4. Fish farming for saline soil management in Khon Kaen Province, Thailand

1. General Information and description of best practice/technology

Information

Saline soil management technology for maximum utilization and efficiency through fish farming by Mr. Sompong Chaisong was applied at 171, Village No. 9, Ban Nong Nang Khwan Mueang Pia Subdistrict, Ban Phai District, Khon Kaen Province. The goal of this method is to productively farm in places with saline soil. Previously, the land was mostly utilized for rice farming, but the yield was of poor quality in terms of flavor and texture, as well as quantity. It generated income of only 4,000 baht per rai in a year which was not worth the investment. Farmers earned 40,000-50,000 baht per pond/cycle after altering and adapting technology to tilapia and snapper farming, which was well worth the investment and required significantly less labour than rice production. In 2013, Mr. Sompong Chaisong, was selected to be the chairman of the Ban Nong Nang Khwan Fish Farmers Network Group. The Objectives of action are to reduce, prevent, restore, soil degradation in saline soil area and to improve agricultural productivity in saline soil to be more diverse and sustainable agriculture.

Fish farming is a close system for Mr. Sompong Chaisong. Water will not be released from the fish pond to the outside, but it will be circulated around the farm. He would pump outside water into the ponds around 2-3 times a year once the water in the fish pond drained and decreased, but rainwater provided the majority of the water. Make a large and high embankment around the fish farming area to prevent saline water from outside seeping into the fish pond and spreading soil salinity. This technology has no serious impact on the environment or the local communities. Plants along the pond's edge include salt-tolerant perennials like coconut and tamarind, which are consumed in the home and to simply prevent soil erosion by holding the dirt on the embankment. Furthermore, it aids in keeping the soil surface moist at all times. It also prevents salt from moving from the bottom layers to the soil surface. Farmers who took part in the program and put the technology to work were pleased because they were able to produce high-quality agricultural products while still earning a steady income. Soil deterioration is also controlled by this technology. The water in the area used to be 9-10 ppt salinity, but it is now 3-4 ppt, resulting in a decrease in soil salinity.

Location where best practice / technology is being implemented/Country

171 Village No. 9, Mueang Pia Subdistrict, Ban Phai District, Khon Kaen Province

Geographical location

Latitude 102.683006, Longitude 16.095718

Year of implementation started

The operation started in 2002

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2. Classification of the best practice / technology

Main purpose of best practice / technology

1. To have eco-friendly sea grapes culture systems
2. To prevent and remove waste water likely to occur in the sea water and water resources
3. To utilize coastal lands (coastal saline soil) sustainably

The area used for fish farming is semi-arid. It receives 1,001-1,500 millimeters of rain on average. The annual rainfall averages 1241.6 milliliters (data from the Meteorological Station: Meteorological Department). The terrain is flat. Plateau height is 101-500 meters, soil depth is 81-120 cm. The topsoil is medium, not coarse and not fine (loam, silty), the subsoil is coarse/light (sandy), and the subsoil is fine/heavy (clay), and the organic matter level is low (1%). Although the surface water is good, the water quality (untreated) is only suitable for

agricultural usage. As a result of the salinity in the water, it is a major issue in agriculture. Only a few types of crops can be produced as a result, and yields are minimal.

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

3.1 Implementation activities

1. The method was applied by digging a fish pond that was divided into two parts: 1) a nursery pond with a size of 1 rai and 2) a pond for raising fish with a size of 1 rai or more per pond. The largest one is 3.5 Rai.

2. The excavated soil was used as a pit with a 6 meter wide.

3. Adjust the acidity and alkalinity (pH) of the soil and water in the pond with manure and lime to reduce the salinity level.

4. With 40,000-50,000 fish, non-sexual tilapia offspring were purchased. For roughly 1-2 months, they will be raised in nursery ponds.

5. Tilapia will be counted and placed into the pond when they reach around 2 inches in length, with 2,000-3,000 fish per pond.

6. Asexual tilapia begin to give birth after three months, resulting in a dense population. The three-inch snapper was introduced into ponds to help remove tilapia juvenile fish. This method will lower the cost of tilapia and snapper food.

7. In a year, there are two rounds of fish production. Tilapia (primary income) sells for 60 bath per kilogram, while Snapper sells for 180-200 baht per kilogram (extra income).

3.2 Income and expenditure on technology

1. **Cost and initial costs of using technology**

input	unit	amount	Cost per unit (Baht)	Total cost per input (Baht)	% of expenses incurred by land users
labor					
Fish pond digging and equipment	pond	22	35,000	770,000	100.0
equipment					

set up such as water pumps, fishing nets	pond	22	15,000	330,000	100.0
other					
herbivorous fish food and carnivorous fish food (given during the last 2 months before fishing) 1 pond 40 sacks of feed per production cycle.	sack	880	350	308,000	100.0
Manure (1 rai, put 100 kg) in an area of 42 rai	kilogram	4,200	2	8,400	100.0
Lime (1 rai put 100 kg) in the area of 42 rai	kilogram	4,200	1.6	6,720	100.0
Total cost of technology establishment				**1,423,120**	
Total cost of technology establishment (US dollar)				44,472.50	

Cost calculations and overhead costs are calculated per technology area. (Unit of size and area: 42 rai, conversion from 1 hectare = 1 ha = 6.25 rai). Currency used for calculating costs Baht Exchange rate The cost (in US dollars) is $1 = 32.0 baht. The average daily wage is 300 baht. Activities include digging fish ponds (period/frequency: beginning of production season) and purchasing established equipment such as Pumps, fishing nets (period/frequency: beginning of production season)

3.3 The most significant determinant of cost is

Costs of fish feed have increased as a result of dense tilapia populations. To get rid of the juvenile tilapia, bring snapper to raise in the pond.

3.4 Maintenance costs

input	unit	amount	Cost per unit (Baht)	Total cost per input (Baht)	% of expenses causing by land users
other					
Herbivorous fish food and carnivorous fish food (given during the last 2 months before fishing) 1 pond 40 sacks of feed per production cycle	sack	880	350	308,000	100.0
Manure (1 rai, put 100 kg) in an area of 42 rai	kilogram	4,200	2	8,400	100.0
Lime (1 rai put 100 kg) in the area of 42 rai	kilogram	4,200	1.6	6,720	100.0
The total cost of maintaining the technological condition				**323,120**	
The total cost of maintaining the technological condition (US dollar)				10,097.50	

Maintenance activities

Feed the fish, check the water condition of the pond and fish in the pond (period/frequency: 2 times a day).

3.5 Revenue from sales of fish product

Before using technology**,** only 4,000 baht per year can be earned from rice farming.

After using technology**,** earning 50,000 baht each pond/production cycle from fish farming (there are 22 ponds). So the entire income is around 2,200,000 bath.

3.6 Spending and net income

Total earnings	2,200,000	baht
The total cost of setup and maintenance	1,746,240	baht.
A total net income of 453,760 baht was generated	**453,760**	bath

4. Environment

4.1 The effects of utilizing technology (Economic and Social)

Title	Effect	Before	After
1. Crop production	The greatest increase	Rice production with low yields but high capital costs.	Farming for tilapia and snapper with high yields and good prices, worth the investment.
2. Land management	Much easier	The efficiency of land utilization is estimated to be around 20%.	Approximately 80% of the land is used more efficiently.
3. Farm income	The greatest increase	Profit from the sale of 4,000 baht rice every production cycle.	Earn income from fish farming 50,000 baht per production cycle.
4. Workload	Increase	During the rice production stage, there are numerous activities and tasks to complete.	It does not require much attention and can be fed fish in its natural state twice a day.

4.2 The effects of utilizing technology (Social and Cultural)

Title	Effect	Before	After
1. Food security and self-reliance	A significant improvement	The return is low, making the investment unprofitable, resulting in debt.	The return on investment is worthwhile, and farmers can become self-sufficient.
2. Land use / Water use right	Improvement	Use the land to grow rice only.	The area is used for fish farming and salt tolerant perennial planting.

3. Knowledge on land degradation management	A significant improvement	Knowledge about land deterioration is limited.	Gaining knowledge through training and hands-on experience.

4.3 The effects of utilizing technology (Ecology)

Title	Effect	Before	After
1. Soil protection	increase	There is no chance for grass or weeds to grow.	Grass or weeds start to emerge. Weeds growing along the pond's embankment edge contributed to an increase in soil cover.

4.4 The effects of utilizing technology (Outside of the area)

title	effect	before	After
3. Greenhouse gas's impact	reduction	Preparing the plot by burning rice fields	It is possible to reduce carbon dioxide emissions from burning by switching to tamarind cultivation. Contribute to the reduction of greenhouse gas emissions.

5. Conclusion

The adoption of the Technology

Without any material or budget incentives, about 1 - 1 0 percent of farmers adopted and applied the technology in the initial phase. This is due to the fact that initial stage modification requires a significant initial investment. Because a nursery pond for baby fish and also many fish ponds must be dug, however when adjusted The price of tilapia and snapper production is relatively high, and the quality satisfies market demand. Furthermore, the quantity of labour required in fish ponds was less than that required in rice cultivation, and the yield from fish ponds was greater than that of rice fields. Farmers in the nearby areas became interested in learning about saline land fisheries from model farmers as a result of this.

Strengths/ advantages/ opportunities in the land user's view

1. Possibility of generating additional revenue.
2. In the area, there is a farmer who is a successful model for using technology.

Strengths: The opinion of compilers

1. Local farmers can successfully farm in saline and deteriorated lands. It helps in the reduction of migration from degraded land areas.

2. Farmers can turn a crisis into an opportunity by taking advantage of the limitations of having deteriorated soil to gain money by farming snapper and tilapia. As a result, greater income is generated because snapper can only be raised in very high salinity water and may be sold at a high price due to its high quality in terms of taste, which matches market demand.

3. Farmers will be able to rely on themselves if their quality of life improves. By measuring the green of phytoplankton in the pond water, the soil becomes more productive and the degree of salinity decreases. It is fish feed produced by balancing the acidity and alkalinity (pH) of the soil by adding manure and lime to the pond.

Weaknesses/ disadvantages/ risks in the land user's view

The salinity of the water in the pond has reduced, impacting snapper production in the area where the farmers in the network are requesting to drill an artesian well.

Weaknesses: The opinion of compilers

Farmers used to operate on their own, which resulted in low yields. Following that, more group meetings and gatherings were held to share information and discover solutions to various issues.

Activities Pictures

Figure 1-2 A field visit to interview and inquire about the details of the successful modification and use of technology in saline soil management by adopted of tilapia and snapper farming at “Pongcharoen farm” owned by Mr. Sompong Chaisong, Mueang Pia Sub-district, Ban Phai District, Khon Kaen Province.

Figure 3-4 Adaptation of the land through the use of saline soil approaches and the conversion of rice fields to fish ponds.

Figure 5-6 Embarkation for salt-tolerant plantations, primarily coconut and tamarind, for domestic consumption. It also helps in the restoration of soil moisture and erosion.