Farmer explaining land use planning under the concept of the new theory of agriculture for managing small-scale areas most efficiently (Prapa Taranet)

The new theory of agriculture for mixed farming systems (Thailand)

The royal new theory of agriculture

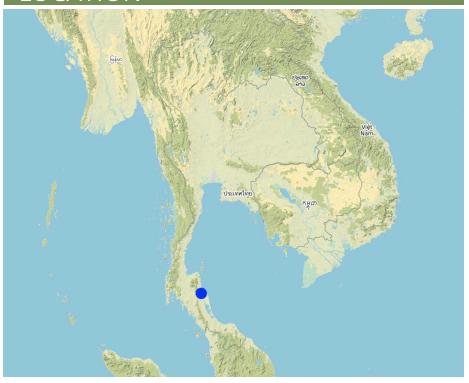
DESCRIPTION

Allocating and managing small-scale farm areas to make them suitable for agricultural production under the highest levels of integration and efficiency.

The new theory of agriculture is the application of improved mixed farming systems to poor farmers with smallholdings - for example in Chang Sai sub-district, Phra Phrom district, Nakhon Si Thammarat province, Thailand. The most important concept underlying the new theory of farming is efficient allocation of land to serve the different needs of farm households. This includes paddy fields, farm ponds for water and fish, and cash crops, fruit trees, and trees for farm income, plus a residential area. It's goal is solving the problem of shortage of land and water resources, which is a very serious problem in Thailand, in order to help smallholder farmers make a living. Apart from the fact that the size of the farm and water resources are the limiting factors in this area, the land is also degraded by both natural and human activities. The area is classified as sand dunes with low to very low soil fertility where farmers mostly grow the same crops continuously. This results in high risk of fluctuations in the amount of production - and insufficient food crop production for household consumption. Therefore, land allocation for agriculture under the concept of the new theory of agriculture is the appropriate use of resources in small-scale areas for optimal benefits and increases in household incomes. Nowadays, farmers in adjacent areas are realizing the benefits obtained from land allocation, and they have formed a group to improve the use of their small-scale holdings for optimal benefits.

The new agricultural theory was initiated by His Majesty the Late King Bhumibol Adulyadej of Thailand to provide help for farmers with small-scale farms. For land allocation, the land is divided into 4 parts. Part 1 is designated for a pond to store rainwater during the rainy season and to supply water to grow crops in the dry season as well as for raising aquatic animals (fish, field crabs) and plants (such as morning glory, water mimosa, etc.). Part 2 is set aside for rice cultivation during the rainy season as the daily staple in households throughout the year, which cuts down on expenses and allows the farmers to be self-reliant. Part 3 is used for growing fruit trees, perennials, vegetables, and field crops for daily consumption. If there is any surplus from consumption, it can be sold. Part 4 is used for dwellings, animal husbandry, roads and other structures - including barns, strawstacks, compost, houses, mushroom nurseries, stalls, flowering-plants, ornamental plants, home-grown vegetables in backyard gardens. The proportion of the area in each section can be adjusted for either increase or decrease depending on the conditions of each location and the necessity of farmers who make use of the area, but it is usually 30:30:30:10.

LOCATION



Location: Chang Sai sub-district, Phra Phrom district, Nakhon Si Thammarat province, Thailand

No. of Technology sites analysed: single site

Geo-reference of selected sites
- 99.94639, 8.33504

Spread of the Technology: applied at specific points/ concentrated on a small area

In a permanently protected area?: No

Date of implementation: 2010

Type of introduction
- ☐ through land users' innovation
- ☐ as part of a traditional system (> 50 years)
- ☐ during experiments/ research
- ☑ through projects/ external interventions

Farm ponds are used for storing rainwater and then for crops grown during dry season. This ponds are also used for raising aquatic animals (fishes, field crabs) and plants (such as morning glory, etc.). (Prapa Taranet)

Limes are cultivated in the area for both household and market purposes (Prapa Taranet)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [x] improve production
- [x] reduce, prevent, restore land degradation
- [ ] conserve ecosystem
- [ ] protect a watershed/ downstream areas – in combination with other Technologies
- [ ] preserve/ improve biodiversity
- [ ] reduce risk of disasters
- [ ] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [x] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Land use mixed within the same land unit: No

Cropland

Other - Specify: Mixed farming system
Remarks: Cropland mixed with aquatic animals

Water supply

- [x] rainfed
- [ ] mixed rainfed-irrigated
- [ ] full irrigation

Purpose related to land degradation

- [ ] prevent land degradation
- [x] reduce land degradation
- [ ] restore/ rehabilitate severely degraded land
- [ ] adapt to land degradation
- [ ] not applicable

Degradation addressed

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion)

water degradation - Ha: aridification

SLM group

- water harvesting
- home gardens

SLM measures

agronomic measures - A1: Vegetation/ soil cover, A2: Organic matter/ soil fertility

vegetative measures - V2: Grasses and perennial herbaceous plants

structural measures - S5: Dams, pans, ponds

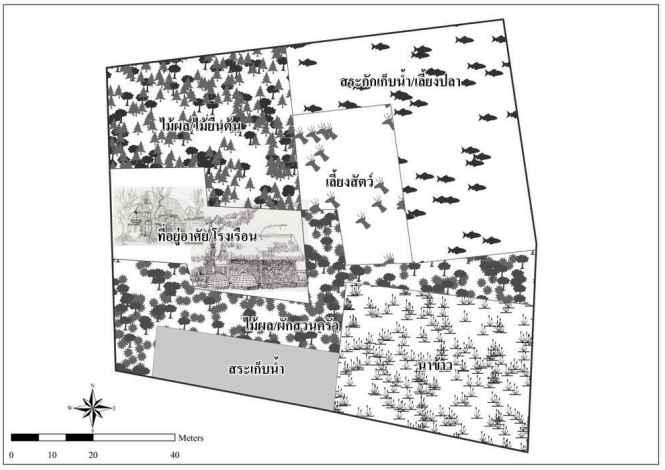
management measures - M2: Change of management/ intensity level

other measures - Introduction of aquatic animal

TECHNICAL DRAWING

Technical specifications

Land allocation according to new theory of agriculture in the area with the size of 5.3 rai (0.85 ha) of informants by dividing the land into 4 parts, first part is the ponds accounting for 1.5 rai (about 28% of the total area), second part is paddy field accounting for 1 rai (about 19% of the total area), third part is for growing fruit-bearing trees, home-grown vegetables, perennials accounting for 1.3 rai (about 25% of the total area) and last is for building construction for dwelling, animal husbandry and other constructions accounting for 1.5 rai (about 28% of the total area).



Author: Prapa Taranet

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **5.3**; conversion factor to one hectare: **1 ha = 6.25**)
- Currency used for cost calculation: **Baht**
- Exchange rate (to USD): 1 USD = 33.0 Baht
- Average wage cost of hired labour per day: 300 Baht

Most important factors affecting the costs

Water - if there is a lack of water during the dry season, some agricultural activities may not be practiced. This leads to a reduction of agricultural cost; however, this also leads to a reduction of a household income during that period.

Establishment activities

1. Pond construction (Timing/ frequency: dry season)
2. Labours (Timing/ frequency: rainy season)
3. Seeds (Timing/ frequency: rainy season)
4. Seedling (Timing/ frequency: rainy season)
5. Aqautic animals (fishes and field crabs) (Timing/ frequency: rainy season)

Establishment inputs and costs (per 5.3)

Specify input	Unit	Quantity	Costs per Unit (Baht)	Total costs per input (Baht)	% of costs borne by land users
Labour					
Cultivation	days	60.0	300.0	18000.0	100.0
Equipment					
Hiring tractors for pond construction	ponds	3.0	16000.0	48000.0	70.0
Plant material					
Seeds	Kilogram	300.0	10.0	3000.0	
Seedlings	Plants	100.0	50.0	5000.0	80.0
Fertilizers and biocides					
Compost	Ton	1.0	2500.0	2500.0	50.0
Construction material					
Roof tiles	each	240.0	60.0	14400.0	
Cement	bags	8.0	100.0	800.0	
Sand and rocks	ton	1.0	1650.0	1650.0	
Pillars	each	12.0	100.0	1200.0	
Other					
Fishes and crabs	each	2500.0	1.0	2500.0	
Total costs for establishment of the Technology				**97'050.0**	
Total costs for establishment of the Technology in USD				*2'940.91*	

Maintenance activities

1. Labours (Timing/ frequency: throughout the year)
2. Seeds (Timing/ frequency: rainy season)
3. Seedlings (Timing/ frequency: rainy season)
4. Aquatic animal (Timing/ frequency: 9 months)

Maintenance inputs and costs (per 5.3)

Specify input	Unit	Quantity	Costs per Unit (Baht)	Total costs per input (Baht)	% of costs borne by land users
Labour					
Cultivation	days	260.0	300.0	78000.0	100.0
Cultivation	days	260.0	300.0	78000.0	100.0
Fertilizers and biocides					
Compost	ton	1.0	2500.0	2500.0	50.0
Other					
Fishes and crabs	each	5000.0	1.0	5000.0	30.0
Feeding	month	9.0	5000.0	45000.0	100.0
Total costs for maintenance of the Technology				**208'500.0**	
Total costs for maintenance of the Technology in USD				*6'318.18*	

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [ ] 751-1,000 mm
- [ ] 1,001-1,500 mm
- [ ] 1,501-2,000 mm
- [x] 2,001-3,000 mm
- [ ] 3,001-4,000 mm
- [ ] > 4,000 mm

Agro-climatic zone
- [ ] humid
- [x] sub-humid
- [ ] semi-arid
- [ ] arid

Specifications on climate
Name of the meteorological station: Nakhon Si Thammarat meteorological station

Slope
- [x] flat (0-2%)
- [ ] gentle (3-5%)
- [ ] moderate (6-10%)
- [ ] rolling (11-15%)
- [ ] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

Landforms
- [x] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

Altitude
- [x] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [ ] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

Technology is applied in
- [ ] convex situations
- [ ] concave situations
- [x] not relevant

Soil depth
- [ ] very shallow (0-20 cm)
- [ ] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [x] very deep (> 120 cm)

Soil texture (topsoil)
- [x] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)
- [x] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [ ] medium (1-3%)
- [x] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [x] medium
- [ ] poor/ none

Water quality (untreated)
- [ ] good drinking water
- [ ] poor drinking water (treatment required)
- [x] for agricultural use only (irrigation)
- [ ] unusable

Water quality refers to: surface water

Is salinity a problem?
- [ ] Yes
- [x] No

Occurrence of flooding
- [ ] Yes
- [x] No

Species diversity
- [ ] high
- [x] medium
- [ ] low

Habitat diversity
- [ ] high
- [x] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [ ] subsistence (self-supply)
- [x] mixed (subsistence/ commercial)
- [ ] commercial/ market

Off-farm income
- [x] less than 10% of all income
- [ ] 10-50% of all income
- [ ] > 50% of all income

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [x] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [ ] women
- [x] men

Age
- [ ] children
- [ ] youth
- [ ] middle-aged
- [x] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [x] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha
- [ ] > 10,000 ha

Scale
- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [ ] individual, not titled
- [x] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Access to services and infrastructure

health	poor ✓	good
education	poor ✓	good
technical assistance	poor	✓ good
employment (e.g. off-farm)	poor ✓	good
markets	poor ✓	good
energy	poor ✓	good
roads and transport	poor ✓	good
drinking water and sanitation	poor ✓	good
financial services	poor ✓	good

IMPACTS

Socio-economic impacts

Crop production
decreased ✓ increased
Quantity before SLM: 100
Quantity after SLM: 500
Considering from rice production in 1 rai

crop quality
decreased ✓ increased

risk of production failure
increased ✓ decreased
As farmers allocate the land to different types of crop, they can evaluate the suitable types of crops for the markets and climatic conditions

water availability for livestock
decreased ✓ increased

irrigation water availability
decreased ✓ increased
Rainwater can be collected in the ponds and this can be a supply for cultivation during the dry season

expenses on agricultural inputs
increased ✓ decreased

farm income
decreased ✓ increased

diversity of income sources
decreased ✓ increased

workload
increased ✓ decreased

Socio-cultural impacts

SLM/ land degradation knowledge
reduced ✓ improved
The knowledge about SLM comes through the support of the government agencies

Ecological impacts

soil moisture
decreased ✓ increased

soil cover
reduced ✓ improved

soil organic matter/ below ground C
decreased ✓ increased
Application of compost in the farm leads to an increase in soil organic matter

beneficial species (predators, earthworms, pollinators)
decreased ✓ increased
Earthworms, Birds, Bees, Cicada, and Varanus.

Off-site impacts

groundwater/ river pollution
increased ✓ reduced
Agrichemical products are not applied to the farmland, resulting in less soil contamination to environment

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns
very negative ✓ very positive

Long-term returns
very negative ✓ very positive

Benefits compared with maintenance costs

Short-term returns
very negative ✓ very positive

Long-term returns
very negative ✓ very positive

CLIMATE CHANGE

Gradual climate change

seasonal temperature increase
not well at all ✓ very well
Season: summer

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- single cases/ experimental
- 1-10%
- ✓ 11-50%
- > 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- ✓ 0-10%
- 11-50%
- 51-90%
- 91-100%

Number of households and/ or area covered

Members in the community (about 50-60 households in the community) and parts of the outside community nearby show interest in this technology because they see that it can increase household incomes and start to implement it in their own areas. However, allocation of the land differs according to the area conditions and the needs of the owners themselves.

Has the Technology been modified recently to adapt to changing conditions?

- ✓ Yes
- No

Since organic markets are increasing in the area, then some farmers produce without using agrichemical products. This allows farmers to improve the prices.

To which changing conditions?

- climatic change/ extremes
- ✓ changing markets
- labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- Water can be available even in the dry season since this technology includes the farm pond construction for rainwater storage.

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- A lack of household labor results in some farmers adopted only part of technology where the efficiency of this technology may be lower than the adoption of full management. Mose farmers hire labor or mechanical

- Farmers should be able to grow enough rice for the whole year's consumption.
- Production planning can be done for the household consumption and supply to the market.

Strengths: compiler's or other key resource person's view

- Allocation of the land into 4 parts according to the new theory of agriculture is considered an appropriate option for smallholder farmers who are having small farmland and water shortage. This is due to they can plan what crops, and when, to grow for each growing season based on climatic condition and market. Importantly, farmers learn how to plan the production that will be distributed to the market and for making a living.

equipment to help them farming. although this increases the farming cost, it helps farmers to get their work done in time.

- The cost of investment is rather high, especially for digging the pond. Farmers ask the support from the government. While some farmers receive 80% help from the government, foundations, and the private sector for digging the ponds, others receive less support from the government.
- Farmers have limited land for farming, to allocate the land to usual allocation as recommendation may not be suitable. Farmers changed or improved the allocation ratio by themselves based on the land conditions, climatic condition, and the environment. For example, some farmers who have enough water sources in their areas, the size of the pond can be reduced to make room for other uses.

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- Due to the fact that managing the area with many activities may require more time to take action than monoculture farming, which cannot interest some farmers to practice. Furthermore, it may take time to make it worth the paid expenses due to complexity, little understanding, insufficient labor force, and more hiring may require. The government needs to take action in the areas to provide more knowledge on this technology and find the solution to the problems.

REFERENCES

Compiler
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Resource persons
Chaung Singhophon - land user

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_4146/

Linked SLM data
n.a.

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Key references

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- Implementation manual for new theory of agriculture, 2015, Ministry of Agriculture and Cooperatives.: http://www3.oae.go.th/rdpcc/images/filesdownload/SUFFICIENCY/9.9.pdf

Links to relevant information which is available online

- Sufficiency Economy & New Theory: http://www.chaipat.or.th/eng/concepts-theories/sufficiency-economy-new-theory.html