

Sustainable Mechanization for Smallholder Farmers in Asia and Africa in Support of the Sustainable Development Goals

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I. Introduction

- Lao PDR is a landlocked country, limited infrastructure.
- Lao PDR is located in Southeast Asia, bordered by Vietnam to the east, Cambodia to the south, Thailand to the west and south, Myanmar to the north west and China to the north.
- In 2016, Lao PDR has a population of about 6.492 million and , one Capital is Vientiane city.
- The country covers an area of 236,800 square kilometers and 80% of the Lao population lives in rural areas.
- About 20% of the land area is lowland, the other 80% is upland and mountainous.
 - Agricultural land (3%) and Area for Agriculture 900,000 hectare.
 - The Ministry of agriculture and forestry aspect 850,000 Ha for rice production and 4.4 million ton of paddy rice in 2019.



The Dual Rural Economy

The Lowlands

- *Transformation Started*
Commercial factor and product
markets operating
- *Beginning of farming systems*
diversification



The Dual Rural Economy



The Uplands

- *Subsistence rural economy*
- *Limited markets*
- *Rural poverty*
- *Traditional farming systems*

Agricultural Production

No	Crop	Planted area (ha)		Harvested area (ha)		Production (mill ton)	
		2015	2016	2015	2016	2015	2016
1	Rice	769,193	771,772	755,243	770,226	3.38	3.43
2	Starchy roots	101,885	189,210	101,885	189,210	2.77	2.80
3	Sugarcane	36,130	36,180	36,130	36,180	2.02	2.02
4	Vegetable	179,690	180,820	179,690	180,820	1.68	1.69
5	Maize	254,025	258,910	254,024	258,910	1.52	1.51
6	Coffee	93,385	94,210	77,535	77,900	0.14	0.14
7	Peanut	20,880	26,880	20,880	26,880	0.06	0.06
8	Soybean	11,880	12,070	11,880	12,070	0.02	0.02

Source: Lao Statistics Bureau, Ministry of Planning and Investment

II. Status of Custom Hiring of farm machines

Machinery Requirement for Improved Rice, corn Production System

1. Land leveling equipment:

- the land leveling equipment so far that use in the agriculture development station, some pilot project and service in farmers field some location.

2. Tractors:

- The majority of tractor itself does not provide a tool to improve productivity. Only in combination with the right equipment, tools and skilled driver it can be of the anticipated benefit.
- In general, the first plough operation by using tractor, rotary and heavy power-tiller cost about 50 US\$ per ha, however, majority of small farmers are using small hand tractor due to farmers can easily invest in this machines with affordable cost.

II. Status of Custom Hiring of farm machines

3. Planter/transplanting machine:

- Services on rice transplanting are also practicing among small farmers, one service package including seedling and transplantation cost about 233 US\$ per ha.
- In general, rice transplanting is manually operated; considering as high labor consumption.

4. Harvester:

- not playing a role in productivity improvement. It is only replacing manual manpower in the harvest operation in some areas.
- The cost of harvest operation by combined harvester is about 38 US\$ per ha, while small mowing machines are playing a role in harvest operation by several small farmers.
- The cost of harvest operation by this small machine is about 12 US\$ per ha, but it needs another step for **threshing**. usually charge in kind method, not cash; for instance, one bag will be withdrawn from 20 bags as fee for thresh operation. It is generally carried out among farmers in Lao PDR.

5. Flat bed dryer for Rice & corn:

- Post-harvest losses account for about 15-20% for Lao PDR. To obtain good quality rice paddy and corn, the moisture content of the paddy and corn needs to be reduced from over 20% at harvest time to safe level of 14% within 24 hours. The cost of drying operation for rice and corn is about 6 and 4 US\$ respectively.

II. Status of Custom Hiring of farm machines

6.Silo-dryer:

- A silo in vicinity of production area is considered necessary to keep the grain for a longer period and prevent for losses due to moisture and rodents etc...however, silo-dryer is rarely used by small farmers .

7. Rice mill:

- Rice mill brings value addition to farmers while good quality white rice, corn with adequate packaging promotes marketing and brand recognition.
- The cost of rice milling operation is about 38 US\$ per ton; or free of charge; if a custom takes back the rice bran.

III. Agriculture and Mechanization

- 70% of population lives in rural areas relying on farming, fishing and natural resources .
- The major staple food is rice (sticky rice and white rice) and following by corn and legumes
- Weak awareness and lack skills and technologies, farm operation usually causes negative impacts to environment and health of the farmers in term of overuse herbicide, pesticide and burning crop residues in the field.
- In the past, traditional production methods which include draft animal power, man power were mainly implied in agricultural activities.
- During 1980s which introduced application of mechanization through DOA (Vernkham Agricultural Machinery Center in Vientiane) and now DTEAP continue.

III. Agriculture and Mechanization

- At present, application of traditional production method based on animal power, particularly in Lowland areas gradually reduce and shift to mechanization, for instance, small hand tractors are play a dominant role in agricultural activities, following medium & large tractors ranging and other related farming equipment such as transplanting machine; harvester; seed dryer and rice mill.
- The most suitable way to implement this full-scale mechanization approach is by the way of pilot projects in various production conditions.
- The pilot schemes must allow the full operation capacity of the machinery in order to establish the cost-benefit analysis under real production conditions; this means that the plantation area shall be at least 50 ha to justify the investment for mechanization.
- Only practical experience in the field can provide the necessary and essential information about specific local needs and necessary modifications.
- Essential services must be implemented and coordinated with machine manufacturers.
- For a successful implementation of mechanization the following issues are essential:
 - Farm Mechanization Planning and Farm Management,
 - Technical training including operation & maintenance

IV. Challenges and Constraints faced

1, **Farmers' perspective:** it has been observed that

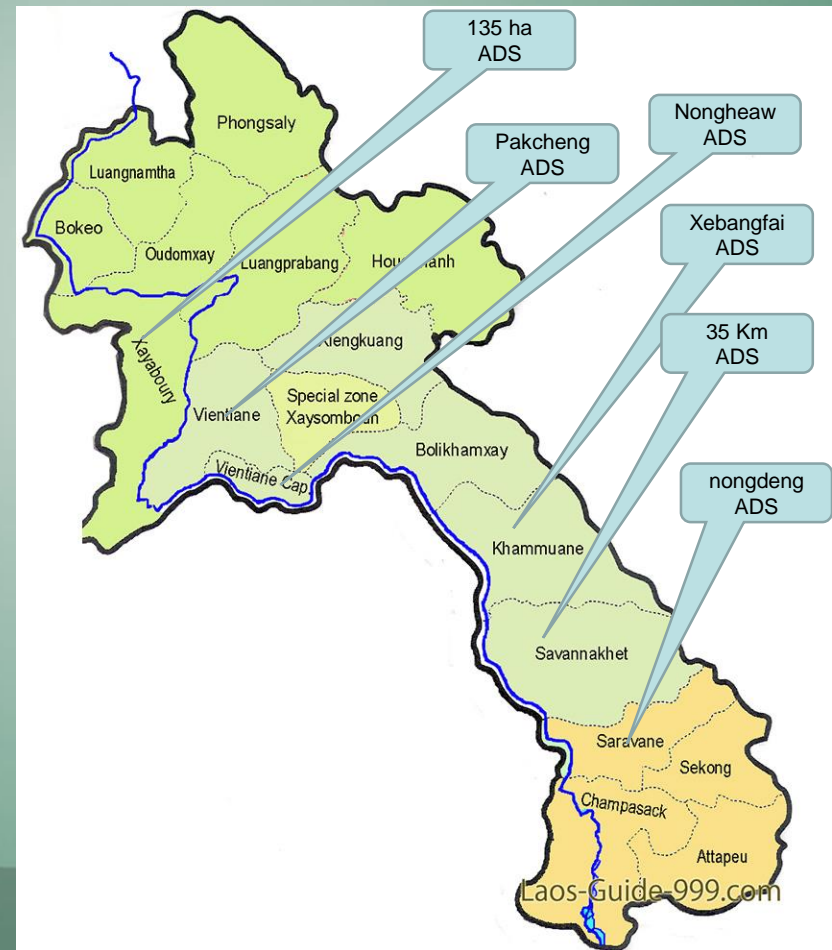
- Small farmers are planting rice in small plots with numerous dikes to keep water because of land leveling. This situation makes it difficult to use mechanization.
- majority of small farmers have been insufficient capacity in production planning (quality & quantity) to meet market demand;
- have limitation technical knowledge of post-harvest handling and marketing techniques;
- difficulty in accessing financing for market-oriented farm-based activities

2, **Government's perspective:** In reality, it has been found several challenges and constraints such as:

- 1) Farmers do not diversify cropping patterns;
- 2) Extension technicians do not meet technical needs of farmers' organizations;
- 3) Foreign agribusiness investors lack experience working with Lao farmers;
- 4) Linkages between agribusiness and farmers are not easy to establish (due to trust does not exist for farmers or companies don't respect contracts, paradigm shift for agricultural extension organization now need to look at the market, not only at production)
- 5) Farmers have a low access to technology (on farm process) and knowledge, finance and labor.

V. Good practices and experiences

- The 6 agricultural development station under department of technical extension and agro-processing :



V. Good practices and experiences

- The agricultural development station supporting
 - Combine
 - Tractor
 - Dryer
 - Transplanting and rice seed sowing



V. Good practices and experiences



Agriculture demonstration and knowledge sharing

1. Agriculture demonstration and knowledge sharing
2. Rice seed production to support the farmers
3. Agriculture machinery Service



Agriculture machinery Service



Rice seed production to support the farmers.

VI. Solutions and Suggestions

- Establishing machinery cooperative in each level and charge the service
- Promote private sector to service on farm machine and marketing
- Diversification of agriculture and introduction of related farming equipment for small farmers
- Provision of knowledge on pre- post harvest technologies and marketing techniques to farmers



**Thank you
for your attention**