EXECUTIVE SUMMARY

3 years research project
Mangrove restoration Myanmar
July 2012-June 2015

Worldview International Foundation
in cooperation with Pathein University, Myeik University, Forestry University and Ministry of Environmental Conservation and Forestry, Myanmar.

Supported by Letten Foundation, Norway.

INTRODUCTION

Mangrove is a unique tropical forest type covering 145,000 Km$^2$ in tropical and subtropical zones in 123 countries. It represents critical provisions of ecosystem services (Spelding et al. 2010). Mangroves are considered as high priorities in climate change adaptation and mitigating strategies throughout the world with exceptionally high carbon stocks, among the highest of any ecosystems (Center for International Forestry Research CIFOR 2012). In spite of the vital role of mangrove in environmental protection, the rate in destruction of mangrove forests are three times higher than of terrestrial forests, with over 50% of global mangrove forests lost during the last 35 years (FAO 2010). If no effective action is taken, most of the world’s vital mangrove forests could be lost within the next 30 years. Between 1-7 % of blue carbon sinks are being lost annually (CIFOR 2012). Myanmar has since 1980 lost 1 million Ha (Myanmar Forestry Department 2013), with only 16% left in the vital Delta region (NASA 2013).
The losses of mangrove forests in Myanmar has already lead to dramatic consequences. Lack of mangroves as a protective shield caused high losses of life and properties from cyclone Nargis in 2008. The rapid destruction of mangrove forests has also dramatically reduced food security and income from fishing, as mangroves contribute up to 50% increase in sea food stocks. 32-75% of all tropical commercial fish species pass part of their lives in the mangroves, where they encounter nursery grounds, shelter and food (CIFOR 2012).

Furthermore, sea grass and coral reefs have been seriously damaged due to lack of natural water filtered by mangroves of sediments and run-offs. Long term value are traded for short term gains in the form of non-sustainable prawn farming, charcoal burning and other short term investments, compared to sustainable value of standing mangrove forests per Ha calculated to USD 200,000-900,000 per year (Wells et al. 2006), USD 300,000/Km of shoreline storm protection and flood control (Gilman et al. 2008) and value for fisheries USD 37,500/Ha per year (Aburto-Oropeza et al. 2008). Taking into account mangrove’s record high CO2 mitigation capacity, up to 5 times higher than rainforest trees, it is worth noting that the social value of Blue Carbon is calculated to USD 41 per ton (Pendleton et al. 2013). This illustrates the value of mangrove’s effective Green House Gas mitigation capacity with high social value, a critical service in the age of climate change and need of poverty reduction. It is therefore not only of national importance to protect and restore mangrove forests in Myanmar, but also it is of equal importance to the global society.
HIGHLIGHTS OF THE RESEARCH PROJECT

The project started in 2012 after initial discussions with the Minister of Environmental Conservation and Forestry and the Rector of Forestry University. The Chief Minister of Ayeyarwaddy Division proposed partnership with Pathein University, with Myeik University to follow. These are two leading coastal universities with marine science departments consisting of dedicated academic staff with special interest in mangrove restoration.

The project has provided better understanding of the prevailing problems and identified better strategies and methods. This is based on needs to further develop capacities of coastal universities to deal with urgent challenges in mangrove conservation and restoration, as well as other sustainable environmental issues. The key to successful achievements is foremost based on high level of knowledge and capacity of national institutions, with a distinctive role for universities.
Capacity Building

During the three years period of the project, capacity building of the universities has been one of the main tasks. The project has supported establishment of computer labs and other development needs, as well as research grants to 47 students and academic staff. 32 research papers have been produced on flora and fauna, water and soil in mangrove restoration areas, in addition to practical research in testing out various methods by mobilizing local communities as well as establishing a mangrove university park on 1,800 acres land, with the first mangrove gene bank of its kind. Extensive research combined with practical test has provided valuable knowledge for future restoration projects.

The research project has been supervised by Worldview’s Senior Science Director, Dr. Ranil Senanayake and supported by Professor Dr. Khin Maung Cho (Head of Marine Science Pathein and later Pro Rector of Myeik), Professor Dr. San Tha Tun and Professor Htay Aung (Marine Science Pathein) and Professor Dr. Nang Mya Han (Head of Marine Science Myeik). The high standard of its professional staff was confirmed in 2015 with the President’s award to Professor Dr. Nang Mya Han for excellent research. In addition, she contributed greatly to the success of the Hearing in the Norwegian Parliament in May 2014 on the role of mangroves in CO2 mitigation/adaptation to climate changed, and her participation as a resource person in other international forum.

The research project has also gained professionally from the most experienced mangrove specialists in Myanmar, U Win Maung, former Director at Forestry Department. He was in charge of the country’s most successful community based mangrove restoration project before joining Worldview in 2015 as manager of the mangrove projects in Myanmar.
POTENTIALS OF MANGROVE RESTORATION

Based on data collected during the research period, it is estimated that Myanmar has potential to restore 500,000 Ha lost mangrove forests (50% of its lost areas since 1980), with capacity to mitigate up to 500 million tons CO2. This is a considerable contribution to global climate efforts (10 times Norway’s yearly emissions), in addition to effectively protecting standing forests of 1 million Ha with carbon sink of 1 billion tons (estimated tonnage by using data from IPCC working group to the Third Assessment Report of the Intergovernmental Panel on Climate Change 2011).

Problems in restoration
The challenge is to stop further destruction and restore as much as possible of the losses of Myanmar’s rich bio-diversity, with special emphasis on mangrove restoration and conservation of valuable national resources. This is a complex issue not only related to the physical environment and planting practises, but even more to the social and economic condition in coastal areas, plagued with high level of poverty. The struggle for millions of people to meet their daily needs is leading to growing pressure on natural resources like firewood and timber.

Charcoal burning village
In order to reach sustainable goals, Myanmar needs a new approach in management of mangrove resources, based on scientific research with practical sustainable solutions, taking into account the immediate needs in livelihoods of coastal communities, combined with stronger implementation of the Government’s Forest Policy of 1995, especially with emphasis of law enforcement.

The project has benefitted from valuable cooperation with the Ministry of Environmental Conservation and Forestry. We are confident the Forestry Department dedicated staff are doing their best to promote mangrove restoration and conservation, in spite of limited resources. We hope the findings of the research project can be of value for future projects in Myanmar.

There is no quick fix for successful implementation. It is basically an issue of carefully planned integrated projects which includes the immediate needs of coastal communities, based on the following priorities:

a) Knowledge based planting methods  
b) Public education and social mobilization of local communities  
c) Livelihood support to reduce economic exploitation of natural resources  
d) Compensation for forest harvests in form of alternative sustainable energy for people’s daily needs  
e) Implementation practises based on long term sustainable goals.
Mangrove forests are fast disappearing, in spite of several well meaning projects. It is learnt that private sector initiatives in general have not yielded expected results, with less than expected impact of community forest projects in general. A case in point is “Rampant illegal cutting in community forests areas” reported by Centre for People and Forests CPF (2015). This is a serious concern, especially with the aim of establishing permanent forests for shore line protection and CO2 mitigation based on sustainable management. Community managed projects sounds good, but if these projects are not sustainable, the expected results are lost. It is therefore important to improve the concept further, including rewards for sustainability. The need for a new strategy has also been identified in other surveys like “Proposal for Burmese forest management” (University of Southern California 2012).

The Worldview research project has highlighted the following concerns:

a) Sustainable long term goals as basic for successful projects
b) Public education and social mobilization of local communities
c) Support for local initiatives of community development
d) Support to schools and community institutions as part of a comprehensive strategy
e) Energy needs to be met by introduction of cost effective fuel saving stoves and low cost solar lamps. Proven saving of Kyat 109,000 per year (40% less cost of fuel and savings of costly candle lights as in 2014-15 tests).
f) Establishment of village based biogas units and wind/solar energy for larger energy needs including alternative sustainable energy forests with gliricidia sepium for additional income generation (2015).
g) Creating new livelihoods by training community based production teams in better utilization of local resources: Establishment of mini-aquaculture projects, nypa natural sweetener production (utilizing potentials from large nypa mangrove palm areas in mangrove environments), and other high potential initiatives for livelihood creation (2013-15).

h) Training of women in the use of mangrove bark natural colours for clothes (2015), utilization of medicinal mangrove based products, honey production in mangrove areas (best quality honey) and orchid production in mangrove forests (2015). A number of other livelihood projects have also been identified based on local conditions. Solutions have been proven possible with creative innovation based on people’s participation.
Role of coastal communities.

Mobilizing coastal communities inspires valuable capacity both in nursery establishment and restoration management. A test project with 43 villagers in Kan Su (mostly women) contributed greatly to production of 36,000 seedlings in their own nurseries (2013-14), with 50% planted on available land in the village, and the balance shared with the neighbouring village Wet Su for protecting paddy fields from water hyacinth pollution. Follow up of the projects have proven successful results, both for increasing bio-diversity as part of sustainable village development, as well as establishing sustainable protection from hyacinth pollution in paddy fields for food security and improved income to rice farmers. The result of these tests is a clear indication of large potentials in mobilization of local communities, with valuable benefits to all stakeholders.

Community based nurseries

Sharing knowledge with village communities promotes strong impact in motivation and understanding of the issues. It bodes well for sustainable effects on local levels, combined with global benefits in mitigation of Green House Gases. This has proven to yield cost benefit results with sustainable impact.

Mangrove restoration and poverty.
Short time gains by shrimp farming, charcoal burning, timber harvest and collection of fuel wood are issues of great concerns. A baseline survey conducted by the project, reveals that most of the destruction in the 1800 acres MaGyi mangrove research park is done by charcoal burners.
They are the poorest of the poor, barely surviving with a family income of USD 60-80 per month. The profit of this business is monopolized by middlemen and exporters. Char coal production, harvest of fuel wood, timber and other forest products, are the biggest threats to standing mangrove forests. Even with legislation against charcoal burning, there is hardly any law enforcement, as it is socially impossible to stop people struggling to survive. In addition, charcoal and fuel wood is the most convenient energy source for cooking with high market demands.

Integration of the local community in the restoration process is paramount in order to preventing destruction due to sheer poverty. This includes practical efforts to introduce fuel savings stoves and other renewable energy sources and create new livelihood opportunities. Planting mangrove is the simplest part in restoration. Many projects have seen good intentions being overshadowed by incomprehensive management. It has been proven that permanent restoration of mangrove forests can only be done in a conclusive process.

The research project has provided solutions for community participation with increased income from creation of new livelihood initiatives. A case in point is test production of nypa mangrove palm natural sweetener (2013-14). It represents future opportunities in creation of thousands of sustainable jobs. Nypa yields 50% more sugar per Ha than sugar cane, and is a renewable resource covering large areas in coastal mangrove zones, presently not utilized.
The mangrove park concept.

It was understood from the beginning that an alternative strategy was needed for sustainable mangrove restoration. Professor Dr. Nang Mya Han, Head of Marine Research Department of Myeik University proposed at an early stage establishment of mangrove parks. This was followed up by professor Dr. Khin Maung Cho, Head of Marine Science Department of Pathein University (presently Pro Rector at Myeik University). The Chief Minister of Ayeyarawady Division gave his fullest support, and 1800 acres land was earmarked for the first mangrove park project in Myanmar, with full support of the Forest Department.

Establishing mangrove parks with university supported management has proven to be an ideal concept. Special interest by the Rector and university staff have contributed to the success in securing one million mangrove trees in the research park by June 2015 (450,000 planted and 550,000 rescued from further destruction), with one million more to be planted in 2016. This will lead to mitigation capacity of 2 million tons CO2 Green House Gases during 20 years growth period. In addition, the park is now well established as an important research centre with the first mangrove gene bank in the country. Species which are listed as endangered mangroves, like Burgeria hainerii has been identified in the park, and now ready with 100 new seedlings in the nursery for sustainable propagation.
Research on soil, water, fauna and flora will continue after the initial 3 year period, as well as social intervention to combat poverty as part of an overall sustainable strategy. With potential future funding of mangrove restoration based on high capacity mitigation of CO2 including other valuable eco services, the trees planted will have a financial protection value above short term gains, based on current price in the voluntary carbon market of USD 12 per ton CO2. The concept of mangrove parks is a secure process in restoration based on CO2 market value, including socio-economic support to vulnerable coastal communities, environmental services with shore line protection, fisheries and other sustainable contributions.
The park represents rich bio-diversity with wildlife to be preserved.

Wild elephants visiting the park in dry season

Endangered dugong feeding on the seagrass meadows

Mangrove gene bank for research and preservation of genetic resources.
Mangroves are defined as association of halophytic trees, scrubs and other plants growing in brackish and saline tidal waters of tropical and subtropical coastlines (Mitch and Gosselin 2007). Mangroves are generally restricted to the tidal zone. As such, mangroves in fringe areas will be inundated by practically all high tides, while those at the higher topographic boundaries may be flooded only during the highest of tides (spring tides) or during storm surges. Globally, there are at least 68 mangrove obligate species, with 65 in Myanmar representing one of the world’s richest mangrove bio resources. In contrast, the Americas has only about 10 mangrove species (Mitch and Gosselin 2007). It is therefore of great importance to protect and take care of this bio rich resource in Myanmar. Establishment of a mangrove gene bank as part of a comprehensive mangrove park concept is of importance for future protection and conservation. The proposed gene bank will consist of all 65 species in Myanmar, as well as associates. The work is in progress and will be completed by end of 2016.

Validation of Carbon Services.

In order to generate necessary funding for large mitigation projects, it is necessary to validate carbon units from mangrove restoration projects as well as standing forests for REDD+ support. This can generate substantial income from carbon climate markets and become an important source for future funding. A small test marketing project was successfully introduced in 2014 with 6 partners in Europe and Asia buying carbon credits for zero climate footprints.

This initiative will be further strengthened with measurement of carbon in the ground in validating the amount for the marketed. Measurement started in 2014 with 440 soil samples collected from the 1,800 acre mangrove park. Due to constraints in laboratory capacity of Yangon University (the only one of its kind available in the country) we are still waiting for all the samples to be analysed. This illustrates an urgent need for further capacity building of universities and research institutions in Myanmar. The initial results from the tests so far analysed, are encouraging with measurements ranging from 1,778 tons per Ha to 3,590 tons per Ha from various plots, with average of 2,650 per Ha. This is a relatively high result indicating valuable benefits in payments for carbon protection services to sustain future projects as rewards for long term protection of the plants.
The 3 years research project funded by Letten Foundation is a promising start, but more has to be done in order to maximise the large potentials in Myanmar. Mangrove restoration is an urgent task with potential to benefit millions of people in the country, as well as supporting global efforts to combat climate change. Myanmar can become an important global power in CO2 mitigation by mobilizing its potentials in mangrove restoration.

Collection of planting materials for the gene bank
Thanks to Letten Foundation

We are thankful to Letten Foundation for generous support during the last three years. The founder of the foundation, Professor Dr. Letten F. Saugstad had a special interest in research and mangrove restoration. She sadly died in late 2014 at the age of 90. She will be remembered as the driving force in providing inspirational support to the project.

We are also pleased to convey our warmest thanks to the Chairman of the Board, Mr. Ernst Alsaker and the Vice Chairman, Dr. Ole Petter Ottersen (Rector of Oslo University) for their valuable interest and support.

On behalf of the benefitting universities in Myanmar, academic staff and students, coastal communities, project staff and volunteers.


Arne Fjørtoft,
Secretary General
Worldiew International Foundation
MANGROVE RESTORATION

The most effective method to capture and store large amounts of CO2 in a permanent sink

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+ Adaptation to Climate Change by saving lives and property from extreme weather

+ Increasing sea food stocks by up to 50%

+ Filtering and cleaning water

+ Providing large cooling effect

All in a natural process with the highest cost efficiency

READY TO BLOOM