

## **1. TECHNICAL ASSESSMENT REPORT**

**ON**

### **STUDIES AND DESIGN AND WORKING MECHANISM OF EXISTING RICE SEED PLANTERS AND THE RESULTS OF GROUP DISCUSSION WITH USERS AND STAKEHOLDERS OF THE MACHINE**

#### **I. DESCRIPTION**

In Cambodia, Agricultural sector plays an important role for food security and poverty reduction. Rice is the main agricultural income comparing with other crops, and it occupies about 70 percent of agricultural land in Cambodia (4,505,267 ha reported by MAFF in 2014). Battambang, Kampong Thom, and Takeo are the three major rice growing provinces in Cambodia. However, farmers in the three provinces face many problems, such as climate change planting techniques, and esp. the shortage of labor force, and the farmers know little about the technology of agricultural mechanization. If technology of rice seed planters can be utilized properly, it could be benefited for farmers to reduce drudgery on the farm and improve the standard of living of the rural farmers. Therefore, rice seed planters should be considered and introduced to farmers to provide additional benefits.

Rice seed planter is a modern sowing implement that positions rice seeds in the soil and then covers them. The rice seed planter sows the seeds at equal distances and proper depth, ensuring that the rice seeds get covered with soil are saved from being eaten by birds. There are different types of rice seed planters utilizing in Cambodia. Some rice seed planters have been imported from other countries, and some have been designed and developed locally.

Department of Agricultural Engineering in cooperation with Appropriate Scale Mechanization Consortium for Sustainable Intensification to assess and develop appropriate rice seed planter in Cambodia through gathering the information in the target provinces about pros and cons of the existing seeders and the demands of the end-users by DAEng' s team and consulting meeting with farmers and stakeholders at DAEng.

#### **II. ACTIVITIES UNDER THE PROJECT**

##### **A. STUDIES ON THE EXISTING SEED PLANTERS**





**Activities of DAEng's Team to Study on the Existing Seed Planters in Battambang**



**Activities of DAEng's Team to Study on the Existing Seed Planters in Kampong Thom**







### **Activities of DAEng's Team to Study on the Existing Seed Planters in Takeo**

From February to late August, 2016, DAEng's team went to the three provinces to conduct the studies on the existing tractor drawn rice seed planters and power tiller drawn rice seed planters in Battambang , Kampong Thom, and Takeo provinces .

In Battambang province, DAEng's team interviewed five farmers and Conservation Agriculture Service Center (CASC)'s coordinator on power tiller drawn rice seed planters and tractor drawn rice seed planters imported from Brazil and adopted by CASC, and presently being used at Boribo village, Sdav commune , Rottanak Modol district, Battambang province. The team also on interviewed two famers and CASC's coordinator on tractor drwn rice seed planters imported from Thailand and adopted by CASC , and presently being used Kirichum village, Raksmei commune, Sangha village, Rottanak Mondol district, Battambang province .The team also interviewed a farmer on rice seed planters produced and developed by DAEng and being used Battambang Town for testing by Battambang Provincial Department of Agriculture. After that the team interviewed the user of seed planters imported from Thailand and adopted by Don Bosco Vocational Training Center .Besides, the team interviewed a famers using power tiller drawn rice seed planters demonstrated by CARDI at O Dambang village, O Dambang commune, Sangke district, Battambang province. DAEng's team also studied on tractor drawn rice seed planters and power tiller drawn rice seed planters at Krapel Khang Lech village, Phnom Sampov commune, Banon district, Battambang province. The seeder was imported from Brazil and adopted by CASC and presently being used covering an area of 150 ha

In Kampong Thom province, DAEng's team interviewed a technician and a farmer on power tiller drawn rice seed produced and developed by DAEng and being used at Trapaing Prey village, Boeung Lvea commune, Santouk district, Kampong Thom province. The seeder adopted by ASMC and currently being used covering an area of 2 ha, and power tiller drawn rice seed planters imported from Brazil .The seeder produced by DAEng and adopted by Cambodian Agricultural Research and Development Institute (CARDI). After that the team interviewed the deputy district governor and asked him to accompany the team to the field of Lim Bunna Company using tractor drawn rice seed

planters. The seeder produced and developed by Russey Keo Agricultural Equipment Manufacturer and being used in the area of 350 ha.

Besides the two provinces, the team also conducted a study on rice seeders at Sorma company in Takeo province by interviewing the farmers using the seeders, and they were happy with the use of the seeders.

As a result of the studies, we found that the tractor drawn rice seed planters were imported from Brazil and Thailand, and other seeders were produced locally, whereas power tiller drawn rice seed planters were imported from Brazil, and some produced and developed by DAEng. The team also learned about the specifications, advantages and disadvantages, adjustment of the seeders for the modifications and development of the existing seeders in Cambodia. Moreover, the team also noticed that using the seeders can help farmers grow rice timely and high germination, reduce the use of seed, fertilizer, be easy to keep seedlings, and reduce labor force. The farmers were interested in the seeders, and they asked the team to adjust /modify some technical specifications and produce seeders with suitable price, high efficiency, and can be affordable. (Types of the rice seed planters, specifications, and key findings, see the appendices).

## **B. CONSULTATION MEETING ON ASSESSMENT AND MODIFICATIONS OF EXISTING RICE SEED PLANTERS IN CAMBODIA.**



### **Activities of the Consultation Meeting on Assessment and Modifications of Existing Rice Seed Planters with Users and Stakeholders**

On 31 August, 2016, DAEng organized a consultation meeting on “Assessment and Modifications of Existing Rice Planters in Cambodia” to share and gather information from users

and all stakeholders for the improvement of existing rice seed planters in Cambodia. There were 52 participants in the meeting, and they come from DAEng , related departments of the General Directorate of Agriculture, Provincial Offices of Agricultural Engineering, CASC , and farmers from the target provinces, CARDI, Kbal Po Agricultural Engineering Center , Prek Leap National College of Agriculture (PLCA), Royal University of Agriculture (RUA) , Don Bosco Vocational Training Center in Battambang, Kong Nuon Group Co.,Ltd , MAFF National Implementation Office for Rice-Sector Development Program (RICE-SDP),and Dr.Gerald Hitzler, agricultural machinery experts and technical assistant for the Faculty of Agricultural Engineering of RUA and a representative of International Rice Research Institute (IRRI).

After the welcome remarks by Dr. Chan Saruth, Director of DAEng and the presentation by the DAEng's team regarding the studies of the existing seeders in the three provinces. The participants were divided into two groups for discussion focusing on the questions with the answers as follows.

**1. Presently, does Cambodia need rice seed planters? Why?**

Presently, rice seed planters are needed in Cambodia with the following reasons.

- Shortage of labour force for transplanting
- Spending less time
- Reducing the use of seeds
- Efficiency is higher than by hand
- Ease to maintain and weed controls
- Farming for commercialization
- Reducing production cost
- Reducing the loss after harvesting
- Higher yield than broadcasting
- Adaption to climate change
- Good quality of soil

**2. Should we improve the existing rice seed planters for the market needs? What should be improved?**

The existing rice seed planters should be improved for the market needs focusing on tractor drawn rice seed planters and power tiller drawn rice seed planters, especially power tiller drawn rice seed planters because most of the farmers have power tillers.

**Things to be improved for the tractor drawn rice seed planters as follows.**

- Adjustment of tube for dropping seeds correctly



- Power transmission PTO
- Adjustment the wheel support and rotating wheel to avoid slippage

**Things to be improved for the power tiller drawn rice seed planters as follows.**

- Adjustment the ski system (furrow opener) using disc type
- Seat should be provided for riding
- Putting fertilizer box (good for tractor)
- Modifications for seeding control depth
- Seeders should be light
- Increasing the working width
- Avoiding of using plastic materials because it is easy to be damaged
- Adjustment for sharp furrow opener
- Weight should be placed in case we need additional depth
- Being able to adjust working width based on rice type
- Depth for fertilizer should be deeper than seed ( 2-3 cm)
- Applying fertilizer at the base is useless when drought
- Depth should be set properly so that seed can resist to the water shortage
- Wheel should not be slipped
- Seeders should be used for multi-crop purposes

### **III. MODIFICATIONS OF THE EXISTING RICE SEED PLANTERS**

After the studies in the target provinces and the consultation meeting at DAEng, DAEng's team has decided to modify and develop the rice seeders produced and developed at DAEng as follows.

- Power tiller drawn rice seed planters
  - Seed metering
  - Furrow system
  - Determination of dropping seeds
  - Putting on fertilizer box
- Tractor drawn rice seed planters
  - Seed metering
  - Furrow system
  - Determination of dropping seeds

- Putting on fertilizer box
- Wheel mechanic system

#### **IV. CONCLUSION AND RECOMMENDATIONS**

Rice seed planters are needed for farmers and companies to deal with the shortage of labor force and drudgery on the farms and to improve the living standards of farmers as well as reducing the poverty of the rural areas. However, with a view to help farmers use the rice seed planters, many rice seed planters should be produced and developed with suitable price, technology and the use should be extended and demonstrated to farmers, credit should be provided with low interest, community should be mainstreamed, and so on. Recommendations from users and stakeholders should be collected for further improvement on producing technical drawings of modified rice seed planters and prototypes.

#### **APPENDIX-I**

##### **Specifications of Rice Seed Planters Assessed by DAEng's Team**

## I. Rice Seed Planters Attached to Power Tiller

### 1. Seeder Type PT01-Brazil

The seeder was imported from Brazil in 2004 by Mr. Sephane BOULAKIA, a technical assistant from CIRAD (French international organization)



Specifications					
1	Length	1.4 m	12	Crop	Rice, Corn, Bean
2	Height	1.2 m	13	Seed rate (Kg/ha)	75 (rice)
3	Width	2.9 m	14	Seed Capacity (Kg)	30 (rice)
4	Weight	150 kg	15	Depth of placement	4-5 cm
5	Seed metering	Mechanic	16	Fertilizer metering	Mechanic
6	Number of Rows	2	17	Fertilizer rate	30-50 kg/ha
7	Row Spacing	60-80 cm	18	Field Efficiency (%)	90%
8	Furrow Opener	Disc	19	Field Capacity	1-1.5 ha/day
9	Wide Operation	2 m	20	Operating Speed (Km/h)	2.5
10	Power Transmission	Wheel mechanic	21	Operating Fuel (L/h)	0.5
11	Power Source (Hp)	12-14 Hp	22	Labor Requirement	1

### 2. Seeder Type PT01-Cam and PT02-Cambodia

The seeder is a locally made model. It was designed and manufactured by DAEng in 2013.



1	Length	800 mm	12	Crop	Rice, Corn, Bean
2	Height	700 mm	13	Seed rate (Kg/ha)	50-200
3	Width	790 mm	14	Seed Capacity (Kg)	20



4	Weight	85 kg	15	Depth of placement	3-5 cm
5	Seed metering	Mechanic	16	Fertilizer metering	N/A
6	Number of Rows	4	17	Fertilizer rate	N/A
7	Row Spacing	18-25 cm	18	Field Efficiency (%)	90%
8	Furrow Opener	Disc	19	Field Capacity	1 ha/day
9	Wide Operation	720 mm	20	Operating Speed (Km/h)	3
10	Power Transmission	Wheel mechanic	21	Operating Fuel (L/h)	N/A
11	Power Source (Hp)	10-12 Hp	22	Labor Requirement	1

### 3. Seeder Type PT03-Cambodia

The seeder is a locally made model. It was designed and manufactured by DAEng in 2014.



Specifications					
1	Length	1540 mm	12	Crop	Rice, Corn, Bean
2	Height	770 mm	13	Seed rate (Kg/ha)	60-100 (rice)
3	Width	1110 mm	14	Seed Capacity (Kg)	30 (rice)
4	Weight	150 kg	15	Depth of placement	3-5 cm
5	Seed metering	Mechanic	16	Fertilizer metering	N/A
6	Number of Rows	6	17	Fertilizer rate	N/A
7	Row Spacing	20-25 cm	18	Field Efficiency (%)	75 %
8	Furrow Opener	Disc	19	Field Capacity	2-2.5 ha/day
9	Wide Operation	0.9- 1 m	20	Operating Speed (Km/h)	3
10	Power Transmission	Wheel mechanic	21	Operating Fuel (L/h)	N/A
11	Power Source (Hp)	10-12 Hp	22	Labor Requirement	1

## II. Rice Seed Planters Attached to Tractor

## 1. Seeder Type TR01-Thailand

The seeder was imported from Thailand in 2011 by Mr. Sephane BOULAKIA , a technical assistant from CIRAD (French international organization)



Specifications					
1	Length	2.6 m	12	Crop	Rice, Corn, Bean
2	Height	1.3 m	13	Seed rate (Kg/ha)	75 (rice)
3	Width	2.1 m	14	Seed Capacity (Kg)	50 (rice)
4	Weight	1200 kg	15	Depth of placement	3-5 cm
5	Seed metering	Mechanic	16	Fertilizer metering	Mechanic
6	Number of Rows	5	17	Fertilizer rate	30-50 kg/ha
7	Row Spacing	45-75 cm	18	Field Efficiency (%)	N/A
8	Furrow Opener	2.1 m	19	Field Capacity (Ha/h)	N/A
9	Wide Operation	Disc	20	Operating Speed (Km/h)	N/A
10	Power Transmission	Wheel mechanic	21	Operating Fuel (L/h)	N/A
11	Power Source (Hp)	60-80 Hp	22	Labor Requirement	2

## 2. Seeder Type TR02-Thailand

The seeder was imported from Thailand in 2015 by Sorma Company



Specifications					
1	Length	2 m	12	Crop	Rice, Corn Bean



2	Height	1.5 m	13	Seed rate (Kg/ha)	75
3	Width	1.8 m	14	Seed Capacity (Kg)	10-15
4	Weight	200 kg	15	Depth of placement	2-5 cm
5	Seed metering	Mechanic	16	Fertilizer metering	Mechanic
6	Number of Rows	7	17	Fertilizer rate	50-75 kg/ha
7	Row Spacing	20-30 cm	18	Field Efficiency (%)	90%
8	Furrow Opener	Shovel	19	Field Capacity (Ha/h)	4-6 ha/day
9	Wide Operation	2 m	20	Operating Speed (Km/h)	3-5
10	Power Transmission	Wheel mechanic	21	Operating Fuel (L/h)	N/A
11	Power Source (Hp)	65-95 Hp	22	Labor Requirement	2

### 3. Seeder Type TR01-Brazil

The seeder was imported from Brazil in 2008 by Mr. Sephane BOULAKIA, a technical assistant from CIRAD (French international organization)



Specifications					
1	Length	2 m	12	Crop	Rice, Corn, Bean
2	Height	1.6 m	13	Seed rate (Kg/ha)	75
3	Width	1.8 m	14	Seed Capacity (Kg)	30-50
4	Weight	200 kg	15	Depth of placement	2-5 cm
5	Seed metering	Mechanic	16	Fertilizer metering	Mechanic
6	Number of Rows	11	17	Fertilizer rate	50-70 kg/ha
7	Row Spacing	20-30 cm	18	Field Efficiency (%)	90 %
8	Furrow Opener	Disc	19	Field Capacity	6-8 ha/day
9	Wide Operation	2 m	20	Operating Speed (Km/h)	3-5
10	Power Transmission	Wheel mechanic	21	Operating Fuel (L/h)	N/A
11	Power Source (Hp)	65-95 Hp	22	Labor Requirement	2

### 4. Seeder Type TR03-Cambodia

The seeder is a locally made model. It was designed and manufactured by DAEng in 2014.



Specifications					
1	Length	3.6 m	12	Crop	Rice, Corn, Bean
2	Height	1.6 m	13	Seed rate (Kg/ha)	75-120
3	Width	1.5 m	14	Seed Capacity (Kg)	250-300
4	Weight	850 kg	15	Depth of placement	3-4 cm
5	Seed metering	Mechanic	16	Fertilizer metering	N/A
6	Number of Rows	14	17	Fertilizer rate	N/A
7	Row Spacing	16-20 cm	18	Field Efficiency (%)	80 %
8	Furrow Opener	Disc	19	Field Capacity	6-8 ha/day
9	Wide Operation	2240-2800 mm	20	Operating Speed (Km/h)	3-6
10	Power Transmission	Wheel mechanic	21	Operating Fuel (L/h)	N/A
11	Power Source (Hp)	80 Hp	22	Labor Requirement	2

### 5. Seeder Type TR05-Cambodia

The seeder is a locally made model. It was designed and manufactured by DAEng in 2015.



Specifications					
1	Length	4.2 m	12	Crop	Rice, Corn, Bean
2	Height	1.6 m	13	Seed rate (Kg/ha)	75-120



3	Width	1.5 m	14	Seed Capacity (Kg)	300-350
4	Weight	970 kg	15	Depth of placement	3-4 cm
5	Seed metering	Mechanic	16	Fertilizer metering	N/A
6	Number of Rows	16	17	Fertilizer rate	N/A
7	Row Spacing	16-20 cm	18	Field Efficiency (%)	80%
8	Furrow Opener	Disc	19	Field Capacity	7-9 ha/day
9	Wide Operation	2560-3200 mm	20	Operating Speed (Km/h)	3-6
10	Power Transmission	Wheel mechanic	21	Operating Fuel (L/h)	N/A
11	Power Source (Hp)	90-100 Hp	22	Labor Requirement	2

## APPENDIX-II

## Key Findings of Advantages, Disadvantages, and Adjustment of the Rice Seed Planters during the Studies in the Target Areas by DAEng's Team under the Project

### 1. Seeder Type PT01-Brazil



#### Advantages

- High field efficiency
- High germination rate
- Reduction of labor force

#### Adjustment

- Back part should be better
- Mark is needed for remembering the furrow for dry soil
- Row spacing at least 2-2.5 cm

#### Disadvantage

- High price
- Row spacing is large
- Difficulty for spare parts

### 2. Seeder Type PT01-Cam and PT02-Cambodia



#### Advantages

- Higher field efficiency
- High germination rate
- Reduction of labor force

#### Adjustment

- Need adjustment

#### Disadvantages

- Need good land preparation & drainage system
- No fertilizer box

### 3. Seeder Type PT03-Cambodia





#### **Advantages**

- High field efficiency
- High germination rate
- Reduction of labor force

#### **Adjustment**

- Need adjustment

#### **Disadvantages**

- Need good land preparation & drainage system
- No fertilizer box

### **4. Seeder Type TR01-Thailand**



#### **Advantages**

- High field efficiency
- High germination rate
- Reduction of labor force

#### **Adjustment**

- The seeder should be lighter

#### **Disadvantages**

- High price
- Difficulty for spare parts

### **5. Seeder Type TR02-Thailand**



#### **Advantages**

- Higher field efficiency
- High germination rate
- Reduction of labor force

#### **Disadvantages**

- High price
- Difficulty for spare parts

### **6. Seeder Type TR01-Brazil**



#### **Advantages**

- High field efficiency
- High germination rate
- Reduction of labor force

#### **Disadvantages**

- High price
- Difficulty for spare parts



## 7. Seeder Type TR03-Cambodia



### Advantages

- High efficiency
- High germination rate
- Reduction of labor force

### Adjustment

- Mark is needed for remembering the furrow for dry soil

### Disadvantages

- Need good land preparation & drainage system
- Outer wheel support
- Silty soil

## 8. Seeder Type TR05-Cambodia



### Advantages

- High efficiency
- High germination rate
- Reduction of labor force

### Adjustment

- Mark is needed for remembering the furrow for dry soil

### Disadvantages

- Need good land preparation & drainage system
- Outer wheel support
- Silty soil

