Project "Integrated planning and practices for mangrove management associated with agriculture and aquaculture in Myanmar - 2017P1-MYR"

MANGROVE RESTORATION BY PLANTING

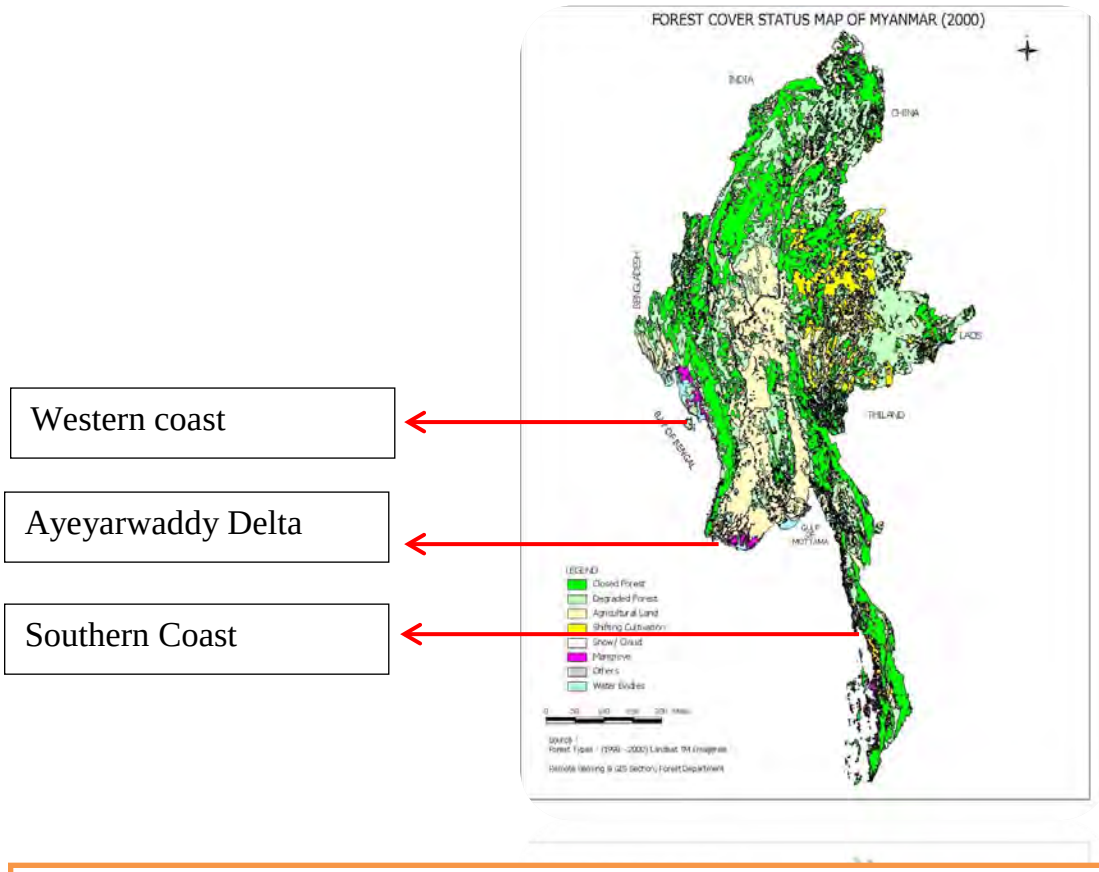
Technical guideline & training

Myanmar 2018

Mangrove restoration by planting

Conditions of mangrove forests in Myanmar

The length of coastline in Myanmar is 1760 miles. Among those areas, Mangroves forests grow copiously in Rakhine State, Ayeyarwaddy Division and Tinintharyi Division. The rest of regions, Yangon and Bago Division have some mangrove forests. The amount of mangrove forest is large. Thus, the place of forests can be classified into three parts as Western coast, Ayeyarwaddy delta and southern coast.



Region	Acres in 1980	Acres in 2015
Western Coast	413850	313792.68
Ayeyarwaddy Delta	732522	194925.31
Southern Coast	482099	635266.04
	1628471	**1143984.03**

The types of mangroves grow in Myanmar

There are two types of Mangroves found in Myanmar.

1. Delta region mangrove forests

This type of mangrove can be mostly found in the regions from **Mawtin Point** in **Ngapugdaw** Township, **Ayeyarwaddy** Division to **Bago** Division, **Yangon** Division and **Mon** state. This type of mangrove can also discovered in **Pyinbugyi** region, **Palauk** Township in **Tanintharyi** division and the mouth of **naf** river in **Rakhine** State where the river silt up the most. The most dominate plants in those forests are Tha-mae group **(*Avicenniaceae lanata Ridley*)**, Lamu group **(*Sonneratia alba*),** Kanaso **(*Heritiera gomes*),** thayaw (***Excoecaria agallocha***),Mandama (***Ceriops ta***gal) and thinbong (***Phonenix paludosa***). Myinka (***leguminosae***), yaykayar (***Ccrostichum cormiculatum***), dani (***Nypa truticans***) grow regionally. Depanding on the region and salty, Byu-chi-dauk M (***Rhizophora apiculata***), Byu auk sang (***Burguiera gymnorrhiga***), Byu-shwe-wa(***Bruguiera Sexongula***), pinle-ohn (***Xylocarpus granatum***), kyana (***Xylocarpus moluccensis***), Panthaka (***Amoora cucullata***), eik-ma-thwe (***Lumnitzera racemosa***) and Byu-bye-dunk (***Kandclia candel***) can be seen ***together. Ka-ya-su-chon (Acrostichum ilicifolius), Nge-gyi-taung (Acrostichum*** Speciosum), Ka-bauk-ngwe (***Derris trifoliate Lour***), sue-kute (***Dalbergia spinosa***), khay-lay-ngwe (***Mucuna-gigantean***), taw-chaut (***Merope angulata***), tha-man-chone (***Brownlowia tersa***), myauk-kyane (Flagellaria indica), a-low-lay-ngwe (***Caesalpinia crista***) and bon-sein-ngwe (***Ipomoea tuba***) can also be found. The soil is mud-flats and silty clayey soil. It is difficult to walk because of sinking into mire. In some regions near the sea, the sandy and silt soils can also be found. Salinity in soil is different during summer and rainy periods. Although the highest salinity is 30 to 35 thousand percent during summer, there is 0 to 20 thousand percent in rainy season.

2. Coastal mangroves

This type of mangroves can mostly found in the creeks near the coast. Along the region, from Myebon Township to Gwa Township in Rakhine State and Shwe Taung kyun , Chaungtha, Ngapudaw region in Tha baung Township in Ayeyarwaddy Division , those type of mangroves can be discovered. Futhermore, those types of mangroves can be seen in Myeik, Kawthaung District in Tanintharyi Division. Mangroves in lampi Island in bokpyin Township, kawthaung District is the best coastal mangroves forest. This is the place where the fresh water and sedimentation get the most. The most dominant trees in those area are Byui-chi - tauk M (***rhizophora apiculata***) , Byu –chi-tauk F (***Rhizophora mucronata***), Byu-auk-saung (***Burguiera gymnorrhiga***), ma –dae- ma -myaw (***ceriops tagal***), eik ma thwe a ni (***Lumnitzera littorea***), Nan Byu (***gurguiera parviflora***), Pin-lae-ohm (***Xylocarpus granatum***), Kya na (***Xylocarpus moluccensis***), sar plants (***Aegialites***

rotundifolia) and pinlae pont nayake. On the new low sand bank is arised from sedimention, tha-mae –phyu (***Avicennia marina***), tha-mae-lak-tak (Avivennia alba blume), lamu-ta-thak (***Sonneratia alba***), laba (***sonneratia griffithii***) and Da ni (***Nypa fruticans***) can also be seen. On some uplands, thin-baung (***Phoenix paludosa***), tha-yaw (***Excoecaria agallocha***) and kone-ka-na-soe (***Heritiera littoralis***) can be seen. In streams where it gets the fresh water, there are ka-na-so (***Heritier littoralis***), mada-ma (***Ceriop decandra***) and yay-ka-yar (***Aegiceras corniculatum***). Weed mostly found is bauk-ngwe (***Finlaysonia maritime***). Ka-yar-su-chone (***Acanthus illicifolius***), ka-byuk-ngwe(***Derris trifoliata***),myuk-kyane(***Flagellaria indica***) can also be found.Nge-gyi-taung (***Acrostichum aureum***) are flourishing at the near the foot of the hill. This type of mangrove has sandy soil. It is easy to walk because of not getting sink into mire but it consists of salt highly from 25 to 35 percent. But, Salinity of soil declines in rainy season.

Inland of delta region, tha-me (*Avicennia marina* , kant-pa-la (*Sonneratia apetala*) and kana-soe(*Heritiera fomes*)

Inland of delta region, kat-pa-la (*Sonneratia apetala*) forest and sarplants

(*Aegialites rotundifolia*) forest

Costal mangroves, Byui-chi -tauk M (*Rhizophora apiculata*), Byu –chi-tauk F (*Rhizophora mucronata*), Byu-auk-saung (*Burguiera gymnorrhiga*)

3. The causes of deforestation of mangroves

- The increasing of population
- The expending of houses and villages into mangroves forests
- Exploiting the forest resources extremely especially firewood and charcoal
- Enlarging the land illegally into the reserved mangrove forests

- Invading of the illegal shrimp ponds and salt farms into the mangrove forests


Charcoal and firewood


Shrimp pond and farm

Restoration and planting practices carried out by Forestry Department

- Formation of Reserved and protected mangrove forests
- Organized the protected natural area such as Meinmhahal and Lampi Island
- Maintaining and replanting the mangrove forests
- Established the community-owned forests
- Founded private farming
- Cooperate with the national and international non-governmental organization

4. Procedures and methods to plant the mangrove trees

Land clearing

In the plantation site, redundant weeds, climbers and vine need to be cleared. If there are mangrove plants left in this spot without cutting down, pruning and take the four re-sprouts form the stump and remove the remaining of the stumps. Do not burn in the mangrove forest.

Ka-bauk-ngwe and sukauk
Killing weeds practice

Spacing and Staking

The spacing between each plant should be at least 6 feets. It is better if plant them closely. It should also be planted 3 feet apart. It need to stake and string in order to be systematic. But, there is no need to do for the local peoples. The point is to plant plenty.

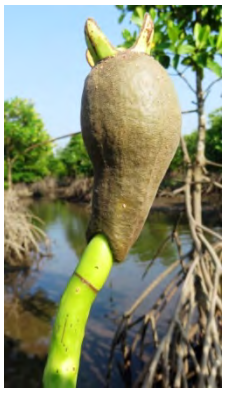
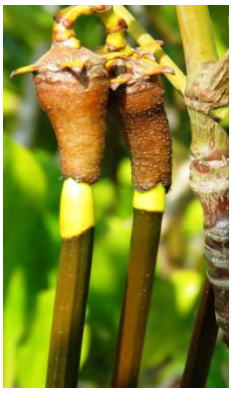
3. Seedling

This will be trained from separate lesson.

4. Plantation

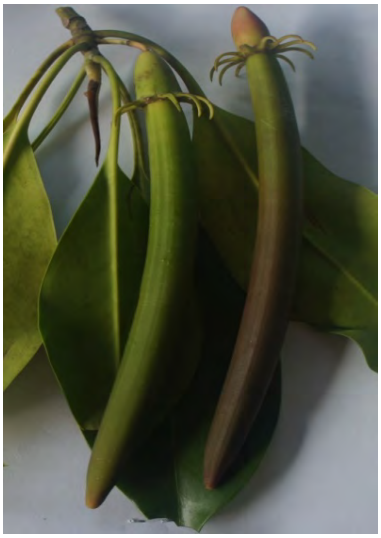
4.1 Sowing directly from the pod

The following species can be grown directly from the pod among the mangroves species. There are Byu-chi-dauk M(*Rhizophora apiculata*), Byu auk sang (*Burguiera gymnorrhiga*), Byu auk sang (*Burguiera gymnorrhiga*), Byu-shwe-wa (*Bruguiera Sexongula*), ma –dae- ma -myaw (*ceriops tagal*), ma-dama-chone (unknown), Nan-byu(*Gruguiera parviflora*). In plantation, put one-third of the fruit where roots may come out into soil. When the pod of Byu group and mada-ma group are ripening, a color appears between the pod and stalk. In But, Byu-auk saung specie, the collor doesn't emerge but the color of the pod turn green into reddish brown and rust color.

The ripen byu-chi-dauk M and Byu-chi-dauk F and ma-da-ma-myaw





The ripen byu-chi-dauk M and Byu-chi-dauk F

The pod is not the stage of seed anymore and becomes seedling stage. The time pods are ripening is starting from February to April. The time of pods are available is the hottest and the pods will be withered by sun and ruined if the plantation start on March and April in the plot. Therefore, the crops have to be stored in the seed banks until the last week of May and should be planted when monsoon rain falls and days of the spring tide. This type of plantation is the lowest cost. It is important to give instructions to the labors carefully not to plant pods upside down.

4.2 Planting with the seedling bags

This type of planting is the high cost because it has nursery cost labors cost and transportation cost. When carrying the seedlings into plantation site, it needs to use seedling buckets and it should not hold the stem of the seedling. Dig the hole which is suitable for the seedling bag and

break it with sharp knife to bring out the seedlings. Put the seedling bag up straightly in the hole and make landfill firmly. Need to keep the seedling bags.


Sowing directly with pods and seedlings

4.3 Planting with the root-ball

This is slicing soil sheet from seed bed with sharp knife for planting without root-ball and bring these into the plantation site and break it into one plant by plant together with root ball. Need to be separated about 2 inches since seedling. By taking care of breaking the soil sheet, the rate of thriving in success could be great. The cost is lower than planting with seedling bag.

Kant pa la garden, seedling to Plant With root ball and without root ball

This type of planting is not suitable for byu group (*Rhizophoeraceae*). Tha-yaw (***Excoecaria agallocha***), Kant-pa-la (***Sonneratia apetala***) and tha mae (Avicenniaceae) species are good for this type of cultivation. This method requires one year in advance to sow for seedling. As soon as rain falls, put the seedling out form the seedling bed on one day in advance. Then, cut the seedlings' root as leaving 6 inches of tap root. The branches roots must be cut off. Thus, the new root will come out faster. Together with cutting roots, the leaves must be stripped off except four flag leaves in order to reduce dehydration in the plants. It is the best to grow plants gathered by daily in one day. Put the plant close to the one side of the wall in the hole and pat the soil down firmly. Need to be careful in making landfill not to leave vacant area in the hole. The thriving of plants can be successful 75 percent if the cultivation is done by skilful labors.

2 Year old of tha-mae plantation (seedling bag) and 3 Year old of byu-chi-daukM(seed directly)

Seed directly

It is still under testing. In September, the seed of tha-mae is available and removed the husks and plants in one stake spot of the plantation site, three seeds into three ways until the half of the seed embed in soil on the days of neap-tide, starting from the day 6 of Burmese days. The current thriving is 98 percent.


10 days after sowing seed of tha-maedirectly into soil

4.6. Planting methods accordance with the species of mangroves

Species	**Suitable Methods**			
Planting Methods	**Seed direclty**	**Seedling bag**	**Without root ball**	**Remarks**
Byu-chi-dauk F(***Rhizophora Mucronata***)	yes	yes	no	
Byu-chi-dauk M(***Rhizophora apiculata***)	yes	yes	no	
Byu-auk-sang(***Burguiera gymnorrhiga***)	yes	yes	no	
Byu-shwe-wa (Bruguiera Sexongula)	yes	yes	no	
Nan-byu (***Burguiera*** cylindrica), saung pho(Bruguiera hainessil),war kyate lane (***Brugulera parviflora***)	no	yes	no	Seed directly
ma-da-mamyaw (Ceriops tagal)	yes	yes	no	
tha-mae (***Avicennia lanata***	no	yes	yes	

Ridley)				Testing on seed directly
Lamu (***Sonnerati caseolaris***), Kant –pa-lar(Soneratia apetala)	no	yes	yes	
ka-na-so(***Heritiera fomes Buch***)	no	yes	No	
kya-na(***Xylocarpus moluccensis***), Pinle-ohm(***Xylocarpus granatum***)	no	yes	No	
thayaw (***Excoecaria agllocha***)	no	yes	yes	
Eik-ma-thwe (***lumnitzera racemosa***)	no	yes	no	