maldives that may be of use elsewhere. Thus, PEP is seen as the most appropriate resource to finance this modest proposal targeted to meeting these objectives—tied to the conservation and sustainable use of natural resources—while also addressing the immediate post-tsunami vegetative die-back crisis. Moreover, given the swift approval procedure, through its Steering Committee, PEP resources can be made available quickly to meet the need for the tsunami-affected areas to help restore the basis for livelihoods and nutrition.

15. **Objectives:** The objective of the envisaged PEP activity is to assist the Government's effort in restoring sustainable livelihoods of the tsunami-affected farmers through a systematic program to help save the country's trees (comprising the majority of its vegetative cover). The program will improve livelihoods, reduce vulnerability to external shocks, improve the basis for sustainable natural resources management and reduce rural poverty in the tsunami-affected outer atolls of the Maldives.

16. **Scope of Work/Description of Proposed Approaches:** The activity aims to save one-half of the estimated 840,000 tsunami-affected trees through a participatory approach, using active informal farmer groups and a public awareness program. MFARM will organize the consultation process with targeted poor communities and lead the planning and formation of farmer groups. An expert team—consisting of tree physiologist, tropical farm tree specialist, horticulturalist, geohydrologist, soil scientist and an agriculture economist—will be mobilized to assess the soil and water contamination, provide technical guidance and identify the feasible ways of saving as many as possible of the affected trees. Their terms of reference are in Annex 1.

17. The seven proposed components of the program are: (i) consult and plan with poor communities to identify the extent of tree damage and to select appropriate pilot intervention sites; (ii) establish informal farmer groups; (iii) assess the contamination of soil and groundwater in selected sites; (iv) identify tsunami-affected trees; (v) select tree species to be treated by the informal farmer groups; (vi) provide inputs to farmer groups treating the trees; and (vii) establish a public awareness program through TV, Internet and newspaper.

18. Practical field treatments to save the tsunami-affected trees that may be introduced based on the recommendations of the expert team will include:

(i) **Immediate supply of irrigation water.** This is expected to be the best method to reduce salts in soil. Unfortunately, surface water is not available now, and much of the groundwater is contaminated with saline water. Irrigation water should have conductivity lower than 4 dS/m to be used to reduce salts in soil. When the rainy season begins in May in the Maldives, natural rainfall is expected to leach out the salts from the soil. However, at least 200 mm of rainfall (or equivalent irrigation) is required to leach out 90% of the salts.

(ii) **Application of gypsum to the soil.** This may be able to help to save trees, as gypsum is a fertilizer made of calcium sulfate. It can temporarily fix the free ions from salt. Later they would be naturally leached out by rain.

(iii) **Mulching with any type of locally available organic materials.** This will reduce evaporation from the soil, which is bringing up the salt to the root zone and increasing damage to the trees. Current estimates are that the depth of mulching should be at least 5 cm or more.

(iv) **Appropriate techniques of tree pruning.** Especially for fruit trees (e.g. mango), this should reduce transpiration and decrease absorption of salt solution by the tree.

(v) **Identification saline-tolerant tree species and genotypes.** As identified, such trees can be immediately propagated and used as rootstocks for grafting.

(vi) **Application of calcium nitrate or magnesium sulfate to the leaves as a solution.** This will supply additional nutrients to the leaves and keep the plants stronger to withstand the period of unbalanced nutrition.

19. **Activities:** Proposed activities are as follows: (i) stakeholders consultations to survey the affected agricultural fields in the Maldives to estimate the degree of damages to agricultural crops and to identify sites for pilot interventions; (ii) organization of informal farmer groups; (iii) field treatment in selected sites to validate the degree of damages, especially to mango and palm trees and to determine treatment methods using locally available resources; (iv) determine the feasibility, timing, and economics of implementing scientific techniques for rehabilitation of the affected trees; (v) training stakeholders on the most economical and practical measures to rehabilitate the damaged farm trees and salinized soils in the Maldives; (vi) pilot rehabilitation of trees in selected sites; (vii) public awareness program; and (viii) preparation of a field manual.

20. **Work Plan and Reporting:** The project will be conducted over 12 months, with the most intensive and urgent period of work during the first 3-4 months. Significant efforts will be given before the onset of the rainy season (in May or June) to improve public awareness and grass roots initiatives, working with the communities and the local governments on planning issues and public awareness. Detailed work plan is provided in Annex 2.

21. The first visit of the expert team in late February or early March 2005 will be to identify constraints and test practical approaches to save trees in the most damaged atolls near Male. Based on the collected information about outer atolls, including availability of needed materials, equipment, labor supply and cost, local experts, soil conditions, and weather patterns, four teams will visit 35 severely affected agricultural islands and demonstrate treatment methods. A training and public awareness program will be established. Informal farmer groups will closely monitor the treated trees over the remaining 9 months. Progress reports will be submitted regularly to the Government and ADB for local communications and exchange of ideas.

22. **Expected Outputs and Outcomes:** The program is setting a target of saving at least 420,000 trees, out of the estimated 840,000 tsunami-affected trees. The program will produce a public awareness program and treatment manual for the tsunami-affected timber trees and fruit trees. The livelihoods of the tsunami-affected farmers, who are marginal and subsistence farmers, will be at least partially restored and their vulnerability to extreme poverty reduced. The program will have improve the future resilience of poor communities to natural hazards by adopting the community decision approach to represent the poor communities in the decision making process. The community decision approach introduced in the program will be also adopted in the major interventions under the ADB emergency assistance grant. The performance indicators for the inputs, activities, outputs, and outcomes are detailed in Annex 3.

23. **Evaluation and Information Dissemination:** Periodic monitoring and analysis with the farmer groups will be conducted during program implementation, with periodic publication of monitoring report and newsletters, highlighting the achievements. At the national level, the Department of Agriculture will be the main dissemination platform. Results will be disseminated

at the national level using informal farmer groups. A mid-term and final workshop will be conducted in Male. Reports and CD-Roms will be prepared, which will be distributed to the atoll offices. Project outputs will be distributed through a dedicated webpage. The activities will be process-oriented, rather than product-based. These processes are considered as instruments for: (i) wide stakeholder involvement; (ii) ownership transfer to the community and local government; and (iii) ensuring sustainability after the program completion. At the community level, the program will provide sustainable benefits to poor people and communities by helping to secure their lives and livelihoods after the disaster as the result of program activities and to improve their resilience to natural hazards for the future.

24. **Scope for Replication/Use in other DMCs:** The treatment methods of saving the tsunami-affected trees are not unique and limited to the Maldives. The approach of application of the methods identified can be replicated in other tsunami-affected countries, Indonesia, Sri Lanka, and India. They may also be of use to other small island states and coastal communities subject to salt-water inundation from extreme storm surges (or tsunamis). The participatory approaches that will be employed will also improve knowledge on how such mechanisms for getting communities involved in responding to natural disasters and restoring livelihoods can be made more effective and replicated in other DMCs faced with similar situations.

D. Cost Estimate

25. The program cost is estimated at \$360,000, of which \$250,000 (69%) is to be financed through the Poverty and Environment Program and \$110,000 (31%) is counterpart fund from the MFARM and the farmers. The detailed estimates are shown in Annex 4.

E. Implementation Arrangements

26. A project steering committee will be formed comprising members from the implementing agency, Ministry of Atoll Development, NGOs, and informal farmer groups. Under the steering committee, a working group will be formed with the representatives of the Ministries of Atoll Development and MFARM. The working group will send periodic reports to the steering committee, which will meet once in every three months (and more frequently during the inception period, as needed). The ADB Project Officer will submit to the PEP Secretariat a progress report 30 days after inception, a mid-term report, and a final report.

27. The program will be undertaken over one year starting in February 2005. ADB will recruit individual consultants in accordance with the *Guidelines on the Use of Consultants by the Asian Development Bank and Its Borrowers* and other arrangements satisfactory to ADB (invoking special emergency procurement provisions of direct selection, as required). The team leader will help the ADB task manager identify and engage suitable, qualified, international experts with expertise in tree physiology, tropical farm tree, horticulture, geohydrology, soil science. The team leader will also recommend a domestic agriculture economist to assist the team leader. The expert team will purchase necessary equipment in accordance with ADB's *Guidelines for Procurement* (and appropriate emergency provisions, as needed). The procured equipment will be registered under MFARM and handed over to MFARM on completion of the program.

Outline Terms of Reference of the Experts

A. Background

1. Huge tsunami waves hit the Maldives on 26 December 2004. Of the 199 inhabited islands in the archipelago, 53 suffered severe damage and 20 islands were totally destroyed. 84 people are known to have died while another 26 are confirmed as missing. About 100,000 people, or 35% of the total population of 290,000, have been severely affected.

2. The tsunami badly hit major economic sectors of tourism, fisheries and agriculture. Within the agriculture sector, there were substantial destruction to standing crops and perennial crops, fruit trees, loss of farming equipment and damage to agriculture infrastructure. Soil and ground water resources are affected by the tsunami waves causing temporary, semi-permanent or even permanent damage. The damages include salinization of many agricultural soils and direct injuries to the leaves of many agricultural crops including banana and mango farm trees. Urgent countermeasures are needed to save the trees and to ameliorate the affected soil. Especially, salinization of soil and ground water is of serious concern to small and marginal subsistence farmer. They also need to replant their annual crops to restore their livelihood.

3. The project will save the tsunami-affected 840,000 trees through participatory approach using active informal farmers group and public awareness program. An international expert team consisting of tree physiology, tropical farm tree specialist, two horticulture specialists, geohydrologist and soil scientist will be mobilized to provide technical expertise and identify the feasible ways to save the affected trees.

4. The proposed components are (i) assess the contamination status of soil and groundwater; (ii) establish informal farmer groups; (iii) identification of the tsunami-affected trees; (iv) selection of species of tree to be treated by the informal farmer group; and (v) treatment and provision of basic inputs to the affected farmer groups; and (vi) establish a public awareness program through TV, Internet and newspaper. Practical field treatments to save the tsunami-affected trees can be introduced from the previous experience of the experts.

5. The Ministry of Finance is the Executing Agency and the Fisheries, Agriculture, and Marine Resources (MFARM) is the Implementing Agency. The Department of Agriculture, MFARM is well aware about the present problem, but does not have experts to treat the tsunami-affected trees.

B. Consulting Services Requirements

6. The TA will require six international experts for 8 person-months and a domestic expert for 12 person-months, all with substantial experience relevant to forestry restoration in the Maldives.

1. Team Leader/ Tree Physiologist (International, three months)

7. The team leader/tree physiologist will undertake the tasks, but not limited to:

- (i) Manage the expert team in conducting assessments, treatments, training, report writing, coordinate with counterpart staff, arrange for the collection of relevant documents;

- (ii) Help the ADB task manager identify and engage domestic individual consultants; prepare draft and final reports
- (iii) Assess the extent of damage on trees;
- (iv) Assess soil and groundwater contamination;
- (v) Develop treatment methods of the tsunami-affected trees;
- (vi) Undertake training program;
- (vii) Establish a public awareness program; and
- (viii) Prepare reports required.

2. Two Horticulture Specialists (international, one month each)

8. The horticulture specialist will undertake the following tasks, not limited to:

- (i) Assess the extent of damage on individual fruit tree and on tree population;
- (ii) Demonstrate potential and practical methods of treating and/or alleviating the effect of salinity on fruit trees;
- (iii) Participate in the preparation of manual and other instructional material related to dissemination of effective treating methods of affected trees; and
- (iv) Participate in the workshop and preparation of reports.

3. Tropical Farm Tree Specialist (international, one month)

9. The specialist will undertake the following tasks, but not limited to:

- (i) Develop treatment methods of the tsunami-affected trees; and
- (ii) Undertake training program;

4. Geohydrologist (International, one month)

10. The geohydrologist will undertake the following tasks, not limited if the ADB project officer requested:

- (i) Measure contamination of groundwater wells;
- (ii) Prepare guidelines on the use of groundwater;
- (iii) Assess the suitability of groundwater for drinking water or irrigation water for the tsunami-affected trees;
- (iv) Recommend treatment of contaminated groundwater to improve its quality for drinking purpose; and
- (v) Advise on the implications of groundwater contamination for efforts to restore drinking water supply and fresh water for other purposes.

5. Soil Scientist (International, one month)

11. The soil scientist will undertake the following tasks, but not limited to:

- (i) Measure contamination of soils;
- (ii) Prepare guidelines on the use of soils;
- (iii) Assess the suitability of soils for cultivation of crops and the tsunami-affected trees; and
- (iv) Recommend treatment of contaminated soils to improve its quality for cultivation purpose.

6. Agriculture Economist (Domestic, 12 months)

The agriculture economist will assist the team leader in implementing project activities, but not limited to:

- (i) Organize stakeholder workshops to finalize the selection of schemes to be developed under the Project;
- (ii) Examine the ability of MFARM staff to implement envisaged works with regard to technical capacity and the amount of work that can be done annually;
- (iii) Verify damage of soil and groundwater resources in 35 agriculture islands;
- (iv) Check and finalize cost estimates for improvement of the soil and water resources;
- (v) Review sustainability aspects of recommended treatment; and
- (vi) Develop a public awareness program and train MFARM staff to operate the program.

Proposed Work Plan

Activity	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1. Stakeholders consultation	→												
2. Organizing informal farmer groups	→												
3. Field treatment to validate degree of damages		→											
4. Determine feasibility, timing, and economics of implementing scientific techniques		→											
5. Training stakeholders on the most economical and practical measures to rehabilitate the damaged farm trees		→											
6. Pilot rehabilitation of tree in selected sites		→	→	→	→	→							
7. Public awareness program;			→	→	→	→	→						
8. Preparation of a field manual.							→	→	→	→	→	→	→

Performance Indicators

	<i>Expected Results</i>	<i>Performance Indicator</i>
<i>Outcome</i>	Restored the livelihoods of tsunami-affected farmers in Maldives and reduced their vulnerability to natural hazards	Number of farmers provided with new livelihood opportunities
	Improved MFARM capacity to apply participatory decision-making approaches in its programs and activities	Participatory decision-making approaches integrated in MFARM's operational procedures
<i>Outputs</i>	Rehabilitated about 420,000 tsunami-affected trees	Number of trees rehabilitated
	Applied effective treatment methods for saline-contaminated fields	Hectares applied with effective treatment methods
	Conducted public awareness program	Completion and Distribution of treatment manual Established website to pose effective treatment methods Number of farmers with access to TV and newspaper
	Applied participatory approaches in rehabilitating trees and restoring livelihoods	Number and diversity of stakeholders involved; Number and percentage of farmers who participated; Number of Farmer Groups formed
	Prepared field manual and cd-roms	Numbers of farmers and government agencies provided with the manual and cd-rom
		Number and diversity of stakeholders involved
<i>Activity</i>	Stakeholders consultation	Number and diversity of stakeholders involved
	Organizing informal farmer groups	Number and percentage of farmers who participated
	Field treatment to validate degree of damages	Estimate of the degree of damage and corresponding treatment
	Determine feasibility, timing, and economics of implementing scientific techniques	Options and corresponding cost to treat saline-contaminated trees are provided by the consultants
	Training stakeholders on the most economical and practical measures to rehabilitate the damaged farm trees	No. and percentage of stakeholders trained
	Pilot rehabilitation of trees in selected sites	Number of sites selected; Number of farmers who adopted the treatment methods
	Public awareness program	Documentation of Proceedings
	Preparation of a field manual.	Timely completion of the manual
<i>Input</i>	Consultants, Staff time, Procurement, Logistical support	Consultants hired, staff appointed, equipment/supplies procured and logistical support provided by the implementing agency

Cost Estimates
(US\$)

Activity	Requested	Government Contribution	Total
1. Community consultation and planning		10,000	
2. Establishment of informal farmer groups	29,600	5,000	29,600
3. Assessment the contamination of soil and groundwater	40,800	37,000	77,800
4. Treatment of the affected trees (field treatment, feasibility of techniques, training of farmers, pilot-testing)	99,100	10,000	99,100
5. Establishment of a public awareness program and preparation of field manual	80,500	18,000	98,500
*Logistical Support (counterpart staff, office space, supplies)		30,000	30,000
Total	250,000	110,000	360,000