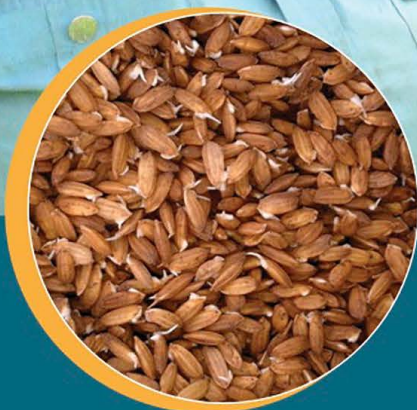




Food and Agriculture Organization  
of the United Nations

# Gender sensitive labour saving technology



**Drum seeder: saving time, effort and money**  
A case study from the Lao People's Democratic Republic



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Mayling Flores Rojas

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Cover photo: Drum seeded rice-fish field in Sayabouly, Farmers using drum seeder

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Woman farmer using the drum seeder, pre-germinated rice seeds

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# Contents

Acronyms and Abbreviations	iv
Acknowledgements	v
Introduction	1
Results from the field in the Lao People’s Democratic Republic	3
Methodology	3
Rice planting methods and gender division of labour in Sayabouly	3
What are the benefits and limitations of using a Drum Seeder?	4
Save time and reduce work burden	4
Increased labour productivity	4
Improved efficiency in the use of seeds	5
Reduction of production cost	5
Some risks and limitations	6
More inclusion of women may increase adoption	6
Contribution to Building Resilience against Climate Change	7
Conclusions and Way Forward	8
References	9

## Tables

Table 1. Division of labour by planting methods and gender in Sayabouly province	4
Table 2. Cost-Benefit of different rice planting methods	5
Table 3. Summary of the Farmer Field Schools (FFS) where the drum seeder was demonstrated in Sayabouly province	7

## Boxes

Box 1: Key messages	1
Box 2: What is a Drum Seeder? – A gender sensitive labour saving technology	2

# Acronyms and Abbreviations

AWD	Alternate Wetting and Drying
FFS	Farmer Field School
FAO	Food and Agriculture Organization of the United Nations
GHG	Green House Gas
IRRI	International Rice Research Institute
NGO	Non-governmental organization
SIRP	Sustainable Intensification of Rice Production
DAFO	The District Agriculture and Forestry Office
ICAR	The Indian Council of Agricultural Research
IFAD	The International Fund for Agricultural Development
SDC	The Swiss Agency for Development and Cooperation

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*Top view of a rice-fish field drum seeded, Sayabouly Province the Lao People's Democratic Republic*



# Introduction

Asian agriculture is rapidly changing, with a shift from traditional labour intensive operations to labour saving technologies and mechanization at farm level and for post-harvest and processing operations. These changes are underpinned by a number of factors, including rising labour scarcity in rural communities in the region, increasing labour costs, the increasing feminization of agriculture<sup>1</sup> and the development of modern agri-food chains in response to market demands (FAO, 2014).

In Sayabouly province, located in the northwest of the Lao People's Democratic Republic, labour scarcity is a common problem for smallholder farmers growing rice, especially during planting and harvesting periods. A drum seeder has been field tested in support of the Sustainable Intensification of Rice Production (SIRP) by the Laotian Government and smallholder farmers, with support from the Food and Agriculture Organization of the United Nations (FAO).

## Box 1: Key messages

- = A drum seeder is a manual technology used for drum seeding pre-germinated rice seeds, it is suited to both men and women farmers
- = Drum seeding appears to be an attractive option compared to the traditional planting methods namely manual transplanting and broadcasting as its use saves time and money (labour and seed), reduces workload and drudgery and increases the labour productivity
- = More than 90% of the time of smallholder farmers is saved when using a drum seeder compared to manual transplanting
- = Using a drum seeder increases the labour productivity by more than 40% when compared to manual transplanting
- = When using the drum seeder, farmers save seeds by more than 60% compared to manual transplanting and broadcasting
- = Drum seeder reduces production cost by 20% when compared to manual transplanting and 1% for broadcasting
- = The drum seeder is an environmentally-friendly technology as it does not require fossil fuel to operate and it is suitable for agro-ecological approaches such as Alternate Wetting and Drying (AWD) and Rice-fish systems
- = More inclusion of women in demonstration of the use of drum seeder and other labour saving technologies can increase their adoption in rural communities
- = The drum seeder increases farmers' resilience against climate change as they can perform timely planting and have more flexibility in their choice of planting time. In case of a natural disaster causing the loss of just-planted rice, farmers can re-do the drum seeding rather easily and fast

<sup>1</sup> Feminization of agriculture is taking place in the region due to propensity of more men than women migrating from rural to urban areas or abroad (FAO, 2014).

## Box 2: What is a Drum Seeder? – A gender sensitive labour saving technology

A drum seeder is a manual technology used for seeding pre-germinated rice seeds on lowland and irrigated rice production systems. It is a gender sensitive labour saving technology as it is suited to both male and female physical characteristics and limitations, reduces drudgery and increases labour efficiency, freeing-up time for resting or performing alternative income activities. It is a gender sensitive technology too because manual transplanting is almost exclusively performed by women in rural communities.

The weight of a drum seeder varies according to the number of drums and therefore the number of rows; for instance a 12-row drum seeder weighs approx. 15 kg and costs between USD 60 to 100 depending on the quality.

It is an environmentally-friendly technology as it does not require fossil fuel to operate and it is suitable for agro-ecological approaches such as Alternate Wetting and Drying (AWD) and Rice-fish systems.

In Asia, a labour saving technology called drum seeder is used by thousands of smallholder farmers thanks to the work of the National Governments, International Rice Research Institute (IRRI), the International Fund for Agricultural Development (IFAD), the Swiss Agency for Development and Cooperation (SDC) and local non-governmental organizations (NGOs) (World Bank *et al.*, 2009; SDC, 2008) and the Indian Council of Agricultural Research (ICAR) in the Philippines, Viet Nam, Myanmar, Bangladesh, and India.

Source: Author



A rice-fish field drum seeded



The 12-row drum seeder used by farmers in Sayabouly province

# Results from the field in the Lao People's Democratic Republic

This study compares three planting methods (i.e. drum seeding, manual transplanting and broadcasting) using data from an initiative in the Lao People's Democratic Republic. Although the sample size is small and the data is based on farmers' recollection, the study illustrates the benefits of a drum seeder on the livelihoods of smallholder farmers. The results can stimulate discussion and interest in conducting similar studies on a larger scale and promoting this technology further.

## Methodology

The below results are based on first hand data (i.e. yields, quantity of seeds and time for planting, etc.) of the wet rice season<sup>2</sup> in Khob district, Sayabouly province, where the drum seeder was field tested within the context of Farmer Field School (FFS) interventions from 2015 until 2017.

The data was collected through focus group discussions, participatory observations and interviews with FFS trainers and farmer graduates during four field visits in November 2016 and September, November and December 2017. Eleven interviews (with six men and five women) were conducted with a member of the households who had adopted the 12-row drum seeder in their own fields in Khob district prior to December 2017. For all of them, their main source of income is farming, specifically maize production. Rice is produced for their own consumption and only the surplus (if any) is sold in the market. Another 16 farmers practicing broadcasting and 25 farmers practicing manual transplanting were also interviewed. The farmers practicing drum seeding and manual transplanting live in the villages Thongmen and HouyLao (there are no farmers practicing broadcasting in those

villages). Some farmers using the drum seeder continue to perform manual transplanting in a portion of their land under rice production. Farmers practicing broadcasting live in a village called Houyngoun.

The yield used for the overall cost-benefit analysis of the three planting methods is assumed to be the same, even though farmers reported slightly higher yields when using the drum seeder compared to manual transplanting (FAO and the National University of Laos, 2018)<sup>3</sup> and broadcasting.

## Rice planting methods and gender division of labour in Sayabouly

Traditionally, there are two main rice planting methods used during the rice seasons (dry and wet season) in Sayabouly province. Smallholder farmers either broadcast the rice seeds by hand directly in the field or they perform manual transplanting. Broadcasting is done by family labour. Manual transplanting is performed by family labour together with exchange labourers<sup>4</sup> or it is done solely by paid labour.

Broadcasting is a much less labour intensive method than manual transplanting. Manual transplanting is a labour intensive operation with a high element of drudgery. It comprises a set of tasks: (1) preparing the seedbed and land, (2) harvesting the sprouted seedlings, (3) transporting the seedlings from the seedbed to the field, and (4) planting the seedlings in the soil. The first and third tasks are mostly performed by men whereas the second and fourth are mainly performed by women in Sayabouly (see Table 1).

<sup>2</sup> The wet season starts in July with the land preparation and planting and lasts until December when the harvest takes place. The rice yields during the wet season are relatively lower than during the dry season

<sup>3</sup> A study carried out by FAO and the National University of Laos (2018) to assess the results of the FFS in Sayabouly showed that six drum seeded plots had an average of 0.64 ton higher yield than manual transplanting. Yet, it is difficult to determine the yield gains coming from the use of the drum seeder as other factors such as improved practices were also implemented in the plots.

<sup>4</sup> Exchange labour is a practice adopted by smallholder farmers in villages where the labour is either scarce, too expensive or both. Exchange labourers are neighbouring farmers who help their peers transplant their fields. In exchange, they will have to help to transplant the other farmers' fields.

**Table 1. Division of labour by planting methods and gender in Sayabouly province**

Description	Drum seeding (working days)	Manual transplanting	Broadcasting
Seedbed and land preparation*	Men	Men	Men
Harvesting sprouted seedling (manually)	–	Women > Men	Women > Men
Transporting seedlings	–	Men	Men
Planting	Women > Men	Women > Men	Women > Men

\* Land preparation is done by power tiller

> it means "more than"

Source: Author

The drum seeder (see Box 2) is used for seeding pre-germinated rice seeds on lowland and irrigated rice production systems. This type of planting method consists of soaking the seeds in water for 24 hours before planting them. As the drum seeder is pulled by a single operator, the drums rotate and the seeds inside them fall on the field; each drum seeds two straight rows at the same time.

## What are the benefits and limitations of using a Drum Seeder?

The variables studied to assess the benefits and limitations of using a drum seeder in comparison to manual transplanting and broadcasting include: time needed to perform the planting operation and work burden, labour productivity, production cost, seed use efficiency as well as the potential for building resilience against climate change. The economic results found on this study (Table 2) are consistent with previous studies carried out in other countries in the region including World Bank *et al.*, 2009; SDC, 2008; the International Food Policy Research Institute (IFPRI); 2016 and Prasad *et al.*, 2014.

**Save time and reduce work burden.** In the villages where the drum seeder was field tested, transplanting performed by exchange labour is the predominant planting method used. Exchange labourers need to work on other farmers' fields for between 10 and 30 days per season depending on the number of labourers who helped them transplant their own field and surface. This social relationship between the farmers allows them to perform this operation; at the same time this poses an important work burden and commitment.

The drum seeder is owned by The District Agriculture and Forestry Office (DAFO) in Khob district in Sayabouly province, and is lent to farmers in the surrounding districts free of charge. When performing drum seeding, one hectare of land

can be planted in one working day by one person.<sup>5</sup> Manual transplanting requires 29 person-days for the same one hectare. This represents a time saving of 97 percent. When comparing drum seeding with broadcasting, the number of person-days required remain the same (i.e. one working day for one person per ha).

No extra time is needed when using a drum seeder in the prior or subsequent agricultural operations because farmers perform land preparation, weeding and harvesting in the same manner for each of the three planting methods. After adopting the drum seeder, smallholder farmers reported more time available for resting, income generating activities and helping other farmers in their fields.

*Mr Noypan Phetsakone (an FFS graduate) explained "Before, 10 people including myself and my wife would work for a whole day to transplant our rice field of 0.26 ha, now with the drum seeder in 30 min I can plant our field"*

**Increased labour productivity.** When using a drum seeder, the labour productivity is higher when compared to manual transplanting; this means that there is more income generated per unit of labour input (see Table 2). The agricultural income when using a drum seeder is 17 USD per day worked, while for manual transplanting it is 12 USD per day worked. This represent an increase of 42 percent. The income for the small farmer-operator (entrepreneur) when using a drum seeder is 32 USD per day worked, while for manual transplanting it is 24 USD per day worked (an increase of 33 percent). When comparing drum seeding to broadcasting the labour productivity remains the same.

<sup>5</sup> Working day of 8 hours

**Table 2. Cost-Benefit of different rice planting methods**

Description	Unit	Drum seeding	Manual transplanting	Broadcasting
(Y) Rice Yield (average)	kg/ha	3 600	3 600	3 600
(P) Rice Price	USD/kg	0.3	0.3	0.3
<b>(Gi) Gross income</b>	<b>USD/ha</b>	1 080	1 080	1 080
(C) Cost of the 12-row Drum seeder	USD	85	–	–
(L) Life of 12-row Drum seeder	year	6	–	–
(Ha) Current number hectares drum seeded per year	ha/year	5		
<b>(D) Depreciation: C / (L x Ha)</b>	<b>USD/ha</b>	3	–	–
<b>(I) Interest: (((C+S) / 2) x i) / Ha</b>	<b>USD/ha</b>	1	–	–
<b>(Fc) Fixed cost: D + I</b>	<b>USD/ha</b>	4	–	–
Labour cost for planting (@ 5 USD per day)	USD/ha	5	145	5
Labour cost for all other operations*	USD/ha	412	412	412
<b>(Lc) Total labour cost</b>	<b>USD/ha</b>	417	557	417
Seed cost	USD/ha	5	18	17
Other inputs cost (herbicides, fertilizer and fuel)	USD/ha	51	51	51
<b>(Ic) Total inputs cost</b>	<b>USD/ha</b>	56	69	68
<b>(M) Maintenance and repair of the seeder: (C x m) / Ha</b>	<b>USD/ha</b>	2	–	–
<b>(Vc) Variable cost: Lc + Ic + M</b>	<b>USD/ha</b>	475	626	485
<b>(Tc) Total Cost: Fc + Vc</b>	<b>USD/ha</b>	479	626	485
<b>Net income: Gi - Tc</b>	<b>USD/ha</b>	<b>601</b>	<b>454</b>	<b>595</b>
<b>Agricultural income</b>	<b>USD/day</b>	<b>17</b>	<b>12</b>	<b>17</b>
<b>Entrepreneur (only family labour) income</b>	<b>USD/day</b>	<b>32</b>	<b>24</b>	<b>32</b>

Notes: Figures are rounded up

USD 1 = LAK 8298

\* Seedbed preparation, spraying and harvesting @ 6 USD/day, land preparation @ 9 USD/day, planting @ 5 USD/day

(i) Interest rate per year (12%), (S) Residual value (0% of the investment), (m) Maintenance and repair (10% of the investment)

The cost of land is assumed to be 0

Agricultural income includes family and non-family labour while Entrepreneur income includes only family labour

**Improved efficiency in the use of seeds.** When using the drum seeder, 17 kg of seeds is required per ha for planting, whereas for manual transplanting 61 kg and for broadcasting 55 kg of seeds is required per ha. This represents seed savings of 72 percent and 69 percent respectively when compared to manual transplanting and broadcasting.

**Reduction of production cost.** The reduction of cost comes from the reduction in labour and seed costs when using the drum seeder. When compared to manual transplanting, smallholder farmers performing drum seeding save USD 147 per ha

per planting season.<sup>6</sup> Comparing the drum seeding with broadcasting, the cost saving is USD 6 per ha per planting season. These represent a total cost reductions of 23 and 1 percent when comparing drum seeding with manual transplanting and broadcasting respectively. During the first year the investment of the drum seeder (cost 85 USD) is recovered if the technology is used in at least 0.6 ha of rice previously manually transplanted. In the case

<sup>6</sup> In Sayabouly province, this is especially true for the wet season in which farmers use the drum seeder. During the dry season farmers having access to water for irrigation will use the drum seeder

of farmers previously performing broadcasting, they can recover the investment after using the drum seeder in 14 ha.

As a result of the reduction of production costs and unchanged yields, the net income for small holder farmers when using a drum seeder is 601 USD per ha whereas for manual transplanting it is 454 USD per ha and for broadcasting 595 USD per ha.

The drum seeder also provides an opportunity for farmers to earn additional income by providing seeding services to neighbouring farmers.

**Some risks and limitations.** In the context of labour scarcity commonly found in the rural communities in the region, the introduction of labour saving technologies such as drum seeder can play a critical role in meeting farmers' urgent needs for the timely planting of crops – a critical and essential factor for productivity and also to reduce the time needed for planting operations as well as optimizing the use of land and resources. On the less positive side, it may displace women as casual labourers from this income activity in rural communities and increase their food security vulnerability. This needs to be taken into account before scaling up the promotion of drum seeder and any other labour saving technology.

When using a drum seeder, the seeds are exposed to birds and can also be washed away during heavy rains (Prasad et al., 2014). Farmers using the drum seeder in Sayabouly reported more weed presence when compared to manual transplanting. In other countries in the region the introduction of drum seeder was done together with improved weed management through Alternate Wetting and Drying (AWD) or conoweeder for removing the weeds between the rice lines mechanically (SDC, 2008). In Sayabouly, some farmers using the drum seeder still continue to perform manual transplanting in a portion of their land under rice production. Farmers explained that only the plots with a reliable supply of water are drum seeded. Further analysis on the cause of this is needed.

**More inclusion of women may increase adoption.** Most of the operators of the drum seeder in the villages in Sayabouly are men; in only one household out of eleven using the drum seeder is there a woman using this technology. This is likely to be related to the fact that the majority of the farmers who learned how to use the drum seeder in the field were men (78 percent). The overall level of adoption remains low (only 6 percent) (see Table 3). On average, during the wet season only 34 percent of



The Senekhamleu family farm side by side as their main source of income. They have been using the drum seeder on their rice field for the last three years

Ms. Khamvean Senekhamleu said "It is good and easy to use the drum seeder, we save money on labour and time. Other women saw me using it and said that they would like to try too in their fields. With the days saved now I rest or go for other income activities.

Mr. Tha Senekhamleu explained "We are also saving food, we used to spend 150 000 LAK (= USD 20) and part of our rice to provide food to the exchange labourers"

the total rice area is planted with the drum seeder, the rest is still manually transplanted. This percentage may potentially be even lower during the dry season if farmers lack access to water for irrigation.

A study carried out in India (IFPRI, 2016) explains that women value labour saving more than men as they are the ones significantly performing manual transplanting (which is a labour intensive operation). In this sense to increase the adoption of drum seeder, extension officers, NGOs and international organizations need to include women in training and demonstrations on the use of the drum seeder (and other labour saving technologies) and facilitate the women's access to this technology.

**Table 3. Summary of the Farmer Field Schools (FFS) where the drum seeder was demonstrated in Sayabouly province**

Year	Description	Location (Khob district)
2015	Number of Save and Grow FFS	1
	Number of farmers graduates (men/women)	25/2
2016	Number of Save and Grow FFS	3
	Number of farmers graduates (men/women)	71/22
2017	Number of Save and Grow FFS	2
	Number of farmers graduates (men/women)	45/17
Total	Farmers graduates (men/women)	182 (141/41)
	Number of farmers operating the drum seeder (men/women)	11 (10 /1)
	Adoption of drum seeder (%)	6

Source: records from Integrated Pest Management (IPM) team in the Lao People's Democratic Republic

### Contribution to Building Resilience against Climate Change.

The time saving and increase in labour productivity when using a drum seeder allow farmers to have a better capacity to cope with erratic weather as they can perform timely planting and have more flexibility in their choice of planting time. According to SDC (2008) the drum seeded rice matures 10-15 days earlier than manually transplanted rice, which allows farmers to plant earlier the following crop after rice, making better use of the residual soil moisture. In case of a natural disaster causing the loss of just-planted

rice, farmers can re-do the drum seeding rather easily and fast while only a relatively small amount of seed is lost. Furthermore, the drum seeder is suitable for agro-ecological approaches such as AWD and rice-fish systems. AWD reduces the amount of water needed for the rice production and the Green House Gas (GHGs) emissions (mitigation of climate change) (IRRI, 2016). Rice diversification, through for example rice-fish systems, represents an important factor to also increase resilience of smallholder farmers against climate change. All this translates into an increased resilience against climate change.

## Conclusions and Way Forward

- = Drum seeding in the rice production systems appears to be an attractive option for both men and women when compared to the traditional planting methods namely manual transplanting and broadcasting. Its use saves time and money (labour and seed), reduces workload and drudgery and increases the labour productivity.
- = Farmers can provide seeding services with the drum seeder to neighbouring farmers. Those providing the service will generate an additional income while the farmers receiving the services will benefit from timely planting and reduced cost in labour.
- = The introduction of drum seeder together with weed management have been positive in other countries in the region. This can be replicated when promoting drum seeder in the Lao People's Democratic Republic.
- = The use of a drum seeder contributes towards building resilience against climate change by smallholder farmers as they can cope better with erratic weather, and re-plant their field faster in case of losing their rice crops due to natural disaster.
- = More inclusion of women in the field demonstrations and training on the use of drum seeder (and other labour saving technology) will help to increase its adoption in rural communities and spread the benefits of using the drum seeder.
- = Raising awareness among local authorities, NGOs and other organizations working together with farmers in the field can allow further support for the promotion of drum seeder and disseminate its limitations and benefits.



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