8. MANAGING AREAS WITH SALINE SOIL BY PRATICING ECO-AGRICULTURE IN MAHA SARAKHAM PROVINCE, THAILAND

1. General Information and description of best practice/technology

Information

This eco-agriculture is located in the zone of Pratai soil series, area of Muang district, Maha Sarakham province. The area has soil with medium salinity. Traces of salt were found about 10-50% of the area. Most of the land is used for the paddy field based on rain water. Regarding the technological use of managing the area with saline soils by practicing eco-agriculture, the objective is to reduce the salinity level in the soil and develop the area with saline soil to be able to grow a variety of plants. This has made farmer living in the area with saline soils have better products, incomes and life qualities.

Mr. Jatuporn Thienma bought a farmland accounting for 8 rai and transformed the whole area into an area of integrated agriculture whereby the area was divided into a 0.24 ha paddy, a 0.16 ha pond, a 0.64 ha plantation of fruit trees and perennial plants, and a 0.24 ha elevated furrow-plantation of fruit trees. Water resources are managed by collecting rain water falling in the area. Moreover, the eco-agriculture system is managed to bring about circulation of matter and energy so that external dependence on factors of production is reduced as much as possible without using chemicals to get rid of pests and chemical fertilizers.

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Geographical location

Latitude 103.20421 Longitude 16.10494

Operation Start Date

The operation started in 2015

2. Classification of the best practice/technology

Activities and details of the operation

1. Building water resources

Building water resources by digging ponds with the depth of 3.50 meters to collect rain water falling within the area based on the calculation of soil surface runoff accounting for 30% of the annual amount of precipitation and building plantation furrows with the dimension of 3 meters wide and 2 meters deep to store water for water hyacinth (*Salvinia cucullate*) and frog spawn culture

2. Apply water to build vegetation

Applying the stored water to build vegetation at the plantation area resulting from filling soil by planting legumes, grass and farm plants. Then, allow these plants to cover the soil surface throughout the year. At the plantation furrow, planting water hyacinth and frog spawn.

3. Use vegetation to manage saline soil

Using the growing vegetation covering the soil surface at the plantation area resulting from filling soil to keep moisture in the soil continuously, improving the soil physical structure and increasing organic matter to the soil. At the furrow ridge, using water hyacinth and frog spawn to cover the soil surface to keep moisture in the soil. Improving the soil physical structure and increasing organic matter including plant nutrients to the soil.

4. Using the area to produce cash crops

Planting various cash crops like fruit trees by experimenting with planting various plants and selecting the variety which corresponds well with the area, namely pomelo, mangos, jackfruits, Manilkara Kauki, rose apples, guava. bananas, custard apples, tamarind. The fruit tree which is the main cash crop is pomelo and other kinds of fruits as supplementary plants. Moreover, the area between rows is used to plant farm plants such as corn, watermelon, pumpkin, including legumes etc.

3. Technical specifications, implementation activities, inputs, and costs

3.1 Technical plan of the technology

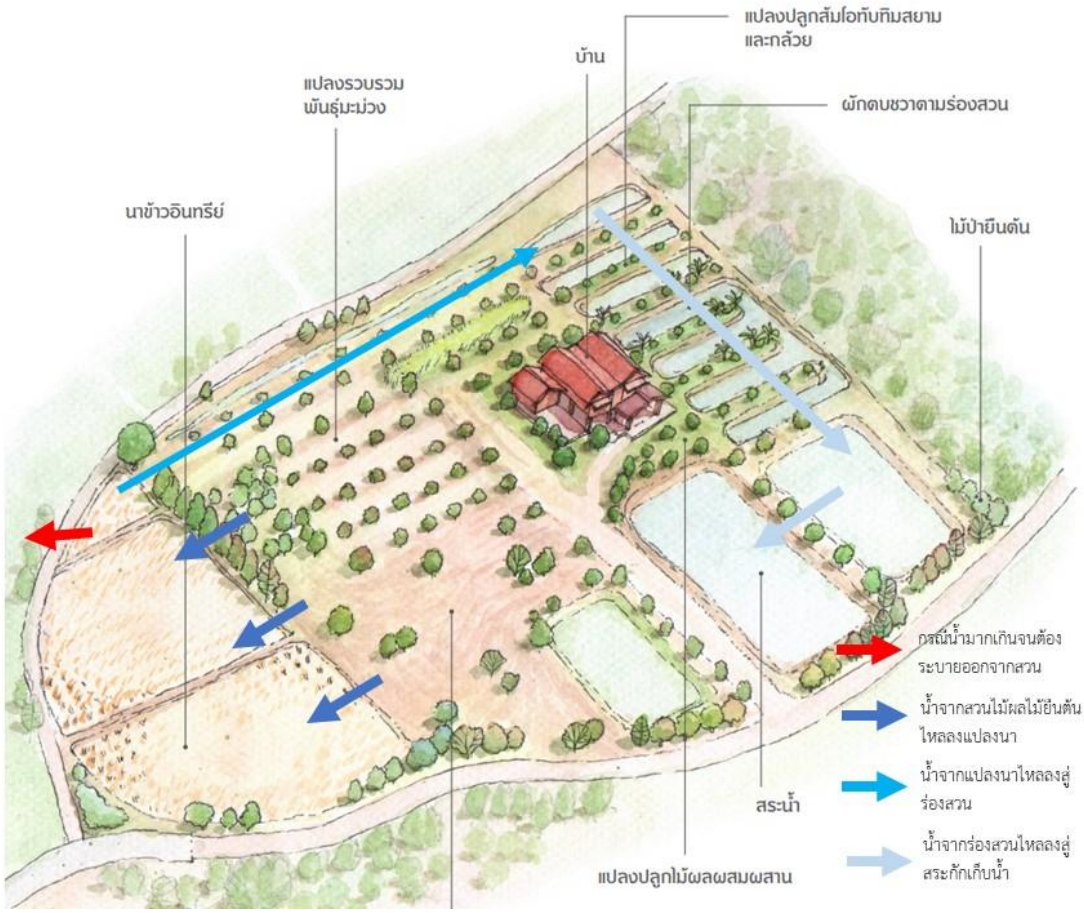

Fig. 1 shows circulation of water in the agricultural area

3.2 Revenues and expenses in using the technology

1. Initial costs and expenses in using the technology

Inputs	Unit	Quantity	Expenses per unit (USD)	All expenses per inputs (USD)	% of expenses incurred by land users
Labor					
Digging ponds	cubic meters	5,300	1.02	5,406	100
Digging plantation furrow	cubic meters	700	1.02	714	100
Equipment					
Water pump of 2 horse power	Pump	1	220.58	220.58	100
Sprinkler system	Zone	4	205.88	823.52	100
Total expenses of establishing the technology (US dollars)				**7,164.10**	

Calculation of costs and expenses

Expenses are calculated per areas using technology (Unit of size and area: 1.28 ha)

The currency used to calculate expenses with the unit as Baht

Exchange rate (to US. dollars) 1 US. dollars = 34.0 Baht

Average wage in hiring labor per day is 300 Baht

Most important factors having effects on expenses

1. Electricity costs
2. Manure costs

2. Maintenance costs

Inputs	Unit	Quantity	Expenses per unit (USD)	All expenses per inputs (USD)	% of expenses incurred by land users
Labor					
-	-	-	-	-	-
Others					
Electricity costs	Month	12	11.76	141.12	100
Manure costs	sack	360	1	360	100
Total expenses of establishing the technology (US dollars)				**501.12**	

3.3 Incomes from selling products and net incomes

Before using the technology There were no incomes from using the area due to the fact that the area was bought from farmers and the whole land was adjusted systematically to practice eco-agriculture.

After using the technology There are incomes from more various agricultural productions, namely pomelo products with the selling price of 2.94 USD per kilogram, jackfruits with the selling price of 100 Baht per kilogram, mangos with the selling price of 1.02 USD Baht per kilogram, bananas with the selling price of 0.73 USD per hand of bananas. Currently, there is an average monthly income of 117.6 USD. However, there is a small quantity of products obtained due to the fact that fruits do not give yields at their full potentials.

Estimating future incomes from pomelo which will be the main cash crop in 2027 or for the next five years is the pomelo tree accounting for 80 trees, each of which gives the yield for 60 fruits annually. The average fruit weight is 2 kilograms. This will give a total of yields accounting for 4,800 fruits annually. The selling price is 100 Baht per kilogram, accounting for the total income of 28,235.3 USD annually.

4. Environment

The mentioned area has the amount of rainwater accounting for 1,264 milliliters on average in 30 years. The area is characterized as being flat on the highland (compared with the surrounding area). The soil texture on the top is light brown clay loam. The soil at the bottom is the soil layer of salt accumulation. The soil texture is greyish brown clay. Traces of salt are found at the soil surface in the dry season.

4.1 Impact in the on-site from using the technology

1. Economic and social impact

Aspect	Impact	Before	After
1. Crops production	Increased at the most	-	Products of rice, pomelo, mangos, jackfruits, bananas, and vegetables
2. Product quality	Increased at the most	-	Planting variably and the products have good qualities and tastes.
3. There are more various income sources.	Increased at the most	-	Expenses are reduced from consumption of pomelo, mangos, jackfruits, bananas and vegetables Having incomes from selling fruits such as pomelo, mangos, jackfruits and bananas
4. Variety of products	Increased at the most	-	Products, namely pomelo, mangos, jackfruits, bananas. mango ice cream and dried bananas
5. Expenses of factors of agricultural production	Greatly reduced	-	Eco-agriculture is the farm management which is favorable for circulation of matter and energy. Therefore, it is not necessary to use external factors of production. There is only manure used at the beginning of planting fruit trees.

6. Incomes	Increased at the most	-	There is an average monthly income of 4,000 Baht. However, yields are not given at a full capacity.

2. Social and cultural impact

Aspect	Impact	Before	After
1. Food security and self-reliance	Improvement at the most	-	Pomelo products cost 2.94 USD per kg. Jackfruit products cost 2.94 USD per kg. Mango products cost 1.02 USD per kg. Banana products cost 0.73 USD per comb of banana.
2. Institute of the community	Improvement	-	Members in the community start to see guidelines of utilizing the area with saline soils. Previously, they believed that nothing could be done about it.
3. SLM or knowledge of land degradation management	Improvement at the most	-	The knowledge starts to be propagated more widely.

3. Ecological impact

Aspect	Impact	Before	After
1. Soil indumentum	Much improvement	-	Legumes, grass or weeds grow and cover the area.

2. Soil salinity level	Decreased at the most	Salinity level more than 6 dS/m	The salinity level has been reduced to be less than 3 dS/m until various kinds of plants can be grown.

4.2 Off-site impact of using the technology

Aspect	Impact	Before	After
1. Water which can be utilized.	Greatly increased	-	Water at the soil surface of areas with saline soil can be utilized. Water can be used to control soil salinity, including increasing organic matter to improve the saline soil structure until various plants can be grown.
2. Damages to neighboring cultivation areas	Greatly reduced	-	There is no use of pesticides and chemical fertilizers.
3. Impact of greenhouse gas	Reduced	-	There is no burning of organic materials at all. Helping reduce carbon dioxide release and reduce the amount of greenhouse gas emission

5. Acceptance of the technology and application

There is acceptance among farmers They implement the technology without receiving any material or financial motivations. This is due to the fact that initial adjustment requires high investment. There are off-site farmers who apply the technology in their own areas by land use changes and types of plants from rice to integrated plants. However, land use changes must be done gradually and there must also be systematic planning.

Activities Pictures


Fig 1 and 2 Establishing soil -surface water resources


Fig 3 and 4 Applying soil -surface water to build vegetation

Fig 6 and 7 Growing vegetation to manage saline soil

Fig 8 and 9 Land use changes in saline soil to increase products