The Kingdom of Cambodia
Ministry of Agriculture,
Forestry and Fisheries

THE PROJECT
FOR
RICE SEED PRODUCTION
AND PROMOTION
IN
THE KINGDOM OF CAMBODIA
PHASE III

COMPLETION REPORT

JUNE 2023

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

TASK., LTD.

KAIHATSU MANAGEMENT CONSULTING, INC.

ED
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23-050

Abbreviation

4PS	Product, Price, Place, and Promotion (Marketing mix)
AC(s)	Agricultural Cooperatives
ADB	Asia Development Bank
APPP	Agricultural Productivity Promotion Project in West Tonle Sap (JICA)
ARS	Agricultural Research Station
AusAID	Australian Agency for International Development
BAPEP	Battambang Agriculture Productivity. Enhancement Project (JICA)
BB	Battambang
BFPP	Boosting Food Production programme (MAFF, Cambodia)
BRAND	Battambang Rural Area Nurture and Development Project (JICA)
CA	Competent Authority
CARDI	Cambodian Agricultural Research and Development Institute
CAVAC	Cambodia Agricultural Value Chain Program
CFAP	Cambodian Farmer Association Federation of Agricultural Producers
C/P	Counterpart
CRF	Cambodia Rice Federation
CS	Certified Seed
D, DS	Dry Season
DACP	Department of Agricultural Cooperative Promotion
DAO	District Agricultural Office
DCS	Department of Crop Seed
DRC	Department of Rice Crop
DX	Digital Transformation
E, EW	Early Wet Season
FAO	Food and Agriculture Organization for the United Nations
FFS	Farmer Field School
FS	Foundation Seed
GDA	General Directorate of Agriculture
IRRI	International Rice Research Institute
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
KC	Kampong Chhnang
LAREC	Local Agricultural Research and Extension Centre (NGO/ Swiss Church Aid)
MAFF	Ministry of Agriculture, Forestry and Fisheries
NAL	National Agriculture Laboratory
NGO	Non-Governmental Organization
OJT	On-the-job training
OM	OM5451, Vietnam long grain white rice 5451
PDAFF	Provincial Department of Agriculture, Forestry and Fisheries
PDCA	Plan-Do-Check-Act
PDM	Project Design Matrix
PRDU	Phka Rumduol
PV	Prey Veng
QDS	Quality Declared Seed (System)
QR	QR (Quick Response) code
Rice-SDP	Climate Resilient Rice Commercialization Sector Development Program (ADB)
RS	Registered Seed
RSPP	The Project for Rice Seed Production and Promotion (JICA)
RUA	Royal University of Agriculture
SKOB	Sen Kra Oub
SNS	Social Networking Service
SPG(s)	Seed Producer Group

SWOT	Strengths, Weaknesses, Opportunities, and Threats analysis
TK	Takeo
TOT	Training of Trainers
W, WS	Wet Season

Unit and Currency

Length/Distance
- mm = Milimetre(s)
- cm = Centimetre(s)
- m = Meter(s)
- km = Kilometer (s)

Area
- cm^2 = Square centimeter(s)
- m^2 = Square meter(s)
- km^2 = Square-kilometer(s)
- ha = Hectare(s) (10,000 m^2)

Volume
- cm^3 = Cubic centimeter(s)
- m^3 = Cubic meter(s)
- L = Liter (1,000 cm^3)

Weight
- g = Gram (s)
- kg= Kilogram(s)
- ton or MT = Metric ton(s)

Time
- sec = Second(s)
- min = Minute(s)
- hr = Hour(s)

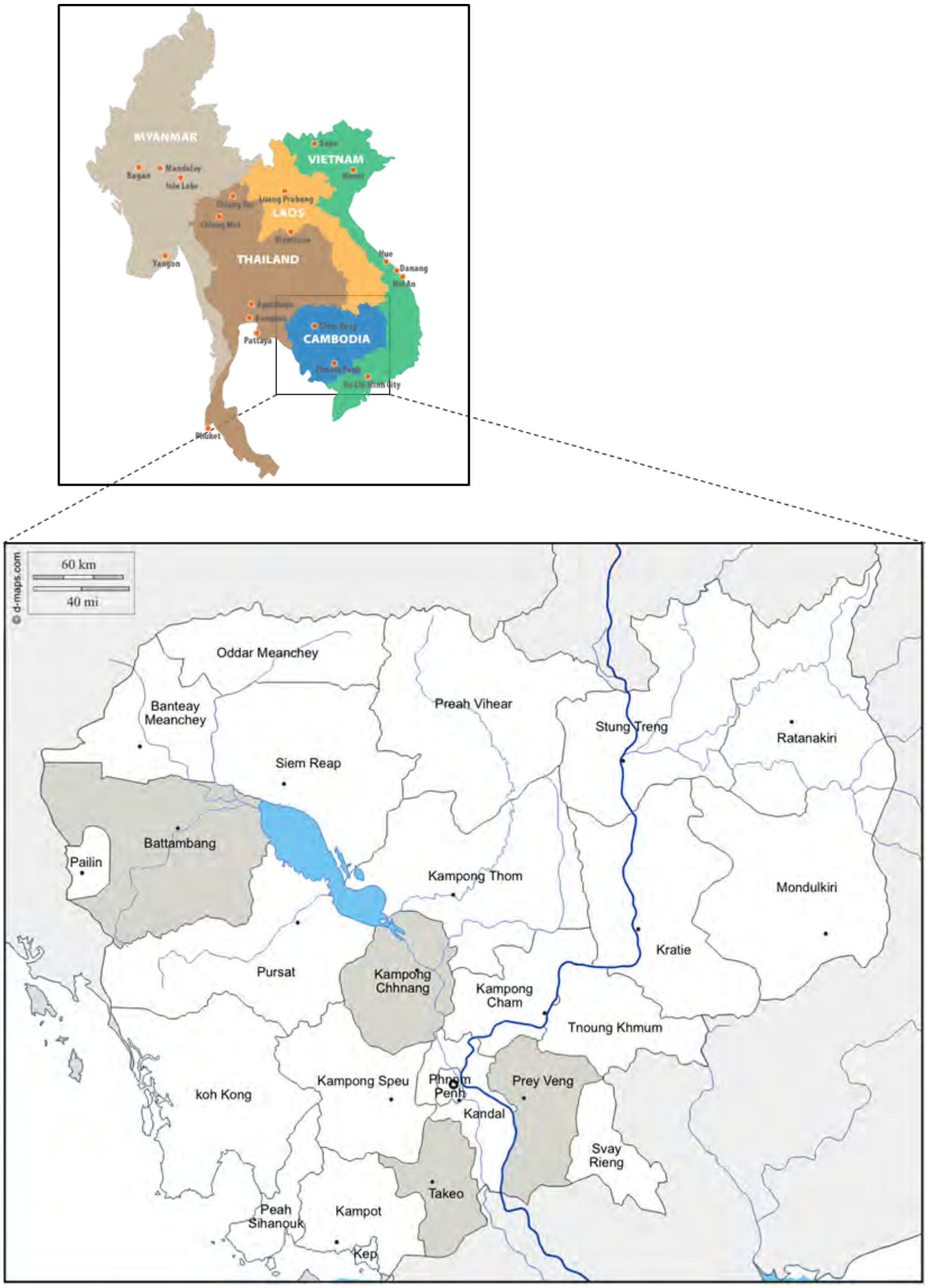
Others
- °C = Degrees Celsius
- % = Percent

Currency rate
- 1US dollar = 4,100 Cambodian Riel

Photos

		
Training on QDS inspections for GDA and PDAFF C/Ps (December 2019)	On field training of field inspection for PDAFF C/Ps (December 2019)	Business forum on QDS seed to network among seed producers and seed business stakeholders (January 2020)
		
Training on QDS laboratory inspections for PDAFF C/Ps (February 2020)	Training on QDS seed production for seed growers (June 2020)	Procured warehouse for the target AC (August 2020)
		
Target ACs promoted the QDS seed at the CAVAC event (May 2021)	The second field inspection done by GDA and PDAFF C/Ps (December 2021)	Training on maintaining the procured seed grader (December 2021)
		
Procured tractor for the target AC (May 2022)	Minister of MAFF participated in inauguration ceremony of procured post harvesting facility (September 2022)	Event of issuance of the QDS tag for the target ACs was broadcast via national TV program (March 2023)

The Map of Target Provinces



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1. Project Overview

1.1. Background

Agriculture is an important sector of Cambodian economy, occupying 24.4% (as of 2021) of the gross domestic product (GDP) and 31% (as of 2023) of the working population[2]. Among those, rice production, which occupies 75% of the total cultivated land, is essential for the stabilization of the national economy, poverty reduction, and food security. Based on the above recognition, the Cambodian government has placed the highest priority on agricultural development and is promoting the improvement of productivity, diversification, and industrialization. Regarding to rice, the government formulated the "Promotion of Paddy Rice Production and Export of Milled Rice" in 2010, and has been promoting the improvement of productivity and quality of rice.

Cambodia's rice production has been increasing year by year, and after achieving self-sufficiency in the 1990s, the country now produces a surplus of nearly 3 million tons per year, and in recent years has become a major rice exporter[3]. On the other hand, production per unit area (yield) remains low compared to neighboring countries. In addition to productivity, there is also quality issue, and there are requests, mainly from rice manufacturers and exporters, to improve the quality of the paddy and milled rice.

To overcome those problems, improvements in irrigation facilities and other infrastructure, as well as the development and introduction of superior rice varieties and improved cultivation techniques, are essential. The percentage of rice farmers who use quality seeds remains low due to low field irrigation rates and farmers' low awareness of quality seeds, in addition to the lack of a well-functioning seed multiplication system and immature rice seed production technology in Cambodia. According to the JICA's preliminary survey report, only 20-30% of rice farmers renew their seeds regularly every three crops.

Given these backgrounds, this project aims to strengthen the seed production system and promote the use of quality seeds, thereby increasing rice production and improving rice quality. Through activities focused on rice seeds, the project will contribute to the development of infrastructure of the country's rice industry.

1.2. Project Summary

1.2.1. Overall Goal

More quality rice seed is produced, and more farmers use it for production nationwide.

1.2.2. Project Purpose

System for producing and distributing quality rice seed is established and functions properly in the target provinces

1.2.3. Outputs

Output 1 Capacity of the General Directorate of Agriculture (GDA), Provincial Department of Agriculture, Forestry and Fisheries (PDAFF), Agricultural Cooperative (AC) / Seed Producer

[2] MAFF 2021, Ministry of Labor and Vocational Training 2023

[3] MAFF 2012

Group (SPG) and private sector is upgraded in the fields of seed production technique and its management.

Output 2 The rice seed inspection and certification system are introduced in target provinces.

Output 3 Rice seed business is accelerated in target provinces.

The Quality Declared Seed System (QDS) is adopted for this Project as a certification system for quality rice seed. The QDS system is a form of seed quality control and certification system developed by the Food and Agriculture Organization of the United Nations (FAO) for developing countries. In general, certification system requires a full inspection at the field and quality control, and the quality of the seed is "guaranteed" by the official body of the country upon passing the inspection. In contrast, the QDS system requires a random sampling of 10% of the products for field inspection and quality control, which can be practiced even in environment with limited financial and human resources for inspection. Therefore, the seed produced under the QDS system is guaranteed by the seed producer, not by the national public agency.

(1) Management Authorities

- As a Competent Authority (CA), GDA shall conduct inspections and registration procedures based on application form submitted by seed producers. It also shall issue QDS label based on quality control reports prepared by inspectors.
- Under the supervision of CA, CA or PDAFF inspectors shall conduct two field inspections based on Declaration A (Seed Production Plan) submitted by the seed producers. In addition, inspectors shall conduct sampling and quality control based on Declaration B (Quality Inspection Request) submitted by the seed producers.

(2) Requirements of the Application for registered seed producer

- The seed producer shall produce seeds of the same variety in at least 5 hectares of fields in the same crop season for QDS seed production and business registration.
- The seed producer shall have attended seed production training before applying for registration (a training completion certificate must be attached to the application).
- Producers shall produce registered variety seeds approved by the CA.

(3) Application procedures

- The producer shall submit an Application Form for registration to CA or PDAFF in the province where the production field is located at least two months before starting QDS seed production.
- The CA shall issue a Certificate of Registration for QDS seed production and business within 14 days of receipt of the Application Form based on the result of the application review. The certificate of registration shall be valid for three years.

(4) Production and inspection procedures

- The registered seed producers shall submit Declaration A (Seed Production Plan) to CA or PDAFF within ten days after sowing;
- CA or PDAFF inspectors shall conduct two field inspections based on Declaration A;
- Seed producers shall allocate lot numbers of final products after post-harvest processing then submit Declaration B (Request for Quality Control) to CA or PDAFF;
- CA or PDAFF inspectors shall conduct sampling and quality control based on Declaration B and prepare an inspection report;
- CA shall report the audit results to the producers within 15 days after sampling and issue the QDS labels.

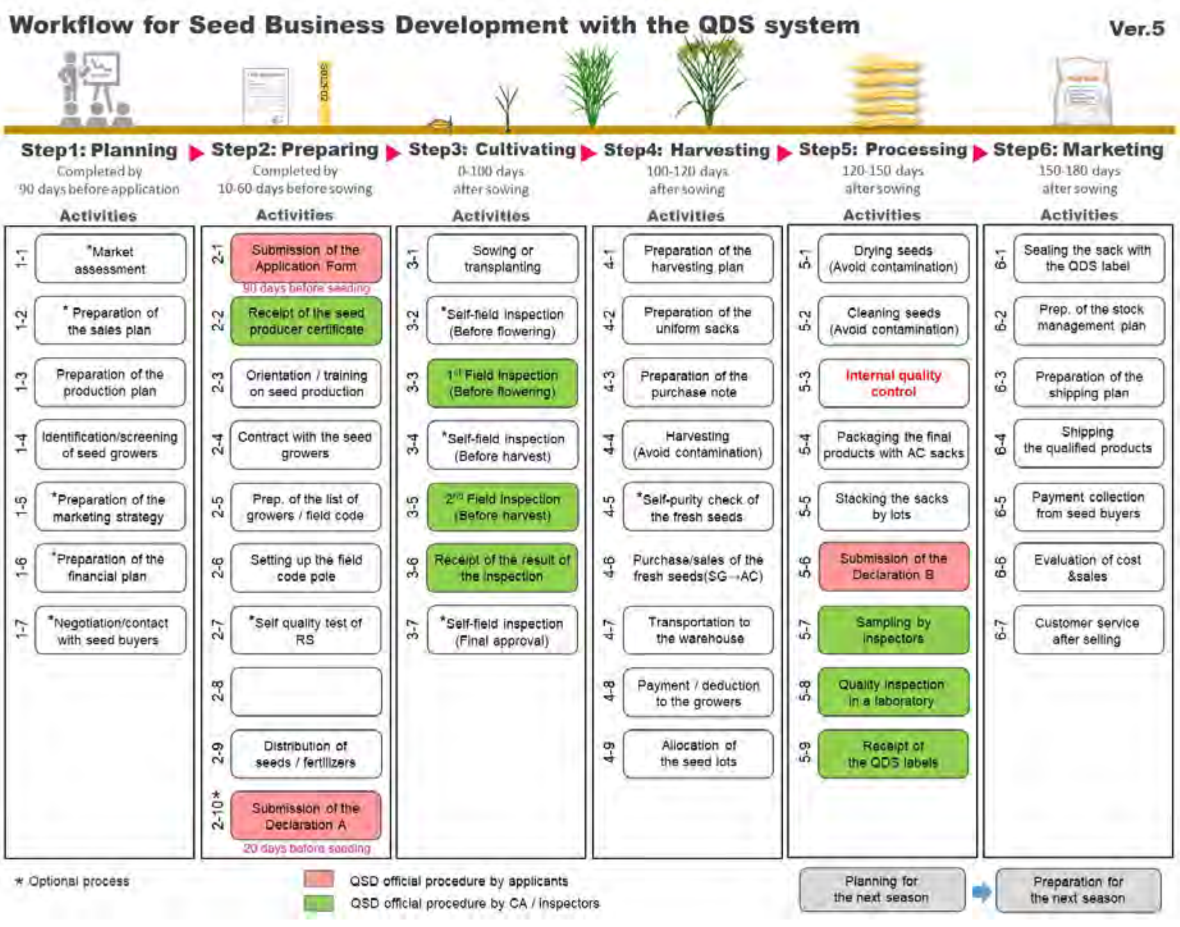


Figure 1: Overall flow of seed production process according to the QDS system in Cambodia

(5) Procedures and criteria of field inspection

- CA or PDAFF inspectors shall conduct field inspection twice before flowering and at the dough stage.
- QDS seed production fields shall meet the following requirements.
  - ➢ The total seed production area shall be at least 0.5 ha for Registered Seed (RS) production and 5 ha for Certified Seed (CS) production of the same variety in the same cropping season.
  - ➢ No different varieties of rice must be produced in the previous cropping season.
- Seed production must be conducted using Foundation Seed (FS) or RS that meets the criteria.
- Seed production must be conducted by line transplanting for RS, random transplanting or direct line sowing for CS.

- The criteria for each field inspection are as follows.

Table 1 : The QDS Field Standard

Items	Details	Standard (per 10 m^2)		
		FS	RS	CS
Off-type plants	Other varieties of rice plants, including red rice	No off-type plant	Maximum of one panicle	Maximum of three panicles
Noxious weeds	1. *Echinochloa* spp. 2. *Leptochloa chinensis* 3. *Cyperus iria*	No noxious weed	Maximum of three panicles	Maximum of five panicles
Plants infected with seed-borne diseases	1. Rice Blast 2. Brown spot 3. Sheath blight	No more than 50% of rice plants in infected		

(6) Procedures and criteria of quality inspection

- CA or PDAFF inspector shall conduct sampling for quality inspection based on Declaration B submitted by the producers.
- The sampling is carried out randomly by the inspectors using a method determined according to the total quantity of the products. A sample of 700-1,000g is collected, of which 500 g are used for quality inspection in the laboratory.
- The main criteria of quality inspection are listed in the table below.

Table 2 : The QDS Seed Quality Standard

Factors	Seed Class		
	FS	RS	CS
1. Pure seed (Min. %)	98	98	98
2. Inert matter (Max. %)	2	2	2
Weed seeds (Max. number of seeds/500g)	3	5	10
Other crop seeds (Max. number of seeds/500g)	2	3	5
Other rice variety seeds (Max. number of grains/500g)	1	5	15
Red rice (Max. number of grains/500g)	0	2	5
3. Germination rate (Min. %)	85	85	80
4. Moisture content (Max. %)	12	13	14

1.3. Project Sites

Four provinces, Battambang (BB), Kampong Chhnang (KC), Takeo (TK) and Prey Veng (PV)

1.3.1. Climate and crop schedule in the target provinces

The table below shows the climate conditions of the target provinces.

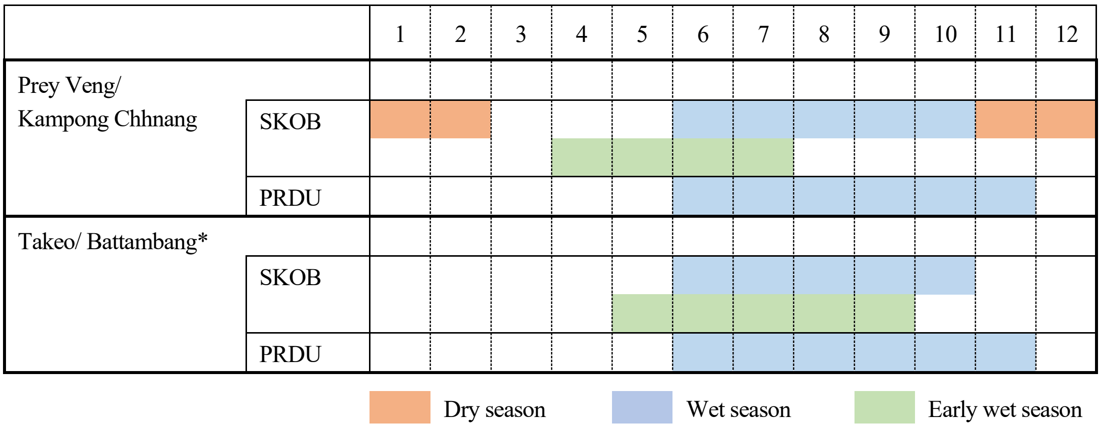
Table 3: Climate conditions of the target provinces (the average of 1999-2021)

	Prey Veng		Takeo		Battambang		Kampong Chhnang	
Annual precipitation (mm)	1,642		1,438		1,111		1,414	
Max.	272	(Oct)	263	(Oct)	200	(Sep)	245	(Sep)
Min.	12	(Feb)	15	(Feb)	14	(Jan)	10	(Feb)
Average temperature (°C)	27.4		27.4		27.7		27.9	
Max.	29.4	(Apr)	29.1	(Apr)	29.6	(Apr)	30.0	(Apr)
Min.	26.4	(Dec)	26.3	(Dec)	25.8	(Dec)	26.3	(Dec)

(Source: CLIMATE-DATA.ORG)

The below table shows crop schedule of the target provinces.

Table 4: Crop schedule of the target provinces



* There is no PRDU variety production in Battambang.

1.4. Counterparts and Implementing Agencies

GDA, PDAFF, District Agricultural Office (DAO), and SPG[4]

1.5. Duration of Project

The initial duration of the Project is as follows. A six-month extension was proposed by the counterpart (C/P) and accepted by the JICA Headquarters at the 5th JCC meeting in May 2022. Therefore, Phase III of the Project is extended until June 2023.

Phases	Duration
Phase I	October 2017- November 2018
Phase II	November 2018 – November 2019
Phase III	[Before] November 2019 – November 2022 [After] November 2019 – June 2023

1.6. Inputs

[4] SPGs are subordinate organizations of agricultural cooperatives that are specialized in seed production, however, there are many Agricultural Cooperatives (ACs) that produce and sell seeds without SPGs. In this project, the term "AC" will be used hereafter to refer to either SPGs or agricultural cooperatives engaged in seed production, since the beneficiaries include agricultural cooperatives that do not have SPGs.

1.6.1. Japanese side

(1) Dispatchment of the Japanese experts

The person-month of the dispatched experts shows in the table below. The actual dispatchment is included in the Appendix.

No.	Position	Person-month		
		Cambodia	Japan	Sub-total
1	Chief Advisor / Seed Business Expert	7.33	4.80	12.13
2	Deputy Chief Advisor / Seed Business Expert	9.13	9.08	18.21
3	Seed Production and Inspection Expert	1.93	2.07	4.00
4	Marketing	5.63	0.10	5.73
5	Extension of seed production and inspection Expert	8.00	7.45	15.45
6	Farmers Organization Expert/ Marketing	4.27	3.40	7.67
7	Coordinator/ Equipment Procurement Expert	29.64	6.05	35.69
	Total	**65.93**	**32.95**	**98.88**

(2) National staff members

The national staffs of the RSPP team are as follows.

No.	Placement
1	Administrator
2	National consultant
3	Technical assistant 1
4	Technical assistant 2
5	Marketing assistant 1
6	Marketing assistant 2
7	Driver 1
8	Driver 2

(3) Training in third country

The training was originally scheduled to be conducted in Japan, but due to impact of the COVID19, the training in Japan became difficult. Therefore, the training was changed to training in a third country. The training in third country was conducted at the headquarters of the International Rice Research Institute (IRRI) in Philippines from 22 to 28 January 2023 under the theme of rice seed production management system. 10 participants from GDA (Crop and Seed Department and Rice Crop Department) and 12 from PDAFF in four project provinces participated (See Activities 2-1. / 2-2. Technical Guidance on Rice Seed Quality Control).

(4) Equipment

The equipment procured by the Project was as follows. Upon completion of the project, all equipment was provided to counterpart institutions.

Equipment	Specification	Number	Location
multi-function printer	Kyocera TASKalfa5550ci	1	GDA
Computer	Microsoft Surface Pro	1	GDA
Computer	Asus A442UA	5	GDA
Motorcycle	YAMAHA SIRIUS	8	PDAFF (BB, PV)
Motorcycle	SUZUKI	8	PDAFF (KC, TK)
Seeder	Eli rice seeder	5	Bopea Sen Chey AC (PV) Ang Kamping Puoy AC (BB) Baphnom Meanchey AC (PV) O'Saray AC (TK) Lve Rong Roeung AC (TK)
Moisture meter	SATAKE SS-7	9	GDA PDAFF (Four target provinces) Agricultural Research Station (ARS) (BB, PV) Baphnom Meanchey AC (PV) O'Saray AC (TK)
Diaphanoscope	220V Diaphanoscope	5	GDA PDAFF (Four target provinces)
Electronic scale	Precision Balance-AND	5	GDA PDAFF (Four target provinces)
Seeder	Lun Heng seeder	2	Baphnom Meanchey AC (PV) LAREC (KC)
Seed grader	AGROSAW Seed Grader, Model UC-2	2	Baphnom Meanchey AC (PV) O'Saray AC (TK)
Tablet	Samsung Galaxy Tab S6 Lite	20	GDA, National Agriculture Laboratory (NAL),, PDAFF (four provinces) Baphnom Meanchey AC (PV) O'Saray AC (TK) Chamroeun Phal Rieng Kesey AC (BB) Camseed Pichangva AC (KC)
Moisture meter	Kett FG521	2	Chamroeun Phal Rieng Kesey AC (BB) Camseed Pichangva AC (KC)
Seed grader	Phuminhphat LS1.5	1	Chamroeun Phal Rieng Kesey AC (BB)
Tractor	Kubota M6040SU Kubota RX220H 4 wheels trailer	1	Camseed Pichangva AC (KC)

The equipment procured by JICA Cambodia Office is as follows.

Equipment	Number	Location
Car (Isuzu Mu-x)	1	GDA
Car (Isuzu D-Max)	1	GDA
Post-harvesting facility(warehouse)	3	Baphnom Meanchey AC (PV) O'Saray AC (TK) Chamroeun Phal Rieng Kesey AC (BB)
Drying yard	3	Baphnom Meanchey AC (PV) O'Saray AC (TK) Chamroeun Phal Rieng Kesey AC (BB)

1.6.2. Cambodian Side

(1) Deployment of Counterparts (C/P)

The Cambodian side deployed 35 staff members as C/Ps as shown in the following table during the implementation of this Project.

No.	Name	Department	Position
1	Ms. Sin Sophorn	GDA	Deputy Director General
2	Dr. Kong Kea	GDA, Department of Rice Crop	Director,
3	Dr. Srun Khema	GDA, Department of Crop Seed	Deputy Director
4	Mr. Chea Sokly	GDA, Department of Rice Crop	Vice Chief of Research and Training Office,
5	Mr. Prum Vuthy	GDA, Department of Rice Crop	Vice Chief of Rice-based Farming System Office
6	Ms. Tim Savann	GDA, Department of Rice Crop	Vice Chief of Rice Seed Management and Development Office
7	Mr. Nget Sovann	GDA, Department of Rice Crop	Vice Chief of Rice Seed Development and Management Office
8	Mr. Sovann Dara	GDA, Department of Rice Crop	Vice Chief of Rice Post-harvest technology and Marketing Office
9	Ms. Nget Chanbo	GDA, Department of Rice Crop	Officer of Rice Seed Development and Management Office
10	Mr. Tai Chandara	GDA, Department of Crop Seed	Deputy Director
11	Mr. Mao Ratthana	GDA, Department of Crop Seed	Vice Chief of Variety Registration and Seed Certification Office
12	Mr. Thim Thuok	GDA, Department of Crop Seed	Vice Chief of Variety Registration and Seed Certification Office
13	Ms. Phorn Sochea	GDA, National Agriculture Laboratory	Officer of National seed lab
14	Ms. Soy Soban	GDA, National Agriculture Laboratory	Officer of National seed lab
15	Ms.Vong Phalla	GDA, Deputy Director, Department of Agricultural Cooperative Promotion	Deputy Director
16	Mr. Chhim Vachira	PDAFF, Battambang	Director of PDAFF, Battambang
17	Mr. Set Vinit	PDAFF, Battambang	Vice Chief of Agro-industry Office
18	Ms. Pov Lina	PDAFF, Battambang	Vice Chief of Agronomy Office
19	Mr. Chhin Nun	PDAFF, Battambang	Officer of Agro-industry Office
20	Ms. Out Pheaktra	PDAFF, Battambang	Officer of Agricultural Cooperative Office
21	Mr. Ngin Hun	PDAFF, Kampong Chhnang	Director of PDAFF, Kampong Chhnang
22	Mr. Chea Sophon	PDAFF, Kampong Chhnang	Chief of Agronomy Office
23	Mr. Huon Lyhor	PDAFF, Kampong Chhnang	Officer of Agronomy Office
24	Mr. Chum Maochandara	PDAFF, Kampong Chhnang	Officer of Agronomy Office
25	Mr. Nhem Sobon	PDAFF, Kampong Chhnang	Officer of Agronomy Office
26	Mr. Tauch Poch	PDAFF, Kampong Chhnang	Chief of provincial Agricultural Cooperative development office
27	Mr. Ouk Samnang	PDAFF, Prey Veng	Director of PDAFF, Prey Veng
28	Mr. Un Ath	PDAFF, Prey Veng	Vice Chief of Agricultural Cooperative Office
29	Mr. Hem Setha	PDAFF, Prey Veng	Officer of Agronomy Office
30	Mr. Mauv Vandara	PDAFF, Prey Veng	Officer of Agronomy Office
31	Mr. Nhep Srorn	PDAFF, Takeo	Director of PDAFF, Takeo
32	Ms. Mel Chantevy	PDAFF, Takeo	Chief of Agronomy Office
33	Mr. Chhorn Sarith	PDAFF, Takeo	Officer of Agronomy Office
34	Mr. Chhong Phon	PDAFF, Takeo	Officer of Agronomy Office
35	Ms. Tuy Rany	PDAFF, Takeo	Officer of Agronomy Office

(2) Project Office

The Cambodian side provided office space in GDA to the Project and covered utilities costs.

1.7. Summary of Past JCC

The Joint Coordinating Committee (JCC) of the Project has organized the following meetings

	Date	Contents
First	December 22, 2017	Agreement on Activity plan Agreement on Project Design Matrix (PDM)
Second	October 2, 2018	Agreement on Project Operation Amendment to PDM
Third	August 20, 2019	Report on Activities during Phase 2 Confirmation of Procurement Agreement on Seed Business Model (Draft) Reminding of Prompt Confirmation of QDS System by MAFF Ownership of the Project among Japanese Experts and C/P Agreement on Work Plan of Phase 3
Forth	August 27, 2021	Report on Activities of Phase 3 Agreement on Institutionalization of QDS System
Fifth	May 17, 2022	Report on Midterm Review The Extension of Project Period Amendment to PDM
Sixth	March 29, 2023	Completion of Project Activities Post-Project Activities

2. Project Activities

The Project Outputs and Activities are shown in the Table 5.

Table 5: Outputs and Project Activities

	Activities	Achievement
Output 1: Capacity of GDA, PDAFF, AC/SPG and private sector is upgraded in the fields of seed production technique and its management.		
1-1	Conduct baseline survey on current situation and compile/submit a proposal for upgrading capacity as well as mechanism for rice seed production, inspection/ certification.	A baseline survey was conducted in four target provinces in Phase 1. Together with the results of the status survey and pilot activities, recommendations were made for capacity development and establishment of mechanisms for rice seed production and quality control.
1-2	Conduct baseline survey on quality rice seed production and distribution in the target provinces.	A baseline survey was conducted in four target provinces in Phase 1.
1-3	Confirm capacity of existing SPGs and identify tasks ahead for upgrading their production capacity.	Pilot activities were conducted in Battambang in Phase 1 of the project to identify SPG capacities and issues to be addressed to improve these capacities.
1-4	Provide training to GDA, PDAFF, AC/SPG and private sector on seed production.	The following activities were carried out between Phases 2 and 3: - Establishment of a technology dissemination system; - Technical guidance (seed production and post-harvest treatment technology) and improvement of target ACs and seed producers.
1-5	Provide training to staff of PDAFF/DAO on-rice seed production, in cooperation with GDA.	Conducted with the Activity 1-4
1-6	Provide rice seed processing equipment/ facilities to selected SPGs in conjunction with training on operation and maintenance	The following activities have been implemented in phase 3: - Provision of post-harvest processing equipment to target ACs; - Technical guidance on how to operate the equipment; - Construction of warehouses and drying yards; - Technical guidance on warehouse management.
1-7	Provide training to SPGs for upgrading their seed business management capacity through PDAFF in the target provinces.	Business management capacity building training, including DX support, was provided to target ACs from Phase 2 to Phase 3.
1-8	Set up mechanism to incorporate market demands into their rice seed production plan through training to SPGs on marketing.	Since Phase 3, trainings to improve business management skills, including marketing, were provided to target ACs.
1-9	Based on the results of above activities, develop final draft of manual for seed production and seed business management, and submit to MAFF as a basis for national guidelines in Cambodia.	Manual preparation by QDS technical working group and approval by the GDA have been completed.
Output 2: The rice seed inspection and certification system are introduced in the target provinces.		
2-1	Provide training to GDA, PDAFF, AC/SPG and private sector on seed quality inspection and certification.	Provided technical guidance on quality control to GDA's DCS staff members, PDAFF CPs, and target ACs during Phase 2 and Phase 3 (including the third country training).
2-2	Provide training to PDAFF/DAO staff on seed quality inspection and certification, in cooperation with GDA	Conducted with Activity 2-1
2-3	Carry out 1-year trial of QDS system and evaluate the performance for the improvement (end/2019)	Implemented in Phase 2, the general framework of the system was developed other than application procedures.

	Activities	Achievement
2-4	Extend the improved QDS system to other SPGs in the target provinces and draft manuals, recommendations on implementation structure and budget for the national rice seed inspection and certification system are prepared (end/2020).	From Phase 2 to Phase 3, the QDS system was tested and improved, and the results were reflected in the manuals for Activities 1-9 and 2-1 and in the Rice Seed Production Roadmap 2028.
2-5	Provide technical support on implementation of the national rice seed inspection and certification system in the target provinces.	Began in Phase 3, a roadmap for QDS seed production was developed in cooperation with GDA.
Output 3: Rice seed business is accelerated in the target provinces.		
3-1	Conduct baseline survey on rice seed and paddy value chain	The current status of paddy rice and rice seed value chain are identified through a baseline survey in Phase 1 in four target provinces, and through a national-level status survey.
3-2	Conduct demonstration activities to show advantage of utilizing quality rice seeds at SPGs' field	Implemented from Phase 2 to Phase 3. Demonstration activities were conducted in Phase 3 with establishment of exhibition plots in the 2019 rainy season and 2020 dry season.
3-3	Conduct demonstration activities to show advantage of utilizing quality rice seeds at rice farmer's field	QDS seeds were distributed to rice farmers for demonstration cultivation as part of QDS seed promotion in Phase 3.
3-4	Verify impact of quality rice seed to the productivity, profitability, and quality of paddy based on the result of 3-2, 3-3. (quality is compared with export standard)	Conducted an impact study on QDS seeds in Phase 3 to identify positive impacts and challenges in productivity, quality and profitability of QDS seeds.
3-5	Carry out events/workshop for networking the stakeholders to identify potential rice seed business model (stakeholders include SPGs, paddy producers (farmers), seed company/sellers, rice millers)	Business forums were held during Phase 2 and Phase 3 prior to COVID 19. After COVID 19, a promotional video of QDS seeds was created and broadcasted.
3-6	Conduct trial for identified rice seed business model, monitor and evaluate the result.	Monitored and evaluated the Activities 1-7, 1-8, and Outcome 3, starting from Phase 3.

2.1. Output 1 Activities Related to Rice Seed Production Techniques and its Management

Activity 1-1. /1-2. Outcome of baseline surveys

In Phase 1, a baseline survey was conducted to determine the actual status of seed producers, rice seed and paddy rice quality, and current status and challenges of rice seed and rice value chains in the four target provinces. The survey consisted of (1) interviews with ACs, (2) rice seed and paddy quality inspections in laboratory under mainly PDAFF, and (3) rice seed and rice value chain surveys in the four target provinces, and it was conducted by the project experts and sub-consultants.

Table 6: Outline of the baseline surveys

	Items	Methodology	Interviewees	Objective
(1)	Interviews with ACs in the target provinces	Structured and semi-structured interviews	40 agricultural cooperatives and NGOs, 1 organization	Understanding the actual situation and status of seed producers in the four target states
(2)	Laboratory	Quality inspection of 8 items	Samples of rice seeds and paddy	Current status and issues of rice seed and

	inspections of paddy and rice seeds	for rice seeds and 7 items for paddy rice	rice in each of the target states (3 samples per province)	paddy quality in the four target provinces
(3)	Value chain survey of rice and rice seed	Structured and semi-structured interviews	Stakeholders for rice seeds and rice value chain in the target provinces	Current status of the rice seed and rice value chain in the four target provinces and identification of key stakeholders

The outcome of the survey identifies the following issues in terms of seed production and quality control (see Activity 3-1 for more information on the value chain study).

(1) Low and unstable seed quality

In Cambodia, there is an absolute shortage of quality-assured high quality rice seed. This is due to a lack of quality control in seed production, the absence of a standardized inspection and certification system, and an undeveloped quality inspection system, all of which must be urgently improved.

(2) Absence of fair price

To increase the production of high quality rice seed, which is more expensive to produce than paddy rice, a fair price of seed (premium price) is essential to provide an incentive to do so for seed producers. However, paddy rice producers, who are the seed users, tend to use more seed than necessary because of their insufficient cultivation techniques. Therefore, they prefer cheaper and lower quality rice seed to reduce their production costs and avoid purchasing higher price and better quality rice seeds. Those vicious cycle has created a situation in which seed price does not increase, and in turn, less farmers are interested in producing rice seeds.

While promoting standardized inspections and certification systems, it is important to identify appropriate cultivation methods (applied seed quantity, fertilizer application, etc.) that use high-quality seeds in a cost-effective manner, and to educate paddy rice producers.

Activity 1−3. Identification of issue and capacity of seed producers

In Phase 1, the Project conducted trainings on rice seed production as a pilot activity in Battambang Province. The contents of the training conducted are shown in Table 7.

(i) To confirm the level of knowledge and skills of C/P and seed producers in rice seed production,

(ii) To identify challenges faced by seed producers

(iii) To identify activities and reflection in a detailed plan to be undertaken in Phase 2 and beyond.

Table 7: Pilot activities in Battambang

	Batch 1	Batch 2	Batch 3	Batch 4
Item	Nursery establishment and seeding methods	Transplantation and rice field management methods	Seed quality inspection methods	Harvesting, post-harvest processing and inspection
Date	January 25- 26, 2018	February 20 – 21, 2018	March 21 – 22, 2018	April 25 – 26, 2018
Venue	Pilot fields	Pilot fields	National Seed Laboratory, GDA	Alternative plots (Seed plots, IRRI)
Participants	C/Ps of GDA & PDAFF, DAO staffs and 18 representative SPGs in	C/Ps of GDA & PDAFF, DAO staffs and 18 representative SPGs in	C/Ps of GDA & PDAFF	C/Ps of GDA & PDAFF, DAO staffs and 18 representative SPGs in

	BB	BB		BB
Numbers	54 persons	51persons	27 persons	48 persons
Contents	・installing flooded nursery ・installing upland nursery	・controlling diseases, pests and weeds ・preparation of the fields ・Transplantation ・managing fertilizing and irrigation	・sampling products for the quality inspections ・sorting out the off-type and other varieties ・calculation of the purity rate ・measurement of the moisture contents ・Germination test	・estimation of the total yield based on the yield components and field sampling ・counting the number of grains ・measuring the weight of 1000 grains and conversion of the moisture contents ・recording the production data

The outcome reveals as follows

(i) Rice seed production capacity and knowledge level of CPs.

-C/Ps in GDA are mainly young and therefore lack of experiences and technical capacities in seed production.

-C/Ps of PDAFF have extensive experiences at field level but need to be strengthened in terms of systematic knowledge and capacities in seed production and quality inspection, as well as in their ability to apply and instruct about these skills.

-There are lack of instructors who can teach on rice varieties, weed and pest control.

(ii) Challenges of seed producers

-Farmers are growing seeds by scattering and random planting, which is not appropriate for seed cultivation due to lack of human resources, rising labor costs, heavy workloads, and negative impacts by the climate change.

-Line sowing by hands is difficult to guarantee the stable production because of its high costs. Rice transplanting machines could be an alternative of the line sowing by hands, however, they are also expensive for farmers to afford (as seen in the example of combine harvesters, there is potential for rice transplanting machines to expand as a private machine service.).

Those issues identified in the pilot activities were integrated with the results of the current status survey, the baseline survey, and the value chain survey conducted in Phase 1, and reflected in the detailed activity plan for Phase 2 and subsequent phases.

Activity 1-4. / 1-5. Provide trainings to GDA, PDAFF and DAO, ACs/SPGs and private sector on seed production

(1) Capacity development of the C/Ps

Through pilot activities in Phase 1, PDAFF C/Ps were found to have more experiences in rice cultivation, while GDA C/Ps had a theoretical understanding but few field experiences (see Activity 1-3). Therefore, from Phase 2, the Project decided not to adopt a cascade method of technology transfer from the Project experts to GDA C/Ps, and then from GDA C/Ps to PDAFF C/Ps, but all C/Ps have received trainings from the Project at the same time.

Under that approach, the Project experts provided a combination of classroom and hands-on trainings to GDA and PDAFF C/Ps during Phase 2 and first half of Phase 3 of the Project. As a result, GDA and PDAFF C/Ps in the four target provinces gradually gained experiences in seed production techniques to meet the standards of the QDS system and became able to instruct seed farmers on these techniques.

With the C/Ps' technical skills acquired, GDA and the Project experts decided that the C/Ps alone were sufficient to implement the activities, and from May 2022, the Project experts were to provide mainly support in the logistical aspects.

Table 8: List of trainings for counterparts

Date	**Training contents**	**Trainer**	**Participants**				
			RSPP *	**GDA**	**PDAFF**	**AC**	**Others**
2019/4/1	TOT*** on rice seed production and field inspection Day 1	RSPP	6	5	8	0	0
2019/4/2	TOT on rice seed production and field inspection Day 2	RSPP	6	4	8	0	0
2019/4/3	TOT on rice seed production and field inspection Day 3	RSPP	6	4	8	0	0
2021/11/12	Refresher training on controlling rice plant diseases	RSPP	4	8	0	0	0
2021/11/16	Refresher training on techniques for managing QDS system	RSPP	5	7	0	0	0
2021/11/17	Refresher training on techniques for managing QDS system	RSPP	4	7	0	0	0
2021/12/21	Training on AC management capacity assessment to C/Ps	RSPP	3	8	0	0	0
2022/2/15	The Reflection WS of the RSPP	RSPP	7	8	11	0	1**
2022/6/13	Refresher training on seed quality control	RSPP	8	6	0	0	0
2022/6/23	Refresher training on the QDS Day1	RSPP	5	9	0	0	0
2022/6/24	Refresher training on the QDS Day2	RSPP	4	9	0	0	0

*The Project for Rice Seed Production and Promotion (RSPP) includes Japanese experts and the national staffs of the Project
**A participant from Cambodia Agricultural Value Chain Program (CAVAC)
*** Training of Trainers (TOT)

(2) Capacity development of the seed producers

In the latter half of Phase 1, based on the selection criteria determined together with the C/Ps (i.e., (1) have irrigation facilities, (2) have farmland with potential for expanding seed production, and (3) are willing to conduct seed production and seed business), one AC in each province, Prey Veng and Battambang was selected and trained in seed production technology. As a result, although the QDS system had not been established yet, those two ACs have been able to conduct seed production based on the standards. On the other hand, challenges were found in post-harvest processing due to lack of facilities and equipment. In addition, the poor business management of the ACs required the creation of a new seed production business model.

Therefore, in Phase 2, the Project decided to adopt a seed business model centered on a "leading ACs" that would be responsible for the seed production management, post-harvest processing, and sales (see Activity 3-6 for more information on the seed business model). Based on the idea, new ACs were re-selected. In addition to meeting the set selection criteria, the following ACs were selected: Ba Phnom Mean Chey AC in Prey Veng Province, O'saray AC in Takeo Province, and Chomroun Phal Reang AC in Battambang Province, all of which have stable business conditions and own land that is available for construction of a 200-ton capacity warehouse and drying yard, which was planned to be procured. Chomroun Phal Reang Kesei AC in Battambang Province were selected as targets. In Kampong Chhunan, Anhjanhrong Samey Thmey AC, which already has a warehouse, a drying yard, and a seed grader, was selected as a target.[5]

Table 9: Target ACs in each province

Target provinces	Phase 1-2 (first half)	Phase 2 (latter half)	Phase 3
Prey Veng	Bopea Sen Chey AC	Ba Phnom Mean Chey AC	Ba Phnom Mean Chey AC
Takeo	NA	O'saray AC	O'saray AC
Battambang	Ang Kamping Puoy AC	Chomroun Phal Reang Kesei AC	Chomroun Phal Reang Kesei AC
Kampong Chhnang	NA	Anhjanhrong Samey Thmey AC*	CamSeed Pichangva AC

*The seed production could not be done in Anhjanhrong Samey Thmey AC because of draught.

Since the introduction of the QDS system was the first time for both C/Ps and ACs, and careful follow-up was required, the QDS seed was not produced simultaneously in the four target provinces, but was introduced and C/P capacity was strengthened in each province in staggered crop phases. In the second phase, activities were gradually

[5] As background, during Phase 1 and 2 of the Project, activities for training and preparation of manuals were conducted in selected PDAFF-recommended ACs in Prey Veng and Battambang provinces in order to secure exhibition plots for cultivation trials and training of GDA, PDAFF staffs, and SPGs. In the meantime, the framework and standards of the QDS system were also being developed and modified while conducting baseline surveys and piloting the QDS system. In the process, the Project found the necessity of constructing a warehouse and drying facility of an appropriate size for drying and storing at least 10 ha of seeds which is required for the QDS application. Consequently, it requires larger site for a seed grader with larger capacity than originally envisioned (small-scale specifications from the APPP is not appropriate), which led to more demanding conditions for the selection of the leading ACs. In Prey Veng and Battambang provinces, the target ACs were changed due to the lack of sufficient land for the construction of warehouses and drying yards. In Kampong Chhnang, Anhjanhrong Samey Thmey AC had a warehouse and drying field, but did not have a seed grader, which was not planned to be provided, and it was impossible to obtain stable water supply due to delays in the construction of irrigation facilities. Therefore, the target AC was changed to CamSeed Pichangva AC.

expanded to Ba Phnom Mean Chey AC in Prey Veng, O'saray AC in Takeo, Chomroun Phal Reang Kesei AC in Battambang, and CamSeed Pichangva AC in Kampong Chhnang in the third phase. Capacity building was conducted through a combination of classroom and hands-on training, and the seed production technology trainings based on the seed production at the field and seed quality standards established by the QDS system. The results of trainings conducted in each province are shown in Table 10 through Table 13. In addition, technical guidance on post-harvest processing was provided to the ACs. In addition to the trainings, Japanese experts and the Project national staffs visited fields and other sites as needed to provide technical guidance.

Seed production does not require particularly difficult technology compared to paddy production. The main differences include the use of appropriate upstream seeds (Foundation seeds (FS), Registered seeds (RS), etc.), seeding or planting in the manner prescribed by the QDS system, and more rigorous weed control, pest control, and removal of different plants. In particular, weed and plant-disease control operations require considerable labor, depending on field conditions, yet these operations are indispensable for passing field inspections and quality inspections.

Besides basic seed production techniques, the training contents were designed to meet the quality standards of the QDS system, focusing on the following essential items, in consideration of the above-mentioned characteristics of seed production.

<u>Seed production techniques in the field</u>

- Use of appropriate upstream seed
- Ensure seed preemergence
- Verify the history of the field (no different varieties planted in the previous cropping season)
- Accurately measure the area of the field
- Ensure proper segregation of the field from other fields
- Ensure proper seeding practices for each seed class
- Proper control of designated weeds from the field
- Proper removal of different varieties from the field
- Proper control of designated diseases before ear emergence
- Combine harvesters are to be cleaned prior to harvest

<u>Post-harvest management techniques</u>

- Use a grain moisture meter to measure moisture content.
- Use of seed graders to remove contaminants
- After drying and grading, conduct germination tests
- Each product shall be given an individual lot number
- Use bags with product information on them
- Store the product in a dry and cool place

Table 10: Trainings conducted in Prey Veng

(1) Bopea Sen Chey AC

Date	Contents	Trainer	Participants			
			RSPP	GDA	PDAFF	AC
2018/10/25	Training on rice seed production in PV Day 1	GDA	0	2	2	17
2018/10/26	Training on rice seed production in PV Day 2	GDA	0	2	2	17
2018/11/13	Training on rice seed production in PV Day 1	GDA	0	2	2	13
2018/11/14	Training on rice seed production in PV Day 2	GDA	0	2	2	14
2018/12/26	Training on rice seed production in PV	GDA	0	1	3	10
2019/1/22	Training on rice seed production in PV Day 1	GDA	0	4	3	14
2019/1/23	Training on rice seed production in PV Day 2	GDA	0	4	3	12

(2) Ba Phnom Meanchey AC

Date	Contents	Trainer	Participants			
			RSPP	GDA	PDAFF	AC
2019/5/2	Training on rice seed production in PV Day 1	GDA/RSPP	3	2	2	26
2019/5/3	Training on rice seed production in PV Day 2	GDA/RSPP	3	2	2	24
2019/5/27	Training on rice seed production in PV	GDA/RSPP	6	1	2	19
2019/8/13	Training on rice seed production in PV Day1	GDA/RSPP	6	5	3	25
2019/8/14	Training on rice seed production in PV Day2	GDA/RSPP	2	4	1	13
2019/11/5	Training on rice seed production	GDA/RSPP	3	3	1	22
2020/2/3	Field Day for Seed Production in PV (with TK)	GDA/RSPP	7	3	9	32
2020/3/6	Feedback Training	GDA/RSPP	7	3	7	13
2020/4/8	Seed Production Training in PV	GDA/RSPP	3	1	2	14
2022/1/13	Stock management (seed storing in the warehouse)	GDA	0	2	4	2
2022/1/21	Stock management (seed storing in the warehouse)	GDA	0	2	4	0
2022/4/25	Training on seeding method	GDA	0	3	4	5
2022/8/11	Refresher training on QDS field practices	RSPP	3	8	0	2
2022/8/12	Refresher training on QDS field practices	RSPP	3	6	0	1
2022/11/16	Field day	GDA/RSPP	4	6	3	12

Table 11: Trainings conducted in Takeo

(1) O' saray AC

Date	Contents	Trainer	Participants			
			RSPP	GDA	PDAFF	AC
2019/6/16	Training on rice seed production in TK Day 1	GDA/RSPP	4	1	2	23
2019/6/17	Training on rice seed production in TK Day 2	GDA/RSPP	1	1	2	21
2019/8/27	Training on rice seed production in TK	GDA/RSPP	1	1	3	14
2019/11/20	Training on rice seed production in TK Day1	GDA/RSPP	5	1	3	14
2019/11/21	Training on rice seed production in TK Day2	GDA/RSPP	1	1	3	3
2019/12/26	1st Field Day in TK	RSPP	3	0	4	22
2020/3/11	2nd Field Day in TK	GDA/RSPP	6	3	8	36
2020/4/9	Seed Production Training in TK	GDA/RSPP	5	1	3	8
2020/4/21	Seed Production Training in TK	RSPP	2	0	6	10
2020/12/10	Field management training	GDA/RSPP	2	4	2	2
2020/12/23	Harvest planning	GDA/RSPP	3	3	4	3
2021/09/16	Field training and monitoring	GDA	0	3	4	1
2022/10/05	Refresher training on QDS system and workflow	RSPP	3	0	0	4

Table 12: Trainings conducted in Battambang

(1) Ang Kamping Pouy AC

Date	Contents	Trainer	Participants			
			RSPP	GDA	PDAFF	AC
2018/12/19	Training on rice seed production in BB Day 1	GDA	0	2	2	29
2018/12/20	Training on rice seed production in BB Day 2	GDA	0	2	2	14
2019/1/15	Training on rice seed production in BB Day 1	GDA	0	4	4	25
2019/1/16	Training on rice seed production in BB Day 2	GDA	0	4	4	19
2019/3/26	Training on rice seed production in BB Day 1	GDA	0	3	4	15
2019/3/27	Training on rice seed production in BB Day 2	GDA	0	3	3	18

(2) Chamroeunphal RaingKesey AC

Date	Contents	Trainer	Participants			
			RSPP	GDA	PDAFF	AC
2019/5/8	Training on rice seed production in BB Day 1	GDA/RSPP	3	2	0	20
2019/5/9	Training on rice seed production in BB Day 2	GDA/RSPP	3	2	0	11
2019/6/14	Training on rice seed production in BB	GDA/RSPP	4	1	0	20
2019/9/5	Training on rice seed production in BB Day 1	GDA/RSPP	6	4	2	21
2019/9/6	Training on rice seed production in BB Day 2	GDA/RSPP	4	3	2	4
2021/5/13	Seed production preparation training	RSPP	4	0	2	10
2021/8/29	Harvest and post-harvest orientation	RSPP	2	3	3	5
2021/9/7	Workshop on seed processing facility	GDA/RSPP	2	3	4	4
2021/12/30	Training on how to use the seed grader	RSPP	4	6	4	9
2022/4/7	Training on internal seed quality test for AC	RSPP	3	0	0	6
2022/4/29	Field day	GDA/RSPP	2	7	4	44
2022/10/13	Refresher training on QDS system and workflow	RSPP	3	0	0	4
2022/11/30	Field day	GDA/RSPP	4	6	2	2

Table 13: Trainings conducted in Kampong Chhnang

(2) CamSeed

Date	Contents	Trainer	Participants			
			RSPP	GDA	PDAFF	AC
2021/5/6	Seed production preparation training	GDA/RSPP	7	4	5	6
2021/5/11	Seed production preparation training	RSPP	4	0	3	4
2021/5/12	Seed production preparation training	RSPP	4	0	6	4
2021/9/2	Harvest and post-harvest orientation	RSPP	1	3	4	6
2021/9/9	Technical training on harvest & post-harvest	RSPP	2	3	3	4
2022/6/2	Refresh training on QDS rice seed production	GDA	0	3	3	13
2022/6/2	Refresh training on QDS rice seed production	GDA	0	3	3	13
2022/9/20	Internal quality control	RSPP	1	0	0	5
2022/9/21	Internal quality control	RSPP	1	0	0	5
2022/10/13	Refresher training on QDS system and workflow	RSPP	3	0	0	3
2022/12/21	Post-harvest management (Lot split and merge)	RSPP	3	0	0	5

(3) Improvement of seed production techniques

Table 14 shows the results of the passing rate of samples produced under the control of the ACs in the four target provinces in FY2021 and FY2022 and submitted for quality inspections, calculated on the basis of the area of production. The results showed that 91% of the seed samples (12 samples out of 133 samples failed) met the QDS standards based on harvested area, although some samples did not meet the standards for purity, weed species[6], and different varieties[7]. In particular, red rice, which reduces the visual quality of white rice, was previously detected in many fields, but after the trainings, it was almost no longer detected above the standard. This is the result of thorough post-harvest quality control and voluntary germination tests conducted by the ACs. In addition, as shown in Table 36 below, the results of interviews with farmers indicate that the stable germination rate has led to a high evaluation of seed quality by seed purchasers.

[6] Contaminants (straw, grass, etc.) were contained, which can usually be removed by re-sorting the seeds.

[7] The results of the Project's investigations indicated that the problem was due to the quality of upstream seeds (RS) and insufficient field management by the growers. The detection standard for off type contamination is 15 grains or less per 500 g (approximately 15,000 seeds), and if more than one heterosis per 1,000 plants is detected in the field, the standard will not be met. Therefore, it is important to carefully remove off types multiple times in the field with the closest attention to detail.

Table 14: The results of the seed inspections (FY2021 and FY2022)

	Year	Variety	Class	Tested samples	Sample passed	Passing rate	Reasons of failure (number of samples)				Harvested area (ha)	Passing amount (kg)
							Purity	Weed	Off-type	Germination		
PV	2021D	SKOB	CS	4	4	100%					2.87	11,240
KC	2021D	SKOB	CS	10	10	100%					7.18	17,338
KC	2021D	SKOB	RS	1	1	100%					0.5	NA
PV	2021W	PRDU	CS	6	6	100%					6.4	9,980
PV	2021W	PRDU	RS	2	2	100%					0.78	1,100
TK	2021W	SKOB	CS	4	4	100%					2.08	5,581
TK	2021W	PRDU	CS	5	2	40%		1	3		11	8,496
BB	2021W	SKOB	CS	7	7	100%					9.15	2,647
BB	2021W	SKOB	RS	1	1	100%					0.75	2,315
KC	2021W	SKOB	CS	14	14	100%					10.48	42,793
KC	2021W	SKOB	RS	2	2	100%					0.63	3,024
KC	2021W	PRDU	CS	7	7	100%					5.6	11,212
KC	2021W	PRDU	RS	2	2	100%					0.75	1,113
BB	2021E	SKOB	CS	5	4	80%	1		1		6.4	16,610
BB	2022E	SKOB	CS	10	10	100%					12	32,379
KC	2022E	SKOB	CS	14	14	100%					10.69	39,060
BB	2022W	SKOB	CS	1	1	100%					1.5	34,405
KC	2022W	PRDU	CS	9	8	89%	1		1		10.7	31,560
PV	2022W	PRDU	CS	10	6	60%			4		13.5	14,880
PV	2022W	PRDU	RS	1	1	100%					0.5	1,490
TK	2022W	SKOB	RS	1	1	100%					0.5	1,200
TK	2022W	PRDU	CS	5	3	60%			2		9.3	11,180
TK	2022W	PRDU	RS	1	0	0%			1		0.5	0
KC	2022W	PRDU	RS	2	2	100%					1.5	2,700
KC	2022W	SKOB	RS	1	1	100%					1	1,740
KC	2022W	SKOB	CS	8	8	100%					5.8	16,660
BB	2022W	SKOB	RS	1	-	-					0.5	1,258
PV	2022D	SKOB	CS	3	-	-					2.3	10,220
PV	2022D	OM	CS	6	-	-					10.3	62,080
			Total	**133**	**121**	**91%**	**2**	**1**	**12**	**0**		

*Passing rate is calculated based on the harvested area.
BB= Battambang, KC=Kampong Chhnang, TK=Takeo, PV=Prey Veng
W=wet season, D=dry season, EW=early wet season, PRDU=PhKar Rumdoul, SKOB=Sen Kra Oub-01, SPDO= Sen Pidor variety, OM= OM5451
The total number of failures does not equal the total number of reasons for failure because a single sample may have failed multiple items.
"-" did not complete inspections as of April 2023. Also, the total number of inspections does not include samples undergoing inspection.

As described above, as a result of the classroom and in-field seed production technology trainings and instructions provided through the Project, the seed production and post-harvest processing techniques of the target ACs were improved, leading to improved outcome of quality inspection. However, in order to continue maintaining the seed quality in the future, voluntary field and quality control needs to be strictly enforced.

(4) Achievement of seed production plan

Table 15 compares the actual production area based on the production plan of the target ACs (items described in Declaration A in the QDS system (see 1.2.4. Outline of the QDS system)). As indicated by the results, the ACs did not produce as planned, and there were many cases of withdrawal or discontinuation of production in the middle of production. Throughout Phase 3, the Project continued to provide technical supports for seed production, and when production was discontinued, GDA staffs, PDAFF staffs, and target ACs were interviewed about the background, and preventive measures were implemented for those cases that could be prevented. In the processes, the Project discovered that there were three main backgrounds behind the withdrawal and discontinuation of production.

The first is production withdrawal that can be prevented and is due to failure to comply the production methods specified in the QDS system. Typical examples include production by hand broadcasting (scattering), seed production in fields that had produced different varieties in the previous cropping season, and declaring a discontinuance for fields that actually meet the QDS standards due to lack of understanding by GDA or PDAFF staff (corresponding to A in the table below). However, the cancellation of OM seed production for the 2022 dry season crop in Prey Veng Province was a special case. During the preparation period, MAFF instructed the AC to produce the OM seed, and the AC started producing the OM seed but were not informed about whether they needed to apply for the QDS system. Later, GDA officials instructed them to produce the seed as the QDS seed, although half of the plots had already been hand broadcasting, so those plots had to be withdrawn from the QDS seed production.

The second is uncontrollable cancellations due to climate reasons, disasters, etc. This is specified as an external factor in PDM Indicator 1-b. Typical examples include: heavy rainfall causing seeds and seedlings to be swept away or outbreaks of pathogenic insects originating from the heavy rainfall, and contrarily, insufficient irrigation water due to lack of rainfall. There were also several cases of insufficient water supply during the cultivation period due to the unavailability of private companies managing irrigation canals. Discussions on this issue were held with the State Water Resources and Meteorology Department, but did not succeed in changing the decision of the companies managing the canals. Other cases were also observed in Battambang Province during the 2022 wet season, such as the sudden start of canal construction without prior notice from the government, which resulted in the unavailability of irrigation water and the failure of seed production as planned (corresponding to B in the table below).

The third is the voluntary decision by ACs to cancel the seed production, which has become apparent as the management capacity of ACs has improved and as the standards of the QDS system have become more widely known. The most common of those are cases where seed producers and laborers are unable to afford the labor required to manage fields to meet the QDS standards due to health problems of seed producers and laborers. As a consequence, these are cases where the AC or seed producer has made a business decision that switching from seed production to paddy rice production, which is less economically demanding, is better than hiring agricultural labor to replace the growers. The Project considered such a decision to be an economic decision for the target ACs and decided to respect it. In another case, in the production of SKOB seeds for the 2022 dry-season in Prey Veng province, a customer who wanted to purchase seeds requested to accelerate the delivery of the seeds even if they were not produced in accordance with the QDS system, and the AC had to cancel the submission of documents related to the QDS system, which was time-consuming for them.

In light of these considerations, the inclusion of cancellations voluntarily determined by ACs, such as external factors, in the non-achievement of PDM Indicator 1-b, "Compared to the planned volume, at least 80% of rice seeds produced" to measure the improvement in seed production capacity of the parties involved, which is Outcome 1, is not appropriate, and is equivalent to uncontrolled production cancellations (This corresponds to C in the table below).

Table 15: Comparison of the QDS seed production plan and the actual production

Variety Season (Planted month year)	Planned area (ha)	Seeded area (ha)	Harvested area (ha)	Area-based achievement rate (%)	Causes
Ba Phnom Mean Chey AC, PV					
SKOB-WS (Jun 2020)	30.00	14.45	4.15	13.8%	A
PRDU-WS (Jun 2020)	11.00	11.00	7.38	67.1%	A
SKOB-DS (Nov 2020)	10.00	10.00	10.00	100.0%	
PRDU-WS (Jun 2021)	11.00	10.10	6.40	58.2%	A
SKOB-DS (Dec 2021)	10.00	10.00	2.87	28.7%	A
PRDU-WS (Jun 2022)	14.50	14.50	13.50	93.1%	
OM-DS (Dec 2022)	23.10	10.30	10.30	44.6%	A
SKOB-DS (Dec 2022)	5.30	2.30	2.30	43.4%	C
O'saray AC, TK					
SKOB-EW (Jun 2020)	10.00	11.88	7.12	71.2%	A
PRDU-WS (Jun 2020)	10.61	10.61	3.84	36.2%	A
SKOB-WS (Sep 2020)	10.00	10.00	7.07	70.7%	A
SKOB-WS (Aug 2021)	10.31	1.81	2.08	20.2%	B
PRDU-WS (Aug 2021)	11.00	11.50	11.00	100.0%	
SKOB-WS (Jun 2022)	11.28	10.94	3.00	26.6%	B
PRDU-WS (Aug 2022)	10.00	11.50	9.30	93.0%	
Chomroun Phal Reang Kesei AC, BB					
SKOB-EW (May 2021)	10.00	11.70	6.40	64.0%	A
SKOB-WS (Sep 2021)	10.60	10.95	9.15	86.3%	
SKOB-EW (May 2022)	15.90	15.90	12.00	75.5%	B
SKOB-WS (Sep 2022)	6.50	1.50	1.50	23.1%	C
CamSeed Pichangva AC, KC					
SKOB-WS (Jun 2021)	10.00	10.57	10.48	104.8%	
PRUD-WS (Jun 2021)	10.00	10.00	5.60	56.0%	B
SKOB-DS (Oct 2021)	10.00	10.00	7.18	71.8%	B
SKOB-EW (Jun 2022)	10.32	10.69	10.69	103.6%	
PRDU-WS (Jul 2022)	10.20	10.70	10.70	104.9%	
SKOB-WS (Sep 2022)	5.80	5.80	5.80	100.0%	

Blue column shows the non-achievement, A: Preventable withdrawal, B: Uncontrollable cancellations due to climate reasons, disasters, etc, C: Voluntarily cancellation by the ACs, WS: Wet season, DS: Dry season, EW: Early wet season

From the above, in the years when seed production in accordance with the QDS system was introduced, such as the 2020 production in Prey Veng and Takeo provinces and the 2021 production in Battambang and Kompong Tunan provinces, the production plan was not achieved due to lack of understanding of the QDS system and lack of technology by the parties involved. However, in 2022 production, the main causes of the cancellations were unpreventable, and although the PDM Indicator 1-b indicator itself was not achieved, the achievement of Outcome 1 can be considered not to be impeded (PDM Indicator 1-b).

(5) Challenges of the QDS seed production

In terms of the QDS seed production quantity, the QDS seed production across the four target provinces has been steadily increasing (Table 16).

However, regarding the harvested area achievements shown in Table 17, there are two provinces (Takeo and Battambang) that have not achieved PDM Indicator 1-c, "produce 20 ha of QDS standard seed per year," as of 2022. In considering the reasons for this non-achievement of 20 ha per year, the Project again cites the reasons for the cancellations in production plan discussed above.

In the planned seed production in Table 15, the harvested area for the 2022 wet season in Takeo Province (the area circled in bold) was 12.3 ha. Of this, about 9 ha of SKOB were cancelled because of "B: Unavoidable cancellations due to bad weather or disasters". Similarly, in Battambang Province, in the 2022 crop season (wet season and early wet season), there were fields where the QDS seed production for both crop seasons (SKOB-EWS and SKOB-WS) was cancelled because of either "B: Unavoidable cancellation due to bad weather or disaster" or "C: Voluntary decision by the ACs". The reasons for these cancellations (B and C) were

As discussed earlier, such cancellations (B and C) have nothing to do with the seed production capacity of the ACs. Based on the above, neither Takeo nor Battambang ACs that did not meet the 20ha harvested area can be attributed to seed production capacity (PDM Indicator 1-c).

Table 16: Quantity of the QDS seed production in 2020-22 (ton)

	2020	2021	2022
Prey Veng	54	21	23
Takeo	26	14	14
Battambang	-	19	36
Kampong Chhnang	-	71	86
Total	80	125	159

Table 17： Achievement of the QDS seed production in 2020-22 (harvested area, ha)

	2020	2021	2022
Prey Veng	21.53	9.27	26.10
Takeo	18.03	13.08	12.30
Battambang	-	15.55	13.50
Kampong Chhnang	-	23.26	27.19
Total	39.56	61.16	79.09

One issue tied to "B: Unavoidable cancellations due to bad weather or disasters" is the unstable cultivation environment. As already mentioned, water supply from irrigation canals is unstable in many fields, making it difficult to plan their production. Many farmers produce CS by direct seeding and hand broadcasting instead of line sowing to reduce labor costs. However, water management after seeding is important in direct seeding, and if the necessary water supply from irrigation or rainfall is not available at this time, the possibility of production failure will be high. In particular, when water supply is delayed and fields are exposed to direct sunlight, drought-tolerant weeds tend to grow, making weed control more difficult, and in some cases, fields fail to meet the QDS standards. Currently, there are few fields in Cambodia that have access to a stable water supply, and the seed production that meets the QDS standards is inevitably subject to weather and other conditions. Therefore, it is desirable to prioritize the development of fields dedicated to seed production.

Further exploring "C: Cancellation voluntarily decided by the ACs", such cancellations relate to the essential issue of guiding the expansion of the production of quality seed in Cambodia (the Overall Goal). For seed producers, the cost of production is higher than that of paddy rice, even though there is no significant difference in the transaction price of seed produced under the QDS standard and that of ordinary seed (together, see Activity 3-4 (2) Impact on Profitability). In addition, producers bear the costs of the QDS system application, inspections, and the QDS tags. In combination with that, the opportunity cost of QDS system audits are also an issue. The administrative services of the GDA/PDAFF for examination and inspection are not smooth, and the long time required for the QDS tag issuance often does not meet the needs of seed buyers who want prompt delivery in time for the sowing season. In other words, the business environment for the QDS seed production at present is more expensive and there is a risk of missing customers (opportunity loss). In these circumstances, it is reasonable and understandable for the target ACs to avoid or suspend the QDS seed production as they obtain their management and marketing capabilities.

(6) Challenges of the upstream seeds

In Phase 1 and 2, the Project utilized training plots to provide technical instructions on high quality seed production. However, despite the seeds produced in those training plots, quality inspection according to the standards of the QDS system showed that all samples did not meet the standards (Table 17).

In particular, abnormal values were observed for different varieties and red rice, and the Project suspected the quality of upstream seeds (RS) used on the plots, so the Project decided to collect samples from the Agricultural Research Station (ARS), which produces RS, for inspection. In addition, samples were collected from the Local Agricultural Research and Extension Center (LAREC), a Non-Governmental Organization (NGO) in Kampong Chhnang Province that produces RS with its own quality standards, as a comparison. The results showed that with the exception of the seed produced at LAREC, the samples did not meet the QDS standards for purity, varieties, and red rice.

Producing high quality CS from low quality upstream seed is impossible. In response to the above results, the Project took the following measures: (1) upstream seed purchased from LAREC should be used by the target ACs, and (2) when using seed other than (1) above, the quality of the seed should be inspected in advance using the standards and inspection methods of the QDS system, and only seed meeting the standards should be used. Before the Project completion, all the target ACs in the four provinces have started to produce RS in-house, using seeds purchased from the Cambodian Agricultural Research and Development Institute (CARDI), and producing RS in accordance with the QDS standards. So far, they have not yet achieved in-house production of all the required RS, however, the ACs are well aware of the importance of upstream seed quality.

Table 18: The results of the seed quality inspections in 2018 and 2019

Samples	Province	Year	Products		Upstream	Purity	Weed seeds	Other crops	Off-type	Red rice	Germ. ratio	Moisture contents
			Variety	Class	Seed class	(%)	(grains)	(grains)	(grains)	(grains)	(%)	(%)
Training plot A	BTB	2019	SKOB	CS	RS	96.9	0	0	6	0	95.0	12.9
Training plot B	BTB	2019	SKOB	CS	RS	94.7	1	0	10	0	96.3	12.9
Training plot C	PV	2019	SKOB	CS	RS	99.6	0	0	41	35	n.a	11.7
Training plot D	PV	2019	SKOB	CS	RS	98.6	1	0	236	45	95.0	11.3
Toul Samraong ARS	BTB	2019	SKOB	RS	FS	99.0	0	0	110	106	92.0	9.8
Polous ARS	PV	2019	SKOB	RS	FS	n.a.	0	0	3	32	57.6	12.9
LAREC (NGO)	KC	2018	SKOB	RS	FS	99.6	0	0	0	0	93.0	12.4
LAREC (NGO)	KC	2018	SKOB	CS	RS	99.8	0	0	0	0	97.0	12.5
QDS standard of FS	-	-	-	**FS**	**BS**	**98.0**	**3**	**2**	**1**	**0**	**85.0**	**12.0**
QDS standard of RS	-	-	-	**RS**	**BS/FS**	**98.0**	**5**	**3**	**5**	**2**	**85.0**	**13.0**
QDS standard of CS	-	-	-	**CS**	**FS/RS**	**98.0**	**10**	**5**	**15**	**5**	**80.0**	**14.0**

Activity 1-6. Provision and technical trainings of rice seed processing equipment

(1) Produrement of post-harvest machinery

Most seed producers use a domestic cleaner provided by government-related projects. However, the performance is low, capable of removing large inert matter such as rice straw, and unsuitable for cleaning QDS. Therefore, RSPP provided a rice seed cleaner to the ACs, except the AC in Kampong Chhnang Province, which already had a Vietnamese-made cleaner. Instead of a cleaner, RSPP provided a tractor and carrying cart to the AC in Kampong Chhnang. Since the production fields of the AC are spread over a wide area, transportation of fresh seeds to the drying yard after harvesting was a problem.

Table 19: Procured Post-harvest machineries

Province	AC	Item	Date
Prey Veng	Baphnom Meanchey AC	AGROSAW Seed Grader (Model UC-2)	Jan 2021
Takeo	O'Saray AC	AGROSAW Seed Grader (Model UC-2)	Jan 2021
Battambang	Chamroeun Phal Riang Kesey AC	PHU MINH PHAT Seed Grader (Model LS-1.5)	March 2022
Kampong Chhnang	Camseed Pichangva AC	Kubota Tractor (M6040SU Rotary, RX220H)	May 2022

(2) Instruction on machinery operation

After procuring and installing the seed cleaner, RSPP provided training on operation and maintenance methods by inviting a professional engineer. Immediately after the starting operation, the seed cleaning process took a long time due to poor operation experiences. After starting the operation, we found several problems, and the provider performed the necessary repairs and replaced parts within the warranty. It is now working usually. The maximum processing capacity of the seed cleaner is 2 MT per hour, but the speed of the processing capacity depends on the paddy condition. The ACs made operational adjustments under the guidance of the RSPP experts, and they can now operate at 1 to 1.5 MT/hour.

In each AC, the seed graders are also properly maintained. The AC in Prey Veng handles several varieties of rice seed, including SKOB, PRDU, and OM5451. Before sorting different varieties, the seed grader is thoroughly cleaned to prevent contamination of different varieties. In the past, they cleaned only the screen where sorting was performed, but now they thoroughly clean other parts of the machine to minimize the risk of contamination with different varieties.

The challenge for the future is to secure sufficient funds to systematically renew the seed cleaner before they reach the end of their service life (about ten years). Each AC is in good financial condition and can secure sufficient funds for equipment renewal.

(3) Construction of warehouse and drying yard

The ACs in Prey Veng, Takeo, and Battambang did not have adequate post-harvest processing and storage facilities, resulting in poor seed quality. Therefore, RSPP provided them with a 200 MT capacity warehouse and drying yard.

Table 20: Construction of warehouse and drying yard

Province	AC	Facilities
Prey Veng	Baphnom Meanchey AC	Warehouse 20m x 12m Drying yard 23m x 16.4m
Takeo	O'Saray AC	Warehouse 20m x 12m Drying yard 25m x 15m
Battambang	Chamroeun Phal Riang Kesey AC	Warehouse 20m x 12m Drying yard 25m x 15m

(4) Instruction on warehouse management

After constructing the above facilities, RSPP conducted training on storage management and inventory control for AC personnel. The training on storage management included instructions on temperature and humidity control and allocation of the products. As a result, the ACs stack the seed sacks neatly by lot on pallets at a distance from the walls, where temperature and humidity can easily increase.

In addition, all ACs use inventory control cards (Stock Cards) and keep inventory records, and they are now able to use to control products by lot. In addition, RSPP provided tablets for inventory management. While the ACs in Takeo and Kampong Chhnang manage their inventory with them, the ACs in Prey Veng and Battambang still use paper-based inventory.

Before the warehouse management trainings

After the warehouse management trainings

Activity 1-7. Capacity enhancement of rice seed business management

(1) Activities in Phase 2

In Phase 2, bookkeeping and business management trainings were conducted regularly to the target ACs in the four target provinces with the involvement of C/Ps from GDA and PDAFF. The trainings mainly included: 1) basic cycle of seed business management (PDCA cycle applied to seed business) and its application method, 2) recording cash in and out during the cropping season, 3) preparation of simple profit and loss statement at the end of the cropping season, 4) analysis of the profit and loss statement, and 5) preparation of farm management plans based on 4) above. As a result of the trainings, the participating target ACs gained a certain level of understanding of the basic cycle and management methods of the seed business, but the following issues were identified.

- When analyzing profit-and-loss statements and identifying areas for improvement, many concluded that labor costs are reduced by using family labor. It was apparent that they were not in the habit of considering family labor as a labor cost.
- The idea of expanding the scale of management through capital investment (e.g., agricultural machinery, warehouses, drying facilities, etc.) was not considered by many of the participants. The training tended to be limited to the allocation of current management resources (including internalization of labor costs, as mentioned above) to improve farming operations.
- One of the challenges for the training was the poor facilitation skills of the training instructors in the area of profit-and-loss statement analysis and farm management planning based on the profit-and-loss statement. In particular, the analysis of income statements and farm management plans required decisions on the cost of seed production (not only items but also appropriate quantities) and the feasibility of sales targets, which required support from practical experience in business, management, and agriculture and were beyond the scope and experience of C/Ps.

(2) Activities in Phase 3: implementation of digital transformation under COVID influences

In Cambodia, profit and loss statements had to be prepared in a format specified for agricultural cooperatives. Therefore, to tackle the issuers identified related to profit-and-loss statement in Phase 2, the Project asked to cooperate in Phase 3 with the Department of Agricultural Cooperative Promotion (DACP), which specializes in this area and had provided support for other JICA project[8]. As activities, bookkeeping training and business management training were provided to the target cooperatives, complementing the marketing training (Activity 1-8). First, prior to the start of the trainings, the Project encouraged the ACs in the four target provinces to assign personnel for quality control, post-harvest processing, and sales, etc. The ACs, with the support of the Project, assigned personnel necessary for rice seed production and sales. The Project then decided to provide necessary capacity building training to each person in charge (PDM Indicator 1-e).

However, due to the impact of the COVID after April 2020, Japanese experts were not able to travel to Cambodia, and the trainings had to be conducted remotely through local staffs. Against this background, the Project decided to add digital transformation (DX) supports to the above training plan for improving business management capacity.

To start the DX support, 20 tablets (Samsung Galaxy Tab S6 Lite) were purchased with the Project funds and distributed to the target participants.

Table 21: The list of tablets distribution

	Members who received a tablet	Organization
1	Ms. Srun Khema	GDA
2	Mr. Thim Thuk	GDA
3	Mr. Hem Setha	PDAFF（PV）
4	Mr. Ouk Samnang	PDAFF（PV）
5	Ms. Mel Chantevy	PDAFF（TK）
6	Mr. Sieng Ren	PDAFF（TK）
7	Mr. Chum Maochandara	PDAFF（KC）
8	Mr. Chum Maochandara	PDAFF（KC）
9	Ms. Pov Lina	PDAFF（BB）
10	Mr. Chhin Nun	PDAFF（BB）
11	Mr. Chea Sokly	GDA
12	Mr. Sovann Dara	GDA
13	Mr. Prum Vuthy	GDA
14	Ms. Phorn Sochea	NAL
15	Mr. Khun Saem	Target ACs（PV）
16	Mr. Savoen Pat	Target ACs（TK）
17	Mr. Bun Sothun	Target ACs（KC）
18	Mr. Soun Leng	Target ACs（BB）
19	As it is a demonstration machine for training purposes, it was used by the project during the project period and provided to GDA upon completion of the project.	GDA
20	Same above	GDA

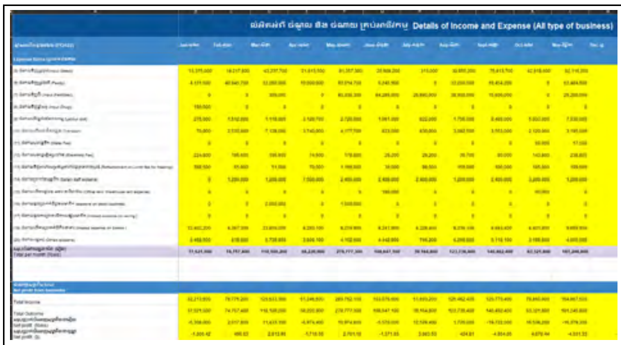
[8] Project for Establishing Business Oriented Agricultural Cooperative Models, May 2014- May 2019

Using the tablets provided, the following supports were implemented based on the contents of Phase 2 of the support for rice seed business management.

- Utilization and recording of the cash book for recording deposits and withdrawals of agricultural cooperatives for those in charge of accounting at the cooperatives.
- Recording the farm records of rice seed production in the field and post-harvest processing management for those in charge of production management at agricultural cooperatives.
- Recording of rice seed stock management and sales records for sales staff of ACs
- Visualization of seed business earnings and production planning based on the above records
- Preparation of annual financial reports and support for holding annual general meetings in collaboration with DACP

The cash book, field/post-harvest management, and stock management/sales records were all formatted by the Project based on the results of Phase 2 of the trainings, and the cash book was developed in Excel on the assumption that the books would be recorded on a computer. The Project did not provide the computers and requested that the ACs prepare them. Although the target AC in Battambang Province was late in preparing the computer, the ACs in the four target provinces provided their own computers at their own expense and participated in the trainings. The format for field/post-harvest processing management and stock management/sales records were developed using Google spreadsheets, which are easy to handle on tablets, to enable bookkeeping at any location, such as in the field or warehouse.

However, the Project found that providing one tablet was not sufficient to make effective use of the tablets. The staffing within the cooperatives is such that the person in charge of field management and the person in charge of stock management are usually different, and because of this, the tablet recording locations are also separated from the field and the warehouse. Due to the lack of tablets, stock management staffs were forced to use paper-based recording. Therefore, to further promote the DX use, the Project distributed one more inexpensive tablet (Huawei MatePad 10.4 2022) to each of the target ACs.

	
Format of bookkeeping	Field/post-harvesting management recording format

Stock and sales management recording format

DACP C/P is teaching how to prepare the annual financial report in accordance with the official format

The Project decided that DX supports would continue after 2021, when Japanese experts resume full-scale travel to the region. Furthermore, at the 5th JCC, it was decided to have a DACP staff actively participate in providing business management training, which has been an issue for training providers. In response to the above, the project promoted DX capacity building for DACP staff themselves, while the DACP staff were mainly responsible for preparing annual reports and supporting annual reporting sessions at the target ACs.

As a result of the above supports, the target ACs submitted their annual reports and held their annual general assemblies from February to March 2023. During the assemblies, the ACs reviewed their business plans, including the rice seed business, and discussed their plans for the coming year (PDM Indicator 1-d).

Table 22: Achievement of the business management trainings

Target ACs	Prey Veng	Takeo	Battambang	Kampong Chhnang
Period	2020/12/24~2023/2/20	2021/2/3~2023/1/26	2021/11/3~2023/1/24	2021/6/23~2023/2/22
Numbers of trainings	12	12	13	17
Total participants from the ACs	50	36	48	62

(3) Collaboration with Cambodia-Japan Cooperation Center

The ACs in Kampong Chhnang Province, where the level of understanding was particularly high and progress was being made in DX support related to Activities 1-7, requested to receive training in efficient and effective business management. The project worked with the Cambodia-Japan Cooperation Center (CJCC) to provide additional training on August 25-26, 2022, including promotion of understanding of business models and preparation of business and financial management plans.

Activity 1-8. Marketing trainings for seed business operation

In Phase 3, when the target ACs were able to produce the QDS seeds, the Project launched a survey of potential customers for the QDS seeds and marketing trainings for the target ACs to assist them in sales of the QDS seeds.

(1) Survey of potential customers for the QDS seeds and trial distribution of QDS seeds (coordinated with Activity 3-3)

In the survey of potential customers, interviews were conducted with the Cambodian Rice Association (CRF) and introductions were made to large rice millers for export in northern Cambodia, and a list of rice producers in the 10-1000 ha scale was compiled from the rice millers. Since medium to large rice producers also showed interest in the QDS seeds, the Project decided to distribute the QDS seeds produced by the target ACs to rice producers and conduct demonstration activities (conducted within Activity 3-3) in order to increase awareness of the QDS seeds. First, information on trial distribution of the QDS seeds was shared mainly with the target ACs in Battambang and Kampong Chhnang provinces, which are close to the location of the list of rice producers.

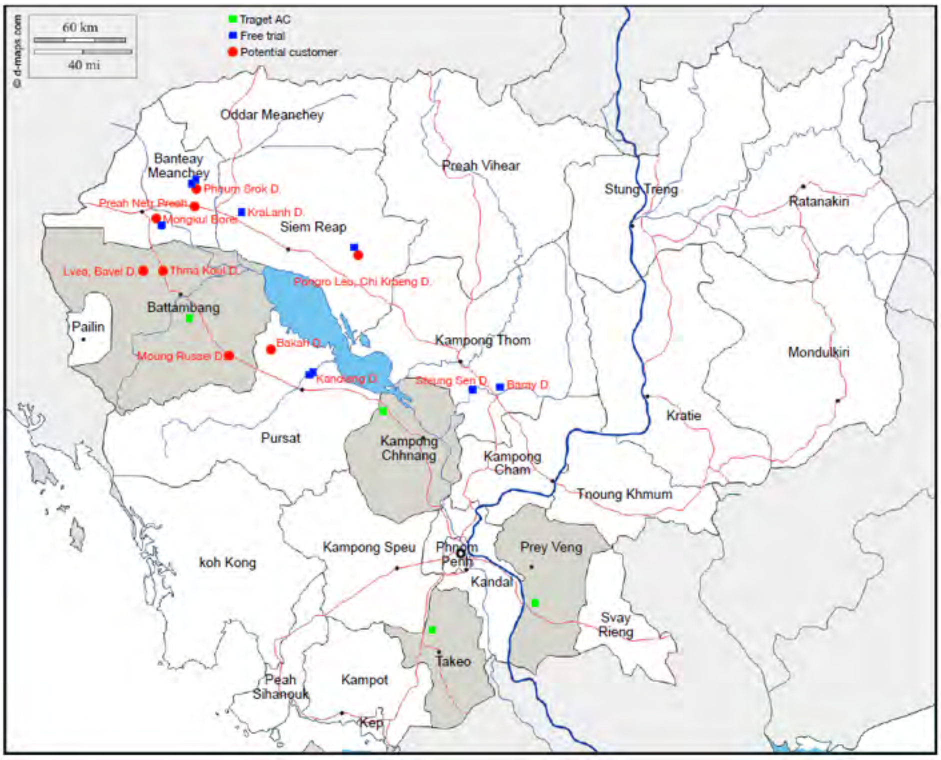


Figure 2: The location of potential customers

Table 23: List of potential customers

No.	Name	Place	Paddy field	Notes
1	Loss Loeurn	Moung Russei, BB	Broker	
2	Peu Chap	Moung Russei	100 ha	SKOB, Demonstration plot sown on 15 Apr.
3	Bong Pet	Moung Russei	50 ha	SKOB
4	Bong Roaun	Moung Russei	40 ha	SKOB
5	Chen	Moung Russei	80 ha	SKOB
6	Bang Pek	Moung Russei	100 ha	SKOB
7	Pek's brothers/ sisters	Moung Russei	400 ha	SKOB
8	Bang Tuy	Moung Russei	60 ha	SKOB
9	Bang Kong	Moung Russei	50 ha	SKOB

No.	Name	Place	Paddy field	Notes
10	Che Pheak	Moung Russei	20 ha	Not conscious about quality control
11	Che Ny & Theum Ny	Moung Russei	10 ha	Also collect paddy from neighbors, Interested in Neang Kong,
12	Chan Kim That	Moung Russei	Seed dealer	Agri-shop in front of ABA Bank
13	Roeut Sary	Thma Kol, BB	Broker	
14	Eung Heang Hy (Seang Hy?)	Preah Netr Preah, BM	300 ha or 1,000 ha	SKOB, some field rent to other farmers, producing high quality paddy, referred by Mr. Roeut and Mr. Chao.
15	May Chubaan	Thma Kol?		
16	Chao Thy	Thma Kol, BB	Broker	
17	San Sambath	Preah Netr Preah	1,000 ha	SKOB, producing high quality paddy.
18	Cheang Raum	Preah Netr Preah	30 ha	SKOB and OM5451.
19	Che Ley	Lvea, Bavel, BB	Broker	She has her own transport. Interested in selling seed.
20	Chhuon Mang	Lvea, Bavel, BB	20 ha	SKOB, Che Ley's paddy producer.
21	Leuk Nay	Lvea, Bavel, BB	15 ha	SKOB, Che Ley's paddy producer.
22	Sao Moeun	Lvea, Bavel, BB	20 ha	SKOB, Che Ley's paddy producer.
23	Sao Sen	Lvea, Bavel, BB	15 ha	SKOB, Che Ley's paddy producer.
24	Che Keo (Bun Savuth)	Lvea, Bavel, BB	25 ha	SKOB, Che Ley's paddy producer.
25	Chhuong Cham	Lvea, Bavel, BB	10 ha	SKOB, Che Ley's paddy producer.
26	Yeay Ry	Bavel, BB	Broker	
27	Samnang Veasna	Ream Samnap V. Lvea C. Bavel	Input shop, 10 ha	SKOB, limited interest in dealing seed
28	Chhuon	Ream Samnap V. Lvea C. Bavel	26 ha	SKOB
29	Chek Bunrak	Daun Nhem V. Lvea C. Bavel	15 ha	SKOB
30	Chen Chantra	Mongkul Borei, BM	Broker	
31	AC Chht Hov	Mongkul Borei	1,000 ha	SKOB and OM5451
32	I Vet Banteay Neang	Mongkul Borei	Seed dealer	
33	Yam Sam (Chhoung Vann)	Thma Puok, BM	Seed dealer	PRDU
34	Teop Vilay	Bakan, PS	Broker	
35	Kim	Bakan	10 ha	SKOB
36	Krit & Kosal	Bakan	Broker	
37	Song	Bakan	5 ha	Somali
38	Nang	Bakan	6 ha	Somali, SKOB
39	Roeum	Bakan	10 ha	Somali, SKOB
40	Art	Bakan	10 ha	Somali, SKOB
41	Soeum	Bakan	8 ha	Somali
42	Roat	Bakan	6 ha	Somali
43	Pher	Bakan	5 ha	Somali
44	Bo Channa	Rolea B'er, KCH	Broker	
45	Im Srey Neat	Rolea B'er	30 ha	Kravan. She also sale seeds.
46	Yeay Chhean	Rolea B'er	20 ha	Kravan
47	Heang Hay	Rolea B'er	40 ha	Kravan

(2) Marketing trainings (coordinated with Activity 3-3)

The ACs, which had traditionally practiced a passive sales approach of selling to nearby customers without sales promotion, did not have much experience in proactively reaching out to new customers. The Project conducted trainings on sales pricing and marketing necessary for sales activities for the ACs in the four target provinces, and prepared a manual. The specific contents of the manual are as follows.

- Production planning based on market demands

- Understanding of product characteristics (SWOT analysis, 4PS) and development of sales tools
- Customer list management and sales promotion
- Setting sales prices and sales targets based on break-even point calculations

In November 2022, the Project also re-planned an on-the-job training (OJT) type marketing trainings in the seed business, which are linked to Activity 3-3, Quality Seed Demonstration Activity. Specifically, a list of medium- and large-scale seed buyers was developed, and the QDS seeds were distributed according to the list to be used for paddy rice production. The Project then took the initiative to accompany the marketing staff of the target ACs to interview them about the results of the QDS seed use and to conduct marketing sales for the following year.

At the same time, QDS seed promotion events were organized in the fields of Kampot Province where the QDS seed trial distribution activities were conducted (see Activity 3-3 for details on the QDS seed trial distribution). At the event, ACs in Takeo Province conducted the QDS seed sales activities with the support of the Project in order to promote the QDS seed sales to paddy rice farmers and to improve the marketing capacity of the ACs. As a result, a rice-producing cooperative and a rice miller in Kampot Province decided to purchase the QDS seeds, respectively, and signed a sales contract. The AC sells 10 tons of PRDU seed at 2,700 Riel/kg (including delivery charge) to the cooperative, and sells 5 tons of the same variety at 2,400 Riel/kg (delivery charge to be borne by the buyer) to the rice miller[9].

Similarly, a QDS seed promotion event was held in Prey Veng Province, where trial distribution activities were conducted in December of the same year, with the participation of rice farmers. At the event, marketing representatives from the AC in Prey Veng explained about the QDS seeds and sold the seeds at 2,700 Riel/kg.
These direct sales activities by the target ACs included preparation of sales tools such as brochures identifying the activities of the ACs and the QDS seeds and business cards with the contact information of the person in charge, which had been an issue at the past business forums. Those activities such as visiting export rice millers and fir brokers and ultimately finding rice farmers are difficult for the ACs by themselves to carry out. However, managing customers so that they continue to purchase rice once they have been captured is possible. Furthermore, as awareness of the QDS system increases in the market, inquiries from potential customers can be expected[10].

Activity 1-9. Development of manuals for seed production and seed business management

(1) Establishment of QDS Working Group

The QDS system has been introduced in Africa and South Asia by FAO since 2006, though the Cambodian government's project by IRRI and the Asian Development Bank (ADB), which has been supporting rice seed production in Cambodia, has adopted a different standard and inspection method. Therefore, in establishing the QDS system, the GDA and its development partners in rice seed production (this Project by JICA, CAVAC/Australian Agency for International Development (AusAID), IRRI, the Climate Resilient Rice Commercialization Sector Development Program (Rice-SDP)/ADB), and established a QDS Working Group. Under this working group, work was conducted on designing the QDS system, setting quality standards, and

9 Interviews with target ACs conducted in January 2023 indicated that home-grown seed are mostly sold less than 2,000 riel/kg.

10 Information on the QDS business certification providers (name, location, and contact information) is available on the GDA's official website, which is open to the public.

unifying inspection methods. The results of these discussions were compiled into manuals to ensure that the contents follow the current rice seed production situation in Cambodia.

(2) Elaboration of the QDS manuals

Based on discussions in the working group, the Project and the CAVAC took the lead in developing a " Quality Declared Seed System (QDS) for Rice Seed Production and Business Manual." The GDA has officially adopted and endorsed the QDS system as a set of procedures and standards written on the manual (PDM Indicator 1-a). Based on the contents of the above manual, the "Technical Guideline for Rice Seed Quality Inspection Conforming to the Quality Declared Seed System (QDS)" was also developed by the Project in cooperation with CAVAC as a teaching tool for the trainings of field and quality inspectors required by the QDS system (PDM Indicator 2-a). The manuals provide detailed information on procedures, methods, and reporting methods for field and quality inspections, and have been used in trainings and other activities of GDA and PDAFF inspectors.

Along with the above manuals and guidelines for the QDS system, the Project has prepared a "Rice Seed Production Manual" (PDM Indicator 1-a). This manual is a compilation of training materials used by the Project in seed production trainings and explains the technical highlights for producing seeds of QDS standard quality. It is a technical manual that could be used in the future when promoting and expanding the QDS system, and it is expected to contribute to improving the quality of rice seed in Cambodia as a whole when it is widely used by rice seed producers.

Table 24: List of the manuals

	English name	Khmer name	Publisher	Target readers
1	Quality Declared Seed System (QDS) for Rice Seed Production and Business	ប្រព័ន្ធធានាគុណភាពពូជដំណាំ (ប.គ.ព) សម្រាប់ផលិតកម្មនិងអាជីវកម្មគ្រាប់ពូជស្រូវ	QDS Working Group	All stakeholders
2	Technical Guideline for Rice Seed Quality Inspection Conforming to the Quality Declared Seed System (QDS)	គោលការណ៍ណែនាំបច្ចេកទេសស្តីពីការត្រួតពិនិត្យគុណភាព គ្រាប់ពូជស្រូវតាមប្រព័ន្ធធានាគុណភាពពូជដំណាំ (ប.គ.ព)	QDS Working Group	Inspectors of GDA、PDAFF
3	Rice Seed Production Manual (Conforming to the Quality Declared System (QDS) for Cambodia)	សៀវភៅណែនាំស្តីពីផលិតកម្មគ្រាប់ពូជស្រូវ តាមប្រព័ន្ធធានាគុណភាពពូជដំណាំកម្ពុជា (ប.គ.ព)	The RSPP team	Rice seed producers

2.2. Output 2 Activity Related to Rice Seed Inspection and Certification System

Activity 2-1./ 2-2. Trainings of rice seed quality inspection

(1) Technical trainings on the quality inspections

In the past, rice seed production has been conducted by agricultural cooperatives and government agricultural research stations (ARS) with supports of other development partners. However, baseline surveys and pilot activities conducted during Phase 1 of the Project revealed that few producers had a clear understanding of how to conduct field inspections and quality inspections, and thus, appropriate field inspections and quality inspections had not been conducted. Some producers submitted seed samples to the National Agriculture Laboratory (NAL), a inspection laboratory under GDA, but did not receive reports on the inspection results and sold rice seed without any information on quality. Thus, the inspection system for rice seed was not well developed, and except for some inspectors at NAL, the C/Ps at GDA and PDAFF did not have sufficient skills and experience in field and quality inspection of rice seed.

Therefore, the Project conducted a three-day QDS inspector training in June and December 2019 respectively by using the QDS Seed Quality Inspection Manual as the teaching material (see Activity 1-9 for more information on the manuals). The training was attended by C/Ps from GDA and PDAFF, and they acquired knowledge and skills in field and laboratory quality inspections based on the standards and procedures of the QDS system, while utilizing the provided inspection equipment. The main contents of the training were as follows.

- Overview and objectives of the QDS system (purpose of inspection, inspection criteria, inspection procedures, how to prepare inspection reports, etc.)
- Field inspection in the QDS system (methods of field selection, inspection methods, identification of weeds, different varieties, etc.)
- Quality inspection in the QDS system (Sampling methods, inspection methods, methods to identify inert matter, weed seeds, diseased seeds, off-type, red rice, etc., moisture test, germination test, etc.)

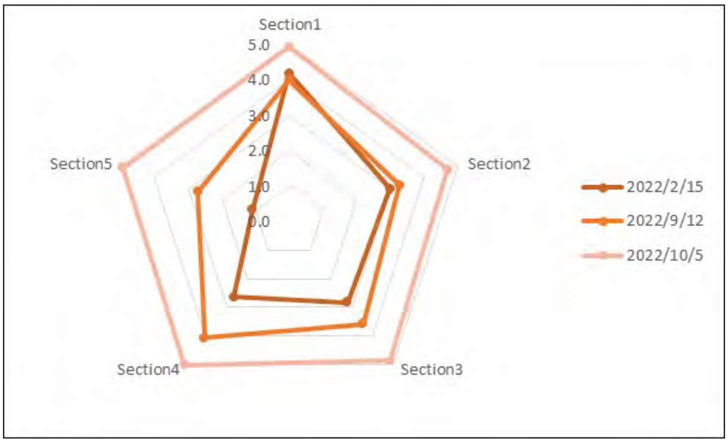
As a result of the training, the GDA and PDAFF C/Ps who participated in the training, with the technical assistance of the Project, were able to continue to inspect actual fields and samples, and to conduct inspections using the methods prescribed by the QDS system. Since most of the C/Ps who participated in the training were technical staffs specializing in rice production, they were able to learn rice seed inspection techniques without problems, but it took them a lot of time to fully understand the operation of the QDS system. Therefore, the Project conducted several instruction and assessment tests on the operation of the QDS system for GDA and PDAFF staffs, and in the end, all GDA and PDAFF C/Ps who participated in the Project achieved a passing score of 80% or higher (Table 24, PDM Indicators 2-b).

Table 25: Technical trainings on the QDS inspections for GDA and PDAFF

Date	**Training contents**	**Trainer**	**Participants**				
			RSPP	**GDA**	**PDAFF**	**AC**	**Others**
2019/6/19	TOT on Seed Quality Inspection to C/P on Day1	RSPP	7	7	8	0	0
2019/6/20	TOT on Seed Quality Inspection to C/P on Day2	RSPP	5	6	8	0	0
2019/6/21	TOT on Seed Quality Inspection to C/P on Day3	RSPP	5	6	8	0	0
2019/12/18	TOT for QDS Inspector (Lecture) on Day1	RSPP	5	17	32	0	8
2019/12/19	TOT for QDS Inspector (Field) on Day2	RSPP	5	13	32	0	2
2019/12/20	TOT for QDS Inspector (Lab.) onDay3	RSPP	5	14	32	0	2
2022/2/16	Training on seed quality inspections for PDAFF	RSPP/GDA	2	4	2	0	0
2022/6/13	Refresher training on seed quality control	RSPP	8	6	0	0	0

Table 26: Results of Assessment Test for GDA and PDAFF staffs

(Unit: Score)



Section	2022/2/15	2022/9/12	2022/10/5
Section 1: Procedure of the QDS System	4.2	4.0	4.9
Section 2: Field Requirement	3.0	3.3	4.7
Section 3: Field Inspection	2.8	3.6	4.9
Section 4: Seed Quality Test	2.6	4.1	5.0
Section 5: QDS work management	1.1	2.7	4.9

*The average score of 10 GDA C/Ps and 14 PDAFF C/Ps, full score of each section is 5.

(2) Providing inspection equipment and trainings

The Project provided PDAFF in the four target provinces with a set of inspection equipment needed for quality inspections (to be conducted in the laboratory/lab after harvesting) and provided instruction on equipment using during the training on quality inspection techniques. We also witnessed the actual inspections and provided technical guidance. As a result, PDAFF inspectors in the four target provinces gained experiences in a sufficient number of inspections and were able to properly use the equipment and conduct inspections with high accuracy (PDM Indicator 2-c).

Table 27: Number of samples inspected by inspectors of PDAFF
(include field and laboratory inspections)

	2019	2020	2021	**2022**
Prey Veng	20	28	10	**22**
Takeo	-	36	10	**17**
Battambang	-	-	11	**14**
Kampong Chhnang	9	4	14	**51**

The inspection equipment provided and the purposes for which it was used are as follows.

- Digital Grain Moisture meter: to measure the moisture content of a sample.
- Purity workboard: used to detect different varieties of rice and red rice.
- Multi-Functional Precision Balance: to weigh samples and inert matter to calculate purity.

Table 28: List of provided equipment for the laboratory inspection

<table>
<tr><th>Equipment</th><th>Model</th><th>Amount</th><th>Location</th><th>Date</th></tr>
<tr><td rowspan="3">Digital grain Moisture Meter</td><td rowspan="3">SATAKE SS-7</td><td>4</td><td>PDAFF (PV, TK, KC, BB)</td><td>June-July 2019</td></tr>
<tr><td>2</td><td>ARS in Toul Samraong and Po Loas</td><td>Nov. 2022</td></tr>
<tr><td>1</td><td>GDA</td><td>March 2023</td></tr>
<tr><td rowspan="2">Purity workboard</td><td rowspan="2">220V Diaphanoscope</td><td>4</td><td>PDAFF (PV, TK, KC, BB)</td><td>June-July 2019</td></tr>
<tr><td>1</td><td>GDA</td><td>March 2023</td></tr>
<tr><td rowspan="2">Multi-Functional Precision Balance</td><td rowspan="2">Precision Balanace-AND</td><td>4</td><td>PDAFF (PV, TK, KC, BB)</td><td>June-July 2019</td></tr>
<tr><td>1</td><td>GDA</td><td>March 2023</td></tr>
</table>

(3) Achievement of trainings and challenges

As a result of the provision of inspection equipment and technical trainings on quality inspection, PDAFF inspectors in the four target provinces have been able to conduct field inspections and quality inspections with a high degree of accuracy. They are also able to accurately prepare reports on inspection results. However, there is still some variation in determinations among inspectors, especially in quality inspections. The Project instructed inspectors to make more accurate assessments by checking and discussing with multiple inspectors when it is difficult to judge different types of products, and other. In the future, to ensure more uniformity in inspection accuracy, a system of licensing inspectors and periodic technical training for inspectors should be established (see 7.3.1. Seed production and seed business management).

(4) Training in third country

1） Outline of the training

The training program on "Rice Seed Production Management System" was held at IRRI Headquarters in the Philippines from January 22 to January 28, 2023. IRRI Headquarters is a research institute that actively accepts trainees from various countries and has a well-developed training system. During the training period, the participants also visited relevant public institutions under the jurisdiction of the Philippine Department of Agriculture (Bureau of Plan Industry, National Seed Industry Council, etc.) to learn about the actual production management from upstream to downstream seeds and the operation of the seed certification system. In the latter half of the training, the C/Ps of GDA and PDAFF shared their future vision for rice seed production management based on what they learned during the training.

2） Participants

10 C/Ps from GDA and 12 PDAFF C/Ps from the target provinces participated the training.

Table 29: List of participants

No.	Name	Organization	Position
1	Ms. Sin Sophorn	GDA	Deputy Director General
2	Dr. Srun Khema	GDA, Department of Crop Seed	Deputy Director
3	Mr. Tai Chandara	GDA, Department of Crop Seed	Deputy Director
4	Mr. Thim Thuok	GDA, Department of Crop Seed	Vice Chief of Variety Registration and Seed Certification Office
5	Mr. Prum Vuthy	GDA, Department of Rice Crop	Vice Chief of Rice-based Farming System Office
6	Mr. Sovann Dara	GDA, Department of Rice Crop	Vice Chief of Rice Post-harvest technology and Marketing Office
7	Mr. Chea Sokly	GDA, Department of Rice Crop	Vice Chief of Research and Training Office
8	Ms. Nget Chanbo	GDA, Department of Rice Crop	Officer of Rice Seed Development and Management Office
9	Mr. Nget Sovann	GDA, Department of Rice Crop	Vice Chief of Rice Seed Development and Management Office
10	Ms. Tim Savann	GDA, Department of Rice Crop	Vice Chief of Rice Seed Management and Development Office
11	Mr. OUK Samnang	PDAFF, Prey Veng	Director
12	Mr. Hem Setha	PDAFF, Prey Veng	Officer of Agronomy Office
13	Mr. Mauv Vandara	PDAFF, Prey Veng	Officer of Agronomy Office
14	Mr. Chuon Bunthoeut	PDAFF, Battambang	Chief of horticulture unit in Agronomy, Office
15	Ms. Pov Lina	PDAFF, Battambang	Vice Chief of Agronomy Office
16	Mr. Set Vinit	PDAFF, Battambang	Vice Chief of Agro-industry Office
17	Ms. Mel Channtevy	PDAFF, Takeo	Chief of Agronomy Office
18	Mr. Chhorn Sarith	PDAFF, Takeo	Officer of Agronomy Office
19	Mr. Chhong Phon	PDAFF, Takeo	Officer of Agronomy Office
20	Mr. Tauch Poch	PDAFF Chhnang	Chief of provincial AC development office
21	Mr. Nhem Sobon	PDAFF, Kampong Chhnang	Officer of Agronomy Office
22	Mr. Huon Lyhor	PDAFF, Kampong Chhnang	Officer of Agronomy Office

3） Achievement of the training

In the Philippines, public institutions are responsible for the operation and management of the system for seed production management. On the other hand, Cambodia has introduced a QDS system with minimal involvement of public institutions due to limited government budget. The training participants recognized the need for the Cambodian government to secure the minimum budget necessary to maintain the QDS system, as well as for the government to continue to develop human resources of relevant institutions and to improve and operate the law.

In particular, public institutions in the Philippines clearly stipulate which laws and regulations under which organizations are operated. Also, in the seed certification and inspection system, each relevant organization has detailed regulations on its operation and management methods, and public organizations are operating and managing in accordance with the regulations. In contrast, since the DCS has just been established, the specific operation of the system has not yet been fully legally established, and the operation is being carried out in a state of exploration. In the future, it is necessary to develop in detail the necessary regulations for the operation of the seed law in Cambodia.

Analysis of rice seed in Cambodia

Hearing the national seed certification system in Philippine

Learning about hybrid seeds from the private company

Activity 2-3. Trial of the QDS system

In Phase 2, the Project, in collaboration with relevant development partners, designed the QDS system according to actual conditions in Cambodia, as requested by the GDA in the latter half of Phase 1. While designing the QDS system, the Project, together with GDA and PDAFF C/Ps, provided trainings to the target ACs in Prey Veng Province on rice seed production in line with the standards of the QDS system. Additionally, the development of a QDS seed production and business manual that provides an overall picture of the QDS system and a QDS seed quality inspection manual that provides technical guidelines for quality inspections were conducted at the same time, and issues raised at the production sites in Prey Veng Province were repeatedly reflected in the manual (see also Activity 1-9). As a result, the framework and manuals of the QDS system were generally put in place, and the QDS system was ready for full-scale implementation.

On the other hand, the launch of the Department of Crop Seed, the operator and administrator of the QDS system, was not accomplished during the se. On the other hand, the launch of the DCS, the operator and administrator of the QDS system, was not accomplished during Phase 2. The reason for the delay was that the DCS was initially planned to be established as a unit within the DRC, where the procedures within the Ministry would be simplified. However, in anticipation of handling seeds of crops other than rice in the future, MAFF was decided to launch DCS as separated department. This required time for discussions and procedures within the Ministry for the establishment of the new department. Other issues such as the consolidation of seed-related departments scattered throughout MAFF and the establishment of the organizational structure, scope of work, and authority of the DCS took time for discussions and procedures within the government of Cambodia. Consequently, the procedures for applying for the QDS system and the identification of the process and role of labeling seeds that have passed the final inspection were left untouched in the second phase of the project.

Activity 2-4./ 2-5. Technical assistance and enforcement of the QDS system

From the second to the third period, the QDS system was tested and improved, and the results were reflected in the manuals for Activities 1-9 and 2-1. From the third period onward, the QDS system was implemented, and technology transfer was conducted in cooperation with GDA and PDAFF to enable target ACs to carry out the processes such as applications and voluntary inspections in accordance with the QDS system.

(1) Capacity development of the ACs in the QDS system

Technology transfer for the QDS seed production was described in Activities 1-4, 1-5, 2-1, and 2-2. From Phase 3, in addition to these activities, periodic monitoring was conducted on the level of adoption of the technology. In the monitoring, the QDS seed production process was divided into (1) planning, (2) preparation, (3) field management, (4) harvesting, (5) post-harvest processing, and (6) sales management, and a checklist was used to confirm whether the ACs in the four target provinces correctly understood and were operating the system. The results showed a certain level of understanding from 2021 onward, and by November 2022, all ACs had achieved a level of understanding of 80% or higher (PDM Indicator 2-d).

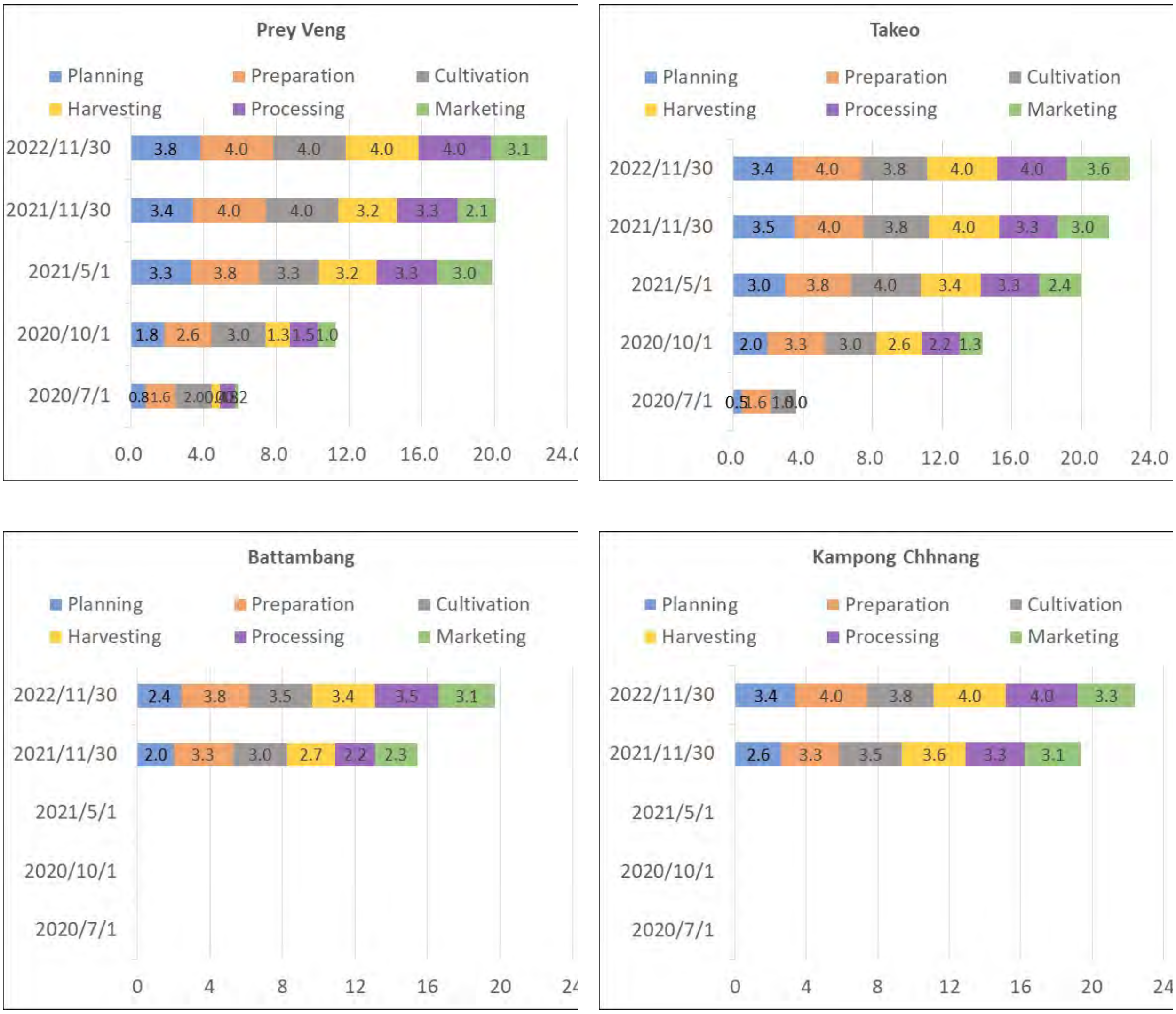
Table 30: The results of the periodic monitoring on ACs (November, 2022)

Unit : Score

QDS seed production	Prey Veng	Takeo	Battambang	Kampong Chhnang
1. Planning	3.80	3.40	2.40	3.40
2. Preparation	4.00	4.00	3.75	4.00
3. Cultivation	4.00	3.75	3.50	3.75
4. Harvesting	4.00	4.00	3.44	4.00
5. Processing	4.00	4.00	3.50	4.00
6. Marketing	3.11	3.63	3.13	3.25
Total	22.91	22.78	19.72	22.40

* Score 4: possible to manage without the supports from the Project, score 3: Almost possible to manage without the supports from the Project, score 2: possible to manage with the supports from the Project. Score 1: impossible to manage
The full score of each process is four and 24 in total. 80% understanding scores 19.2.

Table 31: Progress on the AC's understanding of the QDS system



(2) Development of Rice Seed Roadmap 2028

In Phase 3 of the project, the Department of Crop Seed was officially launched and the operation of the QDS system has begun. The Project has started to support the Department of Crop Seed in developing an action plan for the sustainable operation of the QDS system and its expansion after the completion of the Project.

Furthermore, at the 5th JCC held in May 2022, it was decided that the production target of the QDS seed by 2028 is 30% of milled rice for export. In response to this decision, the Project, together with the Department of Crop Seeds, discussed more specific numerical targets and methods to achieve the target, and the results were compiled into the "Rice Seed Roadmap 2028" (see 4.4 Road Map for the proliferation of rice seeds).

2.3. Output 3 Activities Related to Acceleration of Rice Seed Business

Activity 3-1. Baseline survey on rice seed and paddy value chain

During Phase 1, from January to May 2018, a rice seed and rice value chain survey was conducted to understand the current status and challenges of them. The results revealed that there was a shortage in the number of seed distributors who could trade at a fair price, and that although demand for quality seeds was high, their supply was absolutely insufficient (see attached document prepared by the Technical Cooperation: Baseline Survey Report).

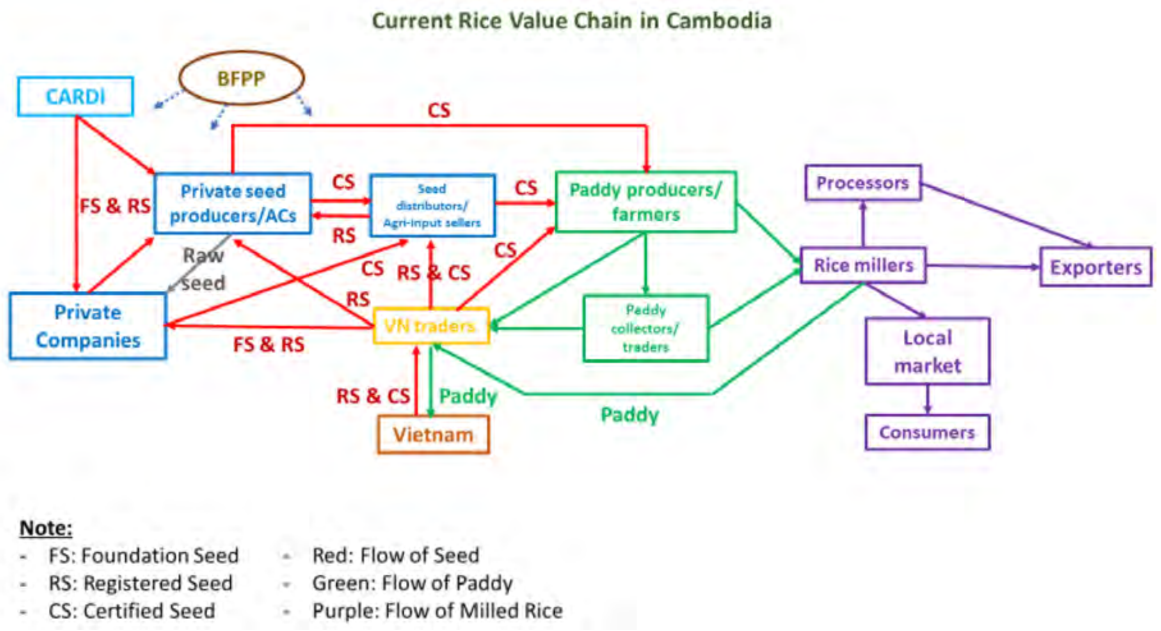


Figure 3: Value chain of the rice seed in Cambodia

Activity 3-2. Demonstration activities in the exhibition plots to indicate the usefulness of QDS seed utilization

(1) Demonstration plots showing the effectiveness of the QDS seed utilization

In the Prey Veng province, where the QDS system has been piloted throughout Phase 2 of the Project, demonstration fields were installed in November 2019 to demonstrate the usefulness of the QDS seed use. The fields were installed on 0.5 hectares (SKOB seeds) of seed-producers who were particularly enthusiastic about their field management among the members of the ACs. In this demonstration fields, transplanting was done using a rice transplanter (seeding rate of 40 kg/ha), and the farmers were asked to carefully manage their fields in order to serve as an example of seed cultivation.

In February 2020, at the harvest time, PDAFF officials from Takeo Province, which planned to introduce the QDS system in the same year, and members of the target ACs were invited, and PDAFF and members of the target ACs from Prey Veng Province explained the management methods, purity, and other advantages of the QDS seed cultivation system (four GDA officials, nine PDAFF officials from Prey Veng and Takeo, and 10 members from the target ACs in Prey Veng and Takeo participated in this demonstration activity).

The yield of this demonstration fields was 4,101 kg/ha, indicating that with careful field management at a seeding rate of 40 kg/ha, sufficient yield could be achieved. For reference, the yield of the same field, grown by the same producer in the wet season of 2019 at 80 kg/ha seeding rate (using a power seeder), was 2,789 kg/ha.

Through this activity, the PDAFF and ACs participants in Takeo who visited the demonstration fields learned the differences among the QDS seed, non-QDS seed and paddy rice cultivation, and that yields could be achieved even at low seeding rates if good seeds were used and the fields were managed properly.

(2) Demonstration activities at the government's Agricultural Research Station (ARS)

At the JCC in May 2022, GDA requested that QDS seed production in ARS would be included in the Project activities in order to promote and raise awareness of the QDS seeds. The Project agreed to this because GDA could demonstrate their capacity building by taking the lead in the QDS seed production, and GDA led the establishment of the QDS seed demonstration fields in ARS in Prey Veng and Battambang Provinces starting in August 2022.

The production results from the ARS demonstration fields are shown in Table 32. The initial quality test results of the QDS seed produced at ARS in Prey Veng Province were failing, but after retesting with a re-collected sample, it passed. This reaffirms the issue that the quality of inspections varied among inspectors (see Activities 2-1/2-2 and 7.3.2. Quality inspection for details).

Table 32 ： Results of QDS seed production in ARS demonstration fields

	Variety (variety-WS (month-year)	Planned area (ha)	Seeded area (ha)	1st field inspection	2nd field inspection	Harvested area (ha)	Harvested amount (Mt)	Final product (Mt)	Laboratory inspection
Prey Veng	PRDU-WS (Aug 22)	2.50	2.50	Pass	Pass	2.50	9.16	7.6	Fail/Pass*
	SKOB-WS (Sep 22)	0.60	0.60	Pass	Pass	0.60	0.83	0.64	Fail/Pass*
Battam bang	PRDU-WS (Aug 22)	5.00	5.00	Pass	Pass	5.00	11.42	-	-
	SKOB-WS (Sep 22)	10.00	10.00	Pass	Pass	10.00	34.81	23.28	Pass

*First laboratory inspection failed but different sample from the same lot passed the second laboratory inspection.
Process of PRDU in Battambang has not been completed by April 2023.

In terms of public awareness, a field day was held in ARS in Prey Veng Province on November 16, 2022 and in Battambang Province on November 30, 2022 to promote the QDS seeds. Each of these events assembled 36 and 57 stakeholders in Prey Veng and Battambang Provinces, respectively. The Project, GDA C/Ps and ARS personnel explained to the participants how the QDS seeds were produced and the advantages of using the QDS seeds. Many of the participants expressed interests in the use of QDS seed as a result.

	
A total of 36 people attended the field day held at ARS' demonstration fields in Prey Veng, including neighboring farmers' cooperatives and rice farmers.	The field day, held at ARS' demonstration fields in Battambang, was attended by 57 participants, including nearby cooperatives and rice farmers.

Activity 3-3. Demonstration activities of quality seeds in rice farmers' fields

(1) Demonstration activities for paddy rice production using QDS seeds

From Phase2, for the purpose of confirming the superiority of using high quality seeds, the QDS seeds produced by the ACs were used to cultivate paddy rice in the demonstration fields.

In Cambodia, direct sowing, in which the seed is sown directly into the paddy field without seedling production and rice planting, has become widespread in recent years, with many farmers sowing at a rate of 150 kg/ha or more. This is much higher than the widely recommended 20-40 kg/ha for sowing in Japan. Consequently, farmers in Cambodia are burdened with the cost of purchasing seeds, which is an obstacle to investing in quality seeds for paddy rice. Against this background, the following activities were conducted to demonstrate paddy rice production using QDS seeds.

(1) Confirmation of the appropriate seeding quantity for paddy rice production using the QDS seeds.

(2) Comparison of yield and quality between home bred seed and the QDS seed to demonstrate the effectiveness of seed that meets the QDS standard.

i. Identification of appropriate seeding rates

A total of five demonstration fields were established in three provinces during the 2019 wet season and 2020 dry season to compare yields of direct seeded cultivation with the QDS seeding amounts of 40 kg/ha, 60 kg/ha, 80 kg/ha, and 100 kg/ha. The results showed that while yields decreased slightly at 40 kg/ha seeding rate, there was no significant difference in yields at 60-100 kg/ha seeding rate. One of the reasons for this is that the QDS seed has a high germination rate of more than 80%, which allows a sufficient number of plants to be secured even with a small amount of seed. This no difference in yield indicates that the introduction of the QDS seed can reduce the seeding quantity to about 60 kg/ha in paddy rice production.

Table 33: Comparison of seeding rate and yield in the demonstration fields

(unit: kg/ha)

Province	Season	Seeding rate			
		40 kg/ha	60 kg/ha	80 kg/ha	100 kg/ha
Prey Veng	2019W	2,289	3,253	3,364	3,585
Battambang	2019W	5,343	5,390	4,640	5,613
Takeo	2019W	4,873	5,441	5,549	5,212
Prey Veng	2020D	1,930	2,429	2,536	2,830
Takeo	2020D	3,207	3,226	3,673	3,399
	Average	3,528	3,948	3,952	4,128
	Rate*	—	1.12	1.00	1.04

W: wet season, D: dry season

*Rate shows increasing rate based on the left column. For example, increasing rate between seeding rate of 60kg/ha and 80kg/ha is one and does not show significant difference.

ii. Use and yield of QDS standard seed

Table 34 shows the results of a comparison of QDS seed and farmers' home bred seed produced under the same conditions. The results show that yields were higher in the plots where QDS seed was used in four of the five plots, except in Takeo Province. The yield of QDS seed plots was lower in the plots in Takeo, but since the plots were produced using farmers' fields, there could be errors due to field conditions, etc. With the exception of plot B in Battambang Province, there were no significant differences in yields. One factor may be that the germination rate of even home bred seeds might be as high as that of QDS seeds. In any case, the use of QDS seed did not significantly increase yields, although yields tended to increase slightly.

Table 34: Comparison of yield in the demonstration fields (2021)

Province	Season	Seeding rate	QDS	Farmer's seed	Yield change
Kampong Chhnang A	2021D	100kg/ha	2,094	1,726	21.3%
Kampong Chhnang B	2021D	100kg/ha	2,904	2,398	21.1%
Takeo	2021D	80kg/ha	4,464	5,176	**-13.8%**
Battambang A	2021D	100kg/ha	4,805	4,492	7.0%
Battambang B	2021D	60kg/ha	5,043	3,367	49.8%

W: wet season, D: dry season

iii. Use of the QDS seed and rice quality

Table 35 compares the quality of paddy rice (brown rice) produced using the QDS seed (CS) in the demonstration fields with that of paddy rice grown in the farmers' fields using self-seeded seed. The results showed that a large amount of red rice was detected in the rice produced by the home bred seeds, while very little red rice was detected in the rice from the demonstration fields using QDS seeds.

Table 35: Result of quality inspection of paddy (Brown rice)

Sample	Province	Year	Original Seed Variety	Original Seed Class	Sample amount (g)	Moisture contents (%)	Perfect grains (%)	Damaged grain (%)	Dead grain (%)	Colored grain (%)	Red rice (%)
Demo plot	PV	2019W	SKOB	CS	425.63	13.33	85.25	11.57	0.21	2.49	0.47
Demo plot	BTB	2019W	SKOB	CS	454.63	12.90	90.13	7.27	0.25	2.35	0.00
Farmer's plot	PV	2019W	SKOB	FaS*	120.97	12.00	82.09	11.37	0.24	1.49	4.80

*FaS: Farmer's home bred seed

(2) Demonstration activities to promote market awareness (coordinated with Activity 1-8)

The QDS system is a new inspection and certification system (or more precisely, a declaration system to report quality) for rice seed established through the Project, and at the launch of the system, there were no market participants who were aware of its existence. In Phase 3 of the Project, when ACs gradually became able to produce and distribute the QDS seeds in the market, the Project began activities to promote market awareness of the QDS system and QDS seeds.

Specifically, QDS seeds were distributed for free to rice farmers along with the customers list created in the marketing activities described in Activity 1-8, and paddy rice was produced in the demonstration plots to promote the QDS seed system. At the same time, a questionnaire survey was conducted among participating rice farmers to obtain feedback on seed quality and other issues.

A total of 24 farmers (9 farmers for the 2021-2022 dry season crop and 15 farmers for the 2022 wet season crop) participated in the trial distribution activities, producing paddy rice using seeds that met the QDS standard produced by the ACs. The area of the trial fields was about 0.5 ha, and the cultivation method was the usual method used by each farmer. Based on the results of the demonstration fields in Activity 3-2, the seeding rate was set at 80 kg/ha. However, some farmers sowed about 100 kg/ha of seeds if they wished.

i. Results of Trial Distribution Activities

After the trial distribution activities were completed, the Project interviewed the participated farmers (Table 36). As a result, 20 out of 24 farmers answered that they would "purchase" or "probably purchase" QDS seed for the next crop (see Q5). One farmer answered that he would "probably not purchase" QDS seed, and he answered that he could use the QDS seed used in the trial for the next crop. Good germination rate was highly evaluated as a reason for using QDS standard seeds for the next crop as well (see Q1). Purity was also highly rated (see Q2), although many farmers pointed out that this was due to the fact that there was less weed contamination by using QDS seed. Other factors regarding the occurrence of disease were also evaluated positively, but the evaluation was lower than for the other items, suggesting that even if the seeds were not infected with an infectious disease, various factors in subsequent cultivation could cause the disease to occur.

Seven of the 24 farmers were positive about the use of QDS seeds, despite the lower yields, especially for germination rate and purity. Summarizing the satisfaction scores from Q1 to Q5, the average satisfaction score was over 80% (20.96 out of 25 points), indicating the high level of satisfaction with QDS seeds among farmers who participated in the trial distribution activities (PDM Indicator 3-a).

Table 36: Results of demonstration with QDS seeds

No.	Province	Variety	Area	Yield*	Q1	Q2	Q3	Q4	Q5	Total
	2021-22 Dry season									
1	Kg Thom	SKOB01	0.40ha	55%	4	4	4	4	3	19
2	Kg Thom	SKOB01	0.55ha	76%	5	4	4	3	5	21
3	Siem Reap	SKOB01	0.40ha	85%	4	5	3	4	2	18
4	Siem Reap	SKOB01	0.60ha	n.a.	5	5	5	4	4	23
5	Banteay Meanchey	SKOB01	0.35ha	172%	5	5	5	4	5	24
6	Banteay Meanchey	SKOB01	0.50ha	225%	5	4	4	3	5	21
7	Banteay Meanchey	SKOB01	0.50ha	124%	5	5	5	4	5	24
8	Pursat	SKOB01	0.50ha	108%	5	4	5	4	5	23
9	Pursat	SKOB01	0.50ha	96%	5	3	5	4	5	22
	2022 Wet season									
10	Kampong Cham	PRDU	0.50ha	100%	5	4	5	4	4	22
11	Kampong Cham	PRDU	0.50ha	100%	4	5	4	4	4	21
12	Kampong Cham	SKOB01	0.45ha	132%	5	4	4	4	4	21
13	Tboung Khmum	PRDU	0.50ha	133%	5	5	5	4	4	23
14	Prey Veng	PRDU	0.50ha	78%	4	4	5	4	4	21
15	Prey Veng	PRDU	0.45ha	62%	5	4	4	3	4	20
16	Svay Rieng	PRDU	0.50ha	134%	5	4	4	4	4	21
17	Svay Rieng	PRDU	0.50ha	118%	4	5	4	4	4	21
18	Takeo	PRDU	0.50ha	138%	4	3	4	4	4	19
19	Kampot	PRDU	0.45ha	120%	5	4	4	4	4	21
20	Kampot	PRDU	0.50ha	100%	4	4	4	4	4	20
21	Kampong Thom	SKOB01	0.50ha	83%	5	4	3	4	4	20
22	Kampong Thom	SKOB01	0.45ha	137%	4	4	4	4	4	20
23	Kampong Thom	SKOB01	0.65ha	118%	4	4	3	4	4	19
24	Battambang	SKOB01	0.50ha	124%	4	4	4	3	4	19
			Average	114%	4.58	4.21	4.21	3.83	4.13	20.96

*the yield of the demonstration divided by the yield of the previous year (%)

Q1: How was the germination of the QDS seed? 1. Very poor, 2. Poor, 3. Fair, 4. Good, 5. Very good
Q2: How was the purity of the QDS seed? 1. Very poor, 2. Poor, 3. Fair, 4. Good, 5. Very good
Q3: How was the growth shape during cropping? 1. Very poor, 2. Poor, 3. Fair, 4. Good, 5. Very good
Q4: How was the disease tolerance? 1. Very poor, 2. Poor, 3. Fair, 4. Good, 5. Very good
Q5: Will you buy the QDS seed for the next season? 1. No, 2. Maybe no, 3. I do not know, 4. Maybe yes, 5. Yes

Activity 3-4. Verification of the impact of quality rice seed to productivity, profitability, and quality of paddy

(1) Impact on productivity

As indicated in Activity 3-2, the use of QDS seed contributes to the improvement of paddy rice quality, with a good germination rate and a low risk of contamination with different varieties or red rice, and is not expected to significantly increase yields. In fact, as indicated in Activity 3-3, farmers using the QDS seed also do not have high expectations for yield increase. This is partly due to the fact that seeds commonly used in Cambodia also retain a certain degree of quality, and if rice seeds of extremely poor quality are being used, yield improvement through the use of QDS seeds can be expected.

On the other hand, the QDS seeds are guaranteed to have a good germination rate through quality inspections. In addition, each ACs conducts repeated moisture tests and germination tests before shipment to maintain quality, which greatly reduces the risk of rice farmers having to re-sow seeds they have purchased without germinating. In fact, there was a case in which the AC in Battambang Province concluded a sales contract with a potential seed purchaser by showing him the germination test, indicating that seed purchasers place importance on the germination rate. In other cases, rice farmers commented that the use of QDS seeds has enabled them to produce high purity paddy rice with fewer weeds.

(2) Impact on paddy rice

The frequency of detection of red rice or different varieties in paddy rice produced using QDS seeds is significantly reduced. However, at present, the purchase price of paddy rice is determined by the evaluation based on purity, moisture content, and other factors, which makes it difficult to lead to an increase in the purchase price of paddy rice produced using the QDS seeds. However, as shown in the results of the trial distribution of the QDS seeds in Table 36, the evaluation of paddy rice production using the QDS seeds was generally high, and paddy farmers commented that the QDS seeds enabled them to produce high purity paddy rice with fewer weeds. Furthermore, as a result of interviews conducted with the target ACs in January 2023 (see Activity 3-6 for details), they indicated that the use of the QDS seeds had increased the reputation of paddy rice among rice millers and other buyers, and that the volume of paddy rice transactions had increased compared to the previous year. Thus, the impact in improving the quality aspect of paddy rice has had the effect of increasing the trust of paddy producers and their recognition in the market, and such "visualization of quality" is a major advantage of the introduction of the QDS system.

(3) Impact on profitability

Sales of QDS seed through the official QDS system were initiated in 2020. <u>As shown in Table 37, a comparison of QDS seed sales in 2022 (at the end of the Project) with the year in which sales began in all target provinces shows an increase in annual sales volume of about 1.8 times (PDM Indicator 3-b)</u>. By the ACs, the volume of sales in Takeo Province decreased, while in Prey Veng Province, it increased slightly. One reason for this is that in the early years of the introduction of the QDS system in 2020, the Project led the way in encouraging the ACs to produce as much as possible, whereas after that year, the Project has respected the autonomy of the ACs, and the production volume has settled at a level that reflects market demands and the ability of the ACs to manage their fields. Another reason is that seed production in Takeo in 2021 was lower than expected in 2022 due to a series of QDS seed production cancellations.

Table 37: Sales volume of the QDS seed (2020~2022)

	Variety	Sales Volume			Achievement rate (%)
		2020	2021	2022*	(Oldest - latest)
PV	SKOB	60.54	70.00	*10.22*	*16.88%*
	PRDU	49.23	17.00	*44.83*	*91.06%*
	OM	-	-	*62.10*	-
	Total	**109.77**	**87.00**	***117.15***	***106.72%***
TK	SKOB	18.29	9.40	*9.46*	*51.72%*
	PRDU	15.72	8.28	*14.16*	*90.08%*
	Total	**34.01**	**17.68**	***23.62***	***69.45%***
BB	SKOB	-	19.26	*35.81*	*185.93%*
	PRDU	-	-	-	-
	Total	**-**	**19.26**	***35.81***	***185.93%***
KC	SKOB	-	-	*55.72*	-
	PRDU	-	-	*28.34*	-
	Total	**-**	**-**	***84.06***	**-**
Total		143.78		***260.64***	***181.28%***

*Includes estimates for FY2022, as sales have not been completed as of April 2022.

Table 38 shows the profitability of farmers who produced the QDS seed and those who used the QDS seed to produce paddy rice. The cost of purchasing QDS seed was not a significant expense, accounting for only 1~2% of this profit. On the other hand, considering the diminishing risk of seed failure to germinate and weed infestation, it can be concluded that the use of QDS seeds is extremely economical. Furthermore, the QDS seed does not need to be renewed every year, and users say that even after three years of continuous use, both quality and yield do not deteriorate, allowing the introduction of seed that meets the QDS standard with little expense.

Meanwhile, low profitability is an issue in the production of QDS seed itself. As shown in Table 38, the production of the QDS seed is less profitable than the production of paddy rice, and furthermore, considering that producers bear the costs of applying to the QDS system, inspecting, and issuing labels, the environment is not currently conducive to making QDS seed production itself a stand-alone business. In fact, many of the target ACs consider the objective of the QDS seed production as in-house seed production for high-quality paddy rice production, and adopt a business model in which QDS seed production is combined with paddy rice production.

Table 38: Costs of both QDS seed and paddy rice production

Product	Yield (kg/ha)	Sales price (USD/kg)	Total cost (USD/ha)	Production cost (USD/ha)	Labor cost (USD/ha)	Self-labor cost (USD/ha)	Gross income (USD/ha)	Net income (USD/ha)
QDS seed	3,438	0.334	724	538	82	103	1,140	417
Paddy rice	4,039	0.264	510	430	13	68	1,069	559

* Average of 12 seed producers (3 x 4 ACs) belonging to the target ACs in 4 provinces. It does not include application, inspection, and tag issuance costs.

** An average of 7 farmers participated in demonstration activities using QDS seed.

Activity 3-5. Networking events for stakeholders of rice seed business

(1) Networking events conducted during Phase 2 and 3 (prior to COVID 19)

Prior to COVID19, the QDS Seed Business Forums were held from February 2019 to February 2020 for networking with seed business stakeholders. A total of 5 forums were held in Prey Veng, Takeo, and Battambang provinces, with a total of 416 participants. A networking platform on SNS was also launched. The target ACs actively engaged in business negotiations with the participants of these forums and SNS.

Table 39: List of networking events

Date	Venue	Participants	Event summary
2019/2/12	Prey Veng	Total 43 (AC/SPG 6, buyers 4, farmer federation 2, CARDI, rice related projects 3, GDA, PDAFF, CRF)	・Presentation on rice seed transaction and its updated market information ・Business negation session.
2019/2/28	Battambang	Total 74 (AC/SPG 14, buyers 5, financial institutes 2, farmer federation 1, GDA, PDAFF, CRF, JICA Cambodia)	・Presentation on the QDS system ・Business negotiation session.
2019/7/11	Takeo	Total 86 (AC/SPG 10, AC (buyers) 10, seed companies 5, millers 3, financial institutes 3, farmer federation 1, CRF, BFPP, GDA)	・Presentation on the QDS system ・Business negotiation session ・Presentation on BFPP and other governmental supports.
2020/1/16	Battambang	Total 116 (seed producer ACs : 15, private seed producing companies : 3, rice mills 3, seed distributors : 3, seed purchasing ACs: 20, farmer unions : 2, financial institution : 1, CRF, CAVAC, Rice SDP, VSO, JICA Cambodia Office, GDA, PDAFF Battambang)	・Presentation on the progress of the QDS system ・Business negotiation session
2020/2/28	Prey Veng	Total 87 (seed producer ACs: 16, private seed producing company:1, rice mills 2, and seed distributors: 5, CRF, CAVAC, RIAPIP, Rice-SDP, Polous Agricultural Research Center, ISF, FACE, CFAP, JICA Cambodia Office, GDA, PDAFF Prey Veng)	・Presentation on the progress of the QDS system ・Business negotiation session

(2) Creation and utilization of QDS promotional videos

After March 2020, due to the effects of the COVID19, it became difficult to organize events and workshops with large assemblies of people. As an alternative, the Project decided to create a promotional video to promote the QDS seeds in Activity 3-5[11]. The promotional video was created in four parts (each about 3 minutes long), which included (1) the benefits of purchasing QDS seeds, (2) how QDS seeds are produced, (3) how the quality of QDS seeds is inspected, and (4) how QDS seeds are stored and delivered to consumers. The filming was completed in May 2022.

[11] The original plan was to jointly create the video with CAVAC, but CAVAC wanted to make the video as an educational tool for seed farmers, whereas the Project realized that it needed to make the video as part of its promotional materials for a wide range of potential customers, including seed purchasers. Therefore, it was decided that the Project would not conduct a joint production and that each would produce the necessary video.

Figure 4: Draft of the QDS promotional video

The created QDS promotional video was utilized as follows

- Posting on GDA's website (URL：https://gda.maff.gov.kh/videos/04ZAIFqqGJ)
- Creating a QR code for the official GDA website and posting it on promotional brochures of the target ACs
- Downloaded to the tablets distributed to the target ACs and used for the QDS seed promotion
- Screening at the demonstration activities and field days
- Screening at ceremonies related to the Project
- Publication through SNS by government officials (such as posting on the Facebook page of the MAFF (total number of likes: 1,295, total number of shares: 294, as of September 28, 2022)).

<u>Activity 3-6. Trial of the rice seed business model and its monitoring and evaluation</u>

The Project proposed a seed business model in the latter half of Phase 1, which was implemented and improved through trials in Phase 2 and 3. The seed business model is a cluster model consisting of a core agricultural cooperative that already has a certain level of organizational management capacity and experiences in seed cultivation, processing, and agribusiness, and the surrounding seed-producing agricultural cooperatives. In other words, the seed business model refers to a business model (Figure 5) in which the core agricultural cooperatives play a central role in connecting seed producers and markets. Although the scale and methods might vary depending on the operational capacity of the core cooperatives and the surrounding environment, basically the form shown in the figure is defined as the seed business model in this Project.

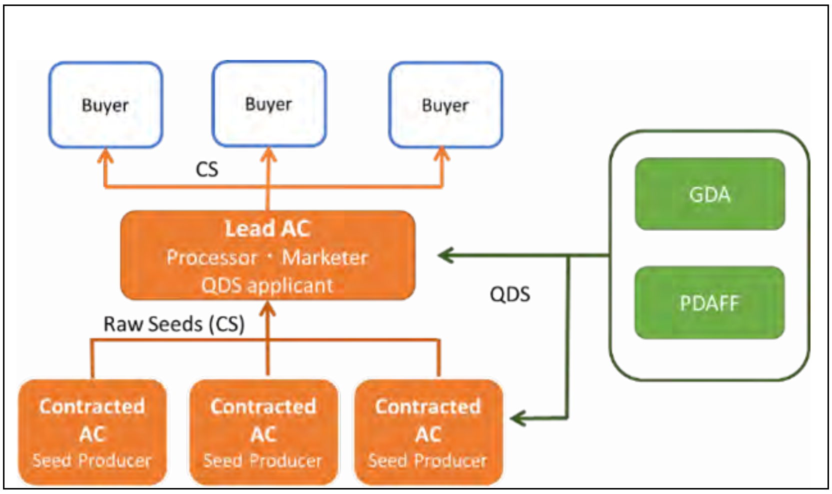


Figure 5: Draft idea of seed business model

Through the activities of Phase 2, the following issues and impediments to the formation of the seed business model were highlighted.

- The core agricultural cooperatives did not have sufficient business skills, such as financial management and fund management, to form clusters centered on the core agricultural cooperatives.
- Lack of business practices such as new customer acquisition, and marketing did not function.
- The QDS seeds were not recognized in the market and there was no market for QDS seeds.
- The core cooperatives lack the human resources to organize and manage neighboring cooperatives.

In Phase 3, in response to the above issues, the Project decided to establish and strengthen the seed business and capacity of the target ACs in each province. Accordingly, activities related to Activities 1-7, 1-8 and Outcome 3 were further strengthened (see also Activities 1-7 and 1-8).

In the second half of Phase 3, from January to February 2023, these activities were monitored and the evaluation results are summarized in Table 40. The first of the monitoring items is the scale of management including paddy rice and the management situation of each target ACs. With the exception of the target ACs in Battambang Province, the main focus of management is paddy rice production, and securing good quality seeds is an issue in producing high-quality paddy rice. Therefore, an important management goal of each AC is to produce high-quality seeds based on the QDS standards and to make these seeds available to paddy rice producers. In particular, the target ACs in Kampong Chhnang Province are aiming to reduce the selling price of the QDS seeds in the future to encourage more paddy rice producers to use the QDS standard seeds.

Next, regarding the reputation and recognition of buyers, as a result of the introduction of the QDS standard and seed production, paddy buyers have come to appreciate the quality of the seed, and trade in both seed and paddy rice has been revitalized in all target ACs. The QDS seed can now be sold at a price about 300 Riel/kg higher than before in all four provinces, and the demand for the seed from customers exceeds the current production volume. Given these factors, the QDS seed production is expected to increase in the future.

Table 40: Current QDS seed and paddy rice business in the target ACs as of January 2023

AC	Prey Veng Ba Phnom Mean Chey	Takeo O'saray	Battambang Chamroeun Phal Rieng Kasey	Kampong Chhnang CamSeed Pichangva
Annual Production	QDS 32.6ha (PRDU 20ha, OM10.3ha, SKOB 2.3ha) Non-QDS 65ha (OM5451 65ha) Paddy 115ha (SKOB 10ha, OM 105ha)	QDS 20ha (SKOB10ha, PRDU10ha) Non-QDS 5ha (Peang Chey 5ha) Paddy 110ha (PRDU110ha)	QDS 12ha (SKOB12ha) Paddy 3ha (Srongae 1ha, OM5451 1ha, SKOB 1ha) ※Due to irrigation construction, the AC reduced the QDS production area.	QDS 30.6ha (SKOB17ha, PRDU12.2ha, SPDO 0.8ha, IR66 0.6ha) Non-QDS 55ha (Phka Kravann 55ha) Paddy 200ha (SKOB, OM5451, Phka Kravann total 200ha)
Current Business	The AC is supplying 65MTof OM seed (Non-QDS) for the government project starting from 2023. The AC is negotiating the QDS sales with the AC in Svay Rieng Province.	The AC has a contract with Amur Rice to supply 400 MT of paddy. 83 farmers produce paddy in 110 ha. The AC is negotiating the QDS(PRDU) sales with an AC and rice miller in Kampot Province.	Nine seed producers produce QDS twice a year. The AC sells the products to neighboring ACs and farmers.	The AC has paddy sales contracts with Phum Young, Apsara rice, Golden rice, and KTS in toral 500 MT.
Reputation	Orders come in even before the harvest. By offering the standards, the market and the selling price of QDS seeds have been increased.	The credibility of the AC and its products with other ACs and buyers increased	The seed has a reputation for not losing quality and yield without renewal for three years and for having fewer weeds. Seed quality has been highly evaluated, and inquiries from neighboring cooperatives are increasing.	As a pot mark seed, the product becomes to be recognized in the markets. Business with rice millers and fertilizer companies has increased.
Seed Price	PRDU Buy 1450R/kg (Fresh seed) Sell 2500R/kg (Processed) The price has increased after introducing the QDS. (2200R/kg→2500R/kg)	PRDU Buy 2100R/kg (Pre-dried) Sell 2500R/kg (Processed) The price has increased after introducing the QDS. (2200R/kg→2500R/kg)	SKOB Buy 1300R/kg (Fresh seed) Sell 2500R/kg (Processed) The price has increased after introducing the QDS. (2200R/kg→2300-2500R/kg)	PRDU Buy 1300R/kg (Fresh seed) Sell 2600R/kg (Processed) →2300R/kg for the members
Market Demand	Seed prices are rising. In particular, the demand for OM seed is high since it has high yields.	Demand for PRDU/QDS is high, while demand for SKOB is weak. Reang Chey (non-QDS) is in high demand for rice flour processing.	OM's purchase price for paddy is increasing. Its price was 500-600 Riel/kg, but it is now trading at 980 Riel/kg.	Seed demand for PRDU and SKOB is high.
Future Plan	AC will expand QDS production using the transplanting machine, which the government will grant. AC will secure the budget to pay 20,000 Riel/day for field inspectors. It will be discussed at the general assembly.	AC wants to expand QDS production, but drying capacity constraints make it difficult to increase production further.	AC wants to expand QDS production from 47 tons to 100 tons annually. It is difficult for the AC to identify red rice. Yield is declining due to unfavorable weather.	AC wants to expand QDS production to improve the quality of paddy. AC aims to increase its production from 280 to 600 tons annually.

Source: Interview from the Target ACs in January 2023

2.4. Challenges in Phase 1 and Results of Improvement in Phase 2 Activities

The activities during Phase 1 (November 2017-November 2018) focused on the following two points in order to refine the activities for Phase 2 and subsequent phase.

(i) Analysis of the current status and challenges of rice and rice seed sector in Cambodia (baseline survey and survey of the current status of rice seed and rice production),

(ii) Confirmation of technical level of C/P and seed producers' seed production through pilot activities in Battambang Province (in line with a previous JICA project, "Agricultural Productivity Promotion Project in West Tonle Sap (APPP)").

In Phase 2 of the Project, a pilot activity was conducted in Prey Veng Province, one of the target provinces, to design a new seed certification and inspection system (later called QDS system) proposed by GDA in the latter half of Phase 1. The following table shows the issues identified in the first phase of the survey and pilot activities, and the results of improvements made in Phase 2.

Item	Challenges in Phase 1	Results of improvement in Phase 2
Technical skills of C/Ps	-The C/Ps of GDA are mainly young and therefore lack of experiences and technical capacities in seed production. -The C/Ps of the PDAFF have extensive experiences at field level but need to be strengthened in terms of systematic knowledge and capacities in seed production and quality inspection, as well as in their abilities to apply and instruct about these skills. -There is lack of instructors who can teach on rice varieties, weed and pest control.	-Revised the cascading method of technology transfer from GDA's C/Ps to PDAFF C/Ps. Instead, technology transfer through on-the-job training by the Project experts was implemented for both C/Ps. -As a result, PDAFF C/Ps acquired not only the known basic cultivation knowledge, but also the specific techniques for seed production and quality inspection. -GDA C/Ps, who had lacked field experiences, have acquired knowledge of rice seed production and quality inspection through many hands-on trainings in the field.
Challenges of seed producers	-Farmers are growing seeds by scattering and random planting, which is not appropriate for seed cultivation because of lack of human resources, rising labor costs, heavy workloads, and negative impacts of climate change. -Line sowing by hands is difficult to guarantee the stable production because of its high costs. Rice transplanting machines could be the alternative of the line sowing by hands, however, they are also expensive for the farmers to afford (As seen in the example of the combine harvesters, there is potential for the rice transplanting machines to expand as a private machine service.).	-Starting with the introduction of a low-cost power seeder for direct sowing and line sowing, field management, seed quality, etc. were analyzed. As a result, the Project found that the seed production for certified seed (CS) was feasible even with the use of a power seeder This made it possible for each seed producer and AC to select a power seeder or rice transplanter according to their respective business conditions.
Technologies of APPP	-While the APPP had generally adopted the technologies that had been disseminated, some of the technologies had not penetrated to the APPP beneficiaries. -As a background, the increasing cost of cultivation, such as labor shortages, high labor costs, and rising costs of work materials, made it difficult to adopt cultivation techniques that would be costly.	Same above
Other	-The fourth training session was held at alternative plots due to rodent infestation in the training plot. -Although rodent infestation is a sudden and natural phenomenon that is difficult to predict, it can be prevented to some extent by sharing the same growing season as the surrounding fields, which would disperse the infestation.	-Both the trainings and demonstration fields were cultivated in consideration of the growing season of the surrounding fields. -In the trainings and demonstration fields, feeding damage by rodents and other insects could be avoided to a large extent.

2.5. Challenges in Phase 2 and Results of Improvement in Phase 3 Activities

In Phase 2, the design of the QDS system was initiated. At the same time, the Project prepared related manuals and provided technical guidance through these manuals to improve the technical issues in seed production and other areas that were identified during Phase 1 of activities. In Phase 3, which launched in November 2019, activities were carried out while addressing each of the issues that emerged through the trial of the QDS system.

The following table shows the issues that emerged during Phase 2 activities and the results of improvements during Phase 3 activities.

Item	Challenge in Phase 2	Improvement results in Phase 3	Remaining challenges
Output 1: Capacity of GDA, PDAFF, AC/SPG and private sector is upgraded in the fields of seed production technique and its management.			
Seed production	-Many seed producers are not clear about the difference between seed production and paddy rice production, and they also perform inappropriate seeding and other practices in seed production. These factors result in unstable seed quality. -Drying, sorting, storage and other post harvesting activities were not properly conducted, resulting in poor seed quality.	-In the QDS Seed Production and Production Management Manual, the difference between seed and paddy rice production is clarified. Moreover, a series of technical guidance was provided, focusing on techniques to meet the quality standards of the QDS system. The result was a significant improvement in seed quality (Activity 1-4). -Drying yards and warehouses were provided to the target ACs that did not have appropriate drying, sorting, and storage facilities. Technical guidance on warehouse management was provided to the target ACs. Consequently, the warehouse management was improved to secure the flow line and facilitate temperature and humidity control (Activity 1-6). -As a result of the guidance on lot-by-lot inventory management, transactions can now be accurately recorded (Activity 1-6).	Seed producers need to ensure quality assurance by conducting thorough self-inspections (field and quality inspection) (Recommendation 7.3 (1) Seed Production, (2) Quality Inspection).

Item	Challenge in Phase 2	Improvement results in Phase 3	Remaining challenges
Business management and marketing	-Many of the target ACs lack basic business management skills, such as bookkeeping, and have not developed the capacity to formulate and improve their farm management plans based on their performance. -The lack of human resources among GDA C/Ps who can provide business management instruction causes concerns about sustainability of the Project after its completion. -Many of the target ACs lack experience in marketing and lack skills in how to develop new customers.	T-he target ACs were instructed on a regular basis (monthly at first, gradually reducing the number of times) on how to close books and prepare financial statements. Particularly in COVID19, digitalization in this area was also promoted, as well as the accumulation and visualization of data necessary for business management (Activity 1-7). -DACP was asked to participate in the Project from Phase 3, and while conducting business management trainings together, the DACP was asked to take on support in this area after the completion of the Project (Activity 1-7). -Marketing trainings (classroom) were provided to the target ACs, and on-the-job marketing trainings were conducted in conjunction with the demonstration activities of quality seeds (Activity 1-8).	In the future, as the scale of the operation expands, the target ACs need to update and reinvest in equipment such as seed graders (see 7.3.1. Seed Production and Seed Business Management).
Output 2: The rice seed inspection and certification system are introduced in the target provinces			
Technical trainings on rice seed quality	-Few seed farmers and C/Ps were familiar with the methods of field and quality inspections.	-By preparing a "Quality Inspection Manual" and repeatedly providing technical guidance accordingly, all C/Ps were able to conduct field inspections and quality inspections with high accuracy, and all passed the assessment test on QDS operation. (Activity 2-1)	The inspection results could have a determination error depending on the inspector. (See 7.3.2. Quality Inspection)
Trial and implementation of the QDS system	-The launch of the DCS was delayed and application procedures for the QDS system could not be implemented (Activity 2-3).	-Following the official launch of the DCS, institutional arrangements were implemented, including the creation of a process for the QDS system from application to label issuance (Activity 2-4). -In conjunction with the DCS, the Seed Production Roadmap 2028, a medium-term production plan for QDS seeds, was developed (Activities 2-4 and 2-3).	-Administrative procedures for the inspections have not been smoothly managed, and it takes a long time before QDS tags are issued. There were cases where agricultural cooperatives with limited working capital sold seeds without waiting for the QDS tags to be issued (see 7.3.3. System Operation of the QDS System). -The applicants bear the cost of application fees and other costs associated with applying for the QDS system. On the other hand, there is no significant price difference between QDS seeds and non-QDS seeds. Therefore, the incentive to apply for the QDS system is low (see 7.3.3. System Operation of the QDS System).
Output 3：Rice seed business is accelerated in the target provinces.			

Item	Challenge in Phase 2	Improvement results in Phase 3	Remaining challenges
Quality seed demonstration activities	-Many rice farmers seed more than 150 kg/ha, and this is one of the factors preventing them from using expensive quality seeds. -Market awareness of the QDS system and QDS seeds remain low.	-In the seed demonstration fields, the proper seeding rate was confirmed to be 60 kg/ha, and the results were presented to neighboring farmers (Activity 3-2). -The QDS seeds were distributed free of charge to 24 farmers, and feedback was given after cultivation. As a result, more than 80% of the farmers showed high satisfaction with the QDS seeds (Activity 3-3).	The QDS system and QDS seeds are still in the budding stage of market recognition, and continuous promotion is needed (see 7.3.4. Promotion of Rice Seed Business).
Rice seed business	-The target ACs have low business management capacity, and forming clusters will take time. -The marketing capacity for new customer development is low and needs to be strengthened in this area.	The Project period was extended for six months to reinforce activities 1-7 on capacity building in business management and 1-8 on marketing training (Activities 1-7 and 1-8).	Refer Seed production and business management/marketing

3. Achievements of Outputs

3.1. Modifications of PDM indicators

The following modifications to the PDM indicators were proposed and agreed upon at the 5th JCC meeting in May 2022.

PDM Indicator (before the modification)	PDM Indicator (after the modification)
The Project Purpose: System for producing and distributing quality rice seed is established and functions properly in the target provinces.	
The indicator: All target ACs of the Seed Business Model meet the requirements of the QDS system. (Need to set numerical target such as production area or volume of seed)	The indicator: GDA counterpart institutionalizes the QDS system to ensure quality rice seed distributed in the market by i. establishing an organizational structure (CA) and QDS workflow, ii. preparing a Road Map for the proliferation of rice seeds, and iii. building capacity to manage the QDS database
Output 1: Capacity of GDA, PDAFF, AC/SPG and private sector is upgraded in the fields of seed production technique and its management.	
1-a. A manual of rice seed production and business management is endorsed by GDA and the manual is utilized by GDA and PDAFF Counterparts who are in charge of the QDS system. (Monitor capacity building level using a check sheet)	1-a. [The contents of parenthesis are erased because it is monitored by the other indicators 2-b and 2-d]
1-b. Compared to the planned volume, at least 80% of rice seeds produced by target ACs in the Seed Business Model meet the standard of the QDS system by the end of the Project. (Tentatively set a target as 80%, but reconsider it after one cropping season of 2019/2020)	1-b. Compared to the planned volume, at least 80% of rice seeds produced by target ACs in the Seed Business Model meet the standard of the QDS system by the end of the Project except for uncontrollable losses by environmental and climate disasters.
1-c. Each Seed Business Model produces at least 200 tons/year of rice seed by the end of the Project.	1-c. Each Seed Business Model produces at least 20 ha per year of high-quality rice seed by the end of the Project except for uncontrollable losses by environmental and climate disasters.
1-d. All lead ACs in the Seed Business Model are able to provide a periodical business plan and evaluate/improve it every year by the end of the Project.	No changes.
1-e. All lead ACs in the Seed Business Model allocates personals to key business roles such as quality control, processing, and marketing and they provide a periodical activity report to other members to show each role functions well.	No changes.
Output 2: The rice seed inspection and certification system are introduced in the target provinces	
2-a. An inspection manual of the QDS system is endorsed by GDA.	No changes.
2-b. Assessment criteria for QDS system inspector a introduced and all target PDAFF Counterparts obtain above 80% of the assessment criteria.	No changes.
2-c. Each inspector of PDAFF and GDA C/P and/or private sectors conducts the field and laboratory inspection of the QDS system above 10 samples/year.	No changes.
2-d. All target ACs are able to operate whole procedures as an applicant in accordance with QDS manual (Monitor capacity building level using a check sheet)	No changes.
Output 3 : Rice seed business is accelerated in the target provinces.	
3-a. Above 70 % of the stakeholders who participate in a rice seed business forum understand the effectiveness of CS.	3-a. At least 70% of paddy farmers who use high-quality rice seeds are satisfied with the effectiveness of CS (purity, germination rate, and yield). (hearing form QDS users and demo-farmers)

PDM Indicator (before the modification)	PDM Indicator (after the modification)
3-b. All target Seed Business Model increase the sales volume of CS per year, compared to the first cropping season by the end of the Project.	No changes.

3.2. Achievements of PDM Indicators

The modified PDM indicators and their achievements are as follows.

PDM Indicators	Achievement
Output 1: Capacity of GDA, PDAFF, AC/SPG and private sector is upgraded in the fields of seed production technique and its management.	
1-a. A manual of rice seed production and business management is endorsed by GDA and the manual is utilized by GDA and PDAFF Counterparts who are in charge of the QDS system.	The rice seed production and management manual was approved by GDA and distributed to GDA and PDAFF C/Ps and target ACs.
1-b. Compared to the planned volume, at least 80% of rice seeds produced by target ACs in the Seed Business Model meet the standard of the QDS system by the end of the Project except for uncontrollable losses by environmental and climate disasters.	The rice seed production and management manual was approved by GDA and distributed to GDA and PDAFF C/Ps and target ACs. Other than unavoidable external factors, the indicator itself was not achieved due to cancellations based on management decisions, however, the ACs have acquired sufficient production technology, which does not hinder the achievement of Outcome 1.
1-c. Each Seed Business Model produces at least 20 ha per year of high-quality rice seed by the end of the Project except for uncontrollable losses by environmental and climate disasters.	Same as 1-b
1-d. All lead ACs in the Seed Business Model are able to provide a periodical business plan and evaluate/improve it every year by the end of the Project.	Trainings on planning in the rice seed business was conducted in the target ACs, and various management tools were introduced. The target ACs held annual general assemblies with Project support and reviewed their business plans.
1-e. All lead ACs in the Seed Business Model allocates personals to key business roles such as quality control, processing, and marketing and they provide a periodical activity report to other members to show each role functions well.	In the target ACs, essential staffs for rice seed production and marketing were assigned and capacity building was provided to each staff member. Regular reporting of activities at the annual reporting meeting was conducted, despite delays in activities due to the COVID19.
Output 2: The rice seed inspection and certification system are introduced in the target provinces	
2-a. An inspection manual of the QDS system is endorsed by GDA.	Development of the manuals through the QDS working group and its approval by the GDA was completed.
2-b. Assessment criteria for QDS system inspector a introduced and all target PDAFF Counterparts obtain above 80% of the assessment criteria.	Assessment tests were administered to GDA and PDAFF inspectors and a 80% or higher correct response rate was achieved.
2-c. Each inspector of PDAFF and GDA C/P and/or private sectors conducts the field and laboratory inspection of the QDS system above 10 samples/year.	Achieved a minimum of 10 samples per year tested by PDAFF inspectors in each state
2-d. All target ACs are able to operate whole procedures as an applicant in accordance with QDS manual (Monitor capacity building level using a check sheet)	Achieved at least 80% understanding of the QDS system in periodic monitoring of target ACs to measure their understanding of the QDS system.
Output 3：Rice seed business is accelerated in the target provinces.	
3-a. At least 70% of paddy farmers who use high-quality rice seeds are satisfied with the effectiveness of CS (purity, germination rate, and yield). (hearing form QDS users and demo-farmers)	Satisfaction of rice farmers who participated in the QDS seed demonstration activities achieved more than 80%.
3-b. All target Seed Business Model increase the sales volume of CS per year, compared to the first cropping season by the end of the Project.	Annual sales of the QDS seed in the target provinces in 2022 (at the end of the Project) were approximately 1.8 times higher than in the year when the seed was first sold.

Outcome 1: Improvement of capacity for seed production and production management

Achievement:

Achieved except for unavoidable external factors and voluntary discontinuation by the ACs due to management decisions. Indicators 1-b and 1-c are linked because they reflect seed production status, and both were partially not achieved. However, the reason for this is not due to insufficient capacity strengthening of the target ACs, but due to unavoidable environmental factors and rational management decisions by the target ACs as they improved their business management and marketing capabilities (see Activity 1-4 (4)).

Output 2 Seed inspections and QDS system implementation

Achievement:

All indicators 2-a through 2-d were achieved. Regarding Outcome 2, "The rice seed inspection and certification system are introduced in the target provinces," through the activities, stakeholders were generally able to operate and utilize the seed inspections and certification systems well. However, uncertainty remains as to whether the QDS system can be stably operated by the administration in terms of budget and deployment of staffs, and whether the QDS system will be actively used by seed producers in terms of market recognition and demand (for details, see 7.3 Recommendations to the Cambodian side).

Output 3 Promotion of the seed business

Achievement:

Indicators 3-a and 3-b were achieved. However, with regard to Indicator 3-b, the total sales volume of the target ACs in the four provinces increased from the beginning, but the sales volume of the target ACs in Prey Veng Province did not achieve the indicator. Although the indicator was achieved, it is still difficult to conclude that a market for the QDS seed business has been established in Cambodia (see 7.3.4. Promoting the Rice Seed Business for more details).

4. Achievements of Project Purpose

No.	Indicators	Achievement
Project Purpose: System for producing and distributing quality rice seed is established and functions properly in the target provinces		
I	GDA counterpart establishes an organizational structure (CA) and the QDS workflow	An organizational chart and the QDS workflow for the operation of the QDS system was established with the DCS under the GDA
II	GDA counterpart prepares a Road Map for the proliferation of rice seeds	Developed the "Rice Seed Roadmap 2028", which is the QDS seed production target and action plan for the 6 years after the Project completion.
III	GDA counterpart enhances his/her capacity to manage the QDS database	Provided operational supports to the newly established database and issued QDS tags.

4.1. Organization structure for the QDS system operation

There are three departments within the GDA for this project: DCS, DRC, and DACP. The DRC was mainly in charge of supporting seed production technology, while the DACP was in charge of improving the business management capacity of target ACs.

As mentioned above in Activities 2-3~2-5, after the establishment of the DCS in Phase 3, the DCS has been the administering body of the QDS system, especially in the introduction and institutionalization of the QDS system, together with the Project. After the completion of the Project, the DCS continues to be responsible for the operation of the QDS system, and the division of duties for the operation of the QDS system has been defined as follows.

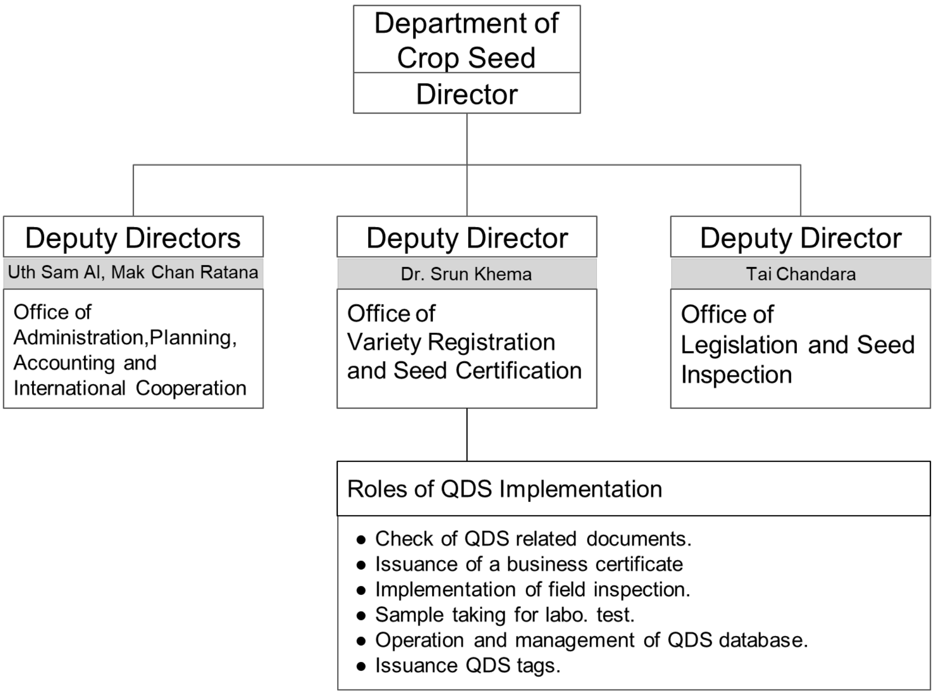


Figure 6: The organizational chart of the DCS regarding the operation of the QDS system

Although the Director of DCS coordinates the QDS system according to the organization chart, the Deputy

Director of the Variety Registration and Seed Certification Section, who is in charge of practical affairs, operates the QDS system in cooperation with the two Deputy Directors of the Administration, Planning, Accounting and International Cooperation and one Deputy Director in charge of Legislation and Seed Inspection. The Deputy Director General of the Variety Registration and Seed Certification finalizes the following tasks and circulation within the GDA, while assigning them to the respective Deputy Director Generals as necessary.

- Receipt and confirmation of various applications related to the QDS system
- Issuance of seed business certification (license for seed production)
- Conducting field inspections and determining pass or fail
- Sampling for quality inspections
- Operation and management of the QDS database
- Issuance of the QDS tags for seeds that have passed the inspections

4.2. The trial of the QDS workflow

Operational procedures, including the use of the QDS database system (described below), were established in collaboration with the DCS in order to administer the QDS system. In August 2022, after the creation of the QDS database was completed, a draft QDS workflow was discussed with DCS officials. The QDS workflow follows the QDS system and consists of the following five steps.

Figure 7: Five steps of the QDS workflow

The Project and DCS agreed to apply the proposal to the QDS seeds production in the target ACs in the four provinces during the wet season of 2022/23 and to finalize it after identifying improvements in the workflow. The Project conducted follow up and monitoring of DCS from August 2022 to March 2023 to ensure that the QDS system was being managed in accordance with the discussed workflow.

The results of the QDS workflow trial and its proposed revisions were as follows.

- The approval and internal circulation flow for various applications was similar to the approval flow for regular operations, so there was little confusion.
- The results of field inspections and quality inspections are sent from PDAFF to the Director General of GDA, and then returned to the Department of Variety Registration and Seed Certification Section. This caused some problems in the early days, such as inspection results did not being delivered to Deputy Director of the Variety Registration and Seed Certification Section, but these problems were resolved as the staffs involved became accustomed to the new system.
- The Project made a proposal to simplify the process of inputting the necessary information into the QDS database with internal approval by the GDA after the originals of the various application forms were

received by Deputy Director of the Variety Registration and Seed Certification Section. Due to internal GDA regulations, the method of storing the original documents could not be changed.

- Variety registration and seed certification section officials' abilities ranged, and the collection of various original documents was slow, and sometimes the collection could not be done or was delayed without encouragement from the Project. As a countermeasure, a checklist of input status was introduced, as described below.
- After the QDS tags were printed, the method of transporting them to the target ACs had not yet been discussed. During the trial period, the PDAFF staffs had to handle irregularities such as handing over the QDS tags when they stopped by Phnom Penh on other business, but the Project suggested using a method that would allow the QDS tags to be sent to the applicants as soon as possible, such as using cab service for shipping the QDS tags. In response to the suggestion, the DCS was willing to consider introducing the cab service after the 2023 dry season.
- The method of receiving application fees had not yet been examined. During the trial period, fees were received in cash or by mobile money transfer. There was no particular method of fee payment prescribed by the Cambodian government, not only for the QDS system. To prevent confusion among applicants, the Project suggested the creation of a phone number and platform on a chat tool to receive questions about payment and other issues at the DCS. Since it was difficult to respond immediately, the alternative was to print the contact information of the individual staffs in charge at the DCS on the back of the QDS seed production technology manual and distribute it as needed.
- The Project proposed the DCS if printing of the QDS tags could be done in-house, however, this was outsourced to avoid the risk of not having the printing environment to print on tear-resistant paper and the budget for printing costs not being available within the DCS.

The revised QDS workflow based on the above is described in the attached document, Roadmap for Rice Seed 2028.

4.3. Price list for the QDS applications

The DCS has established the following application fees for various QDS applications. The payments for 1.1~1.3 and 2.1 are the fees required when applying to the QDS system among the five steps of the QDS workflow described above. 2.2 is the fee required when applying for field inspections, and 2.3 and 2.4 are the fees for laboratory inspections and printing of the QDS tags. However, since the fees were defined in accordance with the Ministerial Decree (Prakas)[12], the amounts of the application fee for application of the QDS system and other fees listed in 1.1 through 1.3 shall not be changed at the discretion of DCS (however, it is presumed that the burden on applicants can be reduced through the implementation of subsidies, etc.). There is no charge for issuing QDS tags, though the applicant must pay the actual costs of printing and shipping the tags.

[12] Prakas No. 837 សហវ.ប្រក issued by Ministry of Economy and Finance on 19th September 2019

Table 41: Price chart related to the QDS seed production

Regulation	Fee/ Validity	Necessary days for issuance
1.1 Certification fee of seed production (production and processing)	500,000 riels Validity: 3years	30days
1.2 Certification fee of seed distribution (only for seed companies, not necessary for ACs)	100,000 riels Validity: 3years	30days
1.3 Quality test fee (For applicant of 1.2 who sells imported seeds, needs to submit the quality test result)	Moisture contents: 20,000riels /a sample Purity: 20,000riels/ a sample Germination: 80,000riels / a sample (paid to NAL) Validity: 1years (if QDS seed follow the QDS regulations)	Moisture takes 1day, purity takes 3days and germination takes 14days
2.1 Training of QDS procedure and QDS seed production (2 days) for application of 1.1 (and partially for 1.2)	400,000 riels (lamp sum) per a person -it includes 3 trainers (at least, 1 from DCS and 1 from DRC, assistance), DSA and transportation for trainers, refreshment, a certification etc -No validity set	
2.2 Field inspection fees	-DSA 60,000 riels/person for total of 3 personnel (1 from DCS and 2 from PDAFF) and -Transportation fee depending on distance (800riel/ km from PDAFF)	
2.3 Laboratory inspection fees/ Sampling fee	-DSA 60,000 riels/person for total of 3 personnel (1 from DCS and 2 from PDAFF) and -Transportation fee depending on distance -Inspection fees follow 1.3	
2.4 Printing fee for the QDS label with QR code	Actual cost (in average 500 riels/bag) including printing and transportation cost -40kg/20kg the price would be the same and the AC can decide the size of bag.	After receipt of the results from NAL, 5days or 1 week

In July 2022, the DCS conducted orientations for some target ACs, yet despite repeated efforts by the Project, the DCS did not hold the orientations for all target ACs due to the busy schedule of the DCS management, and did not respond to questions raised by the target ACs at the July 2022 orientations at a later date. Furthermore, the fee list is not published where applicants had access to it, raising concerns about transparency regarding the collection of fees. The DCS is considering publishing the list of fees, but since immediate action is not feasible, the alternative, as mentioned above, is to print and distribute the contact information of the individuals in charge at the DCS on the back of the QDS seed production technology manual, and respond to individual inquiries from applicants or those considering applying for the QDS system. In addition, since the presence or absence of QDS tags does not contribute to the sales price, the target ACs have complained especially about the payment of printing costs (for details, see 7.3.3. System Operation of the QDS System).

4.4. Road Map for the proliferation of rice seeds

The DCS, with the assistance of the Project experts, has developed the "Rice Seed Roadmap 2028," a six-year QDS seed production target and action plan for the period 2023-2028, after the completion of the project.

The "Rice Seed Roadmap 2028" aims to achieve the goal agreed at the 5th JCC meeting held in May 2022 that "more than 30% of milled rice for export will be produced from the QDS seeds by 2028," with the period from 2023 to 2024 as the start of the application period, the period from 2025 to 2026 as the surge period, and the period after 2027 as the steady increase period. The production targets for each of these periods were presented (see attached document "Rice Seed Roadmap 2028").

Table 42: Target production volume of seed by stages

Seed producers	2023-2024 Application stage	2025-2026 Surge stage	2027-2028 Steady Increase stage
	Target 1,400MT	Target 3,250MT	Target 5,100MT
4 ACs (RSPP) and 5ACs (CAVAC)	900 MT/year (100 MT/year-applicant x 9 AC)	1350MT (150 MT/year-applicant x 9 AC)	1800MT (200MT/year-applicant x 9 AC)
10 newly participating ACs	500MT/year (50MT/year-applicant x 10 AC)	1000MT (100MT/year-applicant x 10 AC)	1500MT (150MT/year-applicant x 10 AC)
9 newly participating individual producers and private seed companies	-	900MT (100MT/year-applicant x 9 applicants)	1800MT (200MT/year-applicant x 9 applicants)

4.5. Capacity enhancement of utilizing QDS database

The policy of the QDS database was to introduce a cost-saving and simple system that would allow GDA and PDAFF to operate and develop the database on their own after the Project was completed. Therefore, the Project was not considering the introduction of a database system that would be outsourced and designed by an external contractor. Accordingly, by 2021, the Project created formats using Google Spreadsheets, and after first conducting field/post-harvest processing management and the QDS system submissions management within the Project on a trial basis, explained how to use the format to GDA and PDAFF staffs, and distributed the formats to GDA and PDAFF staffs.

Year Season	Variety Class	Production Area (ha) Initial plan	Seeded area	Harvested area	Production Initial plan	Final products
20/EW	SKOB/CS					
20/WS	SKOB/CS					
20/WS	PRDU/CS					
20/DS	SKOB/CS					
2020 Total		0.00 ha	0.00 ha	0.00 ha	0 kg	0 kg
21/EW	SKOB/CS					
21/WS	SKOB/CS	10.00 ha	10.57 ha	10.48 ha		42,793 kg
21/WS	PRDU/CS	10.00 ha	10.00 ha	5.60 ha		11,212 kg
21/DS	SKOB/CS	10.00 ha	10.00 ha	7.18 ha		17,338 kg
2021 Total		30.00 ha	30.57 ha	23.26 ha	0 kg	71,343 kg
22/EW	SKOB/CS	10.32 ha	10.69 ha	10.69 ha		39,060 kg
22/WS	SKOB/CS	5.80 ha	5.80 ha	5.80 ha		16,660 kg
22/WS	PRDU/CS	10.20 ha	10.70 ha	10.70 ha		31,940 kg
22/DS	SKOB/CS					
2022 Total		26.32 ha	27.19 ha	27.19 ha	0 kg	87,660 kg

Field/ Post-harvesting format

3. Germination rate (Min, %): Tested value (3 days)	Tested value (7 days)	Result of Germination rate (7days)Pass / Fail	4. Moisture content (Max, %) Tested value	Result Pass / Fail	5. Remarks
97.5	98.5	Pass	12.8	Pass	Pass
	95.0	Pass	12.4	Pass	Pass
87.0	94.0	Pass	13.3	Pass	Pass
89.0	93.6	Pass	12.8	Pass	Pass
88.4	91.3	Pass	14.0	Pass	Pass
83.0	91.0	Pass	13.8	Pass	Pass
87.6	91.0	Pass	13.0	Pass	Pass
92.0	94.0	Pass	11.9	Pass	Pass
87.0	92.0	Pass	13.1	Pass	Pass
89.0	95.0	Pass	12.5	Pass	Pass
84.0	93.0	Pass	12.5	Pass	Pass
85.0	92.0	Pass	12.3	Pass	Pass
80.0	93.0	Pass	13.2	Pass	Pass
83.0	95.0	Pass	12.9	Pass	Pass
85.0	97.0	Pass	13.2	Pass	Pass
83.0	92.0	Pass	12.3	Pass	Pass
89.0	92.3	Pass	14.0	Pass	Pass

QDS system application management format

On the other hand, in July 2022, the DCS and CAVAC (AusAID) contracted a system development company to build a database system for the management of the QDS system, and the DCS as a whole has decided to utilize the same system. For that reason, the Project also amended its policy to support the DCS, including the use of the newly established database system by CAVAC.

The new database system is designed to input the QDS application form, Declaration A, Declaration B, field inspection results, and quality inspection results, and once all data are entered, the QDS tags with QR codes are output. When the QR code is read, the name of the variety, producer information, and lot number can be confirmed.

Printed QDS tags

The result of reading QR code on the QDS tag

Regarding the above, as described in 4.2 The trial of the QDS workflow, an overall workflow based on the QDS database utilization flow was created in August 2022 in cooperation with the DCS.

Although the Project could not directly confirm the input status of the system due to Cambodian government regulations, a hearing on the data input status was conducted in December 2022. Since there were many areas that had not been inputted, the Project prepared a checklist and encouraged the DCS to ensure the data input. In response, the QDS tags were issued from February to March 2023 with no problems.

Name of AC:

Name of Crop	ពាក្យស្នើសុំលិខិតអនុញ្ញាតតាម,ប គព		ទម្រង់ (ក)		ត្រួតពិនិត្យទីវាលលើកទី១		ត្រួតពិនិត្យទីវាលលើកទី២		ទម្រង់ (ខ)		ការត្រួតពិនិត្យគុណភាពនៅមន្ទីរពិសោធន៍	
	QDS Application		DeclarationA		1st Field inspection		2nd Field inspection		Declaration B		Laboratory Inspection	
	Filing	Data entry	Filing	Data entry	Filing	Data entry	Filing	Data entry	Filing	Data entry	Filing	Data entry

*Name of Crop: Variety-Season (Planted month year)

Figure 8: Checklist for the data entry to the QDS database

5. Results of Joint Review

Results of Review based on DAC Evaluation Criteria

At the Project completion, a terminal evaluation has been carried out using the DAC Six (6) Evaluation Criteria, namely: Relevance, Coherence, Effectiveness, Impact, Efficiency, and Sustainability. Joint Bi-annual monitoring by Japanese experts and Counterparts (C/P) have been conducted since the Project started in 2017, to ensure implementation schedule and activity targets are on track. The terminal evaluation is conducted by JICA, together with the Japanese experts measuring the Project's achievement in compliance with the DAC criteria. The summary of the results are as follows:

(1) Relevance: Rating 3[13]

The relevance of the Project is moderately high. The Project is well-aligned with the Development Policy of the Kingdom of Cambodia (hereinafter, Cambodia). Rice is one of Cambodia's priority staple crops, with medium to long-term plan to strategically expand its rice export through improvement of quality and yield. While the Project covered activities that address the upgrading of rice seed quality, it did not cover issues on upstream seed such as the unstable quality of Registered Seeds (RS).

(a) Relevance to the Country's policy and development needs

- Cambodia prioritizes the optimization of target crops' value chain by enhancing seed development, production technologies, post-harvest handling, and marketing (strategy 1-3), based on the country's Agricultural Sector Master Plan 2030. The Master Plan emphasizes the significance of boosting export of agricultural crops, which includes rice, maize, cassava, and others (strategy 2-3).
- Rice is a strategically important crop to Cambodia, as such it remains as a top priority staple crop. The Project's scope has included the upgrading of the quality of rice through improving the standardization of seed quality, that has considerably contributed to the enhancement of the country's rice value chain.
- The Project supported the drafting of the Rice Seed Roadmap 2028, that puts focus on increasing the amount of high-quality rice seeds. By 2028, the Roadmap aims to produce 30% of exported rice using high-quality seed, i.e., QDS seeds, which is compatible with the Quality Declared Seed system, a newly developed national seed inspection and certification system. The goal is aligned with the country strategy of improving and boosting rice seeds for its value chain optimization and expanding rice export.
- According to the interview result from GDA, the Project contributed to the practical and effective application of existing seed laws in Cambodia which enacted in 2008. Before the Project, the rice seed production system was not institutionalized under MAFF, but through the Project, the endorsement of the QDS system has provided a foundation for MAFF and GDA to promote rice seed production.

(b) Relevance of the Project design

- The Project covered activities of the following:
  - ➢ The improvement of the seed production and the business management,
  - ➢ The establishment of the seed inspection and the certification system, and

[13] 4: High, 3: Moderately high, 2: Moderately low, 1 Low

- ➢ The promotion of the seed business, addressing the demand of the country to improve the rice quality and the exports as stipulated in its Agricultural Sector Master Plan 2030 and Rice Seed Roadmap 2028.

- During the Project implementation, it was noted that the quality of upstream seeds (RS and Foundation Seeds-FS) produced by the authorized agencies, however, were not always assured as initially premised. To resolve this issue, the Project selected upstream seeds that went through additional quality tests. The unreliability of the quality of upstream seeds affects the quality of downstream seeds (Certified Seeds-CS). The activities to enhance the quality of upstream seeds is still necessary to address Cambodia's country strategy on rice quality comprehensively.
- In terms of the selection of target provinces and ACs, the selection criteria were mostly relevant and appropriate. All respondents from GDA and PDAFFs agreed that the successful QDS seed production was attributed to the selection of motivated ACs who had experiences of producing rice and fulfilling the minimum standards of facilities (i.e., an irrigation system and a warehouse). They also acknowledged that some of the ACs showed their weak structure and the scarcity of human resources and therefore, they could not fully produce the QDS seeds which was beyond their potential capacity.
- As per the evaluation of the QDS system, all respondents from GDA, PDAFFs and ACs assured that the QDS system was the appropriate and effective system to improve the quality of certified rice seeds. At the practice level, mainly PDAFFs and ACs had difficulties to comply with the QDS standards. The difficulties are mainly comprehension of the QDS procedures themselves, such as preparation, submission and circulation of necessary documents, and capacity development of the seed growers to follow the QDS standards like a sowing method.

(2) Coherence: Rating 4

The coherence of the Project is high. The Project aligns with and directly contributes to the targets of Japan's Country Assistance Policy to Cambodia and the Sustainable Development Goals (SDGs).

(a) Coherence with Japan's Country Assistance Policy

- Japan's Country Assistance Policy to Cambodia (updated, 2021) aims to support strengthening the economic and the social infrastructure of Cambodia. The bilateral cooperation strategy is designed to elevate Cambodia to the upper-middle-income countries category by 2030.
- Aligning with the policy, the Project was formulated to promote Cambodia's priority sector, agriculture, through the enhancement of its rice seed production and distribution system.

(b) Coherence with the SDGs

- The Project contributes to the Goal 2 of the SDGs, for the part of "enhancement agricultural productive capacity in developing countries." The Project supported introduction of simple and cost-effective quality seed certification system, and also enhanced the extension capacity of Government staffs on quality rice seed production and certification through the various related activities. By using the QDS rice seeds, the Project has proved that paddy farmers can produce paddy with lower seeding rate and it guarantees the better productivity of rice in Cambodia.
- The Project's overall goal targets Goal 8 of the SDGs, "promote sustained, inclusive and sustainable economic

growth, full and productive employment and decent work for all". Agriculture is an important sector of the Cambodian economy, occupying 24.4% of the gross domestic product (GDP) and 31% of the working population. The Project targets rice production which accounts for 75% of the total cultivated land. The improvement in rice production directly contributes to the growth of the national economy and poverty reduction.

- The Project closely collaborated with other development partners including International Rice Research Institute (IRRI), Asia Development Bank (ADB), and the Australian Aid (AusAid) to establish the QDS system, nation-first seed inspection and certification system.
- Addressing Goal 17 of the SDGs, "strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development," the multi-development partner collaboration was able to lead the system to be institutionalized by the end of the Project.

(3) Effectiveness: Rating 4

The effectiveness of the Project is high. The achievement of the Project Purpose and the collaboration with other development partners effectively lead to formulate an official endorsement of the QDS manuals.

(a) The achievement of the Project purpose

- The Project Purpose states that, "the system for producing and distributing quality rice seed is established and functions properly in the target provinces." The Purpose was successfully achieved during the Project period. The GDA C/P has institutionalized and operated the QDS system.
- The key indicators of the Project Purpose are the following:
    i. Successfully established an organizational structure and QDS workflow,
    ii. Completed a Road Map for the proliferation of quality rice seeds, and
    iii. Completed building capacity to manage the QDS database.
- Despite the delay in the establishment of the Department of Crop Seed (DCS) and the suspension of the field visits of Japanese experts caused by the outbreak of COVID-19, the Project and DCS strategically worked to establish the organizational structure and the QDS workflow, draft a Road Map, and test run the QDS database, during the latter period of the Project.
- Outputs of the Project were strategically designed to achieve the Project Purpose.

(b) Others

- The close collaboration with development partners encouraged GDA to officially approve the QDS manuals, which are now endorsed by the Cambodian government and referred to and used by development partners in their on-going assistance on rice quality improvement in Cambodia.
- From the aspect from PDAFFs, the inputs (manuals, field and laboratory trainings, refresher trainings etc.) from the Japanese expert team and GDA were well designed and contributed PDAFFs to instruct ACs to produce high quality rice seeds.
- From the aspect from ACs, the assistances and supports from PDAFFs, GDA and the Japanese expert team were well functioned to learning the QDS standards, the seed production techniques and marketing/ the seed business.

- Based on the observation from PDAFFs and ACs, there was smooth collaboration among GDA, PDAFFs and the Japanese expert team.

(4) Efficiency: Rating 3

The efficiency of the Project is moderately high. The Project has successfully produced three QDS manuals that guide the implementors and applicants of the QDS system even after the Project completion. In advocating for efficiency in acquiring new QDS application, however, the use of digital tools and the simplified application procedure could be advantageous. Creative and strategic approaches and quick pivoting of activities (application of the remote trainings, distribution of tablets, publishing the QDS promotion video instead of the seed business forum etc.) to overcome the health and travel restrictions brought by the COVID-19 pandemic resulted in the efficient and smooth implementation of the Project.

(a) Outcomes (QDS Manuals)

- The Project provided necessary manuals and tools for target stakeholders to implement the seed production and seed inspection compatible with the QDS system.
- While Manuals are important tools to understand and manage the system, new QDS applicants could be guided to join and use the QDS system through a simpler document or tool, such as brochures or pamphlets, that can initially provide pertinent information, for example: summarized procedures, contact information, where to get/submit an application form.

(b) Activities to Outputs

- Based on the feedback from GDA in the interview of terminal evaluation, the contents and frequency of the trainings from the Japanese expert team was useful, practical and appropriate for the GDA staff to implement the QDS system. However, as for the trainings for PDAFFs and ACs, both GDA and PDAFF C/Ps found some difficulties for them to adapt what they have learnt, and thus more frequent trainings might have improved the situation.
- Motorbikes, computers and other seed inspection materials were procured for PDAFFs and warehouses, drying yards, seed graders and tablets were procured for ACs. PDAFFs evaluated the procured equipment to be useful and appropriate for operating the Project activities of the field and laboratory inspections, except for the quality of the computers which did not perform well. This was pointed out by the PDAFF that the low performance was because of the low specifications like memory capacity and CPU performance. ACs evaluated the procured machineries supported their seed production business and raised its efficiency.
- The COVID-19 pandemic brought about the two-year suspension of field trips of Japanese experts. The digital tools were introduced and the methodologies were re-strategized to overcome the health and travel restrictions to keep the key activities operating.
- Moreover, the direct-marketing approaches as alternative to business forums and other large in-person gatherings to establish market linkage. One of the examples of the direct marketing was conducting a field day in the paddy farms that participated to the QDS seed trial (distribution of the QDS seeds to the potential customers) with the target ACs. On the field day, the target ACs promoted the benefits of using the QDS seeds and proceeded the sales under the cooperation by the Project.

(5) Impact: Rating 3

The impact of the Project is moderately high. MAFF significantly contributed to the accomplishment of the Project's overall goal. However, to sustain the successful impact, it would rely heavily on the seed producers' capacity in financial management and well-operation of the QDS system by MAFF, GDA and PDAFFs.

(a) Overall goal

- The Project's overall goal is that "more quality rice seed is produced, and more farmers use it for production nationwide." The MAFF has been taking significant steps to fulfill the Project's overall goal in line with the Rice Seed Roadmap 2028.
- MAFF has already allocated the budget for the expansion of the QDS rice seed production to support the Rice Seed Roadmap 2028. The new government project contains the activities of procurement of the foundation seeds (FS), production and distribution of the registered seeds (RS), mobilization of the governmental staffs to implement the QDS system, the governmental procurement (purchasing the CS from seed producers) of the produced QDS seed (CS) and holding the QDS seeds business forum to promote the seeds. According to the interviews to the DRC and DCS, the period of the upcoming government project is two years for the trial expansion of the QDS seed production and the total budget is 2 million USD.
- The Project resulted future expansion of the QDS seed production. Under the upcoming government project, the GDA is planning to increase the number of the target provinces to 13 including 4 target provinces of the Project.
- The target ACs of the Project are also sure for the expansion of the QDS seed production by acknowledging that neighboring non-target ACs are interested in producing the rice seeds (the target ACs are now outsourcing the seed production to the neighboring non-target ACs and purchase the raw seeds from them by taking advantage of their experiences and facilities. In other words, the target ACs, as Lead ACs, concentrate more on seed processing and marketing by outsourcing the seed cultivation).

(b) Other effects

- ACs were able to increase farmgate price of paddy using the QDS seeds. According to ACs, the value-addition brought by their participation in the QDS system resulted in increased volume sales of paddy produced by the QDS seeds and established market credibility for their seed quality.
- Business expansion entails managing the result of increase in cash-flow. Some ACs had difficulty in their cash-flow management, which constrained the financial flow and business growth.

(6) Sustainability: Rating 3

The sustainability of the Project is moderately high. The Project has successfully institutionalized the QDS system, with the first-hand training experience of C/Ps in the front line, the official endorsement of the manuals, and the C/P's initiative to allocate budgets to strengthen the QDS system implementation after Project completion. The digitalization of the QDS operation and application procedures would be the key to manage the increasing numbers of the QDS applicants in the future.

- As mentioned above Impact, MAFF has allocated budgets ensuring the continuation of the Project activities to strengthen the QDS system implementation. The management skills and operational capacity of GDA is a crucial factor in the smooth and sustainable operation of the QDS system.
- According to the interview of PDAFF C/Ps, the government decided to assign two personnel in each province at the PDAFF level to expand the QDS seed production during the upcoming government project. So far, one PDAFF C/P of the Project was appointed for that position in KC and TK but none for BB. The appointed PDAFF C/P of KC would support and collaborate with the personnel of PDAFF in BB who would be newly appointed. As per the PDAFF in PV, no technical C/P has been officially assigned yet but one of the Project C/P may be appointed for the position in near future.
- By the Project completion, DCS was able to manage the whole administrative operation workflow of the QDS system. The workflow requires the paper-based circulation in GDA which takes certain amount of time. From the standpoint of applicants of the QDS system, the longer time it takes to complete the process, the higher risk of losing customers. The optimization of the procedure, particularly through digitalization, would significantly shorten the process time between sampling of the final product and issuance of the QDS tags. Meeting this valid concern of applicants will encourage more applicants and safeguard the sustainability of the QDS system.

6. Challenges, Measures and Lessons of Project Implementation

6.1. Institutionalization of the QDS System with GDA

The QDS system, which set the standard for high-quality seed production in the Project, was not only used in the Project activities, but was also endorsed by the GDA as an official system, and is now used by other donors. There are two factors that led to the widespread use and formal introduction of the QDS system.

One is that, in formulating the system, specific procedures and standards were established as manuals based on a trial of the system, rather than a vague memorandum exchanged with the GDA and MAFF. As a result, the Project and GDA were able to formulate a standard that is generally free of omissions and misinterpretations, and that is easy for anyone to implement on their first visit to the system. The QDS Seed Production and Business Manual and the QDS Seed Quality Inspection Manual, which are also attached to this report, detail the operational procedures of the QDS system, and now that they have been officially approved by the GDA, they are official documents that can be relied upon when producing government-approved, high-quality seeds.

Second, the background that led to the above manuals being operated on a daily basis in the field, rather than just for appearance, is the existence of a technical working group involving GDA C/Ps and other donors. The technical working group was formed in 2019 with the DRC, DCS, other donors such as CAVAC and IRRI, Japanese experts in this Project, and the national staffs as principal members, and met once every 1 to 2 months. In this technical working group, GDA discussed from the viewpoint of system operation in the context with the Cambodian background, the Project's Japanese experts and other donors discussed the technical aspects of the system, and the Project's national staffs discussed the operation in the field based on their own experiences in seed production and the feasibility of the system. Discussions were held from the viewpoint of feasibility. Through these discussions, the working group was able to develop a manual that was user-friendly and met the necessary technical requirements, even for actors at different levels, such as GDA, PDAFF, and seed producers.

From the beginning, the technical working group has been working on the premise of incorporating the system into MAFF as an official system, and has always made the director-general-level GDA officials aware of this. In other words, the fact that they were able to make the members aware that they had created the system themselves is considered to have worked to their advantage in introducing the system.

Therefore, rather than approaching MAFF and GDA after creating the guidelines and manuals, the Project team continued to share the goal of establishing the system with the executive level of the C/P agencies from the beginning of the project, which was beneficial. In addition, rather than holding official ceremonies such as the JCC or activity debriefing meetings, small groups such as working groups were established where not only the Japanese and Cambodian sides, but also project stakeholders from multiple aid agencies could exchange opinions on specific issues such as the QDS system. This made it possible to raise awareness of the introduction of the system among all participants.

Furthermore, although it was initially envisioned that the system would be incorporated in a ministerial ordinance, it was decided to make it a GDA regulation instead of a ministerial ordinance because of the time required, thereby making it possible to introduce the system within the Project period.

6.2. Initiatives to Raise Awareness of the QDS Seeds

The Project has held networking events on seed business and promoted the QDS seed to exporters and rice farmers before COVID19 (February 2019-February 2020), the Phase 2 and early Phase 3 of the Project. At that time, however, the QDS system was being piloted and very little QDS seed was being produced, so the event was limited to explaining and promoting the QDS system. The event participants were interested in purchasing high quality seed, and the event failed to meet the demand of the participants.

Subsequently, the COVID19 made it difficult to organize large events related to raising awareness of QDS seeds.

As an alternative, a promotional video of the QDS seeds was created and operated not only as a publicity tool for the Project, but also as a promotional tool for the target ACs to use when marketing the QDS seeds.

In parallel with the above, the QDS seeds were distributed free of charge to 24 rice farmers of medium size and above as demonstration activities to boost market awareness and to promote the QDS seeds. In this trial distribution activities, promotional events were organized during the harvest season at rice farmers' demonstration plots, and the target ACs in Prey Veng and Takeo provinces, which are easily accessible to the rice farmers, conducted sales activities for their QDS seeds at the same time. Those trial activities were successful, and the target ACs were able to negotiate sales contracts with the cooperatives and rice farmers who participated in the events. The Project also supported the target ACs in their sales activities and sales contracts, specifically in the creation of a template for the contracts. This direct marketing approach also helped raise awareness of QDS seeds.

The background of the study of the above mentioned initiatives is as follows. Seed users include both large and small rice producers, and between them there are both large and small distributors and retailers. In this situation, the Project considered how to efficiently raise awareness of QDS seed among the beneficiaries of high quality seed, and assumed that large rice producers are connected to large seed distributors, rice buyers, and rice millers who are responsible for milling the so-called export rice. Since such rice producers exist throughout Cambodia and seed distribution is conducted on a nationwide scale, the Project conducted a trial distribution of QDS seed to large- and medium-scale rice producers in the target provinces as the first step.

In the second phase, with the cooperation of CRF, the Project identified rice millers who milled rice for export, rice buyers from the millers, and rice producers from the rice buyers, and conducted trial distribution to the rice producers. During this process, we explained the QDS system, the quality of the QDS seed, and the fact that the trial distribution was free of charge to all parties involved, which generated interest in the QDS system and seed.

With this approach from both the downstream and upstream sides of the supply chain, the Project sought to raise awareness. Although the level of recognition is still insufficient, the Project believes that this was a foundation for raising the awareness of QDS seed.

Although MAFF and GDA C/Ps, have been conducting activities such as sharing the QDS seed via SNS, it is difficult to conduct activities such as direct visits to the concerned parties individually due to Cambodian customs. Furthermore, it was important to reach out to a wide range of stakeholders in the supply chain during the project period, as it is expected that once awareness of the project is raised to some extent, it will naturally spread among the relevant parties.

6.3. Efficiency in Project Management via Simplified Digitalization

Due to restrictions brought about by the COVID-19 pandemic, Japanese experts' travel to project sites were suspended. To continue project activities, digital tools were employed to facilitate a smooth implementation without much schedule disruption amidst health and travel restrictions. Specifically, project implementation shifted to a hybrid of online and in-person modalities:

- Use of simple and cost-free digital tools in the conduct of activities
- Weekly meetings online with weekly reports shared through a secure online app (Google Docs)
- Rice seed cultivation management and business management shifted from paper-based to digital-based
- Virtual JCC meeting

The Project made the User's Interface and User's Experience (UI/UX) as simple as possible to ensure quick digital migration. The user-friendly interface allows CPs to easily view and input data on their smartphones and tablets. In addition, Project meetings pivoted online following an agreed reporting flow, which contributed to a more efficient use of time and resources. The online reporting scheme followed these key pointers: 1) advance submission of reports prior to online meetings, 2) discussion of key issues only, and 3) address pending matters not clarified in the reports submitted.

The success of digitalization depended largely on the level of communication among project stakeholders and the internet environment. Fortunately, the communication among project and CPs is relatively advanced, good working relationship was established since project started three years. As such, although there were some initial challenges in the digital shift of activities and reporting mechanisms, both sides quickly became accustomed to virtual communications and online activities given the simple digital tools and an established working relationship.

One interesting offshoot from a hybrid of online and in-person activities allows for a more flexible work-life balance with conventional gender roles shifting to contemporary practicalities such as increased participation of women in project activities and involvement of men in childcare. The virtual workspace may have a positive impact on work-life balance and addressing gender constraints.

SKOB-RS, PRDU-RS 2022 WS(ARS)

Activity	Expected date	Actual date	Status/Result an
QDS Business Certificate			Submitted · Approved · Certificate
Declaration A	06 Sep 22	06 Sep 22	Submitted · Approved ·
Field inspection (1) (SKOB-RS)		01 Nov 22	Passed · Submitted · : G001F05 ·
Field inspection (2) (SKOB-RS)	07 Dec 22	7 Dec 22	Passed · Submitted · : G001F05 ·
Field inspection (1) (PRDU-RS)	To be done in the week 4 of October	12 Oct 22	Passed · Submitted · : G001F02 ·
Field inspection (2) (PRDU-RS)		16 Nov 22	Passed · Submitted · : G001F02 ·
Declaration B	14th Feb 23 (SKOB-RS) 1st week Mar 23 (PRDU-RS)	14th Feb 23 (SKOB-RS) (PRDU-RS)	Submitted · : SKOB01-RS G0011222 Thim-san will arrange the PDAFF to pic PRDU-RS. RSPP accepts 2 PDAFF to do 17th March: PRDU-RS is not processed

Weekly meeting using Google Document

Weekly meeting with GDA C/Ps at the Project office (Japanese experts join remotely)

6.4. Issues on C/P travel expenses Addressed through a Series of Negotiations

An issue that frequently arose in project administration and management throughout the Project was the discussion about C/P's travel expenses. In Phase 1 C/Ps voiced disappointment in the allowable cost of travel expenses (accommodation, transportation, and daily allowance) offered by the Project as too low compared to other development partners. As such, C/Ps had little incentive to participate in the Project. Subsequently, a series of discussions were held with GDA and the JICA office. While a consensus was reached on the unit cost of travel, C/Ps continued negotiations on increasing the number of business trips and overnight stays without justifiable reason for the extra travels.

The Project notes that the C/P's issue with travel costs is essentially a structural problem, which occurs when salaries of civil servants are significantly low compared to local labor market standards. In such cases, projects by development agencies, including JICA, become opportunities for supplemental income. As a stop-gap measure, the Project proposed a method of sharing general operational expenses in the Project budget with GDA, so that activities could be organized in terms of priority and carried out within a limited monthly budget. This method greatly reduced the number of business trips, allowing only the necessary travels and reduced the number of discussions regarding travel expenses that used to occupy weekly meetings.

The Project has spent a considerable amount of time discussing and negotiating travel expenses alone, which distracted focus on the project goals and seriously derailed the implementation schedule. It is therefore beneficial for both the C/Ps and the Project that discussions on budget items, specifically on travel expenses, be agreed at the onset by both governments, prior to the start of the Project. An explicitly defined counterpart arrangements will ease the burden for both C/Ps and Project implementors of having to negotiate sensitive issues like travel allowances. For example, if the time involved in project activities is in addition to regular work, overtime wages will be paid; if it is within the normal work schedule, the C/P is officially mandated to adjust his/her normal work schedule to include the project activities, along with other cost-sharing arrangements must be clearly specified before the agreement is signed (Records of Discussion). This will address the structural challenge of compensation at par with local market standards as well as facilitate good working relationship and smooth implementation without the unnecessary distractions of worrying about money or working hours during the implementation period.

If such an arrangement is difficult to determine during the government-to-government discussions, it is crucial that the Project Design deprioritize capacity building of government officers, to relieve C/Ps and project implementors from negotiating travel expenses during the implementation phase.

6.5. Lesson Learnt from the Selection of Model ACs

The Project selected the target ACs from four provinces (Prey Veng, Takeo, Battambang, and Kampong Chhnang) for technology transfer for the QDS seed production, and although there are differences among the target ACs in the four provinces, they have actively participated and contributed to the Project activities, increased the production of QDS seeds, will continue to do so in the future and active in expanding their seed business.

The selection criteria established during the baseline survey conducted in the first phase of the Project were used as the background for the selection of such effective model ACs. The Project first obtained a list of agricultural cooperatives in each province from the DACP. The list included the number of members of the cooperative, the number of seed producers, the availability of irrigation facilities, the area of fields available for seed production, and the availability of post-harvest processing facilities. From this list, field interviews were conducted to narrow down the list of candidate ACs based on the Minimum Requirement, Highly Considered Requirement, Other Considered Requirement that should be taken into account. From among the candidate agricultural cooperatives, the model ACs were determined, reflecting the opinions of PDAFF, which has knowledge of the field as well as GDA.

Table 43: Criteria for selecting the target ACs

Minimum Requirement	Highly Considered Requirement	Other Considered Requirement
• Existence of irrigation • Existence of land for seed production • Willingness to expand seed production and business	• Land for a drying yard • Warehouse capacity • Organizational capacity (internal management)	• Accessibility to main road and business centers • Number of experienced seed producers

Ultimately, the process related to the determination of the target ACs is described in Activity 1-4/1-5, but the Project established selection criteria, narrowed down the list of candidate ACs, and involved GDA and PDAFF in the final decision, which enabled the selection of the ideal model ACs. Other PDAFF C/Ps commented during the final evaluation interviews conducted in April 2023 that the selection of highly motivated ACs with the necessary facilities for seed production, such as irrigation facilities, contributed to the success of the Project. It was also important to note that the selection criteria established by the Project were consistent with the opinions of the PDAFF.

7. Recommendation to Achieve Overall Goal

Overall Goal: More quality rice seed is produced, and more farmers use it for production nationwide.

7.1. Prospects to Achieve the Overall Goal

The Project supported the formulation of the "Rice Seed Roadmap 2028," which is deemed to be completed once the project ends. The roadmap signifies that rice seed production under the QDS system will expand both inside and outside of the project target provinces. Currently, awareness of the QDS system in the target provinces and signs of expanded QDS seed production are on a steady increase as new farmers are enrolling in the system to produce quality rice seed. To accelerate this trend, there is a need to increase awareness of QDS seeds and the price premium that comes with it. This will require ramping up of advocacy in awareness-raising activities led by the government, the CRF and other industry associations.

In addition to the above, at the 6th JCC held in March 2023, the Director of the DRC made a presentation on a government project scheduled to start in 2023. The government project has been decided to be introduced by the MAFF Minister to promote the QDS seed production and is expected to contribute to the achievement of the Overall Goal. A summary of what is known is as follows.

Table 44: Outline of the government project scheduled to start in 2023

1. Target provinces	・13 provinces (include four target provinces of RSPP)
2. Production of Foundation Seed (FS)	・Budget 440 million riels (appx. 110 thousand US$) ・CARDI produces the FS
3. Production and distribution of Registered Seed (RS)	・Budget 8,640 million riels (appx. 2.1 million US$) ・DRC takes care of this activity ・ARS produces RS and distributes to seed producers
4. Deployment of staffs to the field for the operation of QDS system	・Budget 949 million riels (appx. 230 thousand US$) ・200 students from Royal University of Agriculture (RUA) would be deployed to the field inspections
5. Technical trainings of the QDS system	・Budget 1,350 million riels (appx. 330 thousand US$) ・Target trainees are PDAFF and students from RUA
6. Government procurement of the QDS seed (CS)	・Budget 555 million riels (appx. 130 US$) ・Government procurement from seed producers via PDAFF ・The target varieties are SKOB-CS, OM5451-CS, and PRDU-CS
7. Opening events and forums for raising the awareness of the QDS seed	・Budget 188 million riels (appx. 50 thousand US$)

7.2. Plan of Operation and Implementation Structure of the Cambodian Side to Achieve

(1) Activity plan

DCS under GDA is taking the lead in drafting the "Rice Seed Roadmap 2028," for 2023-2028. The MAFF plans to distribute one-time special budget of 500 million Riel to the DCS for the expansion of rice seed production to support the roadmap. The budget is to hold briefings and trainings on the QDS system in June-July 2023 in provinces, including individual farmers and agricultural cooperatives interested in PDAFF and QDS seed production. An official letter has already been issued to PDAFF to invite participants.

(2) Implementation system

Although the QDS system is operated and managed by the DCS, PDAFFs are in the front-line as coordinators for applications, notifications, inspection reports, and other related documents. The DCS plans to gradually establish a specialized unit within the PDAFF to receive seed-related documents, assign inspectors, and assign enforcement officers to prevent counterfeiting.

7.3. Recommendations for Cambodian Side

7.3.1. Seed production and seed business management

(1) Support for seed production technology

In order to expand the QDS seed production to other provinces in the future, PDAFF staffs other than the C/Ps of this Project need to be able to conduct trainings for seed growers. As a technical support structure for this purpose, it is recommended that a master trainer be trained and assigned within GDA who can conduct trainings for PDAFF staffs with emphasis on the QDS system.

The QDS seed production technology can be broadly classified into two categories: technology related to seed production itself, such as field management, and technologies related to understanding the QDS system and seed business. GDA and PDAFF staffs with previous project experiences with development partners such as JICA, other donors, and NGOs already have the necessary knowledge to train the trainers on seed production technology.

On the other hand, the requirements of the QDS system, such as minimum planting area, assignment of field numbers, restrictions on conversion from other varieties, and seeding methods by seed class, are new knowledge for PDAFF staffs. After accurately informing seed producers of these requirements of the QDS system, PDAFF staffs must also be responsible for preventing unnecessary production cancellations and rejections, controlling quality through voluntary inspections, and providing trainings on customer service, such as returning or exchanging inferior quality seeds when sold.

As a future technical support system, the Project proposes the establishment of a master trainer within the GDA to train trainers (PDAFF staffs) on the requirements of the QDS system and the seed business in particular. The experiences in this Project have shown that the requirements of the QDS system are not easy for PDAFF staffs to understand and operate, and that they cannot be fully mastered in a single training session. Therefore, it is recommended that the master trainers assigned within the GDA provide refresher trainings to PDAFF technical officers on a regular basis. In particular, since there are several DRC and PDAFF C/Ps who have acquired knowledge and skills related to the QDS system through the Project activities, it would be appropriate to give priority to assign them as master trainers.

(2) Proposal of the business management supports for the ACs

The Project proposed a lead agricultural cooperative model in which agricultural cooperatives with relatively high organizational management capacity are selected to oversee rice seed production management, adjustment, processing, and sales. However, insufficient human capital and lack of business management skills at par with a medium-sized agricultural company remain a challenge. The Project has struggled in the areas of production management, field quality management, and accounting management by the ending time of the Project.

For agricultural cooperatives to actively participate and play an important role as seed production entities, they need to continue to undergo training where their capacity for business management (production management, customer management, accounting, inventory management, etc.) is still scarce. This will require cooperation among DCS, DRC, and DACP of the GDA and units within the PDAFF, as demonstrated during the Project.

In the near future, when agricultural cooperatives expand seed production, they will need to significantly improve their management capacity. In such a case, rather than producing everything in-house in terms of field management and accounting management, the use of digitalization (appointment of IT personnel) and appointment external experts should be considered as options. If the objective is to produce rice seeds (CS) for members of agricultural cooperatives, it is not necessary to apply for the QDS system, but rather to visualize quality assurance through self-inspections (such as using labels unique to the agricultural cooperatives). Therefore, it is preferable to choose the method according to the management policy of each cooperative, even for seeds produced within the cooperative.

7.3.2. Quality inspection

(1) Conduct quality inspections at the provincial level

According to the QDS System standards, only CARDI and GDA authorized institutions could conduct quality inspections, and as of the end of the Project, the only inspection institution officially authorized by GDA was the National Agricultural Laboratory (NAL). However, since the Project has been improving the quality inspection capacity of PDAFF from the early stage of the Project. In June 2022, GDA and the Project exchanged a memorandum of understanding (MOU) to tentatively approve PDAFF in the four target provinces as inspection agencies, and to reconsider whether the quality inspection capacity of PDAFF staffs qualifies for the approval after the completion of the Project. There was a persistent opinion from GDA that quality inspections should be centralized at NAL under the central ministry, especially during the third phase of the Project. However, during the project period, the PDAFF in the target provinces has been responsible for quality inspections.

The Project has been advised from the beginning to allow inspections not only at NAL but also at PDAFF, in consideration of the logistics (time and cost) of sending samples from provinces to Phnom Penh and the increased burden on NAL's inspection operations due to the increased number of samples to be inspected in the future as a result of the expansion of QDS seed production. Furthermore, since the Project has been strengthening the quality inspection capacity of PDAFFs in the target provinces for this purpose, the decision to allow quality inspections at PDAFF for this purpose is appropriate.

(2) Introduction of a certified inspector system and a phased self-inspection system

The accuracy of the inspections must be uniform throughout the country. To this end, the Project recommends a qualification system for inspectors and periodic updates (e.g., refresher training and renewal examinations) for inspectors. Furthermore, inspectors do not necessarily have to be public organizations, but can be private individuals or organizations with a certain level of knowledge and ability. The Project recommends that the MAFF introduce and manage this certified inspector system.

7.3.3. System operation of the QDS system

(1) Streamlining procedures for the QDS system

The procedural flow for application and other procedures for the QDS system currently require paper-based approval at key points in the process which require substantial time. From the standpoint of applicants of the

QDS system, however, the longer the time between sampling of the final product, notification of acceptance of the final quality inspection, and issuance of the QDS tags, the more risk of losing customers. During the project period, there were reported cases of seed sold without waiting for the issuance of the QDS tags. While the trend toward digitalization is expected to continue in Cambodia, the Project recommends the robust promotion of efficient digitalization of various procedures such as application forms for the QDS system, notification forms, and notification of inspection results, as this would speed-up the application process.

(2) Tiered fee collection

The GDA has stipulated the fees for various procedures in the QDS system, namely: 1. application fee, 2. field inspection fee, and 3. quality inspection fee. These fees collected from the QDS applicants will cover the costs involved in operating, maintaining, and administering the system. Since the GDA is still in the process of advocating and promoting the use of the system, the fees may be a disincentive for prospective applicants. Requiring users to bear the cost at this stage where benefits of utilizing the system are not yet fully recognized may discourage applicants, resulting in their disengagement from the QDS system altogether. To collect fees in stages only after applicants can obtain stable and sufficient benefits from the QDS system may be a more strategic approach to ensure usage and invites more applications. The Project recommends that the current fee schedule be temporarily put on-hold and resumed only when the market recognizes the benefits of the QDS system, i.e. when QDS seeds and the price premium exceeds the fee borne by the applicant.

(3) Mandatory acquisition of QDS tags for upstream seed

The Project observed cases where quality of RS was unreliable, which negatively affect the quality of CS. Noting that quality of RS was outside of the Project scope, the Project deemed it necessary to showcase the quality of CS through exhibition fields. In the latter part of the Project, RS was cultivated at the ARS under the GDA as one of the activities in the exhibition, with the aim of its meeting the QDS standard. This activity, however, confirmed that the improvement of seed quality right at the upstream is an urgent issue as not all the RS produced there did not meet the QDS standard. The Project recommends the mandatory distribution only of upstream seeds that meet the standards of the QDS system, including FS.

(4) Coexistence with non-QDS seeds (CS)

The GDA intends to convert all rice seed to QDS seed. During the operational midterm review survey conducted in March 2022, the Director General of the GDA stated that the GDA intended to expand the market for QDS seeds by using strategies such as banning the sale of non-QDS rice seeds as soon as possible and enforcing a crackdown on violators.

On the other hand, the Project proposes that upstream seeds such as FS and RS be required to obtain the QDS tags, while for CS, it is not necessary for all seeds to be registered with the QDS. Rice farmers usually home bred seed for a certain period of time after purchasing rice seed, and in some cases, the home bred rice seed is given to neighboring farmers for a fee or free of charge. In other cases, for varieties with limited demand, such as traditional varieties, the minimum production area requirement of 5 hectares under the QDS system may not be met. Therefore, it is appropriate to focus on producing export rice from the QDS seed in accordance with the "Rice Seed Roadmap 2028".

Within Cambodia, there is a demand in terms of variety, quality, and price. The seed does not necessarily have to be of high quality to have sufficient market value for domestic use. However, it should be noted that the DCS should crack down on the sale of seed of lower quality standards than those listed for any level of seed.

(5) Use of the QDS system by governments and development partners

Rice-related programs and projects implemented by governments and development partners may involve seed production promotion and distribution of quality seeds to increase rice production. In such activities, the Project recommends project proponents to actively encourage the use of the QDS system.

(6) Counterfeit Measures

With the awareness on the QDS system increasing and a price premium attached to QDS seeds gradually realized, it is anticipated that products with falsified tags may arise. Detection and prohibition of such counterfeit products also fall under the role of the GDA. One possible method of control is to publish an official list of certified producers of QDS seeds on the GDA's official website and advocate a call not to purchase QDS seeds from producers who are not on the official list. The issuance of tags with holograms, which are relatively inexpensive, may also be considered for added security. The holograms are 1 cm square and cost about 100 riel each (lot 100,000). These measures may be taken as recognition of the QDS increases.

7.3.4. Promotion of rice seed business

(1) Continue measures to increase awareness of QDS seeds

Although QDS seed is gradually gaining recognition through the efforts of the target agricultural cooperatives, it has not yet reached a sufficient price premium. Continued efforts to raise awareness of the QDS system and QDS seed in the market are needed.

The free trial distribution of QDS seed to rice farmers conducted in the Project helped raise awareness of QDS seed. The activity encouraged a number of rice farmers to purchase QDS seeds, after realizing its assured high quality. The Project recommends the conduct of activities that raise awareness through government support, such as the free trial distribution campaign, as this approach will help stimulate the market demand for QDS seeds.

(2) Calling on entities other than agricultural cooperatives to participate in the QDS system

The "Rice Seed Roadmap 2028" sets a target to achieve "at least 30% of milled rice for export to be produced by QDS seeds". The production of milled rice for export involves a chain of events: the rice millers who handle it, the contract farmers and agricultural corporations that serve as suppliers of paddy to the millers, and the farmers and seed companies that serve as suppliers of the seeds to them. The recommendation to obtain the QDS tags on seeds for cultivation of milled rice for export (CS) is the direction that the roadmap aims to achieve. Therefore, the GDA recommends that seed producers in the supply chain of milled rice for export be encouraged to participate in the QDS system, not only through collaboration within government agencies, but also by private industry associations.

(3) Collaboration with the Cambodian Rice Federation

The Project recommends that the CRF to initiate networking among supply chain actors by creating a platform where liaison among stakeholders is possible; establishing a feedback mechanism from the demand side to the production side of the QDS seed. This will ensure continued improvement of the quality of rice seed and the processes involved.

Membership in the CRF network of supply chain actors will be advantageous for QDS-seed producers and their associations as the network will allow them to share the benefits and advantages of QDS seeds with exporters and millers, as well as give seed producer associations access to market trends. The Project recommends that the CRF provide options to cater to potential members' financial capacity. i.e., a premium membership fee and regular membership fee, with corresponding privileges.

8. Summary of JICA's Rice Development Assistance in Cambodia

JICA's technical assistance in the rice sector had started with the "Cambodia-Japan Friendship Technical Education Center" in the 1950s, and after a brief interruption in the 2000s, four major technical cooperation projects have been implemented since 2003 as follows.

Battambang Agriculture Productivity. Enhancement Project (BAPEP)

Period: April 1, 2003 - March 31, 2006

Target area: Kamping Pouy, Battambang Province

Centering in Kamping Pouy district, the project promoted the spread of high-quality seed production by farmers and contract cultivation of high-quality paddy with rice millers. Consequently, the number of farmers was expanded through the supply of high quality seeds and production technology guidance through certification by public institutions. Moreover, paddy rice yields improved in conjunction with improved water management through supports from the water users' association, and diversification of crop types was promoted by recommending the creation of planting plans based on community-based surveys at the local level.

- Production of high quality rice through production and use of high quality seeds
- Improvement of rice production technology
- Improvement of water management technology
- Introduction of diversified management for livelihood stability (vegetable cultivation, peanut cultivation, pig and poultry farming)

Battambang Rural Area Nurture and Development Project (BRAND)

Period: November 30, 2006 - March 31, 2010

Target area: 4 districts in Battambang Province

In order to extend the results of BAPEP to other areas in Battambang Province, the project aimed to strengthen cooperation between PDAFF, pilot stations, and provincial and district level extension, and to enhance agricultural extension services in consideration of farmers' farming improvement and market distribution. Four communes in four metropolitan areas with high development priorities and high agricultural potential were selected for support.

- Introduction of market oriented rice production and marketing
- Development of guidelines for rice farming operations
- Development of agricultural extension plans, agricultural technologies and methods, and extension activities
- Technology dissemination using demonstration fields with superior seeds
- Support farmers to improve productivity (crop diversification)
- Establishment of brand rice standards, certification system, official accreditation of rice mills supplying rice

Agricultural Productivity Promotion Project in West Tonle Sap (APPP)

Period: October 2010 to March 31, 2015

Target area: Battambang Province, Pursat Province, Kampong Chhnang Province

The objectives of the project were to further establish the technologies accumulated through BAPEP and BRAND, to expand and disseminate them on an area-wide basis, and to strengthen the system that leads to higher income through the promotion of rice production and distribution. The three target provinces are areas with high potential for agricultural production in Cambodia, and in order to maximize their potential, C/Ps were selected from the relevant departments at the central, provincial, and district levels responsible for the dissemination of improved technologies, and project activities were implemented.

- Dissemination of seed production technology through Farmer Field Schools (FFS)
- Implementation of farmer group fund system
- Joint purchase of agricultural materials and joint shipment of rice by farmer groups
- Farmers' groups to practice recommended technologies and share information on distribution prices
- Cultivation of guaranteed seeds by seed production groups, field testing, seed quality inspection
- Strengthening organizational management capacity by creating common accounting forms, conducting bookkeeping training, and establishing group bylaws

Project for Rice Seed Production and Promotion (RSPP)

Period: November 2017 - May 2023

Target area: Battambang, Kampong Chhnang, Prey Veng, and Takeo provinces

In order to establish a QDS system, a seed quality control system that includes unified quality standards and production management methods at the national level to expand production of quality rice seeds, relevant documents such as rice seed guidelines and seed production manuals were developed. Additionally, the QDS system was officially launched through the dissemination of seed production technology, field and laboratory inspections, human resource development at the central and provincial levels for the operation of the seed system, and the development of seed-producing target ACs in the target provinces through these activities.

- Support for preparation of guidelines required for the QDS system
- Capacity building in seed production and quality inspection technology in accordance with the QDS system (GDA, PDAFF, seed producing cooperatives)
- Strengthening the management capacity of seed producing agricultural cooperatives (field management, accounting, inventory control, marketing)
- Support for the operation of the QDS database
- Support for development of rice seed roadmap
- Raising awareness of the QDS system and seed quality

In each of the technical cooperation projects, efforts have been made to improve production technology and post-harvest processing technology, water management technology, distribution, and support for group farming by agricultural cooperatives and others, with the aim of increasing the added value of rice and improving farmers' livelihoods. From the beginning of JICA's support, JICA has recognized the importance of rice seeds in Cambodia and has worked to produce quality seeds. During this period, improvements in agricultural infrastructure and agricultural mechanization have progressed, and Cambodia has become a rice exporting country, with export volumes increasing in recent years. Although export volumes have come to a stagnated in recent years, partly due to the COVID19, demand for quality seeds will continue to increase, as the CRF aims to export 750,000 tons by 2024 and 1 million tons by 2025. The government has also set the expansion of agricultural exports as one of its policy goals and has just launched a program to support the rice sector.

After the completion of this Project, MAFF and GDA will continue to improve the productivity, quality, and export of rice in Cambodia without any technical assistance or financial support from JICA, such as travel expenses. To date, JICA has been working to design systems and improve the capacity of all parties involved, from rice self-sufficiency to exports, targeting GDA at the central level, PDAFF at the provincial level, and target ACs at the producer level, including productivity improvement, commercialization, distribution promotion, and production, inspection, and distribution of quality seeds. Through such supports, the Cambodian rice sector has come to have sufficient knowledge, technology, and capacity not only in production, but also in the production of quality seeds, which is necessary to expand rice exports, with the relevant institutions and persons involved.

The government's strong will to expand rice exports can be seen in the fact that the government of Cambodia has already begun preparing a government project (see 7.1 Prospects to achieve Overall Goal) scheduled to start in 2023 in accordance with the Rice Seed Roadmap 2028 to expand production of high-quality rice seeds. Although it will take time to strengthen the capacity of all parties involved at the nationwide level, the Project are eagerly anticipating that it will be realized.

Appendix

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1. Project Design Matrix (PDM) Final Version
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6. Technical cooperation material: Baseline Survey Report [English]
7. Technical cooperation material: Rice Seed Production Manual [English/Khmer]
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9. Quality Declared Seed System (QDS) for Rice Seed Production and Business [English]

Appendix 1

Project Design Matrix (PDM)

Final Version

Project Design Matrix (PDM) Outputs

Final Version

Project Title: Project for Rice Seed Production and Promotion (RSPP)
Implementing Agency: General Directorate of Agriculture (GDA), Ministry of Agriculture, Forestry, and Fisheries
Target Group: Staff of GDA, Provincial Department of Agriculture, Forestry, and Fisheries (PDAFF), District Agriculture Office (DOA), Seed Producers Groups (SPGs) and other stakeholders concerned.
Period of Project: November 2017 – April 2023
Project Site: Phnom Penh and target Provinces (Prey Veng, Takeo, Kampong Chhnang, and Battambang)

Narrative Summary of Objectives	Objectively Verifiable Indicators*	Means of Verification	Important Assumption	Achievement As of March 2023	Remarks
Overall Goal More quality rice seed is produced, and more farmers use it for production nationwide.	- Policy measures to promote the QDS system are authorized. - Rice seed production area or volume of the Seed Business Model is expanded in four target provinces.	Report of Government			
Project Purpose System for producing and distributing quality rice seed is established and functions properly in the target provinces.	GDA counterpart institutionalizes the QDS system to ensure quality rice seed distributed in the market by i. establishing an organizational structure (CA) and QDS workflow, ii. preparing a Road Map for the proliferation of rice seeds, and iii. building capacity to manage the QDS database	Survey/reports made by the Project	- There is no significant change for Cambodian policy on quality rice seed production and promotion.	i. Both the organization structure for the operation of the QDS system and the QDS workflow have been established ii. The target of the future QDS seed production in the roadmap is agreed with DCS iii. The QDS database was appropriately managed by the DCS and the DCS successfully issued the QDS tags.	
Outputs 1. Capacity of GDA, PDAFF, AC/SPG and private sector is upgraded in the fields of seed production technique and its management.	1-a) - A manual of rice seed production and business management is endorsed by GDA and the manual is utilized by GDA and PDAFF Counterparts who are in charge of the QDS system. 1-b) - Compared to the planned volume, at least 80% of rice seeds produced by target ACs in the Seed Business Model meet the standard of the QDS system by the end of the Project except for uncontrollable losses by environmental and climate disasters. 1-c) - Each Seed Business Model produces at least 20 ha per year of high-quality rice seed by the end of the Project except for uncontrollable losses by environmental and climate disasters. 1-d) - All lead ACs in the Seed Business Model are able to provide a periodical business plan and evaluate/improve it every year by the end of the Project. 1-e) - All lead ACs in the Seed Business Model allocates personals to key business roles such as quality control, processing, and marketing and they provide a periodical activity report to other members to show each role functions well.	Project report, Draft manuals, Observation/test done by the Project, Data on productivity, profitability, and quality of paddy as well as financial statements of target ACs Questionnaire survey to target ACs Business plans, and financial statements	- Cambodian side continues to implement awareness raising activities for utilization of quality rice seeds. - The target provinces do not heavily suffer from disasters such as drought and flood.	1-a) - Rice Seed Production Manual is confirmed and endorsed by GDA 1-b) - The indicator has been achieved except for uncontrollable losses and cancelations 1-c) - The indicator has been achieved except for uncontrollable losses and cancellations. 1-d) - The ACs showed the skill of business planning by regular submission of Declaration A form under the QDS system. - The ACs successfully organized annual general assembly to share their achievement and reflections 1-e) - The ACs have allocated their members to maintain and develop their rice seed business	
2. The rice seed inspection and certification system are introduced in the target provinces.	2-a) - An inspection manual of the QDS system is endorsed by GDA. 2-b) - Assessment criteria for QDS system inspector is introduced and all target PDAFF Counterparts obtain above 80% of the assessment criteria. 2-c) - Each inspector of PDAFF and GDA CP and/or private sectors conduct the field and laboratory inspection of the QDS system above 10 samples/year. 2-d) -All target ACs are able to operate whole procedures as an applicant in accordance with QDS manual. (Monitor capacity building level using a check sheet)	Draft guidelines and manuals, The assessment criteria for QDS system inspector Observation/test done by the Project Record of the QDS inspection Observation/test done by the Project. Check sheet	-All relevant stakeholders adopt the guidelines.	2-a) - The inspection manual has been confirmed and endorsed by GDA 2-b) - The GDA and PDAFF C/P achieved above 80% of the score for the capacity development assessment 2-c) - The PDAFF C/P have their capacity to conduct the laboratory inspection for 10samples per year. 2-d) - The ACs achieved above 80% of the score for the capacity development assessment	
3. Rice seed business is accelerated in the target provinces.	3-a) - At least 70% of paddy farmers who use high-quality rice seeds are satisfied with the effectiveness of CS (purity, germination rate, and yield). (hearing form QDS users and demo-farmers) 3-b) - All target Seed Business Model increase the sales volume of CS per year, compared to the first cropping season by the end of the Project.	Questionnaire survey to rice millers and traders Project report, Contracts(documents), Sales record	- The prices of rice are not drastically fluctuated.	3-a) - More than 80% of the rice farmers who joined the seed trial satisfied with the QDS seed and the indicator has been achieved 3-b) - Compared to the sales volume of 2020, that of 2022 has been increased.	
Activities	**Input**		**Pre-Conditions**	**Issues**	**Countermeasures**
	Japanese side	**Cambodian side**			
1-1. Conduct baseline survey on current situation and compile/submit a proposal for upgrading capacity as well as mechanism for rice seed production, inspection/ certification.	Dispatch of Japanese Experts - Chief advisor - Seed business - Seed production and inspection - Extension of seed production and inspection - Marketing - Monitoring - Farmer organization	Assignment of sufficient C/P personnel from Crop Seed Department and the PDAFF (Crop Seed Unit and extension workers) in target provinces including Project Director and Project Manager. Facilities - Office space and furniture in GDA and in target PDAFF as required	- Seed Policy is officially approved. - Seed Management Unit is officially established. - Counterpart (C/P) personnel are assigned.		

	- Coordinator Facilities and equipment - Facility and equipment necessary for Project implementation Training - Training in Japan/third country	- Electricity, water, telephone/ communication			
1-2. Conduct baseline survey on quality rice seed production and distribution in the target provinces.					
1-3. Confirm capacity of existing SPGs and identify tasks ahead for upgrading their production capacity.					
1-4. Provide training to GDA, PDAFF, AC/SPG and private sector on seed production.					
1-5. Provide training to staff of PDAFF/DAO on-rice seed production, in cooperation with GDA.					
1-6. Provide rice seed processing equipment/ facilities to selected SPGs in conjunction with training on operation and maintenance.					
1-7. Provide training to SPGs for upgrading their seed business management capacity through PDAFF in the target provinces.					
1-8. Set up mechanism to incorporate market demands into their rice seed production plan through training to SPGs on marketing.					
1-9. Based on the results of above activities, develop final draft of manual for seed production and seed business management, and submit to MAFF as a basis for national guidelines in Cambodia.					
2-1. Provide training to GDA, PDAFF, AC/SPG and private sector on seed quality inspection and certification.					
2-2. Provide training to PDAFF/DAO staff on seed quality inspection and certification, in cooperation with GDA.					
2-3. Carry out 1-year trial of QDS system and evaluate the performance for the improvement (end/2019).					
2-4. Extend the improved QDS system to other SPGs in the target provinces and draft manuals, recommendations on implementation structure and budget for the national rice seed inspection and certification system are prepared (end/2020).					
2-5. Provide technical support on implementation of the national rice seed inspection and certification system in the target provinces.					
3-1. Conduct baseline survey on rice seed and paddy value chain					
3-2. Conduct demonstration activities to show advantage of utilizing quality rice seeds at SPGs' field					
3-3. Conduct demonstration activities to show advantage of utilizing quality rice seeds at rice farmer's field					
3-4. Verify impact of quality rice seed to the productivity, profitability, and quality of paddy based on the result of 3-2, 3-3. (quality is compared with export standard)					
3-5. Carry out events/workshop for networking the stakeholders to identify potential rice seed business model (stakeholders include SPGs, paddy producers (farmers), seed company/sellers, rice millers)					
3-6. Conduct trial for identified rice seed business model, monitor and evaluate the result.					

Appendix 2

Plan of Operation (PO)

Final Version

Project Monitoring Sheet II (Inputs and Activities) Final Version (As of April 2023)

Project Title: Project for Rice Seed Production and Promotion

Stage III

2019: 11, 12 | 2020: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 | 2021: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 | 2022: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 | 2023: 1, 2, 3, 4, 5, 6

Inputs

【Expert Team Members from JICA】

Assignment Schedule	
Mr. KUDO, Yasunobu (Chief Advisor / Seed Business Experts)	Plan
	Actual
Ms. AKIYAMA, Akiko (Deputy Chief Advisor / Seed Business Expert)	Plan
	Actual
Mr. TANAKA, Toyozo (Seed Production and Inspection Expert)	Plan
	Actual
Mr. TANAKA, Hiroyuki (Marketing (1))	Plan
	Actual
Mr. YAMAZAKI, Masaru (Extension of seed production and inspection Expert)	Plan
	Actual
Ms. TAMURA, Noriko/Ms. IWASAKI, Tamami (Farmers Organizion Expert/ Marketing (2))	Plan
	Actual
Ms. UEHARA, Keiko/Ms. NAKAMURA, Yukiko (Coordinator/ Equipment Procurement Expert)	Plan
	Actual
Mr. SAK Choeun (National Consultant)	Plan
	Actual
Mr. Meas Soborn (Techinical Assitant)	Plan
	Actual
Ms. SAK Sokhena (Secretary)	Plan
	Actual

Activities-sub activities

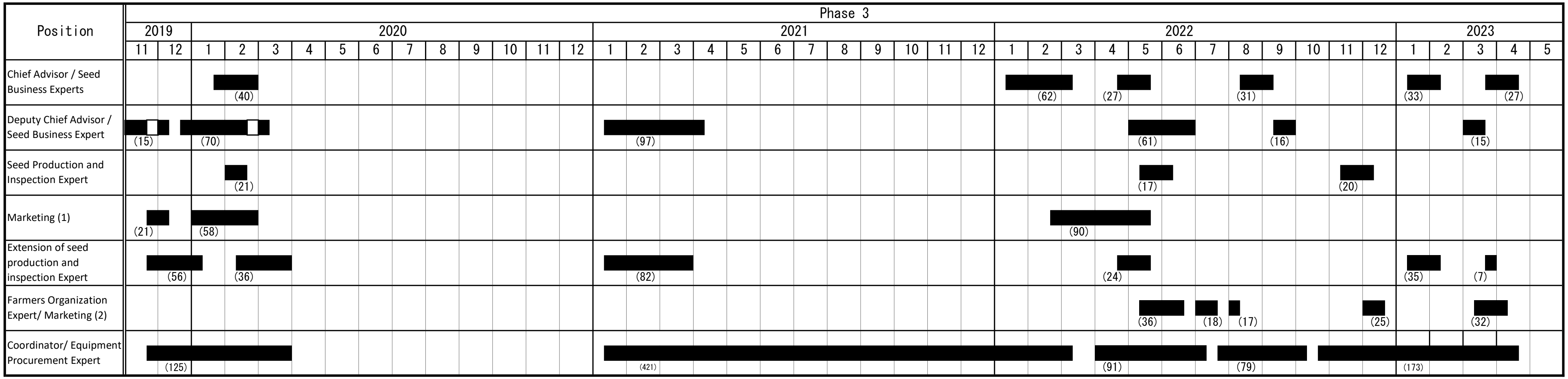
Activity		
OUTPUT1. Capacity of GDA, PDAFF, AC/SPG and private sector is upgraded in the fields of seed production technique and its management		
1-1. Conduct baseline survey on current situation and compile/submit a proposal for upgrading capacity as well as mechanism for rice seed production, certification and quality	Plan	
	Actual	Done during the Phase I&II
1-2. Conduct baseline survey on quality rice seed production and distribution in the target provinces.	Plan	
	Actual	Done during the Phase I&II
1-3. Confirm capacity of existing SPGs and identify tasks ahead for upgrading their production capacity.	Plan	
	Actual	Done during the Phase I&II
1-4. Provide training to GDA, PDAFF, AC/SPG and private sector on seed production.	Plan	
	Actual	
1-5. Provide training to staff of PDAFF/DAO on-rice seed production, in cooperation with GDA.	Plan	
	Actual	
1-6. Provide rice seed processing equipment/facilities to selected SPGs in conjunction with training on how to operate.	Plan	
	Actual	
1-7. Provide training to SPGs for upgrading their seed business management capacity through PDAFF staff in the target provinces.	Plan	
	Actual	
1-8. Set up mechanism to incorporate market demands into their rice seed production plan through training to SPGs on marketing.	Plan	
	Actual	
1-9. Based on the results of above activities, develop final draft of manual for seed production and seed business management, and submit to MAFF as a basis for national	Plan	
	Actual	
OUTPUT2. The rice seed certification and inspection system is introduced in the target provinces.		
2-1. Provide training to GDA, PDAFF, AC/SPG and private sector on seed quality inspection and certification.	Plan	
	Actual	
2-2. Provide training to PDAFF/DOA staff on certification, quality inspection of rice seed, in cooperation with GDA.	Plan	
	Actual	
2-3. Carry out 1-year trial of QDS system and evaluate the performance for the improvement.	Plan	
	Actual	Done during the Phase I&II
2-4. Extend the improved QDS system to other SPGs in the target provinces and draft manuals, recommendations on implementation structure and budget for the national rice seed inspection and certification system are prepared.	Plan	
	Actual	
2-5. Provide technical support on implementation of the national rice seed inspection and certification system in the target provinces.	Plan	
	Actual	
OUTPUT3. Rice seed business model is proposed in the target provinces.		
3-1. Conduct baseline survey on rice paddy and rice seed value chain.	Plan	
	Actual	Done during the Phase I&II
3-2. Conduct demonstration activities to show advantage of utilizing quality rice seeds at SPGs' field.	Plan	
	Actual	
3-3. Conduct demonstration activities to show advantage of utilizing quality rice seeds at rice farmer's field.	Plan	
	Actual	
3-4. Verify impact of quality rice seed to the productivity, profitability, and quality of paddy based on the result of 3-2, 3-3. (quality is compared with export standard).	Plan	
	Actual	
3-5. Carry out events/workshop for networking the stakeholders to identify potential rice seed business model(stakeholders include SPGs, paddy producers (farmers), seed	Plan	
	Actual	
3-6. Conduct trial for identified rice seed business model, monitor and evaluate the result.	Plan	
	Actual	

Appendix 3

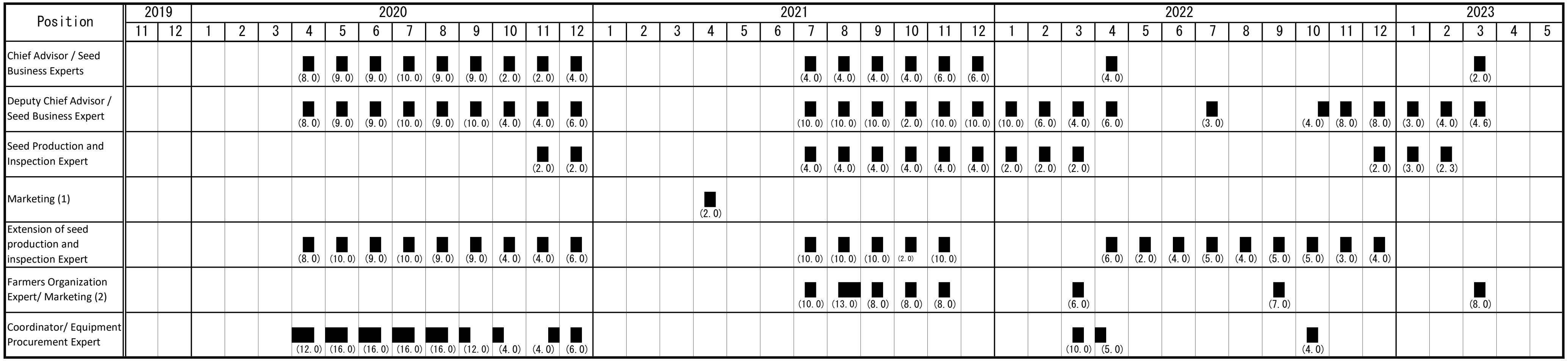
Dispatchment of Japanese Experts

Dispatchment of Japanese Experts

1. Dispatchment in Cambodia



2. Dispatchment in Japan



Appendix 4

List of Equipment

List of Equipment

Product name	Specification	Number	Purchase price (KHR)	Purchase date	Location
Multi-function printer	Kyocera TASKalfa5550ci	1	3,850.00	2017/11/24	GDA
Computer	Microsoft Surface Pro	1	1,976.70	2018/3/5	GDA
Computer	Asus A442UA	5	4,207.50	2018/3/27	GDA
Seeder	Eli rice seeder	4	4,560.00	2018/9/17	Bopea Sen Chey AC (Prey Veng) Ang Kamping Puoy AC (Battambang) Baphnom Meanchey AC (Prey Veng) O'Saray AC (Takeo)
Motorcycle	YAMAHA SIRIUS	8	9,680.00	2019/1/8	PDAFF (Battambang, Prey Veng)
Moisture meter	SATAKE SS-7	5	2,406.25	2019/3/13	GDA、PDAFF (Four target provinces)
Motorcycle	SUZUKI	8	12,584.00	2019/6/3	PDAFF (Kampong Chhnang, Takeo)
Diaphanoscope	220V Diaphanoscope	5	4,288.63	2019/6/21	GDA PDAFF (Four target provinces)
Electronic scale	Precision Balance-AND	5	5,004.90	2019/6/21	GDA PDAFF (Four target provinces)
Seeder	Lun Heng seeder	1	700.00	2019/9/23	Baphnom Meanchey AC (Prey Veng)
Moisture meter	SATAKE SS-7	4	1,925.00	2019/11/29	ARS (Battambang, Prey Veng) Baphnom Meanchey AC (Prey Veng) O'Saray AC (Takeo)
Seeder	Eli rice seeder	1	1,510.00	2019/11/29	Lve Rong Roeung AC (Takeo)
Seeder	Lun Heng seeder	1	850.00	2020/2/23	LAREC (Kampong Chhnang)
Seed grader	AGROSAW Seed Grader, Model UC-2	2	52,659.20	2021/1/20	Baphnom Meanchey AC (Prey Veng) O'Saray AC (Takeo)
Tablet	Samsung Galaxy Tab S6 Lite	20	8,980.00	2021/7/26	GDA、NAL、PDAFF (Four target provinces) Baphnom Meanchey AC (Prey Veng) O'Saray AC (Takeo) Chamroeun Phal Rieng Kesey AC (Battambang) Camseed Pichangva AC (Kampong Chhnang)
Moisture meter	Kett FG521	1	480.00	2021/11/16	Chamroeun Phal Rieng Kesey AC (Battambang)
Moisture meter	Kett FG521	1	480.00	2021/12/3	Camseed Pichangva AC (Kampong Chhnang)
Seed grader	Phuminhphat LS1.5	1	30,750.00	2022/2/15	Chamroeun Phal Rieng Kesey AC (Battambang)
Tractor	Kubota M6040SU Kubota RX220H 4 wheels trailer	1	36,500.00	2022/5/10	Camseed Pichangva AC (Kampong Chhnang)

Appendix 5

Rice Seed Roadmap 2023

Rice Seed Roadmap 2028

1. Goals
Goal: By 2028, 30% of exported rice will be produced by Quality Declared Seed.
Period: Six years from 2023

There are three stages, namely, the Application stage, the Surge stage, and the Steady increase stage, to achieve the goal. In the Application stage, GDA will support increasing the acreage of the existing Agricultural cooperatives (ACs) targeted by Rice Seed Production and Promotion (RSPP) by JICA and Cambodia Agricultural Value Chain Program (CAVAC) by AusAID. GDA will also promote new ACs to participate in QDS production.
The Surge stage invites other producers, in addition to the existing ACs, such as individual seed producers and private seed companies, to participate in QDS production.
By the Steady Increase stage, PDAFF in all rice-producing provinces will be familiar with the QDS system and will become to support seed producers under the QDS system. It is expected that the number of QDS producers will steadily increase from this stage.
The following table shows the necessary volume of certified seed in each stage, estimated from the export volume of milled rice in 2020. Then, the next table computes the main target volume and number of producers at each stage by seed class, based on the necessary certified seeds.

The volume of necessary certified seed in each stage

	2023-2024 Application	2025-2026 Surge	2027-2028 Steady Increase
Export volume (MT)	690,829	690,829	690,829
Use of QDS	10%	20%	30%
Milled rice with QDS (MT)	69,083	138,166	207,249
Paddy with QDS (MT)	119,108	238,217	357,325
Production area with QDS (ha)	39,703	79,406	119,108
Necessary seed (MT)	1,588	3,176	4,764

*Conditions for the estimation: Export volume: 690,829 MT (milled rice) as of 2020, milling ratio: 58%, seed renewal rate: 50%, seeding rate: 80 kg/ha

Target production volume of seed by class and stages

Seed Class	Seed producers	2023-2024 Application stage	2025-2026 Surge stage	2027-2028 Steady Increase stage
CS		Target 1,400MT	Target 3,250MT	Target 5,100MT
	4 ACs (RSPP) and 5ACs (CAVAC)	900 MT/year (100 MT/year-applicant x 9 AC)	1350MT (150 MT/year-applicant x 9 AC)	1800MT (200MT/year-applicant x 9 AC)

	10 newly participating ACs	500MT/year (50MT/year-applicant x 10 AC)	1000MT (100MT/year-applicant x 10 AC)	1500MT (150MT/year-applicant x 10 AC)
	9 newly participating individual producers and private seed companies		900MT (100MT/year-applicant x 9 applicants)	1800MT (200MT/year-applicant x 9 applicants)
RS		Target 20MT	Target 47MT	Target 73MT
	CARDI (Cambodia Agriculture Research and Development Institute)	20MT/year	20MT/year	20MT/year
	ARS (Agriculture Research Station) or private sector	0MT/year	27MT/year	53MT/year
FS		Target 17 kg	Target 39 kg	Target 55 kg
	CARDI	17 kg/year	39 kg/year	55 kg/year

*Conditions for the estimation: Seeding rate: 20kg (BS to FS), 40 kg (FS to RS), 80 kg (RS to CS), Yield: 2.5Mt/ha (BS to FS), 2.8 Mt/ha (FS to RS), 2.8 Mt/ha (RS to CS),

2. Target provinces and seed producers

(1) Target provinces

Taking PDAFF capacity into consideration, GDA shall select new seed producers from QDS-experienced provinces such as Battambang, Kampong Chhnang, Takeo, and Prey Veng. Notably, seed centers with the processing capacity of 60 Mt of rice seeds were newly constructed in the provinces of Battambang and Prey Veng. As such, the two provinces can invite more seed producers.

(2) Target seed producers

To avoid high initial investment, it is highly recommended to prioritize seed producers with the necessary facilities and equipment, such as a warehouse, drying yard, and seed cleaner.

3. Government roles

The GDA and PDAFF play a significant role in the following;

- Provision of the technical training on seed production and inspection based on the QDS system to newly participating PDAFF staff, seed producers, ACs, and seed production companies in new target provinces (costs shouldered by the participants)
- Issuance of QDS business certificates (cost shall be shouldered by the participants)
- Field inspection excluding seeds produced by CARDI (cost shall be shouldered by applicants)
- Laboratory test excluding seeds produced by CARDI (cost shall be shouldered by applicants)
- Issuance of QDS labels (tags)
- Provision of subsidies to promote QDS production.
- Maintaining and rationalization streamlining the QDS system, including minimizing paperwork, introducing an electric application, electric issuance, and handing over of field inspection to PDAFF or applicants.

4. Activities

(1) Activities for human resource development

- Training for provincial extension officers and seed inspectors

New participants in the QDS system need to obtain intensive technical supports. PDAFF and provincial extension officers will be in charge of guiding those new participants. To do so, GDA will provide the training to PDAFF or provincial officers on the QDS system, its flow, and the roles of PDAFF in the system.

The laboratory inspection in the QDS system requires about 15 days for one sample, and the necessary number of inspectors would depend on the seed volume. The following table estimates that each stage requires 12, 28, and 42 inspectors respectively, responding to the increase of seed volume.

	2023-2024 Application	2025-2026 Surge	2027-2028 Steady Increase
The necessary number of inspectors	12	28	42
CS	Target 1,400MT	Target 3,250MT	Target 5,100MT
	15days	15days	15days
RS	Target 20MT	Target 47MT	Target 73MT
	0.21days	0.21days	0.22days

* Conditions for the estimation: Inspection efficiency: 2 samples per day-inspector, Lots of samples: 1 sample per 4 tons of seed. Production seasons: 2 seasons per year

(2) Activities for Increase of recognition of the Quality Declared Seed system

- Public disclosure of applicants with seed business certification in the MAFF and GDA official homepage. For rice seed consumers, the government should disclose the names of QDS certified applicants.
- Promotion of public awareness of the QDS system
  MAFF/GDA shall cooperate with Cambodia Rice Federation, the largest rice stakeholder association, to promote public awareness of the QDS system.
- Free trial of QDS seeds
  Free seed trials conducted by the RSPP have resulted in seed sales contracts between the targeted ACs and the participants in the trials. To raise awareness of the QDS system, the government shall employ the approach in rice-producing areas.
- Financial support to newly participating seed producers
  Quality seed production requires an initial investment such as a warehouse, drying yard, and seed cleaner. The total cost of those investment is as high as $85,000, according to the RSPP's experience. Not all ACs and private companies can bear such an amount. Previously under the Boosting Food Production Program, the government granted warehouses, drying yards, and seed cleaners to a number of ACs. In the same manner the government shall consider the budget allocation to directly subsidize eligible producers or provide a package of interest supplement of bank loans.

- Provision of the sales subsidy to invite more QDS producers
  Since the QDS system is yet to be fully recognized in the market, the selling price of QDS seeds is not always higher than non-QDS seeds. This has discouraged seed producers to participate in the QDS system. The government will incentivize QDS producers by providing a sales subsidy of about 400 Riel per kg. Once the market awareness of the QDS system rises

sufficiently to invite new QDS participants, the government will gradually reduce the amount of the subsidy.

5. Necessary budget for achieving the goal of the roadmap

(1) Support seed production business through capacity development (USD)

	2023-2024 Application	2025-2026 Surge	2027-2028 Steady Increase
Follow-up current target	0	10	9
New target	10	9	0
Total number of target	10	19	9
Unit cost for intervention (USD)	4,860	4,860	4,860
Direct cost total (USD)	48,600	92,340	43,740
Indirect cost (20%)	9,720	18,468	8,748
Total intervention cost (USD)	58,320	110,808	52,488

(2) Support investment of facility and equipment (USD) for the provinces other than Battambang and Prey Veng provinces[1]

	2023-2024 Application	2025-2026 Surge	2027-2028 Steady Increase
Warehouse (200 MT)	10	9	0
Drying yard (25x25m)	10	9	0
Seed cleaner (1 ton/hr)	10	9	0
The unit cost of Warehouse	35,000	35,000	35,000
The unit cost of Drying yard	15,000	15,000	15,000
The unit cost of Cleaner (1 Mt/hr)	35,000	35,000	35,000
Total cost	850,000	765,000	0
Government subsidy (70%)	595,000	535,500	0

(3) Promotion of Quality Declared Seed (USD)

Free seed trial

	2023-2024 Application	2025-2026 Surge	2027-2028 Steady Increase
Number of trial farmers	20	20	0
Unit seed volume (kg/time)	80	80	0
Unit price of seed (USD/kg)	0.675	0.675	
Duration (years)	2	1	0
Total cost (USD)	2,160	1,080	0

(4) Sales subsidy

[1] There are newly constructed seed centers in Battambang and Prey Veng provinces. Seed producers can utilize these facilities for post-harvest processing.

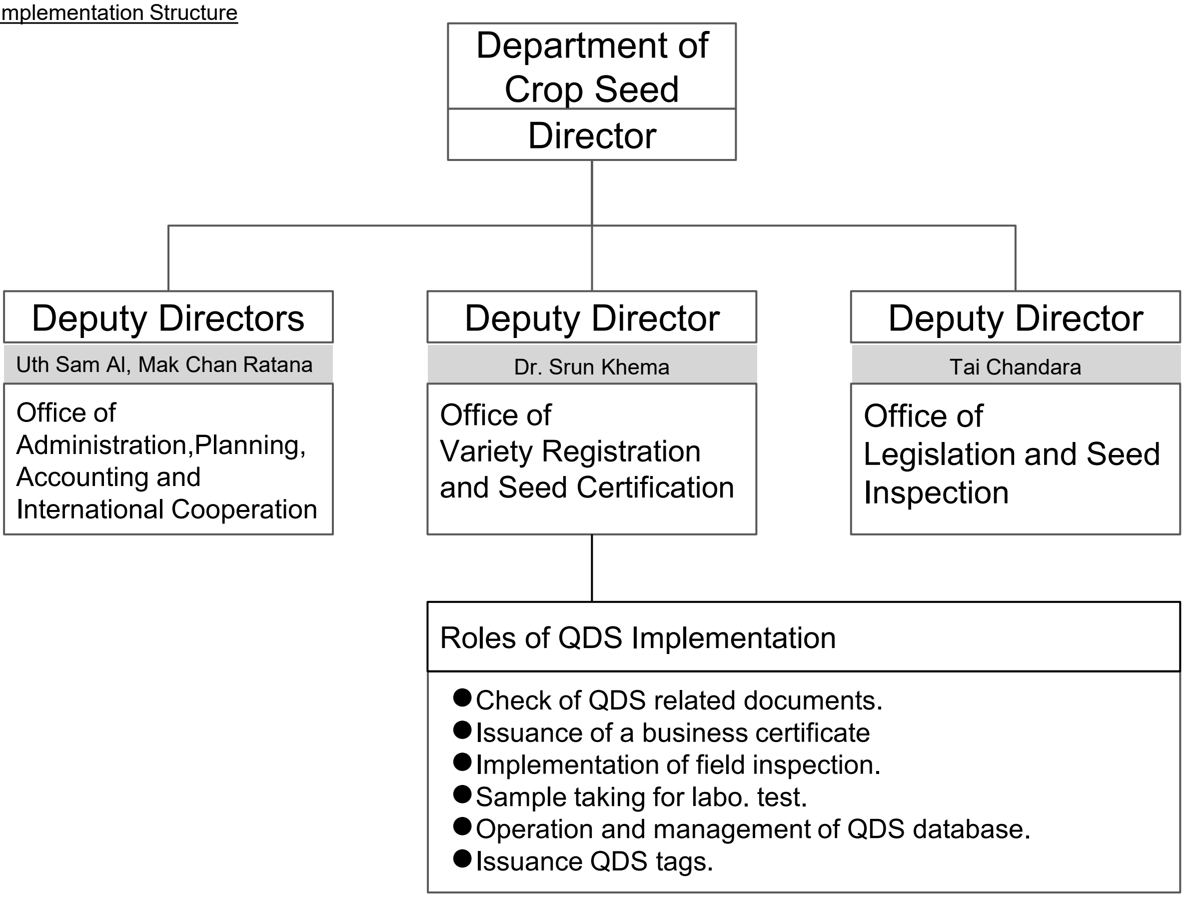
	2023-2024 Application	2025-2026 Surge	2027-2028 Steady Increase
Sales subsidy (USD/kg)	0.1	0.1	0
Target volume (kg)	1,400,000	3,250,000	0
Duration (years)	2	1	0
Total cost (USD)	280,000	325,000	0

(5) Total cost at each stage (USD)

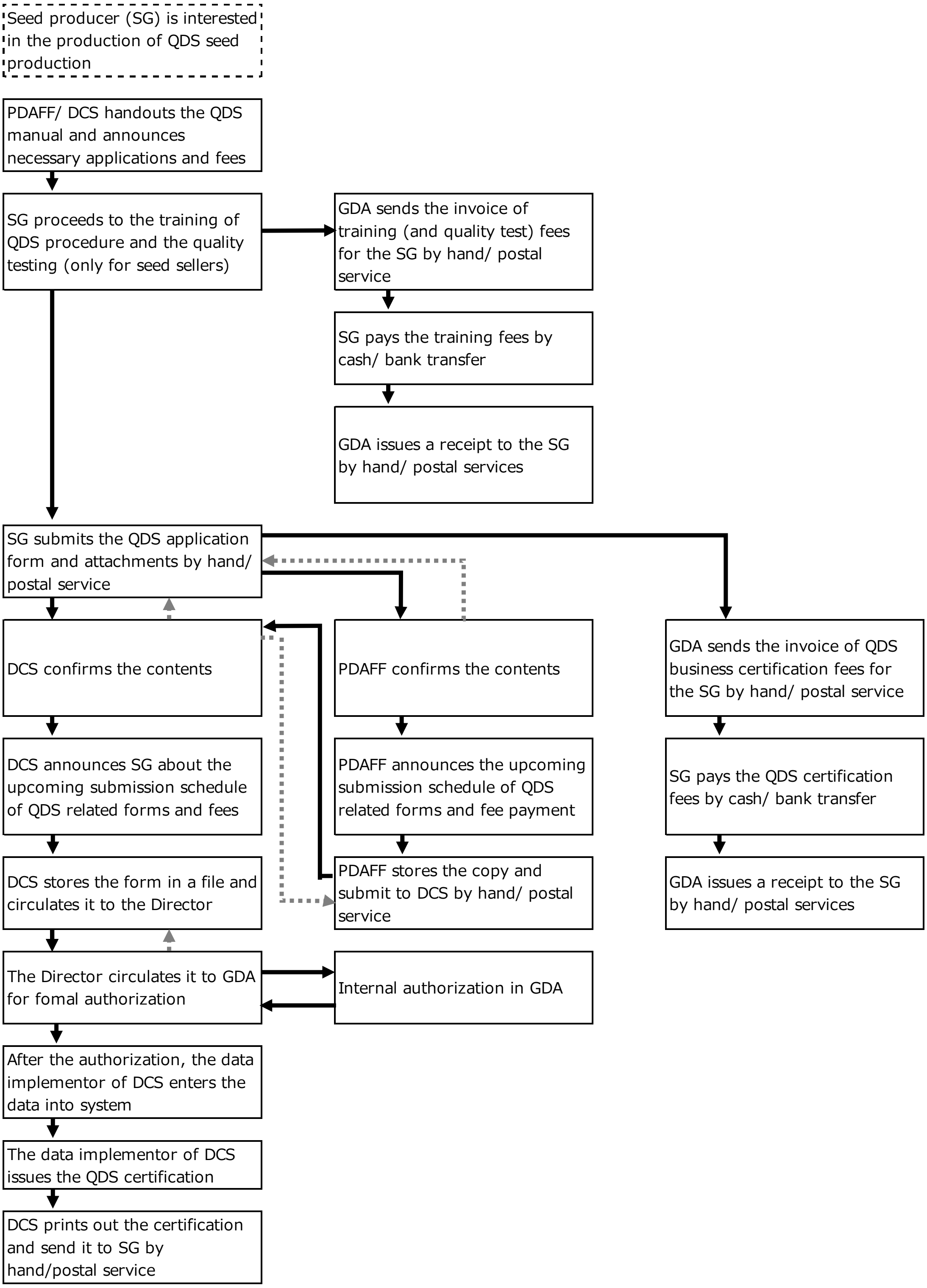
	2023-2024 Application	2025-2026 Surge	2027-2028 Steady Increase
(1) Capacity development	58,320	110,808	52,488
(2) Subsidy for facility and equipment	595,000	535,500	0
(3)-1 Free trial of QDS seeds	2,160	1,080	
(3)-2 Sales subsidy	280,000	325,000	0
Total	935,480	972,388	52,488

Attachments
1) Implementation Structure
2) QDS workflow
3) Fee structure

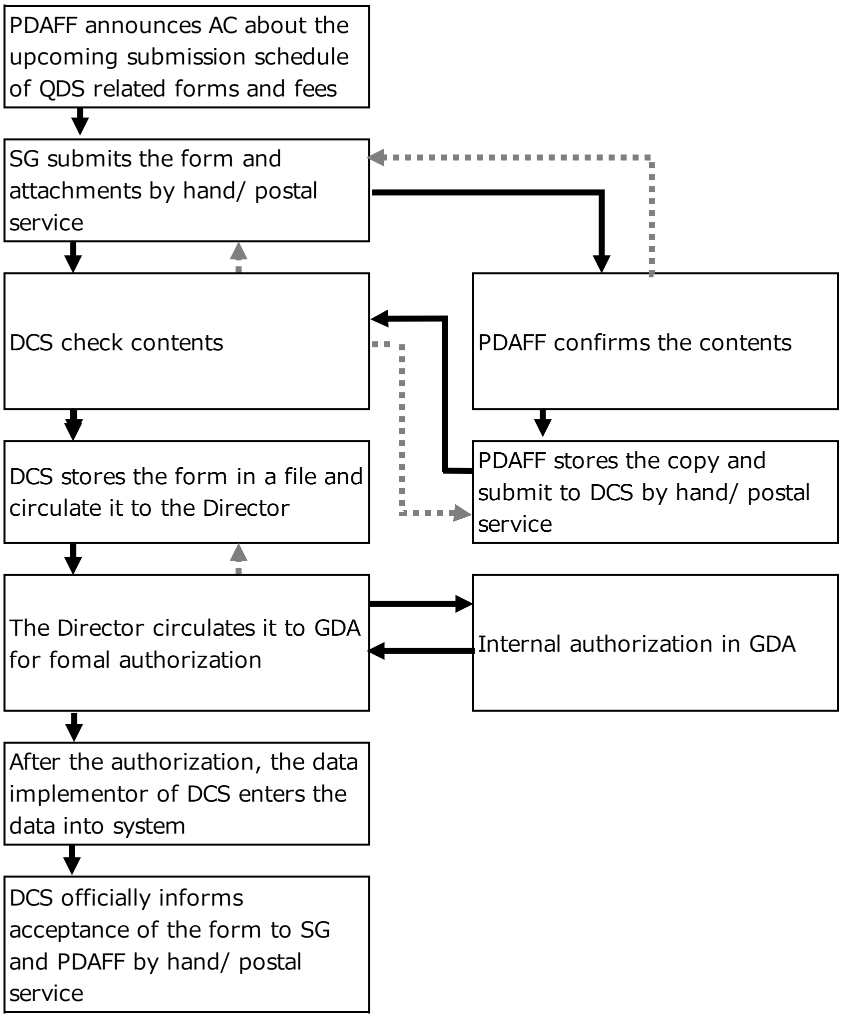
1. Implementation Structure



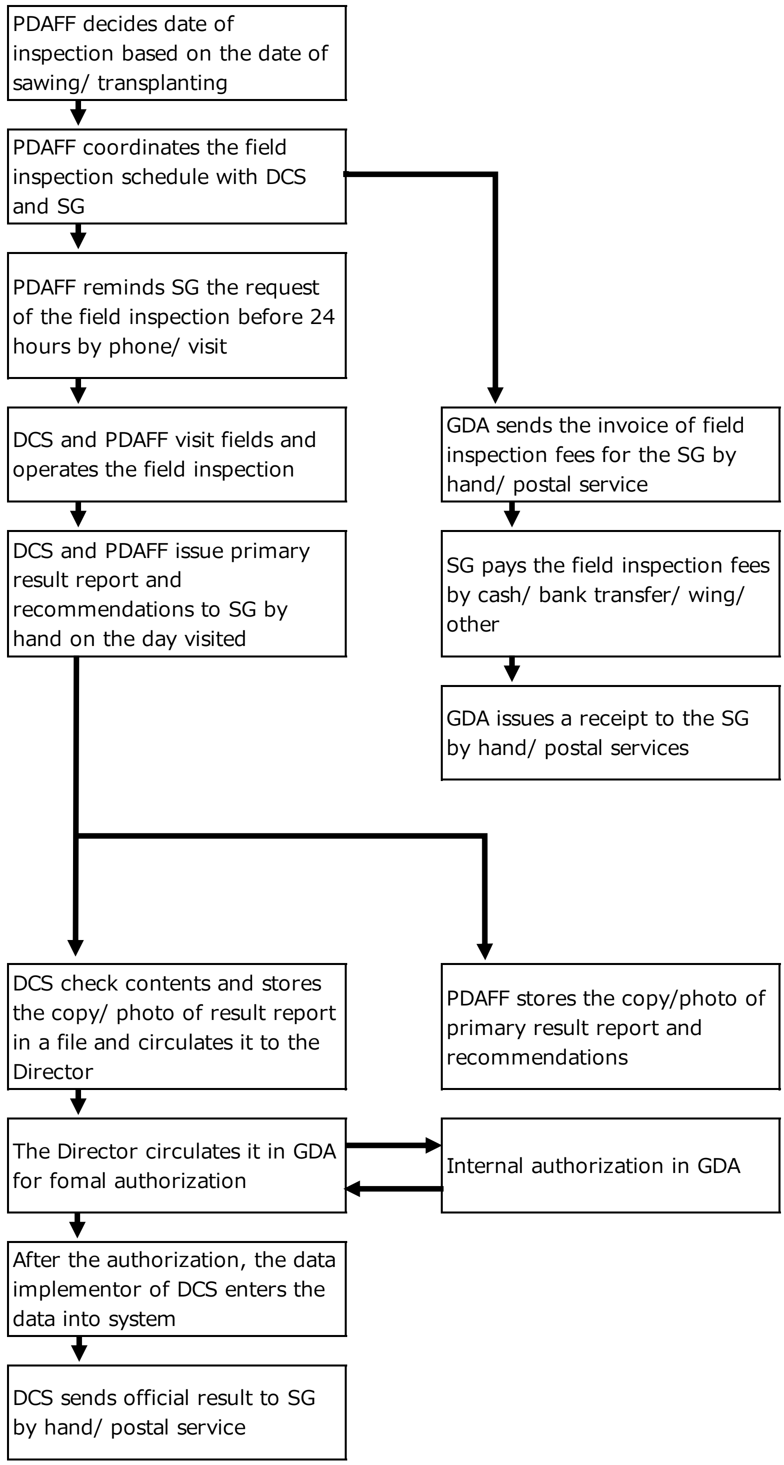
QDS Application Form (60 days before sawing)



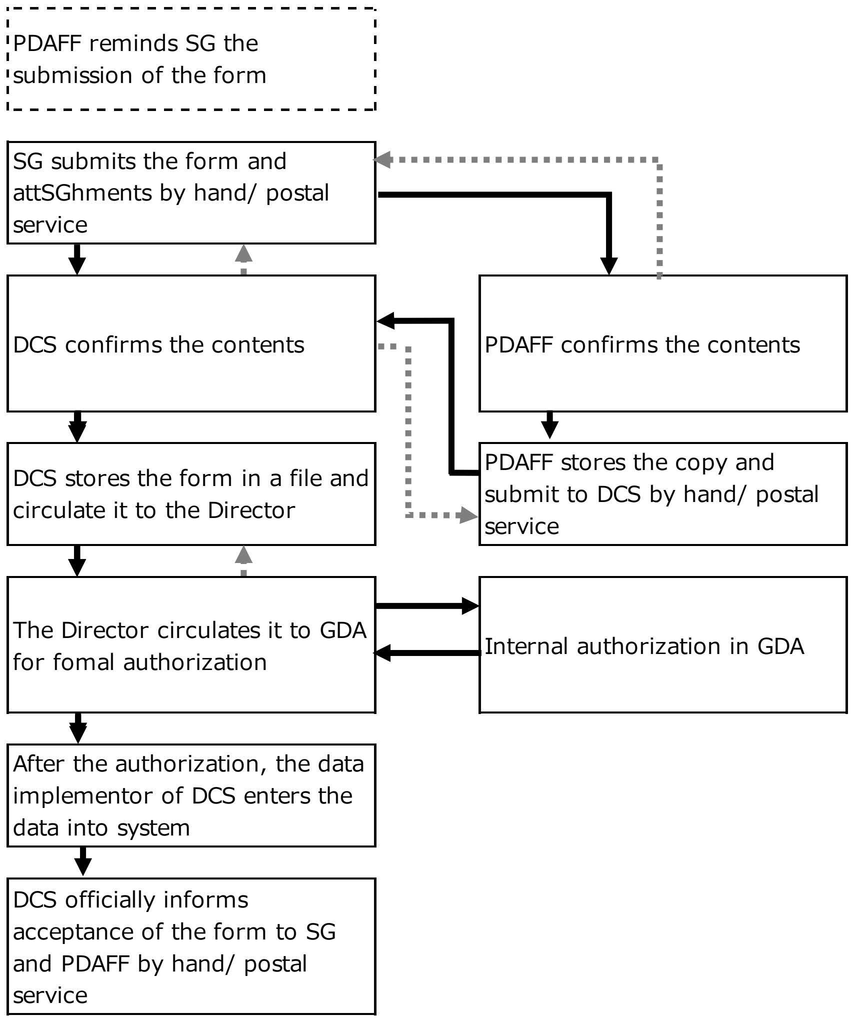
■Declaration A From (20 days before sawing)



■Field inspections (before flowering/ before harvest)

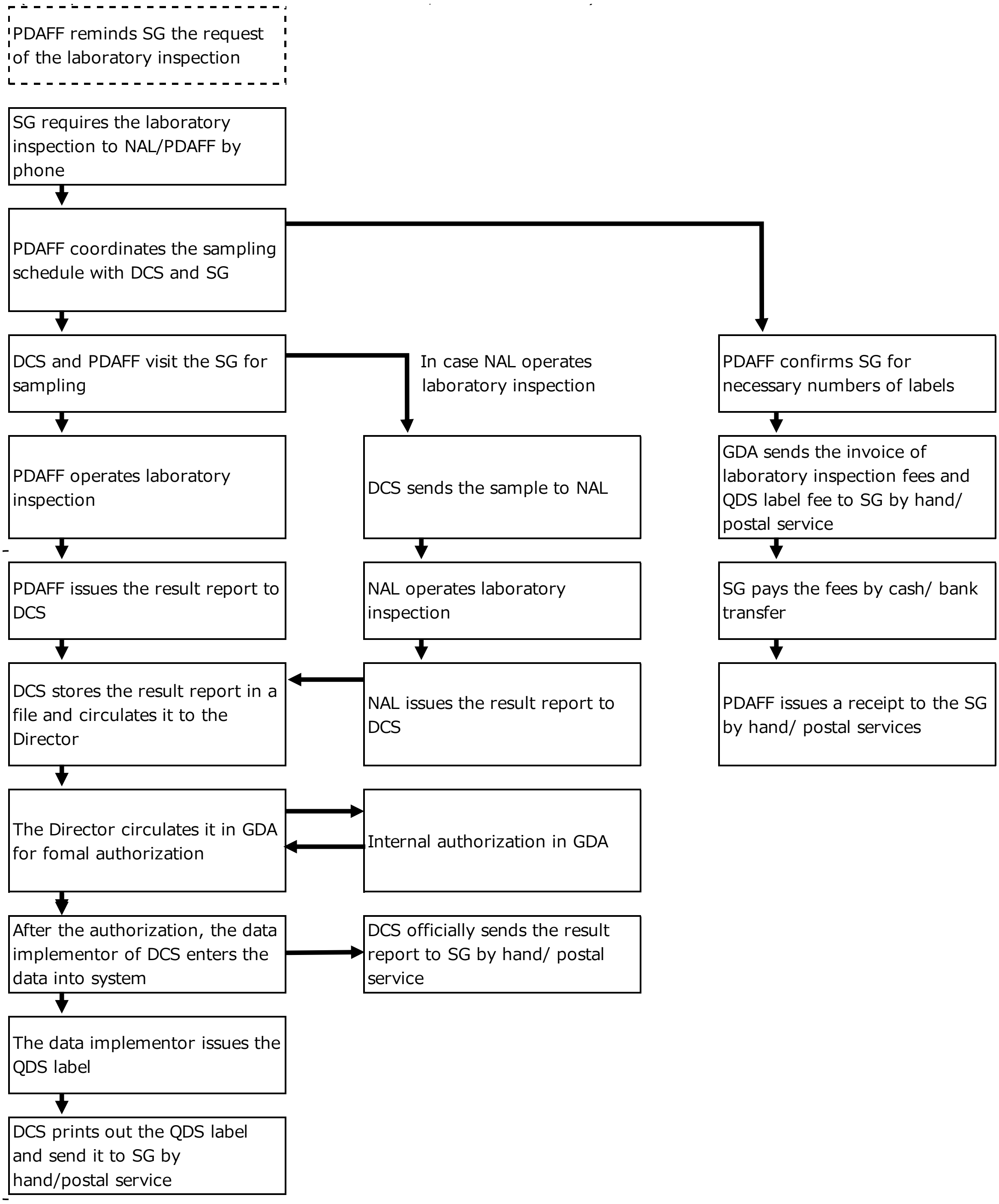


Declaration B Form (after processing and bagging)



Laboratory inspection and issuance of QDS label

(both processes need to be done within, in total two week)



3. Price chart related to the QDS seed production

Regulation	Fee/ Validity	Necessary days for issuance
1.1 Certification fee of seed production (production and processing)	500,000 riels Validity: 3years	30days
1.2 Certification fee of seed distribution (only for seed companies, not necessary for ACs)	100,000 riels Validity: 3years	30days
1.3 Quality test fee (For applicant of 1.2 who sells imported seeds, needs to submit the quality test result)	Moisture contents: 20,000riels /a sample Purity: 20,000riels/ a sample Germination: 80,000riels / a sample (paid to NAL) Validity: 1years (if QDS seed follow the QDS regulations)	Moisture takes 1day, purity takes 3days and germination takes 14days
2.1 Training of QDS procedure and QDS seed production (2 days) for application of 1.1 (and partially for 1.2)	400,000 riels (lamp sum) per a person -it includes 3 trainers (at least, 1 from DCS and 1 from DRC, assistance), DSA and transportation for trainers, refreshment, a certification etc -No validity set	
2.2 Field inspection fees	-DSA 60,000 riels/person for total of 3 personnel (1 from DCS and 2 from PDAFF) and -Transportation fee depending on distance (800riel/ km from PDAFF)	
2.3 Laboratory inspection fees/ Sampling fee	-DSA 60,000 riels/person for total of 3 personnel (1 from DCS and 2 from PDAFF) and -Transportation fee depending on distance -Inspection fees follow 1.3	
2.4 Printing fee for the QDS label with QR code	Actual cost (in average 500 riels/bag) including printing and transportation cost -40kg/20kg the price would be the same and the AC can decide the size of bag.	After receipt of the results from NAL, 5days or 1 week

Appendix 6

Technical cooperation material:

Baseline Survey Report [English]

THE PROJECT
FOR
RICE SEED PRODUCTION AND PROMOTION IN THE KINGDOM OF CAMBODIA

THE REPORT ON THE BASELINE SURVEY IN THE TARGET PROVINCES

October 2018

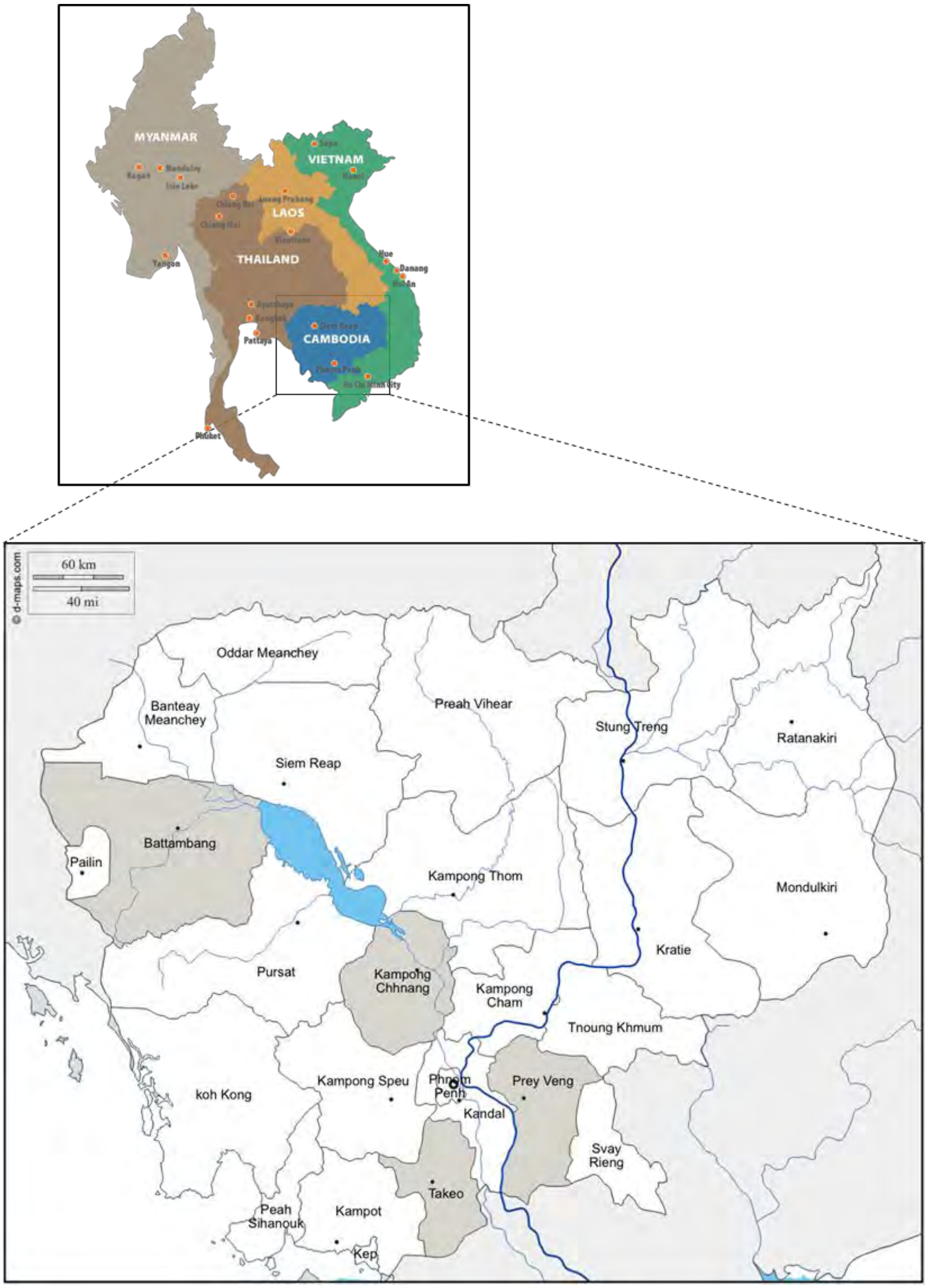
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Task., Ltd.

Kaihatsu Management Consulting, Inc.

Abbreviation/Acronym

AC	Agricultural Cooperative
APPP	Agricultural Productivity Promotion Project in West Tonle Sap
AQIP	Agriculture Quality Improvement Project
BFPPP	Boosting Food Production Project
CARDI	Cambodian Agricultural Research and Development Institute
C/P	Counterpart
CS	Certified Seed
DCS	Department of Crop Seed (under authorization)
DAO	District Agricultural Office
EFAP	Emergency Food Assistance Project
FAEC	Farmer Associations Promoting Family Agricultural Enterprise in Cambodia
FS	Foundation Seed
GDA	General Directorate of Agriculture
HEKS	*Hilfswerk der Evangelischen Kirchen Schweiz*
IFAD	International Fund for Agricultural Development
IRRI	International Rice Research Institute
JCC	Joint Coordination Committee
KHR	Khmer Riel
LAREC	Local Agricultural Research and Extension Centre
MAFF	Ministry of Agriculture, Forestry and Fisheries
NGO	Non-governmental Organization
PDAFF	Provincial Department of Agriculture, Forestry and Fisheries
PPG	Paddy Producer Group
R/D	Record of Discussions
RS	Registered Seed
RIAPIP	Rural Irrigation Agriculture Productivity Improvement Project
RSPP	The Project for Rice Seed Production and Promotion
SOFDEC	Society for Development in Cambodia
SPG	Seed Producer Group
WCS	Wildlife Conservation Service



Target Provinces

Contents

Chapter 1 Introduction

1.1 Background

The report on the baseline survey of rice seed and paddy in the target provinces was prepared under the JICA supported project, "The Project for Rice Seed Production and Promotion" (hereinafter, RSPP or The Project). RSPP was a technical cooperation, aiming at establishing the functional system of rice seed production and extension in the target provinces (Battambang, Kampong Chhnang, Prey Veng, and Takeo). Toward the goal, the Project organized a baseline survey team (hereinafter, RSPP survey team) in order to:

1) Capture the current status of seed production in the target provinces,

2) Capture the current status of the quality of rice seed and paddy in the target provinces,

3) Capture the current status of the value chain and marketing of rice seed and paddy in the target provinces,

4) Select the recommended rice varieties in the target provinces, and finally,

5) Propose the implementation structure of the RSPP's activity in the target provinces.

1.2 Methodology

The baseline survey consists of three approaches: (1) survey of agricultural cooperatives in the target provinces, (2) laboratory quality test of rice seed and paddy, (3) survey of the value chains of rice seed and paddy. All the surveys were conducted in January and May 2018, by the RSPP survey team. Table 1.1 summarizes the methods, targets and objectives of each survey.

Table 1.1 Summary of Baseline Surveys in the Target Provinces

		Methods	Targets	Objectives
(1)	Survey of agricultural cooperatives in the target provinces	Structured and semi-structured interview	40 ACs and one NGO	Capture the current status of seed production in the target provinces
(2)	Laboratory quality test of rice seed and paddy	Laboratory test in seven components for paddy and eight components for seed	Three samples of rice seed and three samples of paddy in the target provinces	Capture the current status of the quality of rice seed and paddy in the target provinces
(3)	Survey of the value chain of rice seed and contract farming	Structured and semi-structured interview	Stakeholders in the target provinces	Capture the current status of the value chain and marketing of rice seed and rice in the target provinces

Based on the results of the above three surveys, the RSPP survey team consider the recommended rice varieties in the target provinces (Chapter 5) and proposes the implementation structure of the RSPP's activity from 2018 to 2022 in the target provinces (Chapter 6).

Chapter 2 Present Condition of Rice Seed Production in the Target Provinces

2.1 Overview of the Four Target Provinces

2.1.1 Agricultural Cooperatives and Seed Producers Groups

Currently, there are 60 Seed Producers Groups (SPGs) under 40 Agricultural Cooperatives (ACs) in the target provinces, namely, Battambang, Kampong Chhnang, Prey Veng, and Takeo. The Prey Veng Province has the largest number of SPGs and members, followed by the Battambang Province. Notably, however, most ACs did not register, nor manage, all SPGs and seed producers. For this reason, the number of SPGs, and members of SPGs listed in Table 2.1 does not capture all seed producers in each province. For instance, in the Kampong Chhnang Province, 113 individual farmers engage in rice seed production while only one SPG is listed.

Table 2.1 Number of ACs, SPG, and Seed Producers in the Target Provinces

Province	Number of ACs	Number of SPGs	Number of Seed Producers
Battambang	14	16	207
Kampong Chhnang	5*	1	113
Prey Veng	14	24	252
Takeo	8	19	131
Total	**41**	**60**	**703**

Note: One NGO is included.
Source: RSPP survey team

2.1.2 Rice Seed Variety and Production

Phka Rumduol and Sen Kra Oub were the two most produced varieties in the target provinces in 2017. 38 ACs produced Phka Rumduol, but only in the rainy season since it is a photoperiod sensitive variety. This variety is one of the governmentally recommended, premium aromatic rice (see Chapter 5 for the detail).

On the contrary, Sen Kra Oub, literally "fragrant rice" was cultivated both in the dry and rainy seasons of the year, since the variety can be cultivated in any general, irrigated area and harvested throughout the year.[1] Sen Kra Oub with a smooth aroma resembles jasmine fragrant rice, and has high market demand all over the country.

Table 2.2 Major Seed Varieties in the Target Provinces in 2017 (Number of ACs)

	Dry Season					Rainy Season					Total
	Battamb -ang	Kampong Chhnang	Prey Veng	Takeo	**Sub Total**	Battamb -ang	Kampong Chhnang	Prey Veng	Takeo	**Sub Total**	
Phka Rumduol	0	0	0	0	**0**	13	4	14	7	**38**	**38**
Sen Kra Oub	1	2	2	0	**5**	7	0	1	2	**10**	**15**
CAR15	0	0	1	0	**1**	1	0	0	0	**1**	**2**
Sbai Mongkul	0	0	1	0	**1**	0	0	0	1	**1**	**2**
IR504	0	1	0	0	**1**	0	0	0	0	**0**	**1**
IR66	0	0	1	0	**1**	0	0	0	0	**0**	**1**
Phka Kravann	0	0	0	0	**0**	0	1	0	0	**1**	**1**
Phka Romeat	0	0	0	0	**0**	0	1	0	0	**1**	**1**

Source: RSPP survey team

[1] http://mekongoryza.com/en/article/products/long-grain-rice/fragrant-sen-kra-oub.html

Table 2.3 Planted Area of Major Seed Varieties in the Target Provinces in 2017 (ha)

	Dry Season					Rainy Season					Total
	Battam-bang	Kampong Chhnang	Prey Veng	Takeo	**Sub Total**	Battam-bang	Kampong Chhnang	Prey Veng	Takeo	**Sub Total**	
Phka Rumduol	15.0	0.0	0.0	0.0	**15.0**	106.0	34.1	174.0	45.3	**359.4**	**374.4**
Sen Kra Oub	0.0	116.4	24.0	0.0	**140.4**	105.5	0.0	16.0	33.0	**154.5**	**294.9**
CAR15	0.0	0.0	59.0	0.0	**59.0**	0.0	0.0	0.3	0.0	**0.3**	**59.3**
Sbai Mongkul	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.4	**0.4**	**0.4**
IR504	0.0	21.8	0.0	0.0	**21.8**	0.0	0.0	0.0	0.0	**0.0**	**21.8**
IR66	0.0	0.0	59.0	0.0	**59.0**	0.0	0.0	0.0	0.0	**0.0**	**59.0**
Phka Kravann	0.0	0.0	0.0	0.0	**0.0**	0.0	69.0	0.0	0.0	**69.0**	**69.0**
Phka Romeat	0.0	0.0	0.0	0.0	**0.0**	0.0	1.1	0.0	0.0	**1.1**	**1.1**
Total	**15.0**	**138.2**	**142.0**	**0.0**	**295.2**	**211.5**	**104.2**	**190.3**	**78.7**	**584.7**	**879.9**

Note: The above data is rounded off to one decimal place
Source: RSPP survey team

Table 2.4 Production of Major Seed Varieties in the Target Provinces in 2017 (Mt)

	Dry Season					**Rainy Season**					**Total**
	Battambang	Kampong Chhnang	Prey Veng	Takeo	**Sub Total**	Battambang	Kampong Chhnang	Prey Veng	Takeo	**Sub Total**	
Phka Rumduol	0	0	0	0	**0**	279.1	65.3	316.7	132.7	**793.8**	**793.8**
Sen Kra Oub	45.0	191.6	60.0	0	**296.6**	368.3	0	44.5	76	**488.8**	**785.4**
CAR15	0	0	236.0	0	**236.0**	1.0	0	0	0	**1.0**	**237.0**
Sbai Mongkul	0	0	N/D	0	**0**	0	0	0	N/D	**0**	**0**
IR504	0	35.6	0	0	**35.6**	0	0	0	0	**0**	**35.6**
IR66	0	0	236.0	0	**236.0**	20.0	0	0	0	**20**	**256.0**
Phka Kravann	0	0	0	0	**0**	0	240	0	0	**240**	**240.0**
Phka Romeat	0	0	0	0	**0**	0	4.8	0	0	**4.8**	**4.8**
Total	**45**	**227.2**	**532.0**	**0**	**804.2**	**668.4**	**310.1**	**361.2**	**208.7**	**1548.4**	**2352.6**

Note: The data are rounded off to one decimal place
Source: RSPP survey team

2.1.3 Labor Cost in Sowing, Harvesting and Post-Harvesting

Transplanting, more specifically row planting, is in principle, recommended for rice seed production in order to optimize the amount of seeds, and to rationalize weed, pest and fertilizer management. In the four provinces, 32 ACs employed transplanting by hand while 10 ACs practiced direct sowing and only two used a drum seeder. Notably, however, transplanting by hand does not mean row planting. According to the APPP's report, random planting is more widely practiced and uses approximately 100 kg/ha of seeds, against 40 kg/ha for the APPP's recommendation[2].

In terms of labor cost, transplanting by hand, regardless of whether planting by row or randomly, required the highest expense per hectare, approximately 19.1 times higher than direct sowing, and 2.9 times higher than if using a drum seeder. As such, transplanting by hand required not only higher labor costs, but a higher seed ratio, and even a physically heavy workload. In the case of random planting, it does not rationalize the farm management despite the higher labor and seed cost. It is necessary to employ an alternative sowing method that is cost-effective and enables the rationalization of weed, pest and fertilizer control.

[2] The final report of APPP (2016)

In the drying of produce, most ACs conducted solar drying while only three used a flatbed dryer. As Table 2.7 shows, the higher labor cost of using a flatbed hinders its dissemination.

Table 2.5 Sowing Practices and Labor Cost in the Target Provinces (plural answers)

	Number of AC					Labor Cost (KHR per ha)				
	Battam -bang	Kampong Chhnang	Prey Veng	Takeo	**Total**	Battam-bang	Kampong Chhnang	Prey Veng	Takeo	**Average**
Direct Seedling	2	2	3	3	**10**	32,500	22,500	36,667	33,333	**31,250**
Transplanting by Hand	10	4	12	6	**32**	773,250	306,875	636,250	666,667	**595,760**
Drum Seeder	0	0	2	2	**4**	N/A	N/A	115,000	300,000	**207,500**
Transplanting Machine	0	0	0	0	**0**	N/A	N/A	N/A	N/A	**N/A**

Note: The data is rounded to be integers
Source: RSPP survey team

In harvesting, a combine harvester has been widespread in the country[3], although manual harvesting is still observed. In the target provinces, 27 ACs utilized a combine harvester, while 20 ACs harvested seed paddy by hand. The cost of using a combine harvester is approximately 1.96 times cheaper than manual harvesting per hectare. It is assumed that the current lack of agricultural labor in the country and the cost effectiveness of a combine harvester will lead to combine harvesters being the main method in the near future.

Table 2.6 Harvesting Practices and Labor Cost in the Target Provinces (KHR /ha)

	Number of AC					Labor Cost				
	Battam bang	Kampong Chhnang	Prey Veng	Takeo	**Total**	Battam-bang	Kampong Chhnang	Prey Veng	Takeo	**Average**
Harvesting by Hand	1	4	9	6	**20**	900,000	490,000	849,794	551,111	**697,726**
Combine Harvester	13	2	8	4	**27**	361,923	312,500	302,222	450,000	**356,661**

Note: The data is rounded to be integers
Source: RSPP survey team

Table 2.7 Drying Practices and Labor Cost in the Target Provinces (KHR /ha)

	Number of AC					Labor Cost				
	Battam-bang	Kampong Chhnang	Prey Veng	Takeo	**Total**	Battam-bang	Kampong Chhnang	Prey Veng	Takeo	**Average**
Solar	14	5	11	8	**38**	50,727	85,000	44,167	30,000	**52,474**
Dryer	0	0	3	0	**3**	N/A	N/A	76,667	N/A	**76,667**

Note: The data is rounded to be integers
Source: RSPP survey team

2.1.4 Inspection

It is notable that there is no standardized certification system, based on appropriate inspection procedures.

In the field inspection, the major inspectors are the AC committee and PDAFF. The AC committee employed an internal inspection system. In the system, typically, the AC board nominates its members who received the training of the inspection provided by NGO or others. Notably, the guidelines or

[3] Combine harvesters are mainly used through mechanization service by large scaled farmers or service providers (Saruth Chan, 2014, Agricultural Mechanization in Cambodia). In 2014, combine harvesters covers 70 % with a growth rate of 384% between 2010 and 2013 ESCAP, 2014, Status and Prospectus of Agricultural Mechanization in Cambodia).

manuals provided by such trainings are not standardized. For instance, the "procedures of seed certification" in the National Seed Strategy for Cambodia[4], instructed that at least 2-3 times, field inspection shall be conducted in the following manner:

(1) The first inspection shall be made before flowering in order to determine isolation, presence of volunteer plants, outcrosses, planting ratio, errors in planting and other relevant factors
(2) The second shall be made during flowering to check isolation, off-types, pollen shedders in female parent and other relevant factors
(3) The third inspection shall be made at or prior to maturity, to verify the true nature of the plant and other relevant factors

Nevertheless, the field inspection by the AC committee concentrated on the reproductive phase (during flowering), while that by PDAFF focused more on the growth phase (before flowering).

In the laboratory quality inspection, only a limited number of ACs received the test. PDAFF plays a main role on the test, but the absolute number of the test practice is still by far below the expected amount.

Table 2.8 Field Inspection in the Target Provinces (Number of ACs)

Inspectors/Timing	Growth Phase (before flowering)	Reproductive Phase (during flowering)	Ripening Phase (maturity)	ACs which received more than 2 phases of inspection
AC Committee	4	27	0	**4**
PDAFF	17	7	1	**8**
BFPP	5	0	3	**3**
GDA	0	0	1	**0**
Others	1	2	2	**2**
Total	**27**	**36**	**7**	**17**

Source: RSPP survey team

Table 2.9 Laboratory Inspection in the Target Provinces (Number of ACs)

Inspectors	Purity	Inert Matters	Weed Seed	Other Crop Seed	Other Rice Variety Seed	Germina-tion	Moisture Content
PDAFF	4	3	0	1	0	3	4
GDA	1	1	0	1	0	0	1
BFPP	1	1	0	0	0	1	1
AC Committee	1	1	0	1	0	0	1
Total	**7**	**6**	**0**	**3**	**0**	**4**	**7**

Source: RSPP survey team

2.1.5 Capacity for Expansion of Seed Production

Table 2.10 summarizes the (1) infrastructural capacity to expand seed production and, (2) organizational capacity and willingness to expand seed production of all target ACs in the four provinces.

In the infrastructural capacity, the common challenge is the lack of post-harvest facilities. Only less than half of the total number of ACs have additional space capacity. This is mainly because of the widespread use of combine harvester in the country, which leads rice farmers to sell wet paddy directly from a combine harvester without postharvest process（See also 2.1.3）.

It is also observed that only less than half of the total ACs have the organizational capacity and willingness to expand seed production. Notably, those who showed the capacity and willingness have been supported by either governmental or donor's projects. Through the supports, they became not only familiar with seed production, but also aware with the market demand in high quality seeds. As such, they tend to expect more

[4] MAFF, GDA 2017 "National Seed Strategy for Cambodia (2017-2022)"(draft version).

profit through the expansion of seed production.

Table 2.10 Infrastructural Capacity to Expand Seed Production and Organizational Capacity and Willingness to Expand Seed Production (the number of ACs who answered yes/total ACs)

Provinces	The existence of irrigation	The existence of farmland	The existence of farmland	The existence of warehouse	Organizational capacity/willingness
Battambang	13/14	12/14	4/14	8/14	4/14
Kampong Chhnang	2/5	5/5	3/5	3/5	3/5
Prey Veng	9/14	13/14	4/14	3/14	5/14
Takeo	3/8	6/8	5/8	3/8	3/8
Total	**27/41**	**36/41**	**16/41**	**17/41**	**15/41**

Source: RSPP survey team

2.1.6 Key Facts of Rice Seed Production in the Target Provinces

	Key Facts
1	41 ACs and 60 SPGs (703 members) are identified in the four target provinces, while there exists a significant number of individual seed producers without forming an SGP.
2	Currently, Phka Rumduol and Sen Kra Oub are dominantly produced due to high market demand.
3	In sowing practice, transplanting by hand requires above 19 times higher labor cost than direct sowing (broadcasting). Considering a shortage of agricultural labor, and higher labor wage, it is urgent to consider another cost-effective sowing technology which enables to control the required level of farming management.
4	There is no standardized certification system with the proper procedures of field and laboratory inspection. Field inspection is conducted mainly by PDAFF and the AC committee (internal inspection system) without the standardized methods and procedures. On the other hand, only a limited number of ACs received the laboratory quality test.
5	Most ACs do not have sufficient capacity postharvest facilities such as drying yard, which can hinder the smooth expansion of seed production.

2.2 Battambang Province

Battambang is a province of Cambodia located in the far northwest. Bordering provinces are Banteay Meanchey to the north, Pursat to the east and south, Siem Reap to the northeast, and Pailin to the west. Battambang area covers 11,702km² with a population of 1.037 million. The rice-cultivated area is about 287,200ha including 270,700ha of wet season rice and 16,500ha of dry season rice.

2.2.1 Agricultural Cooperatives and Seed Production Groups

The RSPP survey team identified only 16 SPGs under 14 ACs in the Battambang Province that currently produce rice seed, although 21 ACs were listed prior to the survey. The AQIP's withdrawing of seed business discouraged the producers in the province to provide rice seed (for the detail, See Chapter 4).

Table 2.11 Number of SPGs

Name of AC	Total Members of AC (Female)	Number of SPGs	Member of SGPs
Phnom Krapeu	470 (268)	1	20
Teuk Chet Kasekar Kea Mean Chey	312 (142)	1	12
Chamreoun Phal Reang Kesei	288 (138)	1	4
Sangha Phal	215 (85)	1	31
Khum Kampong Preang	201 (75)	1	30
Kanteu1 Pheakdey Reasmey Chulsa	184 (87)	1	17
Morodok Bansay Treng	154 (101)	1	7
Kamping Puoy Bangkoeun Phal	123 (62)	1	10
Chrey Samaki Bangkoeun Phal	112 (68)	1	40

Chraneang Cheng Peas Chamroeun Phal	104 (71)	1	4
Reaksmey O'Daun Pov Chamroeun Phal	86 (52)	2	9
Samaki Mean Chey	60 (20)	2	8
Prek Chik	45 (22)	1	12
Beung Pring	42 (14)	1	3
Total	**2396 (1205)**	**16**	**207**

Source: RSPP survey team

Table 2.12 Agricultural Facility, Machinery and Equipment Owned by ACs

Name of AC	Land (m^2)	Flatbed Dryer	Drying Yard (m^2)	Warehouse (m^2)	Tractor	Others
Phnom Krapeu	20,000	10 Mt/time	225	112	N	Power tiller, water pump, weighing scales, stitching machine, moisture meter
Teuk Chet Kasekar Kea Mean Chey	1,200	N	N	N	N	Power tiller, water pump, stitching machine
Chamroeun Phal Reang Kesei	1,500	N	N	54	N	Water pump, stitching machine, moisture meter
Sangha Phal	5,000	N	350	200	N	Power tiller, water pump, thresher, winnower, weighing scales, stitching machine, moisture meter
Khum Kampong Preang	5,000	N	375	60	55 hp	Power tiller, water pump, winnower, weighing scales, stitching machine, pallet, moisture meter
Kanteu1 Pheakdey Reasmey Chulsa	4,500	N	375	112	N	Power tiller, water pump, winnower, weighing scales, stitching machine, pallet, trolley, moisture meter
Morodok Bansay Treng	0	105 m^2	N	60	N	Power tiller
Kamping Puoy Bangkoeun Phal	3,100	N	96	96	N	Water pump, thresher, winnower, weighing scales, stitching machine, pallet, moisture meter
Chrey Samaki Bangkoeun Phal	0	10 Mt/time	N	96	N	Power tiller, thresher, winnower, weighing scales, stitching machine, moisture meter
Chraneang Cheng Peas Chamroeun Phal	150	N	N	N	N	Water pump, stitching machine,
Reaksmey O'Daun Pov Chamreoun Phal	0	N	N	N	N	Power tiller, water pump
Samaki Mean Chey	0	N	N	N	N	Power tiller
Prek Chik	0	N	N	N	N	Power tiller
Beung Pring	0	N	N	N	N	Power tiller

Source: RSPP survey team

2.2.2 Rice Seed Varieties and Production

While Phka Rumduol is applied by the largest number of farmers in the province, Sen Kra Oub is widely produced in terms of the actual planted area and production. All informants indicated that its higher demand and market price are the main reasons to choose these varieties.

Table 2.13 Major Seed Varieties and the Number of SPGs Cultivated in 2016 and 2017

Variety	2016		2017	
	Dry	Rainy	Dry	Rainy
Sen Kra Oub	2	1	1	7
Phka Rumduol	0	7	0	13
CAR15	0	0	0	1
Total	2	8	1	21

Source: RSPP survey team

Table 2.14 Production of Major Seed Varieties in 2017

Variety	Dry			Rainy		
	Number of Producers	Planted Area (ha)	Production (Mt)	Number of Producers	Planted Area (ha)	Production (Mt)
Sen Kra Oub	15	15	45.0	76	106	368.3
Phka Rumduol	0	0	0	139	105.5	279.1
CAR15	0	0	0	1	0.3	1
Total	15	15	45	216	211.8	648.4

Source: RSPP survey team

2.2.3 Labor Cost in Sowing, Harvesting and Post-Harvesting

In the Battambang Province, most ACs practiced transplanting by hand despite its higher cost (approximately 23.8 times higher expense than direct sowing) and only two ACs applied direct sowing. In harvesting, 13 ACs used a combine harvester which is around 2.5 times a lower labor cost than manual harvesting. All ACs dry-harvested seed paddy by solar and its average expense is 50,727.3 per Mt.

Table 2.15 Comparison of Labor Costs of Seedling/Transplanting

	Number of ACs (plural answers)	Number of Labor (persons/ha)	Wage (KHR/person/day)	Duration per ha	Total Labor Cost per ha (KHR/ha)
Transplanting by Hand	10	N/A	N/A	N/A	773,250
Direct Sowing	2	1	32,500	1	32,500

Source: RSPP survey team

Table 2.16 Comparison of Labor Costs of Harvesting

	Number of ACs (plural answers)	Number of Labor (persons/ha)	Wage (KHR/person/day)	Duration per ha	Labor Cost (KHR/ ha)
Combine Harvester	13	N/A	N/A	N/A	361,923.1
Harvesting by Hand	1	45	20,000	1	900,000.0

Source: RSPP survey team

Table 2.17 Comparison of Labor Costs of Drying

	Number of ACs (plural answers)	Expense (KHR/Mt)
By Solar	14	50,727.3
By Dryer	0	N/A

Source: RSPP survey team

2.2.4 Inspection

In the Battambang Province, the field inspection is relatively well practiced. The main inspectors, PDAFF and the AC committee (internal inspection system) conducted the field inspection, in particular at the growth and reproductive phase. On the contrary, the laboratory inspection has not been practiced sufficiently. PDAFF and BFPP conducted a laboratory inspection for only one.

Table 2.18 Field Inspection and Its Timing

Inspectors/Timing	Growth Phase	Reproductive Phase	Ripening Phase	Total
PDAFF	4	5	1	10
AC Committee	4	8	0	12
BFPP	4	0	2	6
GDA	0	0	1	1
RIARIP	0	0	1	1

Source: RSPP survey team

Table 2.19 Laboratory Inspection

Inspectors	Purity	Inert matters	Weed seed	Other Crop Seed	Other Rice Variety Seed	Germination	Moisture content
PDAFF	1	1	0	0	0	1	1
BFPP	1	1	0	0	0	1	1

Source: RSPP survey team

2.2.5 Capacity for Expansion of Seed Production

Table 2.20 shows the infrastructure capacity of the ACs in the province to extend seed production. Most of the ACs, except one, are equipped with irrigation. 12 ACs showed their availability of farmland, while the areas have large ranges, from 5 to 150 ha. For post-harvest facilities, on the other hand, only four ACs have a certain size of land, 00.1 to 0.16 ha, and eight have extra space in a warehouse for seed storage.

Table 2.20 Infrastructural Capacity to Expand Seed Production

Name of AC	Irrigation	Farmland (ha)	Land for Drying Yard (ha)	Warehouse (Mt)	Warehouse (m^2)
Khum Kampong Preang	Y	150	0.01	500	200
Sangha Phal	Y	100	0	300	500
Chrey Samaki Bangkoeun Phal	Y	60	0	200	200
Prek Chik	Y	50	0	0	0
Kanteu1 Pheakdey Reasmey Chulsa	Y	50	0.15	200	200
Phnom Krapeu	Y	38	0	200	200
Teuk Chet Kasekar Kea Mean Chey	Y	30	0	0	0
Morodok Bansay Treng	Y	30	0	0	0
Samaki Mean Chey	Y	30	0.16	50	200
Kamping Puoy Bangkeoun Phal	Y	20	0	500	300
Chamroeun Phal Reang Kesei	Y	10	0.02	100	150
Reaksmey O'Daun Pov Chamroeun Phal	Y	5	0	0	0
Chraneang Cheng Peas Chamroeun Phal	Y	0	0	0	0
Beung Pring	N	0	0	0	0

Source: RSPP survey team

Table 2.21 selected ACs which showed strong organizational capacity and willingness to expand seed production. Out of the 14 ACs in the Battambang Province, four ACs showed both strong organizational capacity and a willingness to increase seed production.

Table 2.21 Organizational Capacity and Willingness to Expand Seed Production

Name of AC	Organizational Capacity	Willingness
Chamroeun Phal Reang Kesei	・ Bookkeeping is well-managed ・ AC committee actively engaged in management ・ AC has its own organizational structure by law and internal regulations	・ With good knowledge in paddy and seed production, the AC is willing to expand rice seed production
Chrey Samaki Bangkoeun Phal	・ Recording of transactions and income/expense is well-managed ・ AC has regular internal meetings ・ Active leadership is observed	・ With high skill levels in seed production, trained by JICA, they are willing to expand seed production
Kamping Puoy Bangkoeun Phal	・ Bookkeeping is well-managed ・ AC committee actively engaged in management ・ AC has its own organizational structure by law and internal regulations	・ With good knowledge in seed production, trained by JICA, the AC are willing to expand rice seed production up to 20ha at an initial stage
Sangha Phal	・ Bookkeeping is well-managed ・ Strong and active leadership is observed ・ Committee members are active and responsible for the management	・ With good experience in seed production supported by JICA and BFPP, they are willing to expand seed production up to 100 ha ・ The AC also plans to enlarge their warehouse up to 500 square meters

Source: RSPP survey team

2.3 Kampong Chhnang Province

Kampong Chhnang is one of the central provinces of Cambodia. Neighbouring provinces are Kampong Thom, Kampong Cham, Kandal, Kampong Speu and Pursat. Kampong Chhnang area covers 5,521km² with population of 472,616 (2011). The rice planted area is around 152,000 ha, including wet season of 121,800ha and dry season of 30,700ha.

2.3.1 Agricultural Cooperatives and Seed Production Groups

The Kampong Chhnang Province has only a limited number of seed producer groups; four SPGs in four ACs and one local NGO. All of them have recently started rice seed production and their experience in production, processing and marketing is limited, compared to the other three provinces.

Among them, Kasekam Chey Chumneas AC, for instance, has the largest number of seed producers (48 members). In 2017, Kasekam Chey Chumneas had a contract for seed with a French-Cambodian rice milling company, Golden Rice Cambodia Co., Ltd (hereinafter, Golden Rice). The AC is contracted to produce rice seed of *Phka Kravann,* on 69 hectare farm land.

Anhjanhroung Samey Thmey AC has the second largest number of seed producers, 43 members from 4 villages. The AC began to produce rice seed in the rainy season of 2017. The AC bought CS or RS from LAREC and produce and sell CS at the Boosting Food Production Project (BFPP)[5] at a subsidized price.

Local Agricultural Research and Extension Centre (LAREC), is one of the projects operated by a local NGO called Society for Development in Cambodia (SOFDEC). The LAREC focuses on the rice sector including seed production, processing and marketing. It's funded by HEKS, a Swiss-based Christian

[5] BFPP is a 3 year, 2016-2019, USD 20 million self-financed project supported by International Fund for Agricultural Development (IFAD). BFPP focuses on rice seed and increased vegetable production among other areas. MAFF and GDA are expected to take a leading role in implementation (IFAD, 2016, Cambodia Accelerating Inclusive Markets for Smallholders Final project design report).

foundation, and is well equipped with related facilities, including a flatbed dryer, drying yard, and warehouse.

Table 2.22 Number of Members of AC and SPGs

Name of AC	Total Members of AC (Female)	Number of SPGs	Member of SGPs
Kasekam Chey Chumneas	1,243 (799)	0	48
Kasekam Khunrorng Reak Reay	221 (196)	1	2
Anhjanhroung Samey Thmey	178 (140)	0	43
Phnom Tauch Samaki	70 (47)	0	20
LAREC (NGO)	12 (1)	N/A	N/A
Total	**1724 (1183)**	**1**	**113**

Source: RSPP survey team

Table 2.23 Agricultural Facility, Machinery and Equipment Owned by ACs

Name of AC	Land (m²)	Flatbed Dryer	Drying Yard	Warehouse (m²)	Tractor	Power Tiller	Others
Kasekam Chey Chumneas	4000	N	N	220.5	N	Y	Moisture meter
Kasekam Khunrorng Reak Reay	N	N	N	N	N	Y	N
Anhjanhroung Samey Thmey	1200	N	300	72	N	N	N
Phnom Tauch Samaki	N	72 m²	N	60	N	Y	Winnower, moisture meter
LAREC (NGO)		8Mt capacity	480 m²	128	N	Y	Water pump, thresher, winnower, weighing scales, stitching machine, pallets

Source: RSPP survey team

2.3.2 Rice Seed Varieties and Production

In 2016 and 2017, the three ACs and one NGO produced two varieties of seed, Phka Rumduol and IR 504 in the dry season, and three, Phka Rumduol, Phka Romeat and Phka Kravann in the rainy season. Marketability, higher selling price and demand are the main factors for selecting these varieties.

Table 2.24 Major Seed Varieties and the Number of SPGs Cultivated in 2016 and 2017

Variety	2016		2017	
	Dry	Rainy	Dry	Rainy
Phka Rumduol	0	2	0	4
Sen Kra Oub	1	0	2	0
IR504	1	0	1	0
Phka Romeat	0	0	0	1
Phka Kravann	0	0	0	1
Total	2	2	3	6

Source: RSPP survey team

Table 2.25 shows the production of the major seed varieties in 2017. The largest number of the producers cultivated Phka Rumduol, followed by Sen Kra Oub. In terms of production, on the other hand, Phka Kravann is the most, followed by Sen Kra Oub.

Table 2.25 Production of Major Seed Varieties in 2017

Variety	Dry Season			Rainy Season		
	Number of Producers	Planted Area (ha)	Production (Mt)	Number of Producers	Planted Area (ha)	Production (Mt)
Phka Rumduol	0	0	0	67.0	34.1	65.3
Sen Kra Oub	62.0	116.4	191.6	0	0	0
IR504	13.0	21.8	35.6	0	0	0
Phka Romeat	0	0	0	2.0	1.1	4.8
Phka Kravann	0	0	0	49.0	69.0	240.0
Total	75.0	138.2	227.2	118.0	104.2	310.1

Note: The data is rounded off to one decimal place
Source: RSPP survey team

2.3.3 Labor Cost in Sowing, Harvesting and Post-Harvesting

Most of seed producers in the province practice both direct sowing (broadcasting) and transplanting by hand (row planting). As Table 2.26 clarifies, the labor cost of transplanting by hand indicates to be approximately 13.64 times higher than that of direct sowing (broadcasting).

Table 2.26 Average Cost of Seeding/Transplanting

	Number of ACs/NGO	Number of Labor (person/ha)	Wage (KHR/person/day)	Duration per ha	Total Labor Cost per ha (KHR/ha)
Direct Seeding by Hand	2	1.5	45,000	0.75	22,500
Transplanting by Hand*	4	N/A	N/A	N/A	30,6875
Transplanting Machine	0	N/A	N/A	N/A	N/A

Source: RSPP survey team

In harvesting, two ACs use a combine harvester and four practiced manual harvesting. The gap in labor cost is approximately 1.5 times.

In drying, All ACs dry paddy seed by solar, with an average cost is 85,000 KHR/Mt[6].

Table 2.27 Average Cost of Harvesting

	Number of ACs/NGO	Number of Labor (Persons/ha)	Wage (KHR/person/day)	Duration per ha	Labor Cost (KHR /ha)
Harvesting by Hand	4	15.5	20,000	1.5	490,000
Combine Harvester	2	N/A	N/A	N/A	312,500

Note: The data of wage and labor costs are rounded off to be integers
Source: RSPP survey team

[6] LAREC has a flatbed dryer and operates it, but the RSPP survey team could not obtain a labor cost of the flatbed.

Table 2.28 Average Cost of Drying

	Number of SPGs/NGOs	Expense (KHR/Mt)
By Solar	5	85,000
By Dryer (fuel)	0	0
By Dryer (electricity)	0	0

Source: RSPP survey team

2.3.4 Inspection

In the Kampong Chhnang Province, the seed inspection is not yet to be well systematized both in the field and the laboratory.

Basically, the field inspection of seed needs to be conducted two or three times; at the growth phase, reproductive phase and ripening phase[7]. Nevertheless, no AC received more than one field inspection either at the growth phase by PDAFF or reproductive phase by AC committee or NGO.

In the case of laboratory inspection, only one AC received the inspection by PDAFF with the limited components; purity, inert matters, other crop seed, and moisture content.

Table 2.29 Field Inspection and Its Timing

Inspectors/Timing	Growth Phase	Reproductive Phase	Ripening Phase	Total
PDAFF	2	0	0	2
AC Committee	0	3	0	3
Private Company	0	0	0	0
NGO	0	1	0	1
Total	2	4	0	6

Source: RSPP survey team

Table 2.30 Laboratory Inspection

Inspectors	Purity	Inert matters	Weed seed	Other Crop Seed	Other Rice Variety Seed	Germination	Moisture Content
PDAFF	1	0	0	1	0	0	1
Total	1	0	0	1	0	0	1

Source: RSPP survey team

2.3.5 Capacity for Expansion of Seed Production

In the Kampong Chhnang Province, only a few ACs have infrastructural capacity large enough to expand rice seed production. For instance, only two ACs, Kasekam Chey Chumneas AC and Kasekam Khunrorng Reak Reay AC, have an irrigation system. In post-harvesting facilities, two ACs and one NGO are equipped with extra land for a drying yard and a warehouse.

7 A draft of "National Seed Strategy for Cambodia (2017-2022)"

Table 2.31 Infrastructural Current Capacity to Expand Seed Production

Name of AC	Irrigation System (Y/N)	Farmland (ha)	Land for Drying Yard (ha)	Warehouse (Mt)	Warehouse (m^2)
Anhjanhroung Samey Thmey	N	50	0	0	0
Kasekam Chey Chumneas	Y	100	0	0	0
Kasekam Khunrorng Reak Reay	Y	10	0.03	100	200
LAREC	N	150	1	500	336
Phnom Tauch Samaki	N	10	0.03	50	200

Source: RSPP survey team

In addition to the infrastructural capacity, the RSPP survey team identified two ACs and one NGO which have strong organizational capacity with the willingness to expand rice seed production. Anhjanhroung Samey Thmey AC is one of them and they are preparing to organize new SPGs. Moreover, Kasekam Chey Chumneas, the largest AC with 1243 numbers, is willing to expand rice seed production up to 400 hectares. LAREC, unlike the other ACs, functions as a marketer, trainer and even an inspector. Backed up by a Swiss-based foundation, the NGO has an outstanding capacity of financial management and marketing experience.

Table 2.32 Organizational Capacity and Willingness to Expand Seed Production

Name of AC	Organizational Capacity	Willingness
Anhjanhroung Samey Thmey	・ Bookkeeping is well-managed ・ AC committee actively and voluntarily engaged in management ・ AC holds regular internal meetings	・ With good knowledge in seed production trained by BFPP, the AC is willing to expand rice seed production up to 20 ha. ・ They are willing to form more SPGs as well as invest in rice seed business
Kasekam Chey Chumneas	・ Recording of income/expense is well-managed ・ AC has a large scale of capital	・ AC has contract farming of rice seed with Golden Rice and LAREC, and willing to expand the scale of the contract up to 400 ha.
LAREC	・ Supported by HEKS, a Swiss-based foundation, it has a secure budget and internal management system	・ The NGO plays a significant role in marketing to neighbouring ACs through contract farming

2.4 Prey Veng Province

Prey Veng is a province of Cambodia located in the southeast, bordering Svey Rieng and Vietnam to the east, Kampong Cham to the north and Kandal to the west. In 2008 it had a total population of 947,357 people. This densely populated agricultural region is located on the east bank of the Mekong. Prey Veng territory covers 4,883km² with a planted rice area of 325,000ha including 250,000ha of wet season rice and 75,000ha of dry season rice, standing as number one of rice planted area in the country.

2.4.1 Agricultural Cooperatives and Seed Production Groups

Currently, the Prey Veng Province has the largest number of SPGs; 24 SPGs out of 14 ACs among the target four provinces. In the Prey Veng province, BFPP, kicked off in 2016/2017, notably assisted those ACs to produce rice seed. Poloas Sen Chey AC, for instance, being the largest seed producers, contracted with BFPP to produce Phka Rumduol seed in 2017. They also contracted with GDA/EFAP in 2017 to produce IR66 (major) and CAR15 (minor) in 55ha by 41 contracted farmers, with the total supplied quantity of 200Mt as final product (processed seed).

Table 2.33 Number of AC and SPGs

Name of AC	Total Members of AC (Female)	Number of SPGs	Member of SGPs
Ponleu Kaksekar Khum Kampong Seung	992 (614)	3	24

Sambo Phal Russey Sanh	685 (518)	1	15
Kantrean	440 (304)	1	16
Chamros Loas Thmey Svay Teap	147 (111)	1	16
Kdey Sangkheum Beung Preah	141 (82)	1	15
Oudom Mongkul Anlong Sar	138 (95)	1	8
Tro Trung Kaksekar	112 (65)	1	8
Baphnom Mean Chey	108 (21)	2	31
Bopea Senchey	84 (17)	2	9
Poloas Sen Chey	71 (7)	5	71
Kdey Sangkheum	62 (27)	3	13
Kaksekar Akphiwat	50 (27)	1	8
Prech Samaki Mean Chey	44 (20)	1	10
Phum Yeoung	30 (10)	1	8
Total	**3104 (1918)**	**24**	**252**

Source: RSPP survey team

Table 2.34 Agricultural Facility, Machinery and Equipment Owned by ACs

Name of AC	Land (m^2)	Flatbed Dryer	Drying Yard (m^2)	Ware-house (m^2)	Tractor	Power Tiller	Others
Ponleu Kaksekar Khum Kampong Seung	N	N	N	N	N	N	Water pump
Sambo Phal Russey Sanh	705	105m^2	N	60	N	N	Water pump
Kantrean	N	N	N	N	N	N	Water pump
Chamros Loas Thmey Svay Teap	5,000	12 Mt	N	N	N	N	Water pump
Kdey Sangkheum Beung Preah	N	N	N	1,000	N	N	Water pump, weighing scales, stitching machine
Oudom Mongkul Anlong Sar	N	N	N	N	N	N	Water pump
Tro Trung Kaksekar	156	N	N	99	N	N	Water pump, stitching machine
Baphnom Mean Chey	1,080	N	540	288	N	N	Water pump, weighing scales, stitching machine, pallet
Bopea Senchey	2,450	N	380	112	N	N	Water pump, weighing scales, stitching machine, pallet
Poloas Sen Chey	N	N	N	N	N	N	Water pump
Kdey Sangkheum	27,000	N	N	N	N	N	
Kaksekar Akphiwat	N	N	N	N	N	N	Water pump, stitching machine
Prech Samaki Mean Chey	N	N	N	N	N	N	Water pump, weighing scales, stitching machine
Phum Yeoung	800	N	N	N	N	N	Water pump, weighing scales,

							stitching machine

"N" means the AC does not own the facility/equipment
Source: RSPP survey team

2.4.2 Rice Seed Varieties and Production

The ACs in the province produced five rice varieties in 2016 and 2017. While the most number of farmers produced IR66 in terms of actual planted areas, the actual production of Phka Rumduol was the most.

Table 2.35 Major Seed Varieties and the Number of SPGs Cultivated in 2016 and 2017

Variety	2016		2017	
	Dry	Rainy	Dry	Rainy
IR66	2	1	1	0
Sen Kra Oub	2	0	2	1
Chul'sa	0	1	0	0
Phka Rumdoul	0	9	0	14
CAR15	0	0	1	0

Source: RSPP survey team

Table 2.36 Production of Major Seed Varieties in 2017

Variety	Dry			Rainy		
	Number of Producers	Planted Area (ha)	Production (Mt)	Number of Producers	Planted Area (ha)	Production (Mt)
IR66	40	59	236	0	0	0
Sen Kra Oub	18	24	60	16	16	44.5
Chul'sa	0	0	0	0	0	0
Phka Rumdoul	0	0	0	21	174	316.7
CAR15	42	59	236	1	0.3	1

Source: RSPP survey team

2.4.3 Labor Cost in Sowing, Harvesting and Post-Harvesting

Table 2.37 computes the average labor cost in transplanting by hand, direct sowing, and using a drum seeder. 12 ACs in the province practice transplanting by hand despite of the high labor cost. Transplanting by hand required approximately 17.4 times higher labor cost than broadcasting and 5.5 times higher than using a drum seeder.

Manual harvesting and using a combine harvester are equally practiced in this province, although harvesting by hand is 2.8 times higher in terms of labor cost than using a combine harvester.

Most of the ACs utilize the solar drying method, as opposed to dryer, as it is considerably cheaper, more specifically, 32,500 KHR/Mt cheaper.

Table 2.37 Average Cost of Sowing/Transplanting

	Number of ACs (plural answers)	Number of Labor (person/ha)	Wage (KHR/person/day)	Duration (day/ha)	Total Labor Cost per ha (KHR/ha)
Transplanting by Hand	12	N/A	N/A	N/A	636,250.0
Direct Sowing	3	1	36666.7	1	36666.7
Drum Seeder	2	2	57,500.0	1	115,000.0

Source: RSPP survey team

Table 2.38 Average Cost of Harvesting

	Number of ACs (plural answers)	Number of Labor (persons/ha)	Wage (KHR/person/day)	Duration per ha	Labor Cost KHR/ha
Harvesting by Hand	9	27.7	19666.7	1.6	849,794.2
Combine Harvester	8	N/A	N/A	N/A	302,222.2

Source: RSPP survey team

Table 2.39 Average Cost of Drying

	Number of ACs (plural answers)	Expense (KHR/Mt)
Solar	11	44,166.7
Dryer	3	76,666.7

Source: RSPP survey team

2.4.4 Inspection

The ACs in the Prey Veng Province, received the field inspection relatively well. 12 ACs obtained the field inspection by AC committee (internal inspection system), at a reproductive phase. PDAFF conducted the inspection of the growth phase for eight ACs and that of the reproductive phase for two ACs. However, no AC received a complete package of the filed inspection.

Compared with the field inspection, the laboratory inspection was less practiced. One AC committee conducted 4 items of the laboratory inspection for only one AC, for instance, and BFPP and GDA also conducted the inspection at one AC.

Table 2.40 Field Inspection and its Timing

Inspectors/Timing	Growth Phase	Reproductive Phase	Ripening Phase	Total
AC Committee	0	12	0	12
PDAFF	8	2	0	10
BFPP	1	0	1	2
RIAPIP	0	0	1	1

Source: RSPP survey team

Table 2.41 Laboratory Inspection

Inspectors	Purity	Inert Matters	Weed Seed	Other Crop Seed	Other Rice Variety Seed	Germina-tion	Moisture Content
AC Committee	1	1	0	1	0	0	1
GDA	1	1	0	1	0	0	1
BFPP	1	1	0	0	0	1	1

Source: RSPP survey team

2.4.5 Capacity for Expansion of Seed Production

In the Prey Veng Province, nine ACs out of 14 have an irrigation system. In addition, 13 ACs possess surplus farmland for additional seed production. On the other hand, a limited number of ACs have post-harvest facilities including land for a drying yard and a warehouse.

Table 2.42 Infrastructural Capacity to Expand Seed Production

Name of AC	Irrigation (Y/N)	Farmland (ha)	Land for Drying Yard (ha)	Warehouse (Mt)	Warehouse (m^2)
Bopea Senchey	Y	73	0	0	0
Kdey Sangkheum	Y	50	0.4	0	0
Poloas Sen Chey	Y	40	0	0	0
Baphnom Mean Chey	Y	37	0	0	0
Chamros Loas Thmey Svay Teap	Y	25	0.1	100	200
Oudom Mongkul Anlong Sar	N	25	0	0	0
Tro Trung Kaksekar	N	10	0	0	0
Sambo Phal Russey Sanh	Y	10	0.04	80	800
Prech Samaki Mean Chey	N	10	0.3	100	300
Kdey Sangkheum Beung Preah	Y	4	0	0	0
Phum Yeoung	Y	4	0	0	0
Kaksekar Akphiwat	N	2	0	0	0
Ponleu Kaksekar Khum Kampong Seung	N	2	0	0	0
Kantrean	Y	0	0	0	0

"Y" means the AC has the facility/equipment while "N" does not.
Source: RSPP survey team

Table 2.43 extracts, out of the 14 ACs, those which have a certain level of organisational capacity with the willingness to expand seed production. In particular, Bopea Senchey AC shows outstanding organizational capacity and potential in the expansion of rice seed production. This AC has experience in contract farming with AQIP and is ready to utilize another 70ha for seed production. The other ACs listed in the following Table 2.43 Organizational Capacity and Willingness to Expand Seed Production have received technical trainings from various projects and have sufficient experience in seed production.

Table 2.43 Organizational Capacity and Willingness to Expand Seed Production

Name of AC	Organizational Capacity	Willingness
Baphnom Mean Chey	・ Balance sheet is well-managed ・ AC has a stock management system	・ With good knowledge in seed production trained by BFPP, PDAFF, GDA and RIAPIP, the AC is willing to expand rice seed production
Bopea Senchey	・ Recording of income/expense is well-managed ・ Strong leadership exists ・ The committee members actively engage in the organizational management ・ AC has its own organizational management structure with internal regulation	・ With good experience in rice seed production through contract farming with AQIP, the AC is willing to expand rice seed production up to 70ha
Chamros Loas Thmey Svay Teap	・ Record keeping is well-managed ・ AC has its own organizational management structure with internal regulation	・ AC has received technical support from several projects of PDAFF, BFPP, RIAPIP, and plans to expand their rice seed production
Kdey Sangkheum Beoung Preah	・ The committee members are active and responsible ・ AC has its own financial policy	・ AC has received the training on rice seed production from PDAFF/RIAPIP and is now willing to expand to produce Phka Rumduol, Sen Kra Oub, IR504 OM5451
Sambo Phal Russey Sanh	・ AC uses accounting software system for financial management ・ The committee members and leader actively engage in organizational	・ AC has received technical support from several projects of PDAFF and RIAPIP, and now plans to expand the production up to 10 ha

	management with its own structure and rules	

Source: RSPP survey team

2.5 Takeo Province

Takeo is a province of Cambodia located in the southwest, and in the south of the Phnom Penh Municipality. Takeo borders Kampot to the west, Kampong Speu to the northwest and Kandal to the north and east. Its southern boundary is the international border with Vietnam. The province consists of the typical plain wet area, covering rice fields and other agricultural plantations. Takeo has a total land area of 3,563km² with a population of 843,931 (2008). The rice planted area is about 245,000ha including 170,000ha of wet season rice and 75,000ha of dry season rice, which ranks as number 4 after Kampong Thom Province.

2.5.1 Agricultural Cooperatives and Seed Production Groups

The RSPP survey team identified 19 SPGs in eight ACs in the Takeo Province. Among the eight ACs, O'Saray AC has the largest number of SPG members (37), followed by the 30 members of the Choeung Kuon Chauk Chey AC.

O'Saray AC started to produce rice seed through contract farming with the Bati Research and Development station of GDA in Takeo, under the Emergency Food Assistant Project in 2015. Then, since 2017, the AC have contracted, through PDAFF, with BFPP in 2017. The AC is well equipped with a flatbed dryer, drying yard, and warehouse.

Choeung Kuon Chauk Chey AC also started rice seed production supported by BFPP in 2017. The AC owns the 1,200 square meter land but it does not possess any other infrastructure such as a flatbed dryer or a drying yard.

On the other hand, Sdok Sdom AC purchased the FS from CARDI and has extended them to RS and CS since 2013, unlike O'Saray AC and Choeung Kuon Chauk Chey AC.

Table 2.44 Number of SPGs

Name of AC	Total Members of AC (Female)	Number of SPGs	Member of SGPs
Sdok Sdom	417 (245)	1	15
Baksey Reak Reay	204 (121)	1	16
Oudom Sorya	101 (48)	3	15
Samaki Sre Kvav	85 (44)	1	3
Choeung Kuon Chauk Chey	81 (50)	6	30
Champey	69 (38)	1	6
O'Saray	55 (11)	5	37
Tipath Punlok Thmey	43 (0)	1	9
Total	**1055 (557)**	**19**	**131**

Source: RSPP survey team

Table 2.45 Agricultural Facility, Machinery and Equipment Owned by ACs

Name of AC	Land (m^2)	Flatbed (m^2)	Drying Yard (m^2)	Ware-house (m^2)	Tractor	Power Tiller	Others
Sdok Sdom	8,200	50	N	600	N	N	Water pump, stitching machine, trolley
Baksey Reak Reay	1,495	N	N	1495	N	Y	Weighing scales

Oudom Sorya	0	N	N	136	N	N	Weighing scales, stitching machine, pallet, trolley, moisture meter
Samaki Sre Kvav	320	N	N	153.6	N	N	
Choeung Kuon Chauk Chey	1,200	N	N	N	N	N	Weighing scales, stitching machine
Champey	0	N	N	N	N	N	
O'Saray	0	Y	375	72	N	Y	Weighing scales, stitching machine, pallet, trolley
Tipath Punlok Thmey	0	N	N	80	N	N	Weighing scales, stitching machine, pallet, trolley, moisture meter

"Y" means the AC has the facility/equipment while "N" does not
Source: RSPP survey team

2.5.2 Rice Seed Varieties and Production

In 2016 and 2017, the ACs in the Takeo Province produce five rice seed varieties only in the rainy season. Phka Rumduol is the most widely produced variety both in terms of the planted area and production. Sen Kra Oub follows the Phka Rumduol.

Table 2.46 Major Seed Varieties and the Number of SPGs Cultivated in 2016 and 2017

Variety	2016		2017	
	Dry	Rainy	Dry	Rainy
Phka Rumduol	0	5	0	7
Sen Kra Oub	0	1	0	2
IR66	0	1	0	0
Phka Rumdeng	0	1	0	0
Sbai Mongkul	0	0	0	1

Source: RSPP survey team

Table 2.47 Production of Major Seed Varieties in the Rainy Season of 2016 and 2017

Variety	2016			2017		
	Number of Producers	Planted Area (ha)	Production (Mt)	Number of Producers	Planted Area (ha)	Production (Mt)
Phka Rumduol	0	0	0	94	45.27	132.7
Sen Kra Oub	0	0	0	39	33	76
IR66	0	0	0	0	0	0
Phka Rumdeng	0	0	0	0	0	0
Sbai Mongkul	0	0	0	3	0.4	0
Total	**0**	**0**	**0**	**136**	**78.67**	**208.7**

Source: RSPP survey team

2.5.3 Labor Cost in Sowing, Harvesting and Post-Harvesting

In Takeo Province, six ACs out of eight practice transplanting by hand. Table 2.48 computes the average labor cost of direct sowing, transplanting by hand, and using a drum seeder. Notably, transplanting by hand is 20 times more expensive than direct sowing by hand, and 2.2 times higher than using a drum seeder. In harvesting, the gap between manual harvesting and combine harvesting indicates approximately 1.2 times. All ACs dry-harvested seed paddy by solar and its average expense is 30,000 per Mt.

Table 2.48 Average Cost of Seedling/Transplanting

	Number of ACs (plural answers)	Number of Labor (persons/ha)	Wage (KHR/person/day)	Duration per ha	Total Labor Cost per ha (KHR/ha)
Direct Sowing by Hand	3	1	33333.3	1	33333.3
Transplanting by Hand*	6	N/A	N/A	N/A	666666.7
Drum Seeder	2	1	30000.0	1	300000.0
Transplanting Machine	0	0	0	0	0

Source: RSPP survey team

Table 2.49 Average Cost of Harvesting

	Number of ACs (plural answers)	Number of Labor (persons/ha)	Wage (KHR/person/day)	Duration per ha	Total Labor Cost per ha (KHR/ha)
Harvesting by Hand	6	21.3	25833.3	1	551111.1
Combine Harvester	4	N/A	N/A	1	450000.0

Source: RSPP survey team

Table 2.50 Average Cost of Drying

	Number of ACs (plural answers)	Expense (KHR/Mt)
By Solar	8	30,000
By Dryer (fuel)	0	0
By Dryer (electricity)	0	0

Source: RSPP survey team

2.5.4 Inspection

No AC in Takeo Province has received the complete package of field and laboratory inspections. In the field inspection, some ACs were inspected at either growth phase or reproductive phase. In the laboratory inspection, on the other hand, only two ACs were inspected by PDAFF with three components, namely purity, inert matters and germination.

Table 2.51 Field Inspection and Its Timing

Inspectors/Timing	Growth Phase	Reproductive Phase	Ripening Phase	Total
PDAFF	3	0	0	3
AC Committee	0	4	0	4
FAEC*	0	1	0	1
NGO	1	0	0	1
Total	4	5	0	9

** Farmer Associations Promoting Family Agricultural Enterprise in Cambodia*
Source: RSPP survey team

Table 2.52 Laboratory Inspection

Inspectors	Purity	Inert Matters	Weed seed	Other Crop Seed	Other Rice Variety Seed	Germina-tion	Moisture Content
PDAFF	2	2	0	0	0	2	2
Total	2	2	0	0	0	2	2

Source: RSPP survey team

2.5.5 Capacity for Expansion of Seed Production

In the Take Province, six ACs possess surplus farmland for additional seed production while only three of them are equipped with an irrigation system. Considering post-harvest facilities, a limited number of the ACs have sufficient facilities; five have surplus land for a drying yard and four have extra space for a warehouse.

Table 2.53 Infrastructural Capacity to Expand Seed Production

Name of AC	Irrigation System	Farmland (ha)	Land for Drying Yard (ha)	Warehouse (Mt)	Warehouse (m^2)
O'Saray	Y	50	0.038	300	0
Choeung Kuon Chauk Chey	Y	35	0.06	200	112
Sdok Sdom	N	30	0.011	0	0
Oudom Sorya	Y	20	0.08	300	200
Baksey Reak Reay	N	10	0.02	200	200
Tipath Punlok Thmey	N	5	0	0	0
Champey	N	0	0	0	0
Samaki Sre Kvav	N	0	0	0	0

Source: RSPP survey team

In terms of organisational capacity and willingness to expand rice seed production, three ACs show notable strengths; O'Saray, Choeung Kuon Chauk Chey and Oudom Sorya, as Table 2.54 shows.

Table 2.54 Organizational Capacity and Willingness to Expand Seed Production

Name of AC	Organizational Capacity	Willingness
O'Saray	・ Bookkeeping of transactions, income and expenditure is well-managed ・ AC committee actively and voluntarily engaged in management ・ AC holds regular internal meetings ・ AC has its own internal regulation	・ With good knowledge in seed production trained by BFPP, the AC is willing to expand rice seed production up to 50 ha
Choeung Kuon Chauk Chey	・ Recording of income/expense is well-managed ・ AC committee actively engaged in management.	・ AC has received technical support from PDAFF/BFPP, practices contract farming of rice seed with BFPP, and is willing to expand rice seed production up to 35 ha
Oudom Sorya	・ Bookkeeping of transactions, income and expenditure is well-managed ・ Strong leadership exists ・ AC has its own internal regulation	・ AC is willing to expand rice seed production up to 20 ha, if some projects support it

Source: RSPP survey team

Chapter 3 Present Condition of the Quality of Rice Seed and Paddy in the Target Provinces

3.1 Methodology of grain quality inspection

In order to identify the current quality of rice seeds (hereinafter, seeds) and paddy (for consumption), the RSPP survey team collected 24 samples from the four target provinces. Three samples of seeds (300-500g each) and three samples of paddy (300-500g each) were collected in each province. The RSPP Survey Team extracted 100g of grains from each sample and used them for inspection at the GDA laboratory.

The paddies were examined from seven categories, namely purity, other variety contamination, red rice contamination, broken grains, weed seed contamination, other seed contamination, and moisture of grains. In addition to these seven categories examined, the seeds in germination rate was assessed. The quality inspections have been done by the technical staff of the GDA laboratory for rice quality inspection under the supervision of C/P. The results of the survey are compared to the seed standards in Table 3.1 in "National Seed Strategy for Cambodia (2017-2022)[8]" drafted by MAFF.

Table 3.1 Seed Standards in National Seed Strategy for Cambodia (2017-2022)

Factor	Standards for each class		
	Breeder	Foundation and Registered	Certified
Pure Seed (minimum)	99.0%	98.0%	98.0%
Inert Matter (maximum)	1.0%	2.0%	2.0%
Huskless Seeds (maximum)	1.0%	2.0%	2.0%
Other Crop Seeds (maximum)	5/kg	10/kg	20/kg
Other Distinguishable Varieties (max)	5/kg	10/kg	20/kg
Red Rice (max)	0	2/kg	10/kg
Total Weed Seeds (maximum)	5/kg	10/kg	20/kg
*Objectionable Weed Seeds (maximum)	0	2/kg	5/kg
Seeds Infected by Paddy Bunt	0.001%	0.10%	0.50%
Germination (minimum)	80%	80%	80%
Moisture (maximum)	13%	13.0%	13.0%
For Vapor-Proof Containers (max)	8%	8.0%	8.0%

*Objectionable weeds: Echinochloa spp, Cyperus iria, Monocharia vaginalis, Leptochlora Chinensis

3.2 Results of the quality inspection of seeds in target provinces

Table 3.2 shows the results of the quality inspection of seeds in target provinces. The results of the quality inspection are converted from 100g of sample to one kg of sample.

The contamination of other varieties and red rice is the most critical issue. According to the criteria of Certified Seeds (CS) in the seed standards, grains of other distinguishable varieties should be less than 20 grains/kg and red rice should be less than 10 grains/kg. Nevertheless, only three out of the 12 samples met the criteria. The contamination of other varieties and red rice can be reduced by applying good quality Registered Seeds (RS), frequent field visits and removing plants of other varieties.

Broken rice, including huskless seeds could be reduced by adjusting the setting of the harvester. Although it does not affect seeds of the next generation, broken rice decreases the purity of the grains, which leads to a lower quality rice for the consumers, thus a lower market price. For the case of the

8 The Strategy has not been formally authorized.

samples, only 0.20 to 1.02% of broken rice were identified. The contamination of weed seeds was well controlled, since only two samples included the contamination. Moisture content should be less than 13% but four out of 12 samples exceeded the criteria. It could be reduced by applying an appropriate drying method and pre-shipment inspection with a moisture meter.

Lastly, all the samples except CAR15 of the Battambang Province achieved more than 80% of the germination rate. CAR15, one of the popular varieties in the province, has a dormant period of one month in its harvesting period. The RSPP survey team collected the samples of CAR15 in early April, nearing its harvesting time. So, the grains might've still been in the dormant stage, which could be the main reason for the lower germination rate. Grain moisture of all the samples indicates about 13%, achieving the target rate.

As a result, only two out of the 12 samples satisfied all criteria. The failures are mainly due to the contamination of other distinguishable varieties, red rice and a lack of drying.

Table 3.2 Results of the Inspection for the Seeds in Target Provinces

Province	Variety	Purity (%)	Other variety contamination (No. of grain)	Red rice contamination (No. of grain)	Broken grain (g)	Weed seed contamination (No. of grain)	Other crop contamination (No. of grain)	Moisture of grain (%)	Germination rate (%)	Certifiable grains as CS
Battambang	CAR15	97.88	70	0	0.35	0	0	12.9	26.00	
	CAR15	93.95	210	20	0.42	0	0	12.7	26.00	
	CAR15	95.43	470	40	0.57	0	0	12.5	25.00	
Kampong Chhnang	Riang Chey	97.12	50	0	0.42	0	0	12.5	86.50	
	Phka Rumduol	98.06	0	0	0.48	0	0	12.6	97.00	✔
	Sen Kra Oub	93.73	210	740	0.90	0	0	11.3	92.00	
Prey Veng	Phka Rumduol	98.01	120	0	0.79	0	0	13.1	89.00	
	Phka Rumduol	98.33	0	0	0.30	0	0	12.9	86.00	✔
	Phka Rumduol	98.02	20	0	0.22	0	0	13.9	97.00	
Takeo	Sen Kra Oub	99.33	30	20	0.20	10	0	14.2	92.00	
	Sen Kra Oub	98.94	10	110	0.17	0	0	13.9	92.00	
	Sen Kra Oub	98.09	20	20	1.02	30	0	12.5	94.00	
Seed Standard of CS		98.00 (min)	20 (max)	10 (max)	2.00 (max)	20 (max)	20 (max)	13.0 (max)	80.00 (min)	

*Indicates that the colored cells do not meet seed standard of CS

Source: RSPP survey team

3.3 Results of the quality inspection of paddy in target provinces

In the Institute of Standards of Cambodia, there are criteria of milled rice for export, namely, high quality jasmine rice, ordinary jasmine rice and high-quality non-jasmine rice. In the domestic market, however, the price of rice is decided by a different category, such as jasmine rice, mixed rice or other rice. Jasmine rice is the most expensive, followed by mixed rice. Mixed rice consists of several traditional varieties. Since farmers have collected seeds by themselves for a long time, many kinds of seeds have been mixed. It has been widely distributed in the domestic market and is generally accepted by consumers in Cambodia. However, the various shapes of rice are not suitable for post-harvest machines such as a dryer and others. As such, it is expected that mixed rice will be eliminated from the market once the institutionalization of the criteria of the milled rice and the maturing consumers' preference are proceeded.

It is necessary to reduce the contamination of red rice and other seed verities in order to enhance the value of Cambodian rice in the international market. The best solution is to use pure seeds without red rice and to renew seeds periodically. It should be recognized that quality improvement can be achieved by using high-quality seeds and effective dissemination should be promoted urgently.

Table 3.3 Results of the inspection for the paddy in the target provinces

Province	Variety	Purity (%)	Other variety contamination (No. of grain)	Red rice contamination (No. of grain)	Broken grain (g)	Weed seed contamination (No. of grain)	Other crop contamination (No. of grain)	Moisture of grain (%)
Battambang	Sen Kra Oub	95.89	60	40	0.57	0	0	12.2
	Kramom Yuon	90.98	250	3200	0.15	10	0	12.4
	Sra Ngae	96.77	530	70	0.13	30	0	12.9
Kompong Chhnang	Kreum	97.23	120	60	0.14	0	0	12.1
	Riang Chey	98.02	0	0	0.23	0	0	12.3
	Kantol	97.55	210	20	0.14	120	0	12.7
Prey Veng	Krosiang Teab	89.85	780	3280	0.15	30	0	12.5
	Krosiang Teab	94.2	110	1910	0.08	10	0	12.8
	Krosiang Teab	97.81	50	250	0.02	30	0	13.5
Takeo	Sen Kra Oub	93.36	0	50	0.19	20	0	14.7
	Sen Kra Oub	97.87	30	0	0.19	20	0	15.2
	Sen Kra Oub	97.28	80	240	0.02	0	0	12.4
Average		96.17	36.67	96.67	0.13	13.33	0.00	14.10

Source: RSPP survey team

3.4 Summary

Most of the sample seeds have not reached the standard set out in the National Seed Strategy for Cambodia (draft) mainly due to the high contamination of other varieties and red rice. It is urgent to improve the challenges of seeds since these items can significantly cause the low-quality of the paddies.

In order to achieve this, it is required to improve the quality of RS and CS and increase its amount of production. This will allow seed producers to easily access high-quality RS and CS. Furthermore, seed producers should practice proper seed cultivation methods, so quality seeds can be disseminated to ordinary farmers. Lastly, the seed certification system should be introduced to certify high-quality seeds properly.

Besides, it is necessary to note that the above result was derived from the limited number of the samples. For this reason, the result indicates no more than the general quality of seeds and paddies in the target provinces. Once the target SPGs are selected, the RSPP will test the quality of seeds of the target SPGs and their neighbours for a comparison and regard the result as formal baseline data.

Chapter 4 Present Condition of Value Chain and Marketing of Rice Seed and Paddy/Rice in the Target Province

4.1 Overview

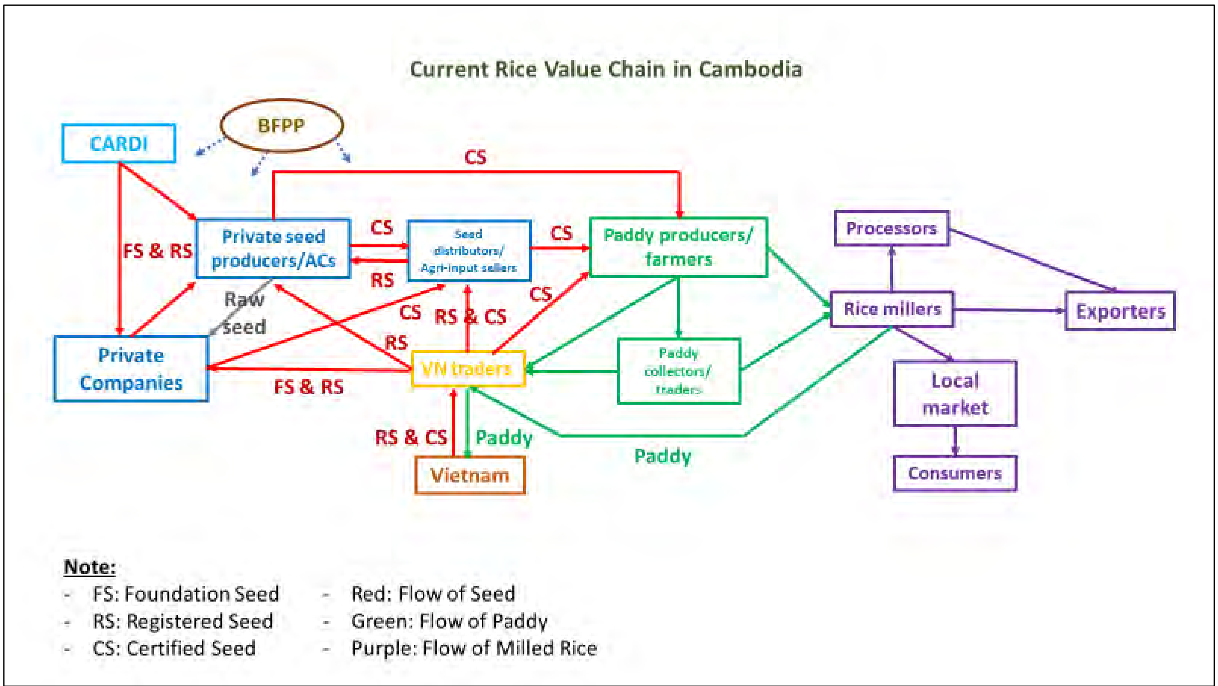
The supply of high-quality seeds in Cambodia is still not reaching the market required amount. It is estimated that the total need of rice seed is around 124,000Mt per year (the seeding rate is 80kg/ha, the total rice cultivation area is 3.11million[9] ha, and the renewal rate is 50%), while the supply of the seeds was no more than 12,204Mt in 2017. Currently, the gap in supply and demand is significantly filled by unofficial import from neighbouring countries, in particular Vietnam.

Table 4.1 Rice Seed Supply in 2017

No.	Producer	Quantity, Mt
1	AQIP	1,444
2	Other companies	4,000
3	ACs	3,800
4	BFPP	2,960
	TOTAL	**12,204**

Source: AQIP Annual Report 2016-2017, List AQIP Competitors 2017, BFPP Achievement Report 2018 for 1st Quarter, and Technical Working Paper "Overview of a Cambodian seed sector" AusAID and World Bank Group, May 10, 2011

A number of stakeholders in the rice sector play an implicative role in relation to rice drive and demand. Figure 4.1 represents the rice value chain in Cambodia that describes an interrelationship of those stakeholders.



Source: RSPP survey team

Figure 4.1 Current Rice Value Chain in Cambodia

[9] Source: MAFF Annual Report 2016-2017

4.1.1 Key Stakeholders of the Value Chain

(1) Cambodia Agricultural Research and Development Institute

It is a national institute that predominantly produces rice seeds of different varieties and classes. Cambodia Agricultural Research and Development Institute (CARDI) plays a main role in supplying foundation and registered seeds only for the private sector, ACs, government projects and others who have a need for seed-multiplication for businesses or distribution to target customers or beneficiaries. CARDI is normally producing about 5Mt of foundation seed per year. It is now trying to work more on privately-orientated research and development to fit private sector preferences, in particularly for rice exporters. CARDI has sufficient physical infrastructure, processing facilities and equipment to function at its production level. CARDI has capacity to produce up to 50Mt of foundation seed per year.

(2) Private Companies

There are approximately 24 local private companies, including the Agricultural Quality Improvement Project (AQIP) Seed Company, producing self-declaring certified rice seed and distribute through their channels in the entirety of Cambodia. AQIP purchased foundation seeds from CARDI, as well as from Vietnam and contracted with farmers to produce registered and certified seeds under an internal quality control system at field and plant levels. AQIP also produced foundation and registered seeds of specific varieties by itself, those of which not produced by CARDI. For certified seed production, it was carried out through contract farming with individual seed growers, which some of them are AC members, in order to supply raw seeds to AQIP. AQIP carried out all the activities related to seed processing, packaging, storing, quality control and marketing. AQIP sold certified seeds to paddy farmers through its distribution channel (AQIP seed distributors are mostly agricultural input sellers). AQIP supplied between 2,500Mt-3,500Mt certified seeds per year from 2013 to 2016.

Unlike AQIP, most of the private companies do not have their own adequate facilities and equipment to perform as a rice seed business, but they have to lease. Furthermore, besides AQIP, the private companies have not provided proper technical assistance to the contracted seed growers yet. Sometimes, they use AQIP seed growers to produce seeds rather than invest in seed growers' capacity development, as well as not hiring enough technical staff to function at appropriate seed production levels. The areas are mainly related to quality control and inspection at either field or plant levels, including laboratory.

AQIP closed its operation in October 2017; they only sold 1,444Mt that year. Other private seed companies have adopted AQIP's model and practices and are trying to expand their volume of production based on their affordable capacity by using the existing AQIP seed distribution channel to sell their seed products to the paddy farmers.

(3) Private Seed Producers

Farmers with large farmland also produce rice seeds for their own retention, for their next rice production, and also for selling to paddy farmers, whether through agricultural input sellers or directly. For rice seed production, they purchased seeds from CARDI, AQIP or sometimes from Vietnamese traders. The private seed producers process their seeds by using traditional facilities and equipment and pack the seed with unprinted bags for sale. The quality of seed is uncertain, with high variation of germination and purity, but the price is cheaper, between 2,000KHR - 2,300KHR/kg (according to different varieties), in comparison with AQIP and other private companies that range between 2,600KHR - 3,200KHR/kg. However, the seed supply of private seed producers is not so stable due to the demand change, natural disasters, climate change and hesitance towards more investment due to limited technical and marketing capacity and too few varieties produced; Phka Rumduol, Sen Kra Oub or IR504.

(4) Agricultural Cooperatives

There are Seed Producer Groups (SPG) under ACs, who produce and supply rice seeds to their members and neighbouring farmers. Normally, each AC produces rice seed between 40-50Mt per year when their processing capacity is too small. The estimated total quantity of rice seed supplied by ACs in Cambodia is around 3,800Mt per year, which is comparatively too small for the required amount (124,000 Mt).

Recently, in a special contract with NGOs or a government project, they increase the production area by mobilizing more SPG members to meet the contracted plan. For certified seed production, they purchase seed from CARDI and AQIP. Apart from such a contract with local NGOs or government projects, ACs also contract with rice millers/exporters to supply paddies that most of the seeds are purchased from Vietnamese traders such as IR504, OM4900 and OM5451, but there is uncertainty around the quality and class of seed, since the seed prices are different between companies and the packaging language being Vietnamese. However, the quality of paddy was checked by the rice millers during the procurement.

Currently, a few government projects work on rice seed production and promotion by providing technical knowledge and some facilities and equipment, so that they can enhance the quality and quantity of seed.

(5) Other Seed Traders

Other seed traders include rice millers and Vietnamese traders, who also play the role as rice seed distributor to farmers with the promise of buying back the paddy. But, the majority of those supplying seed are Vietnamese traders, while the rice millers sell not as many seeds from their own sources. The tendency of supplying seed from Vietnamese traders is still increasing, while Vietnamese short-maturity rice is gradually grown by the farmers versus a lack of local seed supply.

(6) Paddy Farmers

At household level, seed retention for own paddy production is very limited due to reasons of labor shortage as a serious barrier in farming, lack of seed and post-harvest technologies, limited access to fundamental seeds for multiplication, and crop failure caused by disasters, such as climate change. The farmers also approach ACs or private companies for high-quality seeds, but they’re sometimes unavailable or not available on-time, with limited choices of varieties, causing production failure, and food and nutrition insecurity. The traditional rice varieties are more underutilized and less conservative due to the paddy price of such varieties be competitively lower than high-yielding ones. A number of planted varieties are also narrowed down to fit export purposes. Meanwhile, it has been difficult to find rice mills at village level to mill small quantities of paddies of producing traditional varieties. Therefore, the farmers have gradually given up the traditional varieties and have sought high-yielding ones, buying back milled rice for home consumption. As a consequence of seed shortage, sometimes the farmers use paddy grain as seeds, which has a negatively very high sowing rate, up to 300kg/ha, low productivity, poor paddy quality, and the price of paddy offered is lower.

(7) Boosting Food Production Project

Boosting Food Production Project (BFPP) is a government-funded project, which merely emphasizes on aromatic quality rice seed to make them more available and accessible to farmers in the country. The project is for 3 years and started in mid-2017, with the plan to produce 15,000Mt in total. The project initially started work with 19 ACs and extended up to 36 ACs in the 11 provinces of Takeo, Kampong Speu, Kandal, Prey Veng, Tboung Khmum, Kampong Cham, Kampong Thom, Siam Reap, Battambang, Pursat and Kampong Chhnang, to produce certified seeds.

BFPP’s facilitation is to produce paddy under contract farming with rice millers/exporters. The BFPP's contract is formulated between Paddy Producer Group (PPG) under ACs and BFPP. The PPG has to buy certified seed from the BFPP to produce paddy for supplying to rice millers/exporters through contract farming. The PPG purchase certified seed from the BFPP, only 2,000KHR/kg, but the PPG receive a subsidy of 1,000KHR/kg from the project, thus the PPG pays only 1,000KHR/kg. The certified seed purchased by PPGs has to be from other ACs determined by the BFPP.

Table 4.2 below indicates the prices and subsidy amounts.

Table 4.2 Prices of Seeds and Subsidy Offered by The Project in 2017 (KHR/kg)

No.	Producer	Actual Price of RS	Actual Price of CS	Producer Paid Actual Price	Subsidy Offered by BFPP
1	CS Producer	3,000		2,000	1,000
2	Paddy Producer		2,000	1,000	10,00

Source: RSPP survey team

In 2017, ACs could only produce 1,487Mt, equal to 50.24% out of the planned 2,960Mt, while in 2018 they will produce 2,990Mt out of the planned 5,540Mt. The certified seed produced is to supply to 114 other ACs for high-quality paddy production, to supply to rice millers for export through contract farming. However, the BFPP is not a business body involved in the long-term process of supplying the seed. In terms of subsidy, the BFPP is now considering to eliminate this for PPGs who produce paddy for rice millers/exporters through contract farming. This is due to a trial with some PPGs on unsubsidized seed which was carried out and PPGs accepted the price of seed even up to 2,400 KHR/kg. However, it is still considered that the periodical subsidy may affect the mechanism of market-based pricing and might delay to establish a sustainable foundation of seed supply and distribution.

The main role of the BFPP is to strengthen ACs' capacity to produce certified seed in compliance with the national minimum rice seed standard. It is also to facilitate subsidies of rice seed production and paddy production produced by identified ACs under the project, coordinating linkage between ACs and the private sector to promote the use of certified rice seeds – an opportunity for the private sector in rice development.

(8) Paddy Traders

Their main role is to collect paddy from farmers in different provinces and supply to rice millers and Vietnamese traders. Vietnamese traders also come into Cambodia and collect the paddy by themselves. In early 2018, it was found that plenty of paddy had been collected by Cambodian and Vietnamese traders by offering better prices in comparison to previous years and transported to Vietnam. Subsequently, the rice millers in Cambodia could not collect the paddy by offering the same competitive Vietnamese prices, except rice millers in Battambang and Banteay Meanchey provinces since they are strongly financially competitive. This causes Cambodian farmers to double and sometimes triple their rice crops by using early-maturing varieties, which require a lot of seeds in the year.

(9) Rice Millers

They buy paddy from farmers and paddy collectors. It is about 60% of paddy they purchase through paddy collectors/traders, and about 40% directly from farmers and ACs through contract farming. The rice millers/exporters prefer to purchase paddy from ACs through contract farming rather than through paddy collectors/traders due to quality concerns and mistakes. Rice millers mill rice and supply to processors and exporters, and also to the domestic market. Meanwhile, rice millers also sell paddy (dry paddy) to Vietnamese traders due to price increases. The rice millers claimed that the milled rice price is stable in the market, but paddy prices have increased and electricity and labor are expensive, so it's expressively better to sell paddy and make more profit, rather than milling.

(10) Exporters

Most of the exporters are not only processors, but sometimes rice millers. They purchase milled rice from rice millers in bulk, then polish and repack into printed bags with their own trademarks. Occasionally, they order milled rice from the rice millers, who can fulfil the order specifications and pack with their brand-printed bags. Exporters who have their own mills are now trying to connect with potential ACs who are able to supply adequate required volume of paddy with an ensured quality.

4.1.2 Key Facts of Current Rice Value Chain in Cambodia

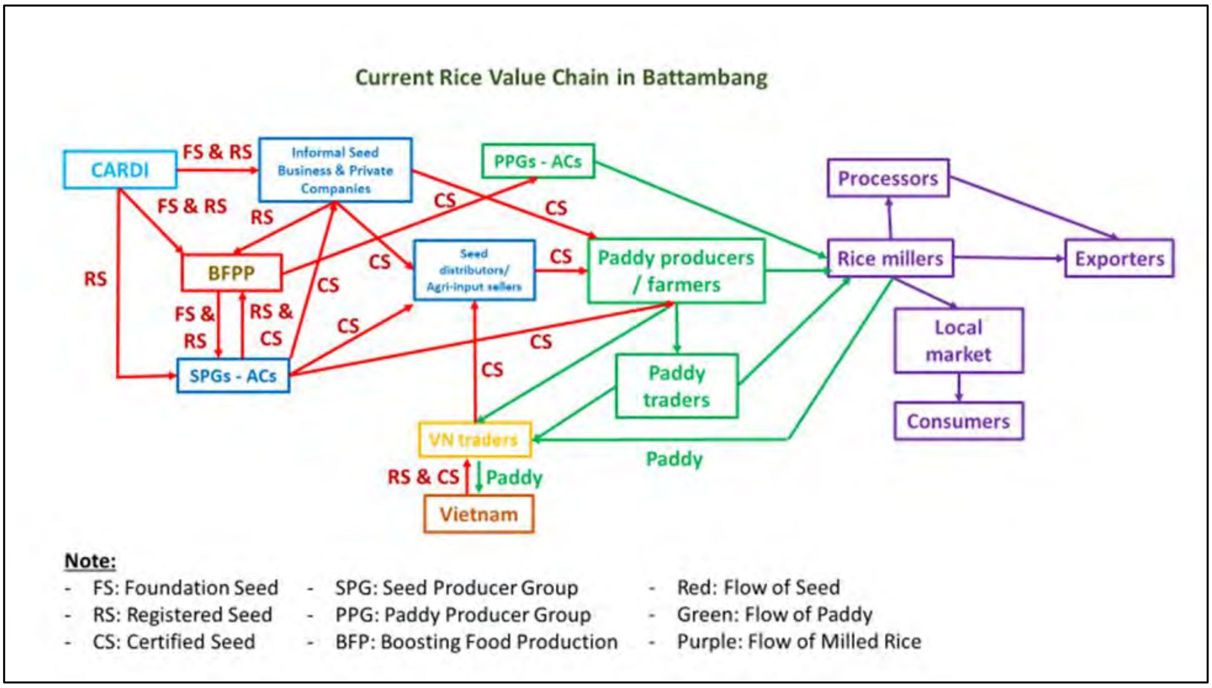
No.	Key Facts
1	There is a significant lack of supply in high-quality seeds against the required amount in Cambodia. Currently the gap is filled by unofficial trading with the Vietnamese.
2	CARDI plays a significant role as the producer and supplier of foundation and registered seeds to the private sector, ACs, government project, NGOs and individual farmers for seed multiplication.
3	Seed traders are various; private companies, private seed producers, ACs and paddy traders. Private companies claimed that they produce certified seeds under a self-certification system, while ACs and private seed producers produce seeds based on their practices.
4	There is a lack of sustainable distributors of seeds, since AQIP stopped producing and selling rice seed.
5	BFPP supplies CS/RS to contracted ACs and purchases CS with a subsidized price. The Project drastically enhances the seed production in the country. However, it might be challenging for periodical

	support to establish a sustainable foundation of high-quality seeds, supplied and distributed, as well as appropriate pricing.
6	Recently, rice millers/exporters prefer to purchase through contract farming with ACs, rather than through paddy collectors/traders due to quality concerns and mistakes.

4.2 Battambang Province

4.2.1 Current Rice Value Chain and Key Stakeholders

In Battambang, there exists a large area of rice plantation, which stands in second place after Prey Veng. Every year, the farmers purchase seed from different sources, such as private companies, informal businessmen and ACs, to produce paddy and sell to paddy traders and rice millers. Figure 4.2 shows the complicated relationship between rice value chain stakeholders in Battambang.



Source: RSPP survey team

Figure 4.2 Current Rice Value Chain in Battambang

The private companies outside of the province produce certified seeds and sell to paddy farmers in Battambang. The seed produced by private seed companies is distributed to farmers through agricultural input sellers that were mostly recruited by AQIP. There are 6 seed wholesalers and approximately 30 seed retailers in Battambang. The private companies sell rice seed at approximately 800Mt per year, out of which the AQIP Seed Company was accountable for 650-700Mt. The private companies are mainly AQIP Seed Co., Ltd, KK Seed Co., Ltd, and Super Gold Seed (SGS). Unfortunately, in 2017, AQIP supplied only 220Mt of certified seeds to Battambang from January to October, and then stopped for unknown reasons. Henceforth, in 2018, only KK Seed and SGS produce and sell to Battambang. They only sold 77Mt of Sen Kra Oub (70Mt from KK Seed and 7Mt from SGS) due to running out of stock.

Apart from private companies, there are informal rice seed businesses based in Battambang which cooperate with AC members, also producing and selling seeds in the province at an approximate rate of 80Mt per year.

ACs in the province also produce rice seed and sell to paddy farmers. There are 83 ACs in Battambang, out of which only 14 ACs produce rice seed. It is estimated that approximately 693Mt are produced and sold by ACs every year, and this quantity is excluded from certified seed production contracted with the BFPP. In Battambang, there are only 6 ACs contracted with BFPP to produce 453Mt of certified seeds.

The study found that Sen Kra Oub and Phka Rumduol are the most popular varieties grown in Battambang, which are now largely in a deficit supply for 2018; which is making the farmers more troubled with their rice production. Consequently, the farmers grow other varieties instead, for instance Sra Ngae (short maturity, photoperiodic insensitive) from their own or unreliable sources. It has also been revealed that the farmers believe the good quality seed (certified seed) provides them with more benefits to their production and income, since by using good quality seed they can comply with the requirement of paddy buyers – rice millers/exporters and paddy traders are saying it's easy to sell and has a good price offering, thus the demand for certified seed is increasing.

Table 4.3 Rice Seed Supply in Battambang in 2017

No.	Producer	Quantity, Mt
1	AQIP	220
2	Other companies	150
3	Informal business	80
4	ACs	693
5	BFPP	453
	TOTAL	**1,596**

Source: RSPP survey team

The quantity of certified seeds produced by six ACs sold to other ACs inside and outside of Battambang for paddy production is coordinated by BFPP through contract farming with rice millers/exporters, such as AMRU Rice and BRICo. The certified seed growers and paddy growers under the targeted ACs received a subsidy from the project.

In Battambang, paddy farmers mostly sell wet paddy to rice millers rather than to Vietnamese traders, since rice millers have strong financial competition to pay farmers the same price and via immediate cash as Vietnamese traders. However, Vietnamese traders have to pay an extra cost of for transportation from Battambang to the Vietnamese border. The farmers also sell paddy to paddy traders/collectors. The prices of paddy vary according to varieties and paddy quality standard determined by those factors.

4.2.2 Marketing

(1) Rice Seed

In Battambang, it is rare to see an advertisement related to rice seed products of private companies and ACs. Most of the farmers access rice seed at the seed dealers' shops or agricultural inputs sellers' shops. Besides this, the farmers contact rice seed producers directly, since they know they can supply the seed in their respective areas.

The quality of rice seed also varies from one supplier to another without any guarantee when the farmers face germination problems and impurity, whereas AQIP do have guarantees in place. Thanks to an increase in demand, the supply is also surging from the private sector, NGOs and government projects, all of them trying to promote the rice seed industry.

The prices of certified seeds differ in accordance to the varieties and suppliers. The retail price refers to selling price to paddy farmers, NGOs and development donor project, whereas wholesale price refers to seed dealers who retail seed to paddy farmers. The prices of certified seeds are revealed in Table 4.4 below.

Table 4.4 List of Certified Seed Prices Offered by Private Companies and ACs in 2017, KHR/kg

Variety	AQIP		KK Seed		SGS		Informal		AC	
	Retail	Wholesale	Retail	Wholesale	Retail	Wholesale	Retail	Wholesale	Retail	Wholesale
Sen Kra Oub	3,100	2,850	3,100	2850	3,100	2,750	3,000	2,400	2,800	2,200
IR504	2,600	2,400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OM4900	2,600	2,400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phka Knhey	2,800	2,600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phka Rumduol	3,200	2,800	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Riang Chey	2,800	2,600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Neang Khon	2,800	2,600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: RSPP survey team

Table 4.4 indicates that Sen Kra Oub is the only variety that sold the most, with the same prices when comparing AQIP and KK Seed. But, the variation in prices compared to SGS, Informal seed businesses and ACs is comparatively lower.

Based on the survey, sometimes the selling prices of seed offered to farmers are above listed prices, especially for Sen Kra Oub and Phka Rumduol, due to a deficit supply. However, it is found that the trend of the seed price is not really increasing.

(2) Paddy and Rice

Paddy has been much easier to sell to buyers in 2017 and 2018 because of the competition between Vietnamese traders and rice millers for export. The quality of paddy is found to be much better if produced through contract farming, as indicated by rice millers.

The ACs. individual farmers, and farmer groups contracted with rice millers/exporters to supply paddy (Phka Rumduol variety) have to comply with the required paddy quality standard (see Table 4.5) of the rice millers/exporters. The quality and prices of paddy under the contract are interrelated. The setting price is flexible according to the paddy market referent price, which is quoted from three different sources identified and agreed by both ACs and rice millers. The prices during purchase of Phka Rumduol wet paddy in 2017 were between 1,170KHR, 1,190KHR and 1,200KHR per kg.

Table 4.5 Required Paddy Quality Standard During Purchase by BRICo

No.	Description	Category A	Category B
1	Moisture (max, %)	22 - 26	26 - 29
2	Pure paddy (min, %)	92	90
3	Inert matter (max, %)	3	5
4	Red rice & short grain rice (max, %)	3	3
5	Broken grain (max, %)	1	1
6	Impure grain (max, %)	1	1
7	Other varieties (max, %)	8	10

Source: RSPP survey team

In the case of the required paddy quality standard being unmet under category B, there are two ways of reduction; (1) reduce by 50kg/Mt of purchased paddy, so only 950kg of paddy to be paid, and (2) reduce the price of 20KHR/kg of purchased paddy. However, the AC committee and paddy producers receive sale commission of 10USD per Mt, which is allocated into 1USD for AC committee and 9USD for paddy contracted producers. It is noted that the AC committee plays a role as paddy collector and delivers to a contracted rice miller warehouse. All quality checks and quality report issuances are carried out by the contracted rice miller. The terms of payment is within 3 days after paddy is delivered to the rice mill and the payment is made by check in USD. Besides the payment, the contracted rice miller also provides technical assistance to paddy contracted producers in cooperation with the NGO, WCS (Wildlife Conservation Service).

Rice millers/exporters have a certain quality paddy standard with a price category, while small rice millers and others have not, and they check paddy quality by using a traditional method of visual observation. Table 4.6 indicates the prices of wet paddy in Battambang.

Table 4.6 Prices of Wet Paddy in Battambang in 2017, KHR/kg

No.	Variety	Bin Rath (RM)	Chheung Chan Duong (RM)	BRICo (RM)	Yin Mann (RM)	Paddy Trader
1	Sen Kra Oub	1,100-1,350	N/A	1,100-1,365	1,100-1,365	1,040-1,170
2	IR504	N/A	800	N/A	1,040	N/A
3	OM4900	910-920	N/A	N/A	N/A	N/A
4	Phka Knhey	920	920	N/A	N/A	N/A

5	Phka Rumduol	1,100	N/A	1,200	1,300	1,105-1,235
6	Riang Chey	N/A	920	N/A	N/A	N/A
7	Neang Khon	930-1,130	920	N/A	1,066	N/A

RM means a rice miller.
Source: RSPP survey team

The small size rice millers in Battambang mainly purchase paddy directly from farmers. They focus more on rainy season rice such as Phka Rumduol, Phka Khney, Riang Chey and Neang Khon (mixed up traditional varieties and named Neang Khon, because it is a popular traditional variety). Meanwhile, they also purchase dry season paddy rice like Sen Kra Oub and OM4900. They mainly supply milled rice to local markets in Battambang. They also purchase Phka Rumduol paddy and sell to Vietnamese traders with a high price of 1,400KHR/kg (dry paddy).

Table 4.7 List of Paddy Prices Offered by Small Sized and Village Rice Millers in 2017

No.	Variety	Wet Paddy Price, KHR/kg	Dry Paddy Price, KHR/kg
1	Phka Rumduol	1,100	N/A
2	Phka Knhey	920	1,000
	Riang Chey	N/A	920
3	Neang Khon	930-1,130	920
4	Sen Kra Oub	1,100-1,300	N/A
5	OM4900	910-920	N/A
	IR504	N/A	800

Source: RSPP survey team

Whereas, village rice millers always purchase dry paddy rather than wet paddy due to having small capacity dryers. They mainly purchase traditional rice such as Phka Knhey, Neang Khon and Riang Chey, and sometimes IR504. For Neang Khon, the wet paddy is reversely more expensive than dry paddy due to the different time of supply with small quantities and also this variety is known as a mixed-up variety. The village rice millers supply milled rice to the villages and small markets close to public gathering places.

In general, the wet paddy price offered by large scale rice millers and paddy traders is higher than small scale rice millers.

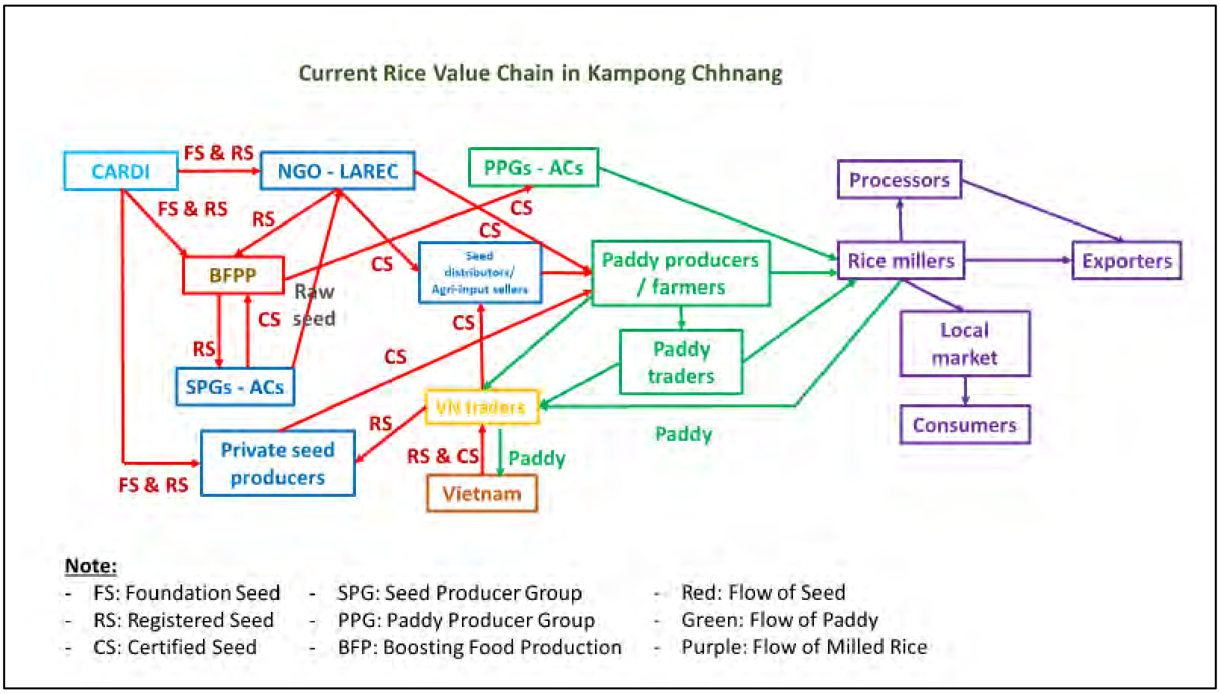
4.2.3 Key Facts of Rice Value Chain in Battambang

	Key Facts
1	Seed supply to Battambang by private companies was 800Mt in 2017, and AQIP supplied 750Mt. Nevertheless, currently AQIP has stopped supplying seed, whereas two other companies, KK Seed and SGS, supplied only 77Mt.
2	Currently, the dominant varieties produced and supplied in Battambang are Phka Rumduol and Sen Kra Oub, due to high demand for export by rice millers/exporters.
3	There are 83 ACs in Battambang, but only 14 ACs produce rice seed, including six ACs producing certified seeds of Phka Rumduol and Sen Kra Oub for BFPP.
4	Rice millers/exporters now prefer more contract farming for paddy production rather than purchasing paddy through paddy collectors/traders, due to quality concerns and varieties being mixed-up.
5	Vietnamese traders cannot procure paddy in competition with rice millers/exporters in Battambang due to additional costs of transportation to the Vietnamese border.

4.3 Kampong Chhnang Province

4.3.4 Current Rice Value Chain and Key Players

In Kampong Chhnang, farmers largely purchase seed from private seed producers LAREC (Local Agricultural Research and Extension Centre), and agricultural input sellers for paddy production, and sell paddy to paddy traders and rice millers. Figure 4.3 represents the relationship of the rice value chain in Kampong Chhnang.



Source: RSPP survey team

Figure 4.3 Current Rice Value Chain in Kampong Chhnang

The NGO, LAREC, based in Kampong Chhnang, plays an important role in seed distribution in Kampong Chhnang and other provinces. LAREC purchase foundation seed of CARDI released varieties for registered seed multiplication. It also produces its own foundation seed, such as Sen Kra Oub, for registered seed production. In addition, LAREC also produces other varieties demanded by the market, such as Chul'sa, Phka Kravann (Vietnamese rice variety), IR504 and Damnoeb Sbai Mongkul (glutinous rice). For certified seed production, LAREC contracts with ACs to produce raw seed. LAREC has its own equipment and facilities to carry out all processing activities.

There are 4 ACs that produce rice seed in Kampong Chhnang. LAREC is likewise one of the registered and certified seed producers supplying to the BFPP. In 2017, LAREC could sell certified seeds up to 400Mt to the BFPP and farmers through agricultural input sellers in Kampong Chhnang, Kampong Speu, Kandal, Kampong Thom, Banteay Meanchey and Battambang.

In 2017, the BFPP contracted with 2 ACs to produce 82Mt of certified seed of Phka Rumduol only. In 2018, the project contracted with 4 ACs to increase up to 277Mt of Phka Rumduol. This certified seed will be used for paddy production through contract farming with rice millers/exporters in 2019.

Some private seed producers under the name of AC as local suppliers in Kampong Chhnang, produce rice seeds and sell to farmers and rice millers. Most of the seed produced by private seed producers are Vietnamese rice varieties such as IR504 and Phka Kravann. In 2017, they produced the rice seed Phka Kravann through contract farming with Golden Rice Company for 400Mt, and they received certified seed from Golden Rice Company for the paddy contract.

The private company overlooked Kampong Chhnang as being a small market for rice seed business. Even AQIP put in little effort due to the demand being smaller than other provinces, and at the same time, some local seed suppliers exist.

Notably, however, the demand for high-quality seeds has risen. Several seed dealers informed that farmers frequently requested high-quality rice seeds, but a lack of its supply hinders dealers' business opportunities.

Table 4.8 Rice Seed Supply in Kampong Chhnang in 2017

No.	Producer	Quantity, Mt
1	AQIP	15
2	Other companies	N/A
3	Informal business	100
4	LAREC	20
5	ACs	400
6	BFPP	82
	TOTAL	617

Source: RSPP survey team

4.3.5 Marketing

(1) Rice Seed

In Kampong Chhnang, as in other provinces; it is hard to notice rice seed advertisements at the dealers' shops. Only a few of ACs' signboards indicating rice seed production are found along the national road number 5. LAREC, the main supplier in the province also does not disclose a proper advertising board to attract the farmers. The farmers access rice seed between each other, as they realize the need, and sometimes they obtain seed from agricultural inputs sellers. It is revealed that the demand of seed is now intensely rising versus the vast deficiency in supply.

Selling prices of the rice seed differ from one supplier to another based on how popular they are at the provincial level. Table 4.9 describes selling prices of major seed varieties in 2016 and 2017.

Table 4.9 List of Certified Seed Prices Offered by Private Companies and Others in 2017, KHR/kg

Variety	AQIP	LAREC	Others
Sen Kra Oub	2,850-3,100	2,500-2,700	2,500
IR504	2,400-2,600	N/A	2,000
OM4900	2,400-2,600	N/A	N/A
Phka Kravann	N/A	N/A	1,500
Phka Knhey	2,600-2,800	N/A	N/A
Phka Rumduol	2,800-3,200	2,500-2,700	2,500-2,675
Phka Romeat	N/A	N/A	2,700
Riang Chey	2,600-2,800	N/A	N/A
Neang Khon	2,600-2,800	N/A	N/A

Source: RSPP survey team

The prices of rice seed sometimes fluctuate in conjunction with the availability of supplying specific varieties and seasonality. Rainy season rice variety prices, especially, are often altered, with them being lowered near to the end of the rainy season.

(2) Paddy and Rice

Paddy is always sold to paddy traders and rice millers in the form of wet paddy rather than dry. Rice millers in Kampong Chhnang town expressed that it is very difficult to find good quality paddy. They buy paddy from approximately 80% provincial paddy collectors and stress that most of the paddy is impure and sometimes over mature. They check the quality by visual observation, a traditional method.

They mostly mill rice for supplying to the local market and Phnom Penh market. The local market typically demands traditional varieties, but there is mixing-up with different varieties when rice is milled (only Neang Khon or Neang Menh) since both of these varieties are popular in the country, whereas Phka Rumduol and Phka Malih are milled for the Phnom Penh market. A medium scale rice miller, known as KTS Rice Mill, the biggest mill in Kampong Chhnang, mostly mills for the Phnom Penh market and exporters, such as AMRU, Khmer Food, Golden Rice and Primalis. Due to paddy supply within the province being inadequate and of an undesirable quality, KTS Rice Mill frequently acquires from Battambang and Banteay Meanchey provinces, mainly Phka Rumduol and Sen Kra Oub varieties. They also milled IR504 and Phka Kravann for exporters. Table 4.10 indicates the prices of wet and dry paddy procured by rice millers.

Table 4.10 List of Wet and Dry Paddy Prices Offered by Rice Millers in 2017

No.	Variety	Wet Paddy, KHR/kg	Dry Paddy, KHR/kg
1	Phka Rumduol/ Phka Malih	1,100-1,200	1,500
2	Neang Khon/ Neang Menh	900-950	1,000-1,050
3	Sen Kra Oub	1,100-1,140	N/A
4	Phka Kravann	820-890	1,200
5	IR504	800-850	900-950

Source: RSPP survey team

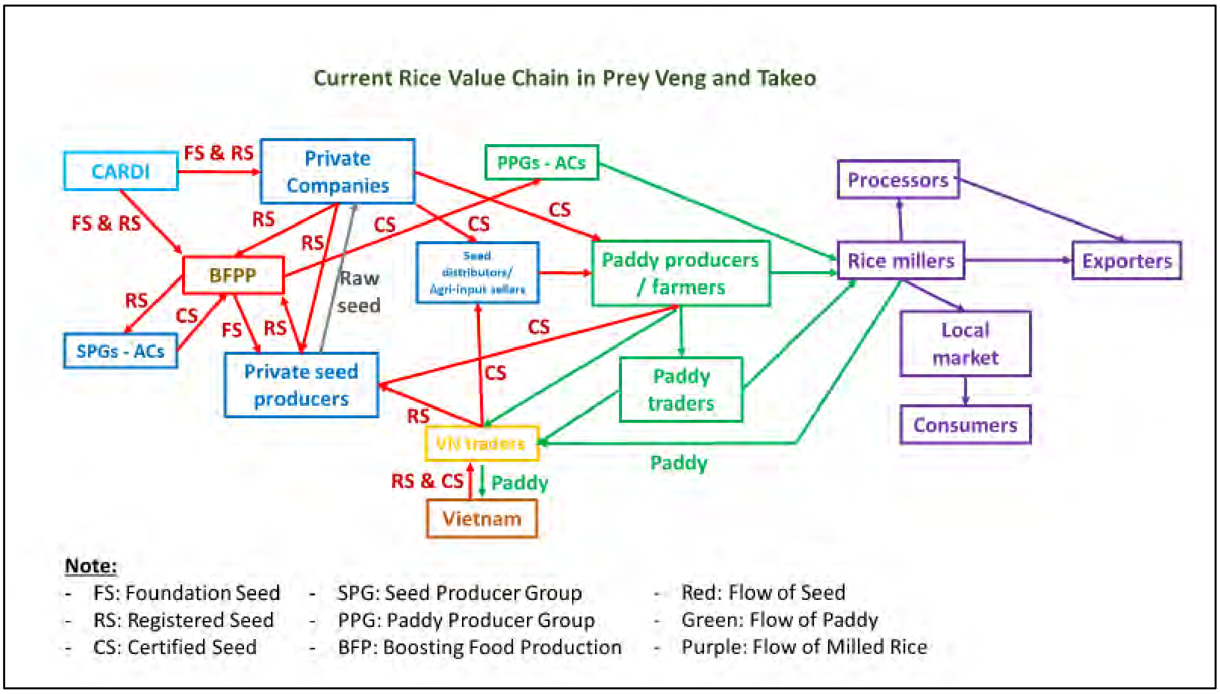
4.3.6 Key Facts of the Rice Value Chain in Kampong Chhnang

	Key Facts
1	LAREC plays an important role in certified seed supply in Kampong Chhnang. LAREC has supplied a significant amount of CS with existing facilities and equipment.
2	Currently, the dominant varieties produced and supplied in Kampong Chhnang are Phka Rumduol, Sen Kra Oub, IR504, OM4900 and Phka Kravann due to high demand for exportation by rice millers/exporters.
3	There are 38 ACs in Kampong Chhnang, but only four ACs produce rice seed and one NGO, LAREC, purchases raw seed from ACs and processes and sells seed inside and outside the province. All 4 ACs only produce Phka Rumduol and Sen Kra Oub for BFPP, but other Vietnamese varieties also for LAREC.
4	Seeds are in high demand by farmers in the province and the supply is lacking.

4.4 Prey Veng Province

4.4.7 Current Rice Value Chain and Key Players

Private companies, private seed producers and agricultural input sellers play a very key role in the supply of rice seed in Prey Veng. Figure 4.4 represents the rice value chain in Prey Veng.



Source: RSPP survey team

Figure 4.4 Current Rice Value Chain in Prey Veng

The private companies produce rice seed through contract farming with individual seed growers to supply raw seeds. In particular, AQIP has its own facilities and equipment, unlike KK Seed having to hire the facilities and equipment for seed processing. They sell their seed in Prey Veng and other provinces of Cambodia. But now, AQIP has stopped, which has caused a gap in the seed supply to this province.

Private seed producers can be members and non-members of ACs who access irrigation systems and have their own facilities to produce and process the seed. They produce seed and sell to farmers through agricultural input sellers.

Three ACs in Prey Veng produce certified seed for the BFPP. They produced 202Mt of Phka Rumduol and Sen Kra Oub in 2017, and 300Mt of the same varieties in 2018, and then distribute to other ACs.

Generally, paddy farmers obtain the rice seed from private seed producers, private companies and agricultural input sellers. Rainy season rice is mostly produced for home consumption with some surplus sold to rice millers in the province. They regularly sell their paddy to Vietnamese traders rather than rice millers, since it's easy to sell, they receive cash in hand payment and there's not much concern about the quality.

Owing to consequences of inadequacy and quality concerns of paddy supply, recently the rice millers in Prey Veng have turned to ACs for paddy supply through contract farming arrangements. The rice millers in Prey Veng also sell dry paddy to rice exporters who also own rice mills. The dry paddy of which most is sold to exporters is Phka Rumduol. They also sell dry paddy to Vietnamese traders, most of the varieties being sold are IR504 and OM4900.

Table 4.11 Rice Seed Supply in Prey Veng in 2017

No.	Producer	Quantity, Mt
1	AQIP	116
2	Other companies	250
3	Private producers	150
4	ACs	250
5	BFPP	202
	TOTAL	**968**

Source: RSPP survey team

Paddy traders do not buy paddy only in Prey Veng, but from other provinces including Siam Reap, Preah Vihear, Kampong Thom, Kampong Cham, Tboung Khmum and Kratie and transport to the Vietnamese border pass, namely “Banteay Chakrey”; here, the paddy is easily transported by boat to Vietnam. The research revealed that there are approximately 300-400 trucks with loads of 25-30Mt per truck per day during the harvest season, from November to December, for wet season rice and from January to April for dry season rice. The estimate of wet paddy transported to Vietnam is around 2 million Mt from November 2017 up to May 2018.

4.4.8 Marketing

(1) Rice Seed

The rice seed can be obtained from the AQIP dealers’ shops, through which other private companies also use to distribute their seeds. Rice seed promotion through any means is rarely carried out, excluding AQIP’s signboards. The majority of rice seeds supplied by local private seed companies is Sen Kra Oub and Phka Rumduol. Since the local private companies have been limited in supply capacity, there are a lot of seeds imported from Vietnam and distributed to Cambodia through the border pass “Banteay Chakrey” in Prey Veng province. The Vietnamese rice varieties are IR504, OM4900 and OM5154.

The selling prices of seed differ according to the varieties and suppliers. However, for Cambodian rice varieties, the variance of price is between 200-400KHR/kg, unlike Vietnamese rice varieties where the price variation is between 725-875KHR/kg. This means the same Vietnamese rice seeds produced by Vietnamese companies receive more profit than Cambodian companies. On the other hand, the cost of rice seed production in Cambodia is much more expensive than in Vietnam.

Besides, there is no promotion of Vietnamese rice seeds, but more attractive packing bags, shorter duration of planting and easiness of paddy sales contributed to using more of Vietnamese rice seeds in the province. However, it is a complaint of the farmers using Vietnamese seed imported from Vietnam that there are lots of off-types and weeds in their fields, which caused poor quality paddy and a hesitance of buying from traders and rice millers.

Table 4.12 Selling Price of Major Seed Varieties at Dealer Shops in 2017 (KHR/kg)

Variety	AQIP	KK Seed	Others
Sen Kra Oub	2,850-3,100	2,500-2,700	2,500
IR66	N/A	N/A	2,100
IR504	2,400-2,600	N/A	1,700-2,575
OM4900	2,400-2,600	N/A	2,150-2,875
OM5154 (mild aromatic)	N/A	N/A	1,800-2,575
Phka Kravann	N/A	N/A	1,500
Phka Knhey	2,600-2,800	N/A	N/A
Phka Rumduol	2,800-3,200	2,500-2,700	2,500-2,675
Phka Romeat	N/A	N/A	2,700
Riang Chey	2,600-2,800	N/A	N/A
Neang Khon	2,600-2,800	N/A	N/A

Source: RSPP survey team

(2) Paddy and Rice

The farmers mainly sell their paddy to paddy collectors/traders rather than rice millers due to it being easy to sell, they receive immediate cash payment and not much concern with regards to the quality. Both Cambodian and Vietnamese traders accessed the rice fields during harvest season, identified the paddy quality and negotiated the price with immediate payment. Unlike rice millers who wait for paddy collectors to supply to their warehouse gates before carrying out their quality checks, and up to 5-day payment terms. The rice millers’ practice is such due to a lack of labor to travel to check and collect paddy at the fields; on occasion, they did purchase paddy at field level.

The prices of paddy vary in accordance to varieties and quality as well. Table 4.13 shows the list of prices of paddy offered by different buyers at the field.

Table 4.13 Purchasing Prices of Wet Paddy Prices at field in 2017 (KHR/kg)

No.	Variety	Rice Miller	Paddy Collector/Trader
1	Phka Rumduol/ Phka Malih	1,200	N/A
2	Neang Khon	N/A	N/A
3	Sen Kra Oub	N/A	850
4	Sen Pidor	900	900-950
5	IR504	850	850-880
6	OM4900	950	700-990
7	OM5154	900	N/A

Source: RSPP survey team

The rice millers bought paddy from the field by using their own transportation, but sometimes they paid 30-40KHR/kg for transport rental with distances of 30-40km from field to their warehouses.

In general, rice millers in Prey Veng offered prices competitively lower than paddy collector/trader and with longer terms of payment, which led the farmers to more frequently sell paddy to paddy collectors/traders.

4.4.9 Key Facts of the Rice Value Chain in Prey Veng

	Key Facts
1	Only KK Seed now supply seed in Prey Veng.
2	Vietnamese rice varieties (IR504, OM4900 and 5154) are dominant crops in Prey Veng. Most of Vietnamese rice seeds are directly supplied from Vietnam through agricultural input sellers.
3	Rice millers turn to contract with ACs for the supply of high-quality paddy
4	Prey Veng is a key province where the paddy is transported to and the seed is imported from Vietnam.

4.5 Takeo Province

4.5.10 Current Rice Value Chain: From Foundation Seeds to Milled Rice

The rice value chain in Takeo is similar to Prey Veng Province. Figure 4.4 Current Rice Value Chain in Prey Veng above shows the flow of seed and paddy in that province.

Under the BFPP, 2 ACs produced certified seeds of 146Mt of Phka Rumduol and Sen Kra Oub in 2017 and distributed to 3 other ACs to produce paddy through contract farming with exporters. In 2018, there are 3 ACs producing 280Mt of the same varieties and who distribute to other ACs for paddy production contract with rice millers/exporters.

Private companies such as SGS and Golden Seed sell rice seed through agricultural input sellers. However, it is found that private companies are not so strong in seed distribution in Takeo due to high competition from Vietnam and local private seed producers.

Table 4.14 Rice Seed Supply in Takeo in 2017

No.	Producer	Quantity, Mt
1	AQIP	47
2	Other companies	N/A
3	Private producers	600
5	ACs	30
6	BFPP	146
	TOTAL	**823**

Source: RSPP survey team

Most of the varieties demanded from private companies are Sen Kra Oub and rainy season rice varieties, such as Phka Rumduol, Phka Knhey and Riang Chey. For dry season rice production, the farmers regularly purchased seeds from Vietnamese traders due to Vietnamese rice varieties being shorter, easy to sell at the field with good prices and cash payment carried out immediately. The paddy produced close to the Cambodian-Vietnamese border is sold to Vietnam after immediate harvest, unlike the paddy produced far from the border being sold through paddy collectors/traders. There are seven large scale Cambodian paddy traders who collect paddy and sell to Vietnam. The paddy collectors in Takeo purchased paddy not only in Takeo, but from other neighbouring provinces such as Kampot, Kampong Speu, Kandal, Kampong Cham and Pursat. They estimated that they sold about 1.4 million Mt of paddy in 2017. There are three focal Cambodian-Vietnamese border passes where the paddy is sold in the dry season: Number 21 port (namely, Yin Ya), Kampong Ampil port, and Angkor Borey port. In the rainy season, the paddy is sold to Vietnam at Takeo town port.

Rice millers/exporters in Takeo purchased approximately 60% of their paddy from collectors and 40% directly from farmers. They complained about impure and mixed-up paddy purchased through paddy collectors. The Sok Keo Rice Mill in Takeo claimed that the paddy purchased from either the farmer or collector is not so pure, which caused a lot of rejection and losses while milling. Most of the paddies are purchased from Takeo, Kampot, Kampong Speu and Pursat. They also added that they would like to have contract farming with ACs or large farm paddy producers to ensure the purity and quality. The rice they mill are Phka Rumduol and Sen Kra Oub for export to European Market, and IR504 for export to China.

4.5.11 Marketing

(1) Rice Seed

Rainy season farmers access rice seed from agricultural input sellers' shops where AQIP signboards are located and at the AQIP seed center in Takeo town. The varieties the farmers produce in the rainy season are Sen Kra Oub, Phka Rumduol, Riang Chey, Phka Knhey, and other traditional rice varieties. For dry season production, the farmers mostly procured Vietnamese rice seeds from agricultural input sellers and private seed producers in Takeo town, and from seed dealers in Vietnamese bordering districts, where a large area is planted to dry season and recession water rice. Large scale paddy producer farmers chiefly access seed directly from Vietnamese dealers at the border. Sen Kra Oub has been slowly adopted in the dry season production in Takeo due to it being difficult to sell and the price offered by traders is the same as IR504 or OM4900. In addition to that, the duration of Sen Kra Oub is longer and the yield is even lower than Vietnamese types.

Table 4.15 Selling Price of Major Seed Varieties at Dealer Shops in 2017 (KHR/kg)

Variety	AQIP	Private Producers	Vietnamese Dealers	Others
Sen Kra Oub	2,850-3,100	N/A	N/A	2,500
IR504	2,400-2,600	1,300	2,500-2,800	1,300
Phka Knhey	2,600-2,800	N/A	N/A	N/A
Phka Rumduol	2,800-3,200	2,500	N/A	3,000
Riang Chey	2,600-2,800	N/A	N/A	N/A
Neang Khon	2,600-2,800	N/A	N/A	N/A

Source: RSPP survey team

There are three variety seeds predominantly supplied in Takeo province; IR504, Sen Kra Oub and Phka Rumduol by AQIP, private seed producers and Vietnamese dealers. Whereas traditional and other varieties are mostly retained by farmers and bought from the rice seed dealers of AQIP.

(2) Paddy and Rice

As in Prey Veng, the same reasons exist as to why most of the farmers sell paddy to Vietnamese traders rather than rice millers in Takeo. The paddy prices differ from one to another of the same variety due to the required quality by visual observation. Table 4.16 shows the prices offered by different buyers.

Table 4.16 Price of Wet Paddy Offered by Buyers in 2017 (KHR/kg)

No.	Variety	Sok Keo RM	Local Trader	VN Trader	Other
1	Phka Rumduol	1,000-1,150	1,150-1,200	N/A	1,050
	Chmar Prum	N/A	1,120-1,130	1,150-1,180	N/A
	Sreov Krahorm	N/A	1,120-1,130	1,150-1,180	N/A
	*Mixed Rice	N/A	800	850	N/A
2	Sen Kra Oub	1,050-1,100	N/A	N/A	1,000
3	IR504	760-770	730-850	820-860	800-830

Source: RSPP survey team
**Mixed rice (traditional rice): Banteay Meas, Neang Menh, Neang Khon, Riang Chey, Krahorm*

4.5.12 Key Facts of the Rice Value Chain in Takeo

No.	Key Facts
1	Phka Rumduol, Sen Kra Oub and IR504 are the dominant crops produced in Takeo mainly for export. IR504 is the majority produced in the dry season and sold to Vietnam.
2	Vietnamese traders are strong in seed distribution to farmers.
3	Takeo is the province where the paddy supply flows from other provinces in to Vietnam.
4	Rice millers/exporters turn to focus on contract farming to ensure the quality.

Chapter 5 Recommended Rice Seed Varieties in the Target Provinces

Currently, CARDI registers 46 rice varieties and selects 12 recommended varieties out of the registered varieties (Table 5.1). Nevertheless, this baseline survey found that only four of 46 registered varieties are actually produced in the target provinces (Table 5.2, and Chapter 2 for the detailed information).

Table 5.1 Recommended Rice Seed Varieties by CARDI

Early Type	Medium Type	Late Type
IR 66 Chul'a sa Sen Pidao CAR14 CAR15	Phka Rumduol Phka Rumdeng Phka romeat Phka Chan Sen Sar	Riang Chey CAR4 CAR6

Source: Rice Seed Manuals, APPP, 2014. JICA and information from GDA C/P

Table 5.2 Major Rice Seed Varieties and Their Production in the Target Provinces

	Dry		Rainy		Total	
	Number of ACs	Production (Mt)	Number of ACs	Production (Mt)	Number of ACs	Production (Mt)
Phka Rumduol	0	0	38	38	38	793.8
Sen Kra Oub	5	296.6	10	311.6	15	785.4
CAR15	1	236	1	238	2	237
Sbai Mongkul	1	0	1	2	2	0
IR504	1	35.55	0	36.55	1	35.55
IR66	1	236	0	237	1	256
Phka Kravann	0	0	1	1	1	240
Phka Romeat	0	0	1	1	1	4.79

Source: RSPP survey team

Market demand levels change the prices of different rice seed varieties and naturally, producers and distributors respond to the dynamics. For this reason, it is not appropriate for The Project, which plans to promote the market-oriented distribution system of rice seeds, to fix the recommended varieties. Instead, The Project will consider the market demand and availability of registered seeds at each crop season, and choose suitable varieties, considering each of their agroecological conditions, through consultation with GDA and PDAFF.

For the dry and rainy seasons of 2018/2019, the first training period, the following varieties will be used for the project activities:

- Sen Kra Oub, Phka Rumdoul and CAR15 (only in Battambang)

Chapter 6 Recommended Implementation Structure of the Project in the Target Provinces

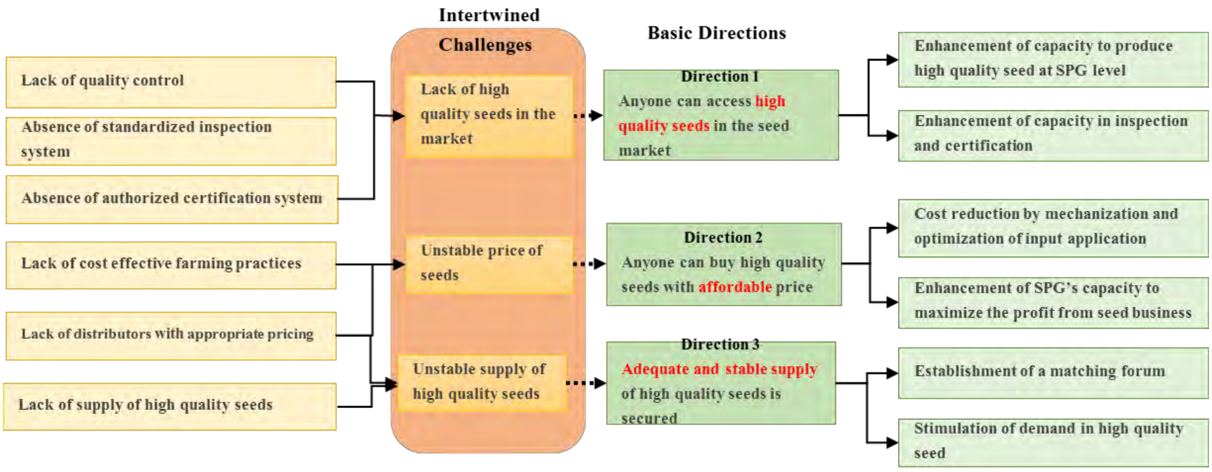
6.1 Proposed Basic Directions

Table 6.1 summarizes the significant challenges toward the RSPP's project purpose; "system for producing and distributing quality rice seed is established and functions properly in the target provinces", and Figure 6.1 shows the basic directions which RSPP proposes to employ. The challenges that hinder an appropriate production and distribution of quality rice seed can be compiled into three intertwined factors, namely, (1) lack of high-quality seeds in the market, (2) unstable price of seeds, and (3) unstable supply of seeds.

Table 6.1 Summary of Challenges

Intertwined Challenges		Reference
Lack of high-quality seeds in the market	Lack of quality control	Chapter 3.2 and 3.3
	Absence of standardized inspection system	Chapter 2.1
	Absence of authorized certification system	Chapter 2.1
Unstable price of seeds	Lack of cost-effective farming practices	Chapter 2.1
	Lack of distributors with appropriate pricing	Chapter 4.1
Unstable supply of quality seeds	Lack of supply of high-quality seeds	Chapter 4.1

Source: RSPP survey team



Source: RSPP survey team

Figure 6.1 Challenges and Basic Directions

The RSPP aims to turn over the hindrances toward the driving forces; *basic directions,* to achieve the project purpose:

(1) Anyone can access high quality seeds in the seed market, through;
- enhancement of capacity of produce quality at SPG level,
- enhancement of capacity in inspection and certification

(2) Anyone can buy high quality seeds with affordable price, through
- cost reduction by mechanization and optimization of input application,
- enhancement of SPG's capacity to maximize the profit from seed business

(3) Adequate and stable supply of high quality seeds is secured through;
- establishment of a matching forum with stakeholder exchange information
- stimulation of demand in high-quality seeds, via a demonstration farm

6.2 Selection of the Target Seed Producer Groups

The RSPP plans to create the business model, employing the above basic directions. The business model is a sustainable business-linkage of seed producers, distributors (private organizations) and consumers, tied up by a standardized inspection and certification system. To do so, the RSPP needs to cooperate with highly potential SPGs who (1) own the necessary infrastructure and equipment to expand rice seed production, and (2) are willing to participate in the project activity and engage in seed business. With this understanding, the RSPP proposes the criteria for selection of target ACs as Table 6.2 lists.

Table 6.2 Criteria for Selecting Target ACs

Minimum Requirement	Highly Considered Requirement	Other Considered Requirement
・ Existence of irrigation ・ Existence of land for seed production ・ Willingness to expand seed production and business*	・ Land for a drying yard ・ Warehouse capacity ・ Organizational capacity (internal management)**	・ Accessibility to main road and business centers ・ Number of experienced seed producers

**Those who are willing to expand seed production and business, are aware of the current high demand in quality seeds and expect an increase in their profit through seed production.*
***The organizational capacity is evaluated by the practice (or not) of book keeping, regular meetings, and the existence of internal regulation, leaderships.*
Source: RSPP survey team

The selection criteria is divided into three levels; minimum, highly considered, and other considered requirement by priority order. The following tables, Table 6.3 - Table 6.6 show the results of screening based on the minimum and highly considered criteria. The screening results of each provinces narrow down the following ACs:

(1) Battambang
- Chamroeun Phal Riang Kesey AC
- Chrey Samaki Bangkoeun Phal AC
- Kamping Puoy Bangkoeun Phal AC
- Sangha Phal

(2) Kampong Chhnang
- Anhjanhroung Samey Thmey AC
- Kasekam Chey Chumneas AC
- LAREC (NGO)

(3) Prey Veng
- Baphnom Mean Chey AC
- Bopea Senchey AC
- Chamros Loas Thmey Svay Teap AC
- Kdey Sangkheum Beung Preah AC
- Sambo Phal Russey Sanh AC

(4) Takeo
- O'Saray AC
- Baksey Reak Reay AC
- Choeung Kuon Chauk Chey AC
- Oudom Sorya AC

The Project would like to finalize the selection through consulting GDA and each PDAFF.

Table 6.3 Nominated ACs in the Battambang Province

No.	Name of AC	Total Members of AC (Female)	Number of SPGs	Member of SGPs	Irrigation system (Y/N)	Current cultivated farmland for rice seed (ha)		Farmland for additional seed production (ha)	Land for drying yard (ha)	Warehouse (ton)	Organizational Capacity	Willingness
						Dry	Rainy					
1	Beung Pring	42 (14)	1	3	N	0	5	0	0	0	Low	Low
2	Chamroeun Phal Riang Kesey	288 (138)	1	4	Y	0	5.5	10	0.02	100	High	High
3	Chraneang Cheng Peas Chamroeun Phal	104 (71)	1	4	Y	0	2	0	0	0	Low	Fair
4	Chrey Samaki Bangkoeun Phal	112 (68)	1	40	Y	0	40	60	0	200	High	High
5	Kamping Puoy Bangkoeun Phal	123 (62)	1	10	Y	0	2	20	0	500	High	High
6	Kanteu1 Pheakdey Reasmey Chulsa	184 (87)	1	17	Y	0	16	50	0.15	200	Fair	Fair
7	Khum Kampong Preang	201 (75)	1	30	Y	15	15	150	0.01	500	Fair	Low
8	Morodok Bansay Treng	154 (101)	1	7	Y	0	11	30	0	0	Fair	High
9	Phnom Krapeu	470 (268)	1	20	Y	0	24	38	0	200	Fair	Low
10	Prek Chik	45 (22)	1	12	Y	0	12.3	50	0	0	Fair	Fair
11	Reaksmey Odaun Pov Chamroeun Phal	86 (52)	2	9	Y	0	2	5	0	0	Fair	Low
12	Samaki Mean Chey	60 (20)	2	8	Y	0	10	30	0.16	50	Fair	High
13	Sangha Phal	215 (85)	1	31	Y	0	65	100	0	300	High	High
14	Teuk Chet Kasekar Kea Mean Chey	312 (142)	1	12	Y	0	2	30	0	0	Fair	High
	Total	**2396 (1205)**	**16**	**207**	**13**	**15**	**211.8**	**573**	**0.34**	**2050**	**4**	**7**

Source: RSPP survey team

Table 6.4 Nominated ACs in the Kampong Chhnang Province

No.	Name of AC	Total Members of AC (Female)	Number of SPGs	Member of SGPs	Irrigation system (Y/N)	Current cultivated farmland for rice seed (ha)		Farmland for additional seed production (ha)	Land for drying yard (ha)	Warehouse (ton)	Organizational Capacity	Willingness
						Dry	Rainy					
1	Anhjanhroung Samey Thmey	178 (140)	0	43	N	0	11	50	0	0	High	High
2	Kasekam Chey Chumneas	1,243 (799)	0	48	Y	0	69	100	0	0	High	High
3	Kasekam Khunrorng Reak Reay	221 (196)	1	2	Y	0.4	0.7	10	0.03	100	Fair	High
4	LAREC (NGO)	12 (1)	N/A	N/A	N	137.75	5.45	150	1	500	High	High
5	Phnom Tauch Samaki	70 (47)	0	20	N	0	18	10	0.03	50	Fair	Low
	Total	**1724(1184)**	**1**	**113**	**2**	**138.15**	**104.15**	**320**	**1.06**	**650**	**3**	**4**

Source: RSPP survey team

Table 6.5 Nominated ACs in the Prey Veng Province

No.	Name of AC	Total Members of AC (Female)	Number of SPGs	Member of SGPs	Irrigation system (Y/N)	Current cultivated farmland for rice seed (ha)		Farmland for additional seed production (ha)	Land for drying yard (ha)	Warehouse (ton)	Organizational Capacity	Willingness
						Dry	Rainy					
1	Baphnom Mean Chey	108 (21)	2	31	Y	0	33	37	0	0	High	High
2	Bopea Senchey	84 (17)	2	9	Y	74	6	73	0	0	High	High
3	Chamros Loas Thmey Svay Teap	147 (111)	1	16	Y	0	6	25	0.1	100	High	High
4	Kaksekar Akphiwat	50 (27)	1	8	N	0	2	2	0	0	Fair	High
5	Kantrean	440 (304)	1	16	Y	0	8	0	0	0	Fair	Low
6	Kdey Sangkheum	62 (27)	3	13	Y	0	13.6	50	0.4	0	Fair	High
7	Kdey Sangkheum Beung Preah	141 (82)	1	15	Y	0	2	4	0	0	High	High
8	Phum Yoeung	30 (10)	1	8	Y	0	2	4	0	0	Fair	Low
9	Punleu Kaksekar Khum Kampong Seung	992 (614)	3	24	N	0	6	2	0	0	Fair	High
10	Prech Samaki Mean Chey	44 (20)	1	10	N	0	2	10	0.3	100	Fair	High
11	Poloas Sen Chey	71 (7)	5	71	Y	69	35.7	40	0	0	Fair	High
12	Sambo Phal Russey Sanh	685 (518)	1	15	Y	0	4	10	0.04	80	High	High
13	Tro Trung Kaksekar	112 (65)	1	8	N	0	2	10	0	0	Fair	High
14	Oudom Mongkul Anlong Sar	138 (95)	1	8	N	0	2	25	0	0	Fair	High
	Total	**3104 (1918)**	**24**	**252**	**9**	**143**	**124.3**	**292**	**0.84**	**280**	**5**	**12**

Source: RSPP survey team

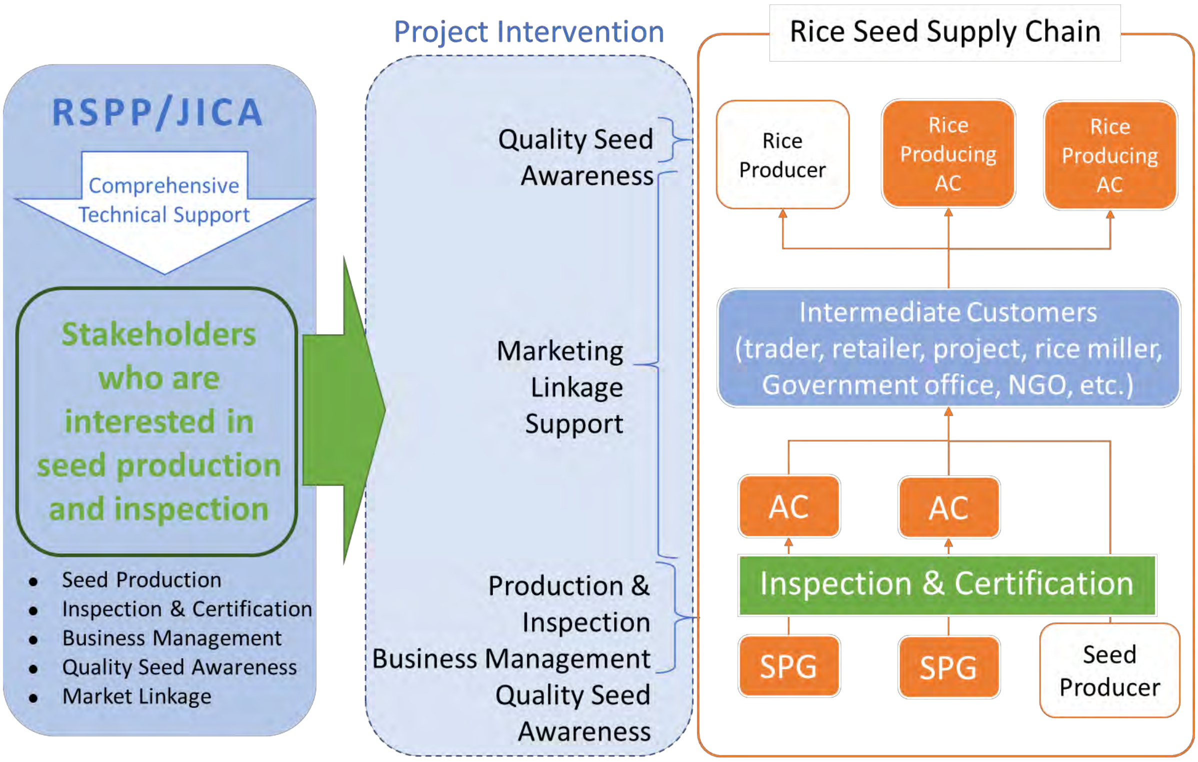
Table 6.6 Nominated ACs in the Takeo Province

No.	Name of AC	Total Members of AC (Female)	Number of SPGs	Member of SGPs	Irrigation system (Y/N)	Current cultivated farmland for rice seed (ha)		Farmland for additional seed production (ha)	Land for drying yard (ha)	Warehouse (ton)	Organizational Capacity	Willingness
						Dry	Rainy					
1	O'Saray	55 (11)	5	37	Y	0	60	50	0.038	300	High	High
2	Baksey Reak Reay	204 (121)	1	16	N	0	0.6	10	0.02	200	High	High
3	Champey	69 (38)	1	6	N	0	2.5	0	0	0	Fair	Fair
4	Choeung Kuon Chauk Chey	81 (50)	6	30	Y	0	2.7	35	0.06	200	High	High
5	Samaki Sre Kvav	85 (44)	1	3	N	0	2.87	0	0	0	Fair	High
6	Sdok Sdom	417 (245)	1	15	N	0	13	30	0.011	0	Fair	High
7	Tipath Punlok Thmey	43 (0)	1	9	N	0	18	5	0	0	Fair	Low
8	Oudom Sorya	101 (48)	3	15	Y	0	6	20	0.08	300	High	High
	Total	**1055 (557)**	**19**	**131**	**3**	**0**	**105.67**	**150**	**0.209**	**1000**	4	6

Source: RSPP survey team

6.3 Implementation Structure

Figure 6.2 draws the proposed implementation structure and Table 6.7 describes the main roles of the implementation bodies, namely, RSPP/JICA (Japanese side), GDA and PDAFF.



Source: RSPP survey team

Figure 6.2 Proposed Implementation Structure

Table 6.7 Main Roles of RSPP/JICA, GDA and PDAFF

	The Project	GDA/CSD	PDAFF
Overall	- Overall management and M&E of the Project activities.	- Establish Crop Seed Department (CSD).	- Establish a rice seed inspection and certification unit
Rice seed production and its management	- Provides training to GDA, PDAFF, AC/SPG and private sector - Provides the necessary equipment and facilities to GDA and PDAFF	- Provides training to PDAFF	- Provides training to DAO and SPG
Inspection/ Certification	- Provides training to GDA, PDAFF, AC/SPG and private sector	- Establish an inspection system - Provides training to PDAFF	- Provides training to DAO and SPG - Conduct inspection of rice seed
Business model and Market linkage	- Develop rice seed business models and introduce them. - Promote a market linkage among stakeholders at the beginning	- Build national network and coordinate with relevant players	- Organize rice seed business forum and provincial network

Source: RSPP survey team

Appendix 7

Technical cooperation material:

Rice Seed Production Manual [English/Khmer]

Rice Seed Production Manual

Conforming to the Quality Declared Seed System (QDS) for Cambodia

January 2023

Project for Rice Seed Production and Promotion (RSPP)
General Directorate of Agriculture (GDA)
Japan International Cooperation Agency (JICA)

Preface

In May 2022, the General Directorate of Agriculture (GDA) officially endorsed the Quality Declared Seed System for Rice Seed Production and Business (QDS). Based on the QDS, a group of experts from the Project for Rice Seed Production and Promotion (RSPP), funded by the Japan International Cooperation Agency (JICA), compiled this manual.

The purpose of the manual is to share practical knowledge and experiences on the QDS rice seed production with the seed producers, especially those who pursue the rice seed business.

The manual consists of two parts: Rice Seed Production and Post-harvest Management. Notably, the manual intends to show the sequential steps in each part so that the practitioners can easily follow them.

In addition, the manual is also a complementary document to the technical manuals for rice seed production that exist at the GDA.

The GDA gratefully thanks JICA and its experts for their efforts, in particular the RSPP's advisors and the technical counterparts from the Department of Rice Crop.

The GDA also would like to devote this accomplishment to contributing to the seed sector in the Kingdom of Cambodia.

Technical Working Group

No.	Name	Position	Organization
1	H.E Dr. Ngin Chhay	Royal Government Delegation in charge as Director General of the General Directoriate of Agriculture	General Directoriate of Agriculture
2	Dr. Kong Kea	Director of Department of Rice Crop	General Directoriate of Agriculture
3	Mr. Chea Sokly	Vice Chief of Research and Training Office	General Directoriate of Agriculture
4	Mr. Prum Vuthy	Vice Chief of Rice-based Farming System Office	General Directoriate of Agriculture
5	Mrs. Tim Savann	Vice Chief of Rice Crop Development and Management Office	General Directoriate of Agriculture
6	Mr. Nget Sovann	Vice Chief of Rice Crop Development and Management Office	General Directoriate of Agriculture
7	Mr. Sovann Dara	Vice Chief of Rice Postharvest and Marketing Office	General Directoriate of Agriculture
8	Mrs. Nget Chanbo	Officer of Rice Crop Development and Management Office	General Directoriate of Agriculture
9	Mr. Sak Choeun	Advisor	The Project for Rice Seed Production and Promotion (RSPP)
10	Mr. Masaru YAMAZAKI	Expert	The Project for Rice Seed Production and Promotion (RSPP)
11	Mrs. Sak Sokhena	Assistant to Advisor	The Project for Rice Seed Production and Promotion (RSPP)

Introduction

What is a good quality seed?

a. High Purity Seed
Grains are neither contaminated by other varieties nor other plants and have the genetic characterization of the variety.

b. Healthy Seed
Grains are neither affected by diseases nor insects.

c. Good Germination Seed
Grains are well-matured and have a high germination ability.

What is the Quality Declared Seed System (QDS)?

The QDS label promotes a trusted seed market between seed producers, traders, and paddy producers. The QDS is to certify the quality of seeds by field inspection and seed quality inspection, according to the standard that the QDS Manual for Rice Seed Production and Business specified. The Competent Authority shall issue the QDS label to the qualified seed.

Table of Contents

Part 1: Rice Seed Cultivation

Ten things to do for the QDS seed cultivation

1. Use an appropriate class of authorized upstream seed.
2. Treat the seed with a fungicide before seeding.
3. Confirm the cultivation history of your field.
4. Measure the size of your field correctly.
5. Confirm the isolation of your field from other fields.
6. Practice proper seeding method according to the seed class.
7. Control noxious weeds in your field.
8. Remove off-type plants from your field.
9. Control seed-borne disease before heading stage.
10. Clean the harvester before harvesting.

1. Use an appropriate class of authorized upstream seed.

1.1. Seed Class

Use the proper class of upstream seed for the lower class seed production. Certified Seed (CS) production requires Registered Seed (RS), and RS production requires Foundation Seed (FS).

1.2. Foundation Seed (FS)

Only recognized agencies, such as the Cambodian Agricultural Research and Development Institute (CARDI) and other authorized institutes, can produce FS to maintain genetic identity and purity.

1.3. Registered Seed (RS)

RS is the progeny of FS. CARDI and other authorized seed producers are allowed to produce RS. The seed quality must meet the QDS standard.

1.4. Certified Seed (CS)

CS is the progeny of RS produced by the authorized seed producers. The seed quality must meet the QDS standard.

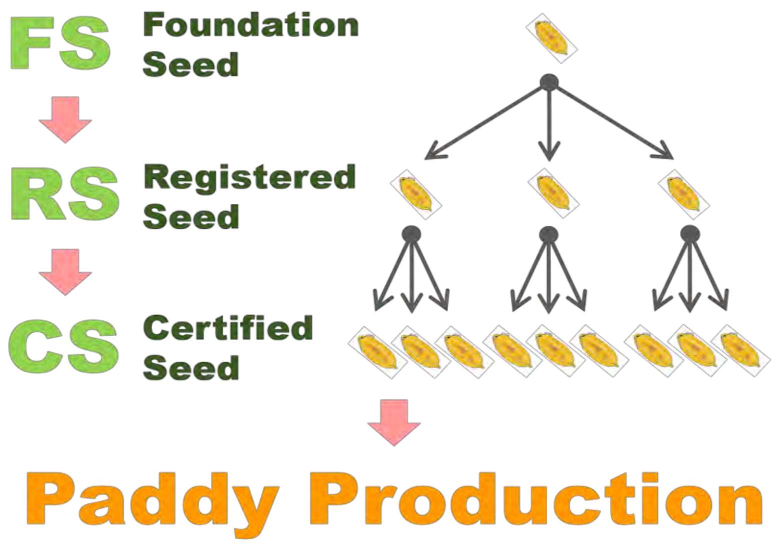


Figure 1-1 Seed propagation system

1.5. Seed Quality Standard

The Quality Declared Seed System (QDS) defines the seed quality standard in Table 1-1.

Table 1-1 Seed quality standard of the QDS

Factors	Seed Class		
	FS	RS	CS
1. Pure seed (Min, %)	98	98	98
2. Inert matter (Max, %)	2	2	2
• Weed seeds (Max, No. of grain/500g)	3	5	10
• Other crop seeds (Max, No. of grain/500g)	2	3	5
• Other rice variety seeds (Max, No. of grain/500g)	1	5	15
• Red rice (Max, No. of grain/500g)	0	2	5
3. Germination rate (Min, %)	85	85	80
4. Moisture content (Max, %)	12	13	14

1.6. Seed Source Certification

Renew the upstream seed every season as the QDS requires and retain the label/tag of the sack and invoice/receipt of the upstream seed as evidence of the seed source and show it to a field inspector upon request.

Figure 1-2 Evidence of the seed source

2. Treat the seed with a fungicide before seeding.

2.1. Seed Treatment

Put the seed into the water and remove the floating unfilled grains since diseases might affect them. Then, disinfect the seed with a chemical fungicide to prevent seed-borne diseases.

Recommended fungicide for seed treatment

Cruiser Plus 10ml (Thiametoxam, Difenoconazole, Fludioxinil)

Dilute 30ml of Cruiser Plus with 3L of water and apply to 100kg of dry seed. Then, leave it for more than 3 hours.

2.2. Seed Incubation

Soak the seed in the water for at least 24 hours for better germination. After soaking the seeds, cover them with a cloth or plastic sheet to keep them under the shade for 12-24 hours, according to the seeding method.

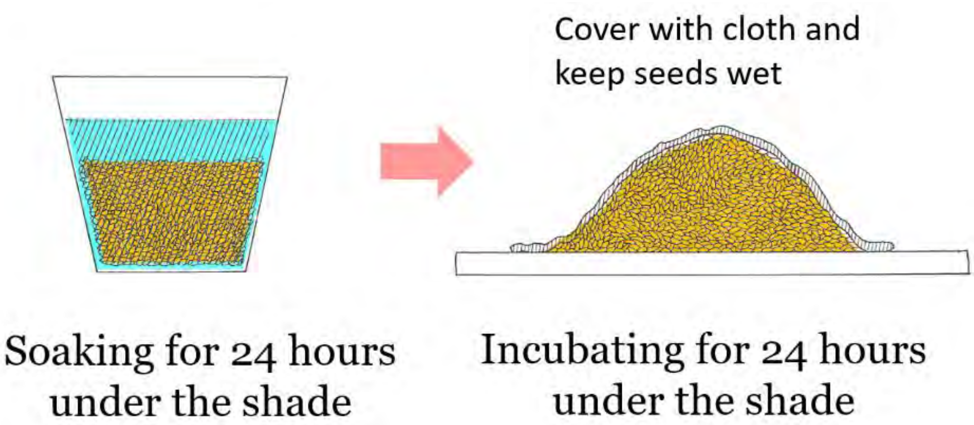


Figure 2-1 Seed treatment method

3. Confirm the cultivation history of your field.

3.1. Field Requirement

The QDS standard requires a seed production field where the same rice variety or other small grain crops had been planted in the previous season.

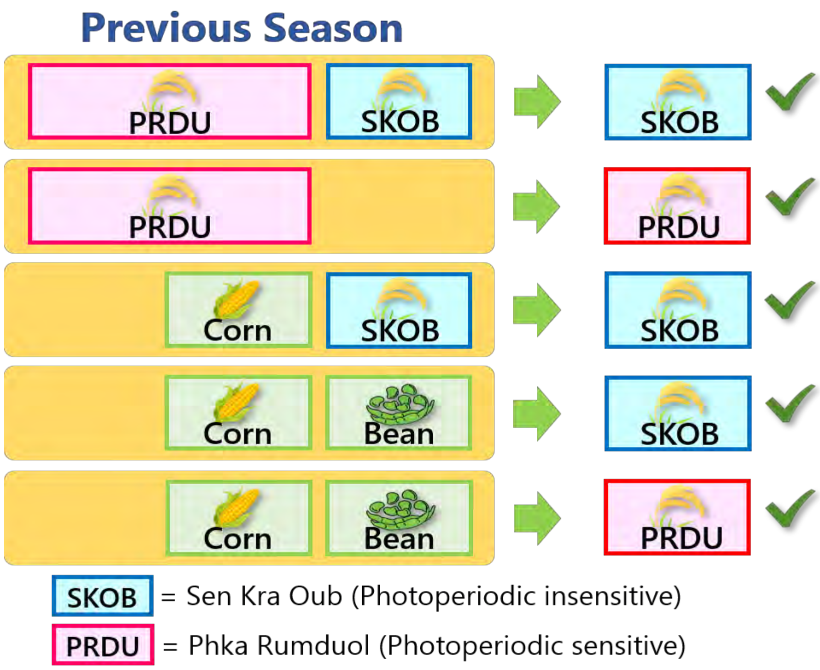


Figure 3-1 Requirement of cultivation history of the field

3.2. Prevention of Volunteers, Ratoons, and Other Plants

Your seed production field should be free from volunteers, ratoons, and other plants. Remove them, and plow the field well before seeding for seed production.

4. Measure the size of your field correctly.

4.1. Production Area Requirement

A total CS seed production area should be more than 5ha for each variety and class per season to comply with the QDS system. RS seed production requires 0.5ha of the production area at least.

4.2. Minimum Size of the Field

Each seed production field should be more than 0.5ha for CS/RS production and more than 0.2ha for FS production.

Table 4-1 Production area and field size requirement

Seed class	FS	RS	CS
Minimum production area per season, variety, and class	0.2ha	0.5ha	5.0ha
Minimum size of each production field	0.2 ha	0.5 ha	0.5 ha

4.3. Integration of the Plots

If the same variety and class of seeds are grown in several plots nearby at the same time, the plots can be considered as one field.

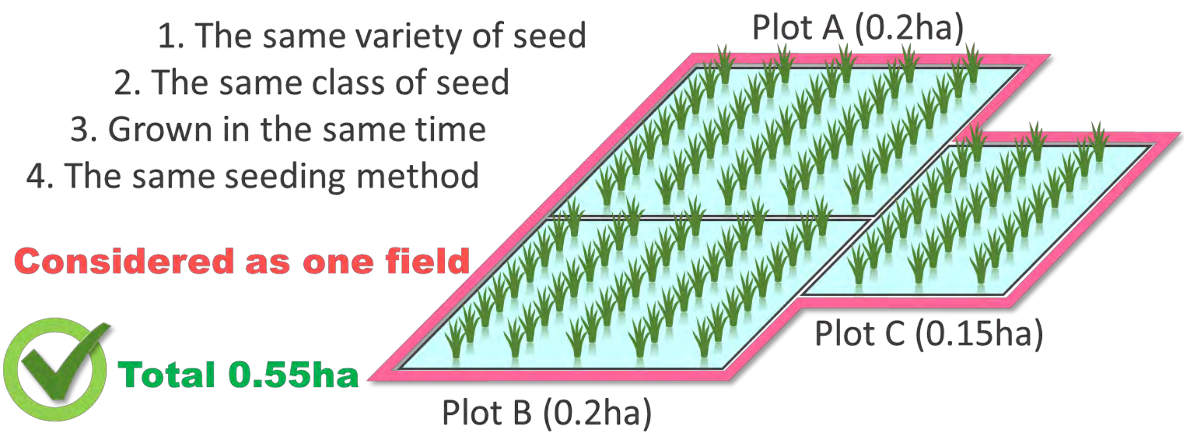
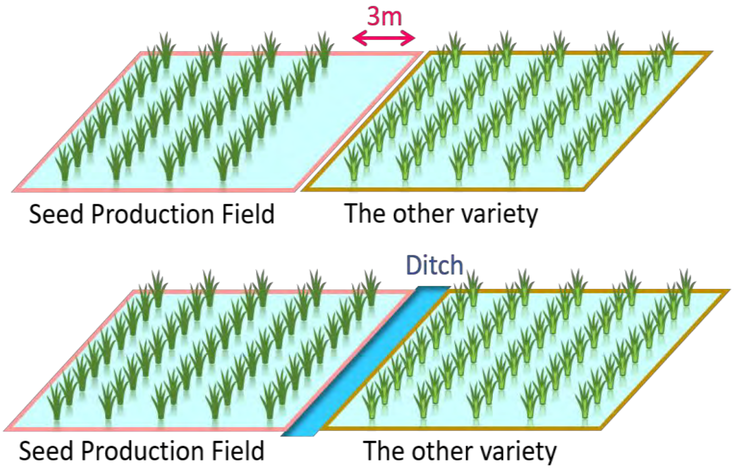


Figure 4-1 Field requirement for seed production

5. Confirm the isolation of your field from other fields.

5.1. Field Isolation

Keep the isolation from other fields by more than 1m or physical barriers, such as a ditch, hedge, and fence.



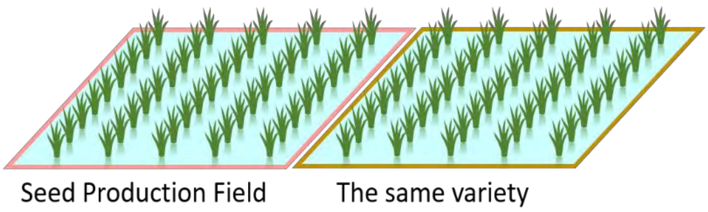
Buffer zone
Make a more than 3m buffer zone to the next field where the other variety of rice is grown.

Physical barrier
In case that there is a physical barrier such as a ditch, hedge, or fence, a buffer zone is not required.

Figure 5-1 Requirement of isolation from other fields

5.2. Exemption

Isolation is not required if the same rice variety is grown in the adjoining field.



Exemption
In case that the same variety of rice is grown in the next field, a buffer zone is not required.

Figure 5-2 Exemption of isolation from other fields

How to select rice seed production field.

a. Accessibility: Select the field near the road for inspection.
b. Water availability: Confirm water availability during seed production.
c. Land flatness: Select the flat field to control the weeds.

6. Practice proper seeding method according to the seed class.

6.1. Seeding Method for FS/RS Production

Transplant in lines by hand or a machine is required to produce FS/RS. Random transplanting or direct sowing is not allowed for FS/RS production.

6.2. Seeding Method for CS Production

CS can be produced by random transplanting or direct line sowing, but broadcasting is not allowed.

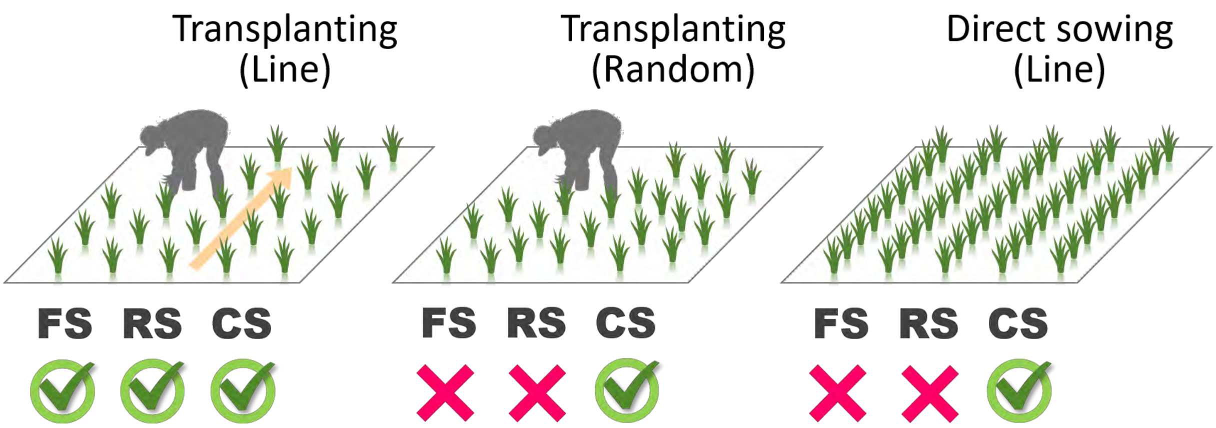


Figure 6-1 Planting method for RS/CS production

Equipment for line sowing

a. Small scale rice transplanting machine (Contact: 023 666 0337 / 011 447 725)
b. Eli Seeder (Contact: 023 666 0337 / 011 447 725)
   The Eli seeder is used with a power tiller.
c. Lun Heng Seeder (Contact: 061 664 947 / 097 797 4545)
   The Lun Heng Seeder is a kind of drum seeder, but a power tiller tows it. No other power source is required.
d. Thai Kit Seeder is a kind of dry seed planter with a power tiller tows it.
e. Drum Seeder: Several types of drum seeders are available in Cambodia. It is suitable for the small size of the plot. It can be operated by human power.

7. Control noxious weeds in your field.

7.1. Noxious Weeds

The QDS field standard defines three kinds of weeds, such as Barnyadrgrass, Sprangletop, and Rice flatsedge, as harmful plants. They shall be strictly controlled in the field.

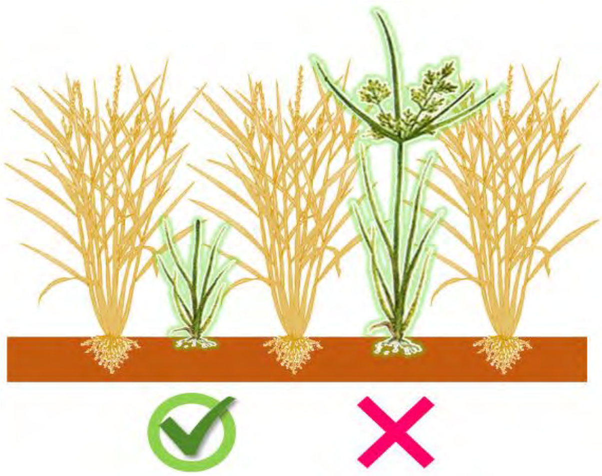
Barnyardgrass	Sprangletop	Rice flatsedge
		
Genus: Echinochloa	*Genus: Leptochloa*	*Genus: Cyperus*

Photo: Website of the University of Arkansas Cooperative Extension Service

Figure 7-1 Noxious weeds by the QDS field standard

7.2. The QDS Field Standard

Those noxious weeds shall be less than ten plants per $10m^2$ for CS production and less than five plants for RS production to meet the QDS field standard.



Small weeds without flowers do not affect the quality of the seeds, and they are not counted as noxious weeds. On the other hand, flowering noxious weeds with flowers or seeds are not acceptable.

Figure 7-2 Judgement of noxious weeds at the field level

8. Remove off-type plants from your field.

8.1. Roguing Off-types

Rouge off-types from time to time. They can be identified by observing the plant height, shape, color, number of tillers, heading time, panicles, and grains.

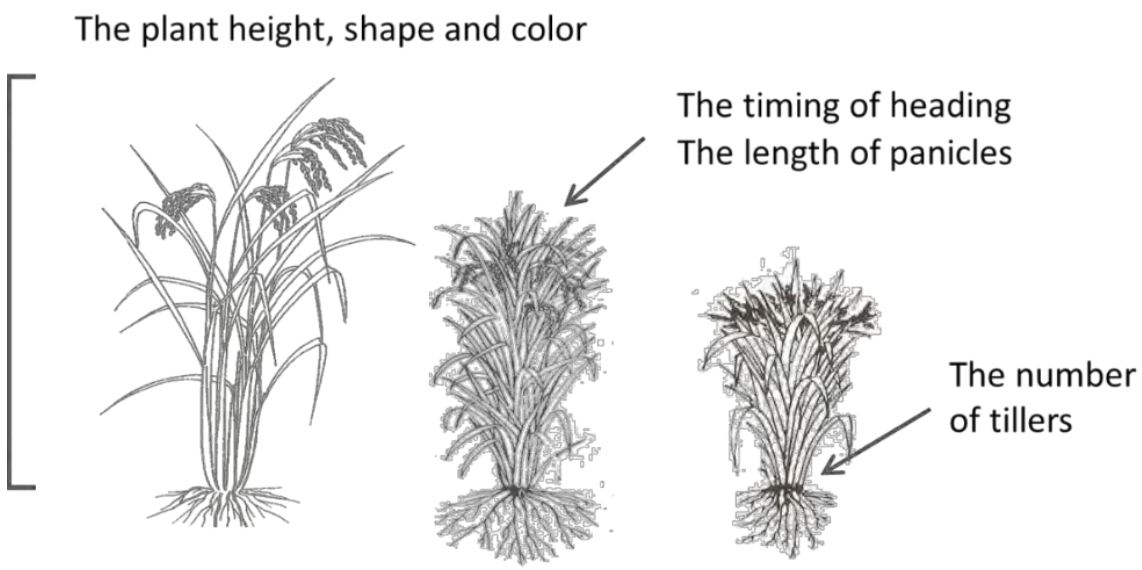


Figure 8-1 Identification of off-types

8.2. The QDS Field Standard

Off-types shall be less than one plant tiller per 10m^2 for RS production and three plant tillers for CS production to meet the QDS field standard.

Table 8-1 The QDS field standard

Seed Class	Registered Seed	Certified Seed
Noxious weeds	Less than 5 tillers/10m^2	Less than 10 tillers/10m^2
Off-types	Less than 1 tiller/10m^2	Less than 3 tillers/10m^2

9. Control seed-borne diseases before heading stage.

9.1. Three Types of Seed-borne Diseases

Three kinds of seed-borne diseases must be controlled in a seed production field, such as Rice Blast, Brown Spot, and Sheath Blight.

a. Rice Blast

- Before heading: Vertical diamond shapes with brown and yellow lines appear on leaves.
- Before harvesting: Infection is observed on the leaf collar under the panicle.

b. Brown Spot

- Before heading: Dark brown and yellow round shape rings appear on leaves.
- Before harvesting: The panicle turns light brown. Infection is also observed on the leaves.

c. Sheath Blight

- Before heading: The infection starts from a lower part of the sheath.
- Before harvesting: Flag leaf withers, and infection is also observed on the sheaths.

d. Non-disease infection

- Before heading: The plant is affected by stem borers.
- Before harvesting: The panicle is easily pulled out by hand.

Figure 9-1 Identification of seed-borne diseases

9.2. Judgment of the plant with diseases

Seed-borne diseases should be controlled before the flowering stage to avoid infections on panicles. While excessive nitrogen promotes Rice Blast, lack of nitrogen causes Brown Spot.

a. Rice Blast and Brown Spot

The affected tillers should be less than 25% after the booting stage.

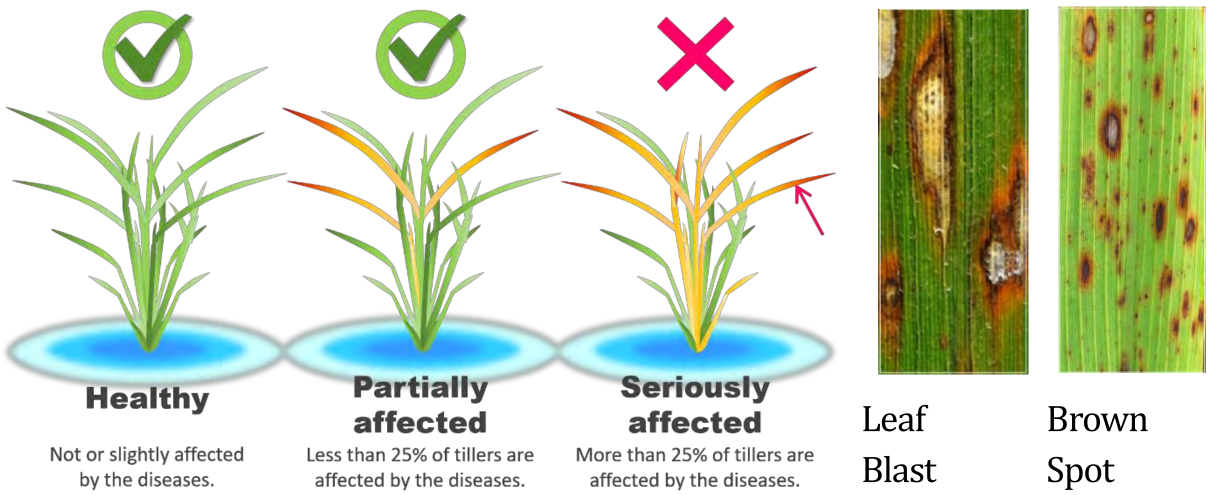


Figure 9-2 Judgement of blast and brown spot infection

b. Sheath Blight

The affected tillers should be less than 25% after the heading stage.

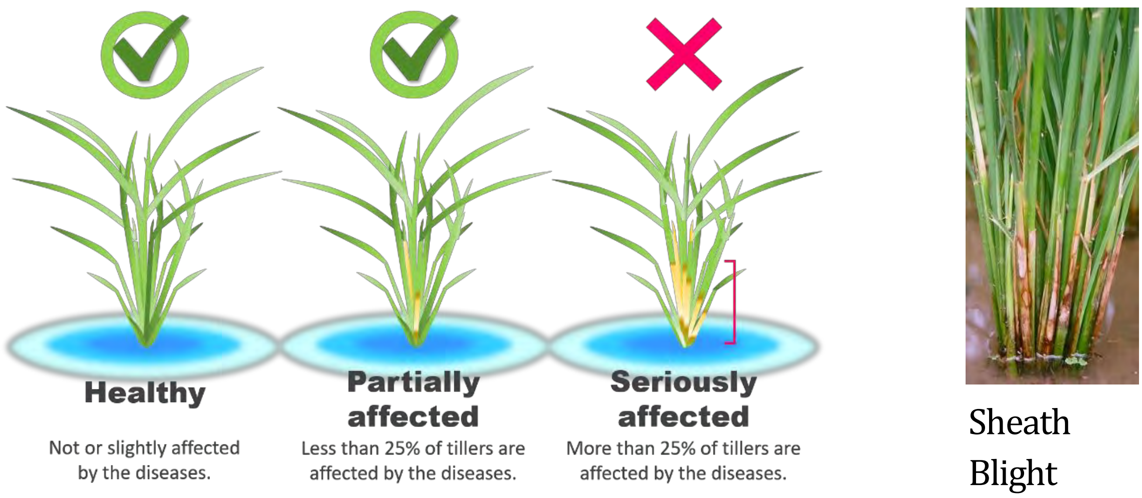


Figure 9-3 Judgement of sheath blight infection

10. Clean the harvester before harvesting.

10.1. Harvesting

When around 85-90% of grains mature, it is the time for harvest.

Figure 10-1 Timing of harvest

10.2. Avoiding Contamination of Other Varieties

To avoid contamination by other seeds, clean a harvester well before harvesting and use clean sacks to carry the products.

Figure 10-2 How to clean harvester

Harvest the outmost area of the field first and do not use the first harvested products as seeds since other grains may remain in the harvester.

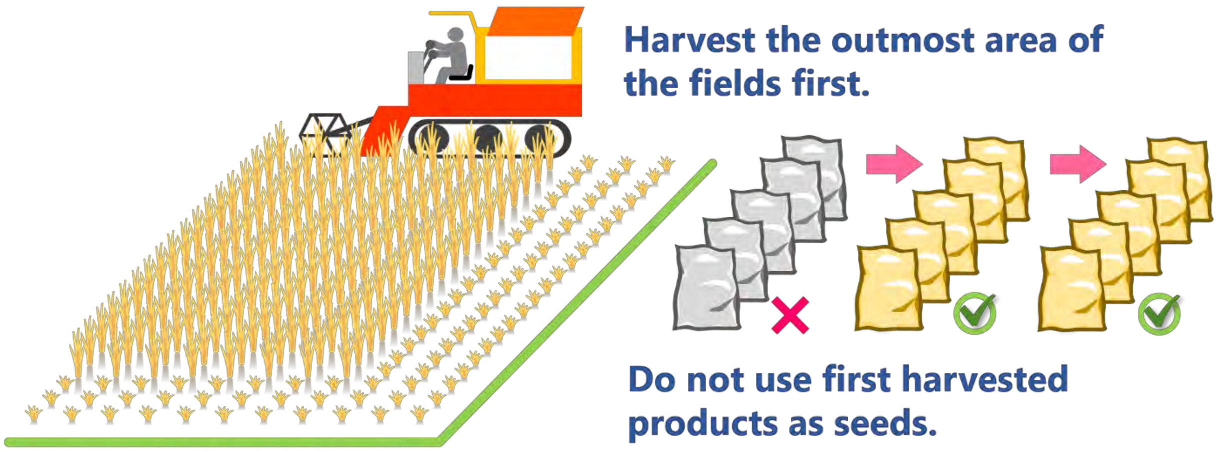


Figure 10-3 Quality control after harvesting

Part 2: Post-harvest Management

Six things to do for the QDS post-harvest management

1. Check the moisture content with a moisture meter.
2. Remove inert matters with a seed cleaner.
3. Check the germination rate after processing.
4. Allocate the specific seed lot number to each product.
5. Use a printed sack with accurate product information.
6. Store the products in dry and cool condition.

1. Check the moisture content with a moisture meter.

1.1. Moisture Control

Soon after harvesting, dry the fresh seed. Do not keep it wet for more than one day. Dry the product gradually to avoid grain cracks. The drying speed shall be 0.5% of moisture per hour. Dry the product evenly. Make small hills of the product and turn it over from time to time when you dry it under the sun.

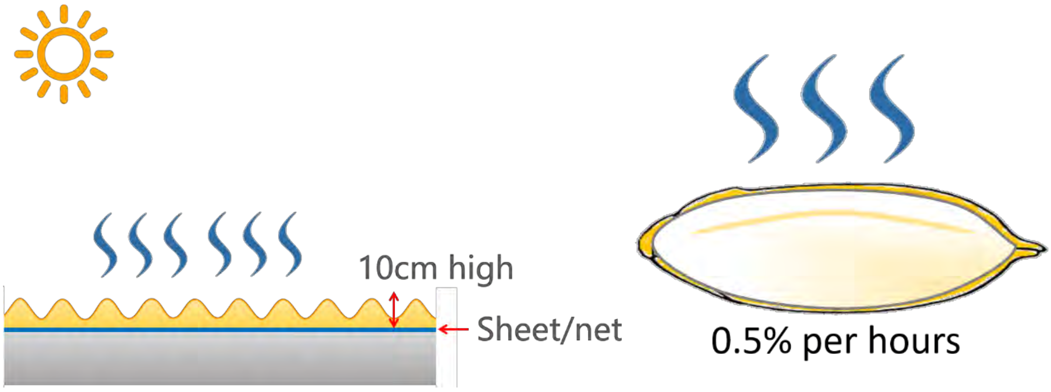


Figure 1-1 How to dry the product

1.2. How to Use a Moisture Meter

Measure the moisture content of the product three times and calculate the average. If an abnormal value is detected, measure the moisture content twice more. Then, eliminate two abnormal values and estimate the average.

Figure 1-2 Digital moisture meter

1.3. The QDS Seed Standard

Maintain the moisture level at less than 13% for RS and less than 14% for CS as the QDS standard.

Figure 1-3 Moisture contents standard

2. Remove inert matters with a seed cleaner.

2.1. Cleaning Products

After drying, remove the inert matters with a cleaner to avoid contamination by other rice varieties and maintain purity. Use designated sacks for the product before cleaning and after cleaning separately.

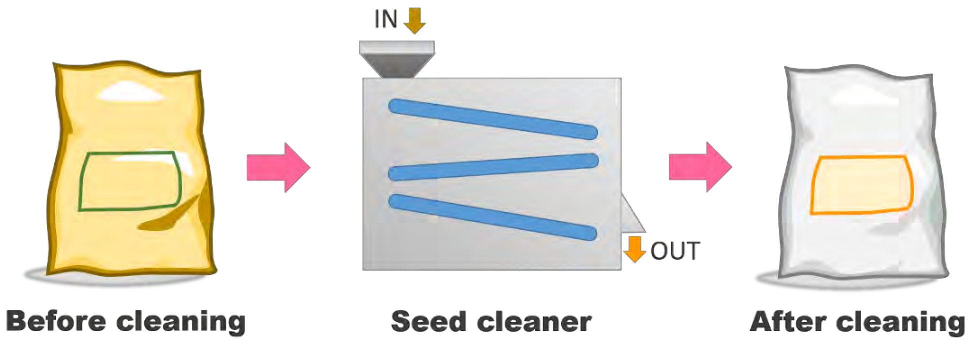


Figure 2-1 Process of seed cleaning

2.2. The QDS Seed Standard

After cleaning, check the quality of the products. If you find inert matters such as rice straws, stones, weeds, and immature grains over the QDS standard, clean the products again. The QDS standard specifies that pure seed should be more than 98% of the product's weight.

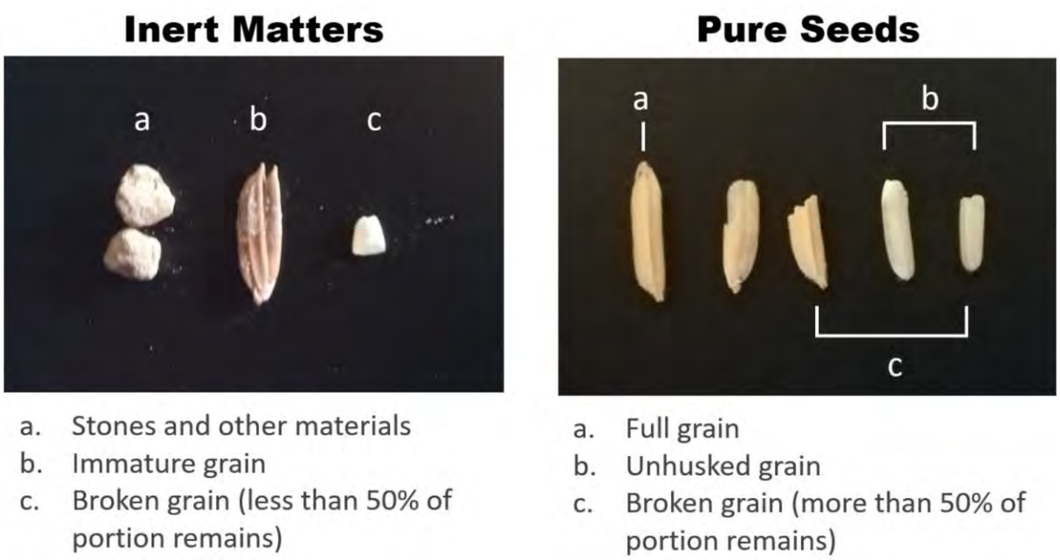


Figure 2-2 Distinction between inert matters and pure seeds

3. Check the germination rate after processing.

3.1. Germination Test

Set 300 grains on the wet paper and keep them moist by spraying water from time to time. After seven days, count the number of germinated seeds and calculate the germination rate.

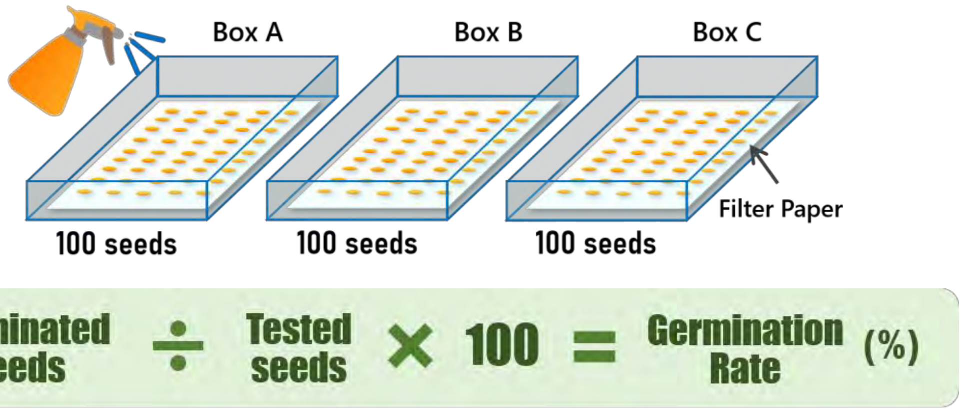


Figure 3-1 Germination test

3.2. The QDS Seed Standard

The germination test shall be done three weeks or later after harvesting, considering the seed dormancy period. A dead, abnormally germinated, or spoiled seed after germination shall not be counted as a germinated seed. The QDS standard requires more than 85% of the germination rate for FS/RS and more than 80% for CS.

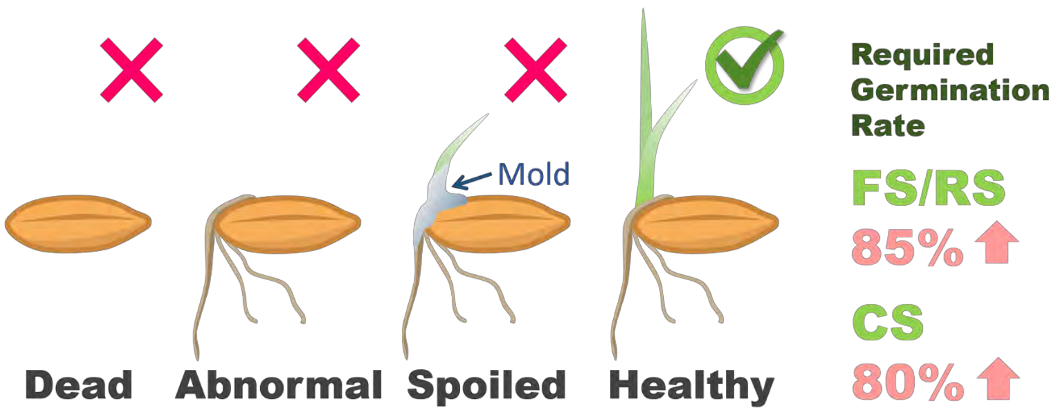


Figure 3-2 How to identify germinated seed

4. Allocate the specific seed lot to each product.

4.1. Seed Lot Preparation

The size of each lot shall be less than 10 tons. If the amount of the product exceeds 10 tons, divide the product into several lots. If the products are harvested from the different fields nearby, they can be combined as the same seed lot. Note the points below before integrating the products as one seed lot.

a. The variety of the products is the same.
b. The class of the products is the same (FS/RS/CS).
c. The products are produced in the same season.
d. The moisture contents of the products are the same (±1%).

4.2. Seed lot allocation

Allocate the seed lot to each product, referring to the example shown in Figure 4-1.

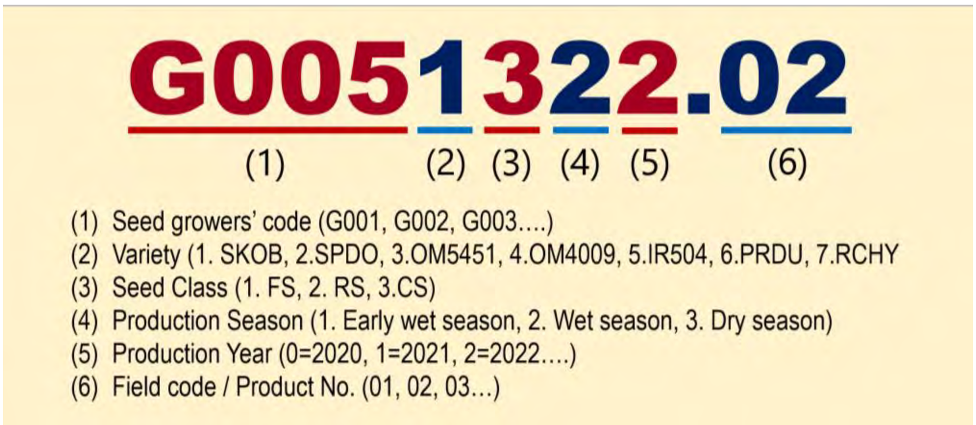


Figure 4-1 Example of lot allocation

5. Use a printed sack with accurate product information.

5.1. Information on the Sack

Prepare the printed sack for the QDS-qualified product. The printed sack shall show the necessary product information.

Product Information

Lot No.	G0051322.02
Seed Variety	SKOB
Seed Class	CS
Producer	XXXXX AC
Producing area	XX, XXX province
Harvested date	2 Feb, 2022
Moisture content	Less than 13%
Germination rate	More than 90%
Expiration date	2 Oct, 2022

Figure 5-1 Example of the appropriately printed sack

5.2. Non-certified Seed

The grains which fail to pass the inspection should be separated from the other certified seeds. If the inert matter is detected excessing the standard, reclean the product and submit the samples for retesting.

QDS Certified Seed	The seed officially certified by the QDS system.
Non-Certified Seed	The seed failed to be certified by the QDS system.
Paddy Rice	The grains which is not suitable to be used as rice seed.
Feed Rice	The grains which is not suitable to be used as paddy rice

Quality information should be provided to the buyers for selling non-certified seed.

Figure 5-2 Categorization of the seed quality level

6. Store the products in dry and cool condition.

6.1. Warehouse Management

Keep the storage cool and clean it to avoid product deterioration and damage by rats, birds and insects. Keep space between the products and walls for ventilation and avoid moisture or heat in the walls.

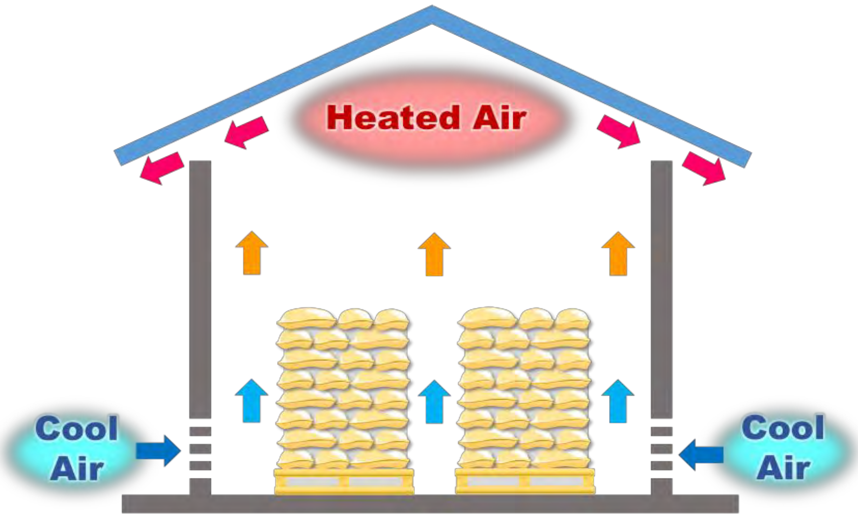


Figure 6-1 Ventilation system of the storage

6.2. Stock Management

Store the products according to the seed lot. Use a pallet to keep the products dry. Don't put seeds of different varieties and classes together on the same pallet(s). Keep enough space between the piles for sampling by an inspector.

Record all transactions of the product with seed lot code. The product information such as the seed, the seed class, the grower's name, the date of harvest, and the moisture content should be traceable by seed lot.

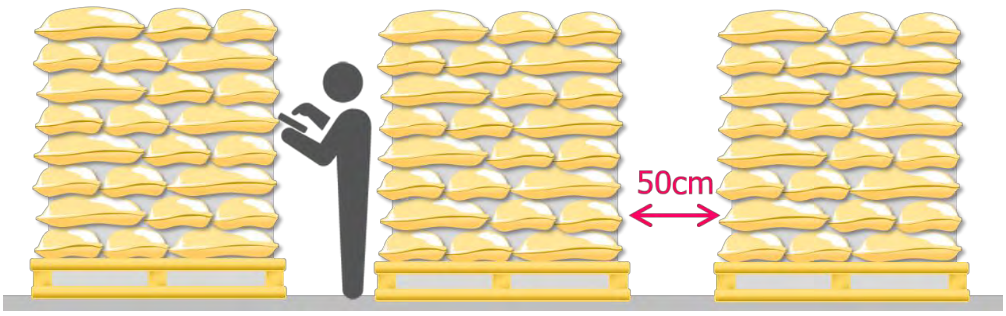


Figure 6-2 Storage of the products

Appendices

Appendix 1

Proper Use of Herbicides

1. Introduction

Several methods can control paddy weeds. However, prevention is more important.

- Use pure seeds without contamination of weed seeds.
- Consider the timing of cultivation before seeding.
- Make the paddy field flat and keep enough water.
- Avoid using paddy fields with a high risk of drought.
- Practice transplanting in the field where irrigation is not available.
- Consider the timing of the weeding. Once the rice leaves cover the paddy's surface, most weeds cannot grow under the shadow.
- Do not use the same herbicide many times.

2. Integrated Weed Management

Cultural control

- ✓ Hand weeding
- ✓ Straight row planting
- ✓ High-quality seeds

Mechanical control

- ✓ Rotating hoe
- ✓ Good land leveling
- ✓ Tractor weeding during the fallow season

Chemical control

- ✓ Herbicides
- ✓ Lime nitrogen

Proper weed management plan is required.

3. Types of Weeds

Grass and sedge weeds

Barnyardgrass

Noxious weed

Sprangletop

Noxious weed

Rice flatsedge

Noxious weed

Broadleaf weeds

Monochoria vagialis
Potederiaceae

Ipomoea aquatic
Convolvuaceae

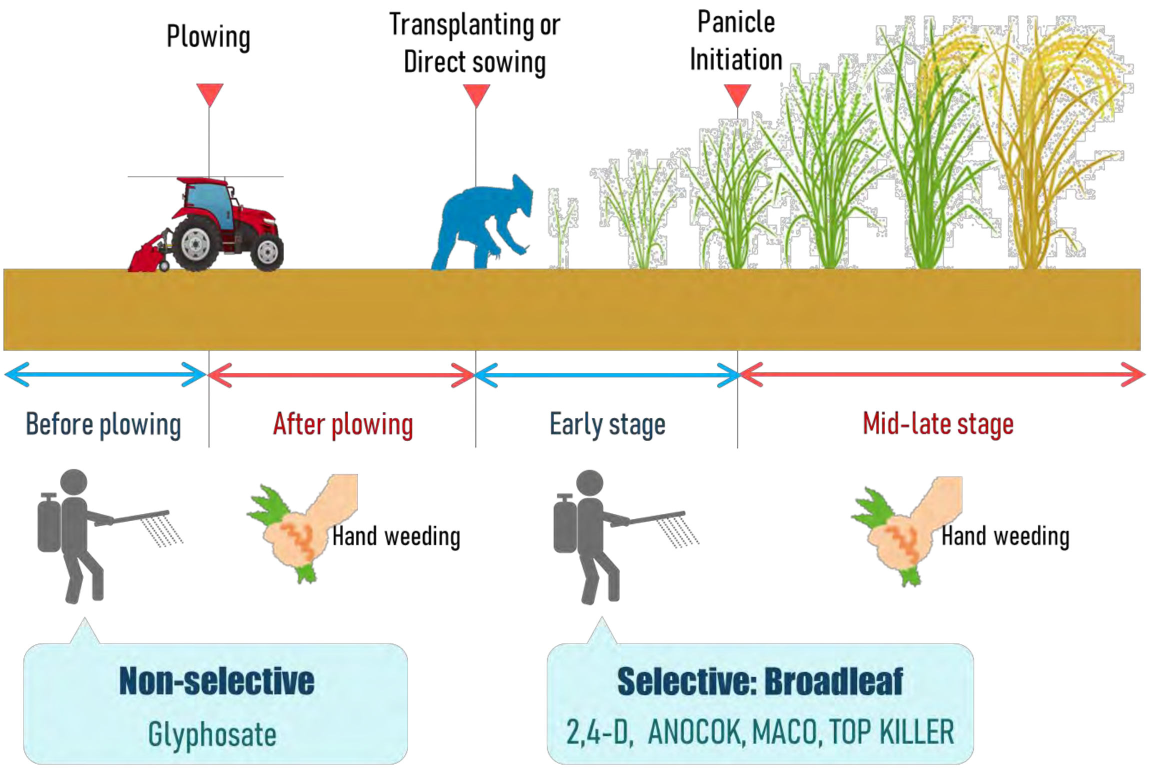
Ludwigia adscendens
Onagraceae

4. Target of Herbicides

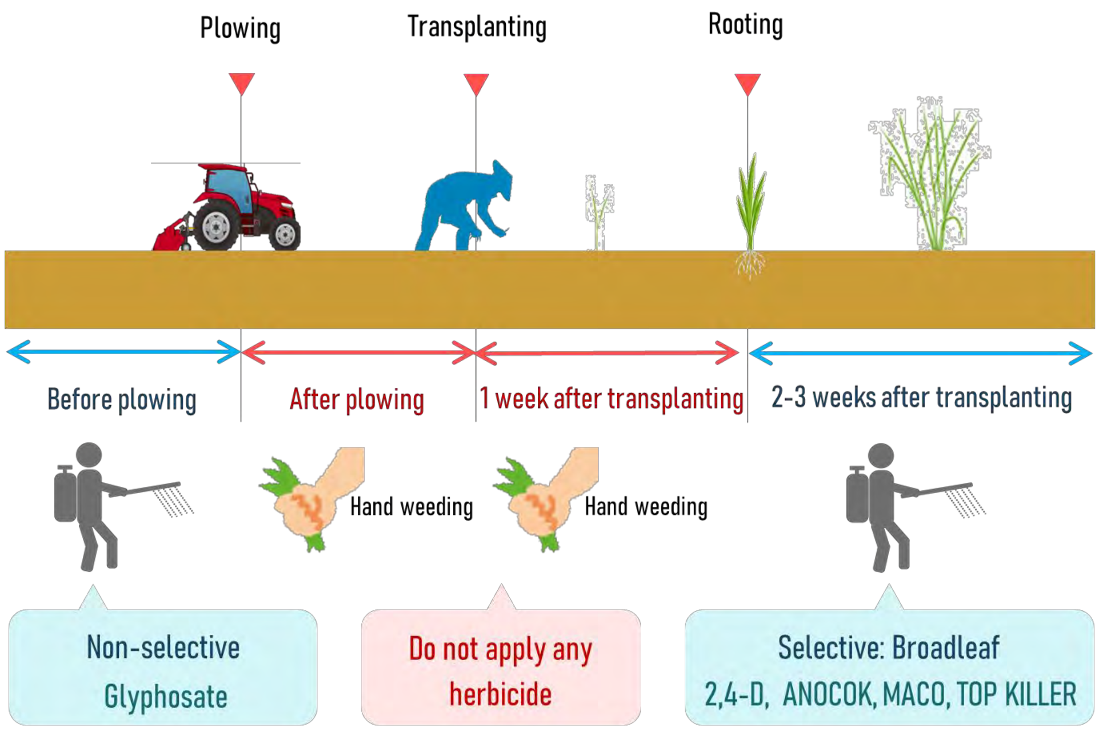
Type of herbicide	Grass	Broadleaf	Weed seed	Rice
Non-selective Glyphosate	✓	✓	✗	✓
Selective: Grass Xevelo, Apsara, Giant Force, NEWRIUS	✓	△	✗	✗
Selective: Broadleaf 2,4-D, ANOCOK, MACO, TOP KILLER	✗	✓	✗	✗
Selective: Grass and weed seeds MECO	✓	△	✓	✗

✓ Effective   △ Poor effective   ✗ Ineffective

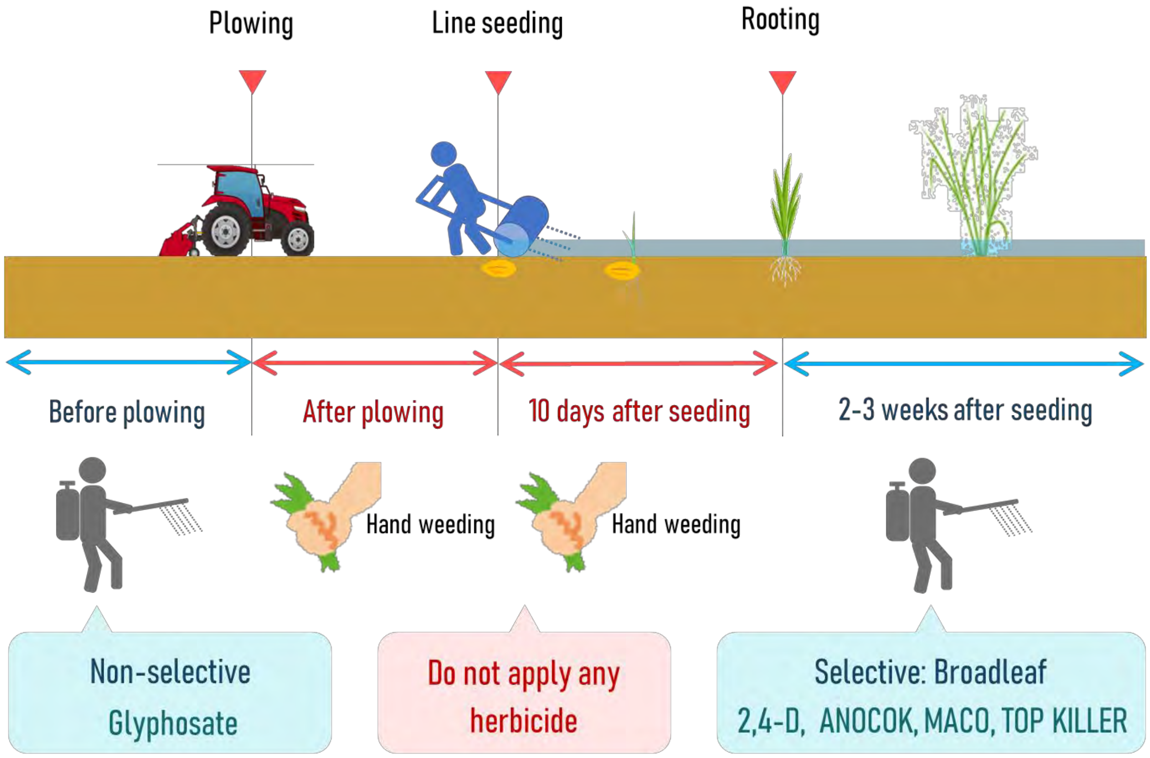
5. Crucial Points for Weed Control



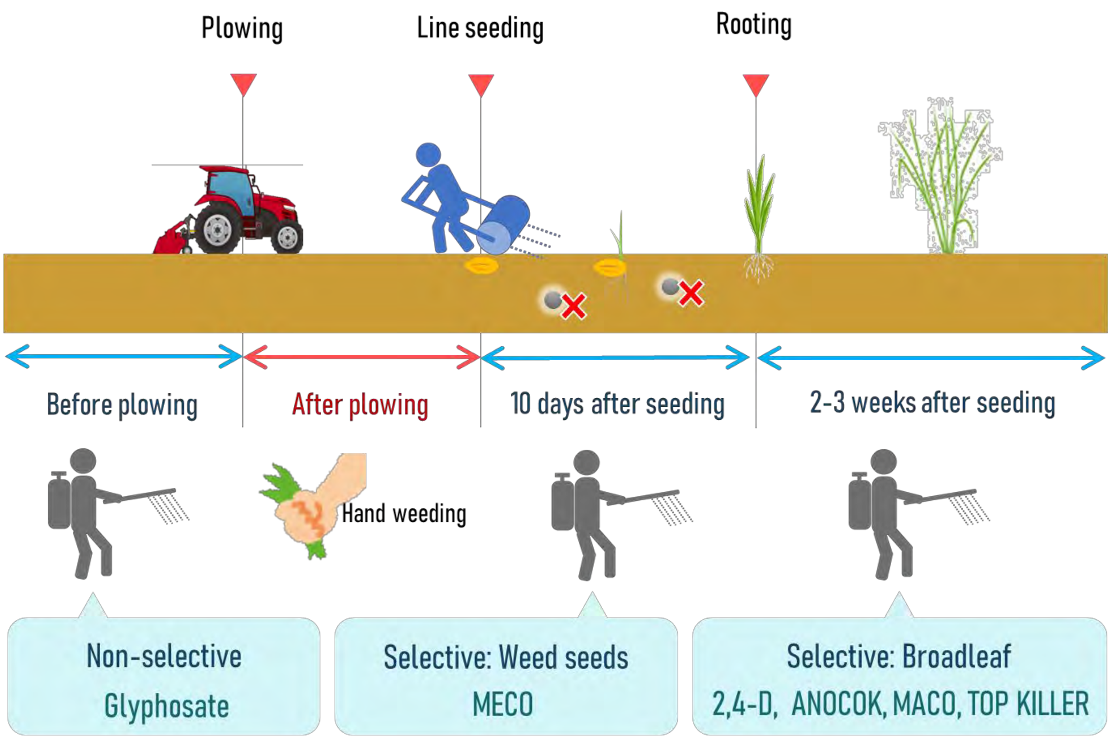
6. Weed Control for Transplanting



7. Weed Control for Line Seeding in Wet Field



8. Weed Control for Line Seeding in Dry Field



9. Types of Herbicides

Contact herbicide

- ✓ Immediate effect (Weeds die after 2-3days)
- ✓ Effective only for the contacted weeds
- ✓ Effective for tall weeds (up to 100cm high)

Systemic herbicide

- ✓ Immediate effect (Weeds die after 2-3days)
- ✓ The effect lasts for 3-6 months.
- ✓ Effective only for small weeds (up to 30cm high)

Residual herbicide

- ✓ Delayed effect (Weeds die after one week)
- ✓ The effect lasts for 3-6 months.
- ✓ Effective only for small weeds (up to 30cm high)

10. Basic Information of Herbicides

MECO
Trade name

60
Ingredient%

EC
Formulation Type

Butachlor
Active ingredient

Check active ingredient to identify herbicide type.

11. Target of Herbicides

Trade Name	Type	Active Ingredient	Target
Glyphosate (S)	S	Glyphosate	N
2,4-D 720 W/V SL MACO 720 ANOCOK 600SL	S	2,4-D 72% 2,4-D 72% 2,4-D 60%	B
Xevelo	S	Florpyrauxifen-benzyl 1.2% Cyhalofop-butyl 16.0%	G B
MECO 60EC	EC	Butachlor 60%	G B W
Apsara 99	SC	Bispyribac 40%	G B
TOP KILLER 155WP	WP	Pyrazosulfuron-ethyl 0.14.8% Metsulfuron-methl 0.7%	B
Giant Force 888	WP	Bensulfuron 6% Quinclorac 34%	G B
NEWRIUS 155WP	WP	Quinclorac 430g/kg Pyrazosulfuron 70g/kg	G B

N Non-selective G Selective: grass B Selective: Broadleaf W Selective: Grass & weed seeds

12. Formulation and Mixing Order

Formulation Type | **Mixing Order**

1 **Solutions (S or CS)**
2,4-D, MACO, ANOCOK

2 **Emulsifiable Concentrate (E or EC)**
MECO

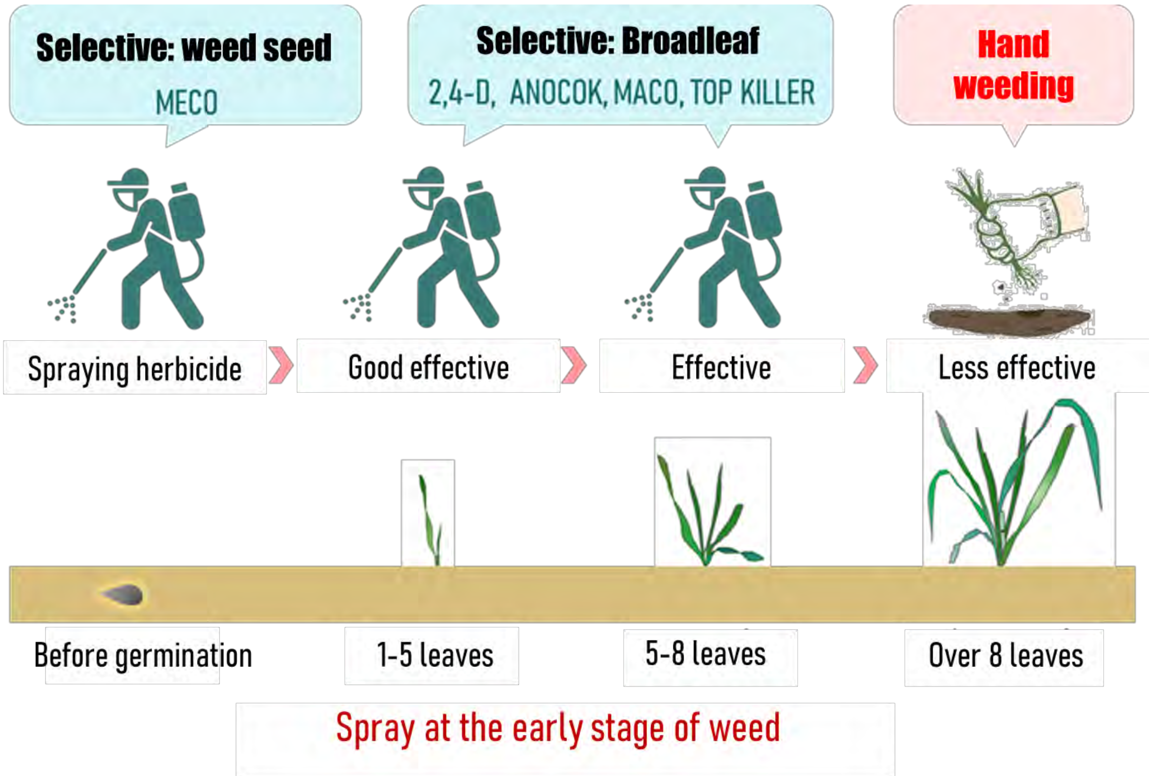
3 **Flowables (F, L, or SC)**
Apsara

4 **Wettable Powders (WP or W)**
Giant Force, NEWRIUS, TOP KILLER

Easily

Hardly

13. Tips of Herbicide Use



14. Safety in Herbicide Use

Skin allergy due to chemicals

Appendix 2

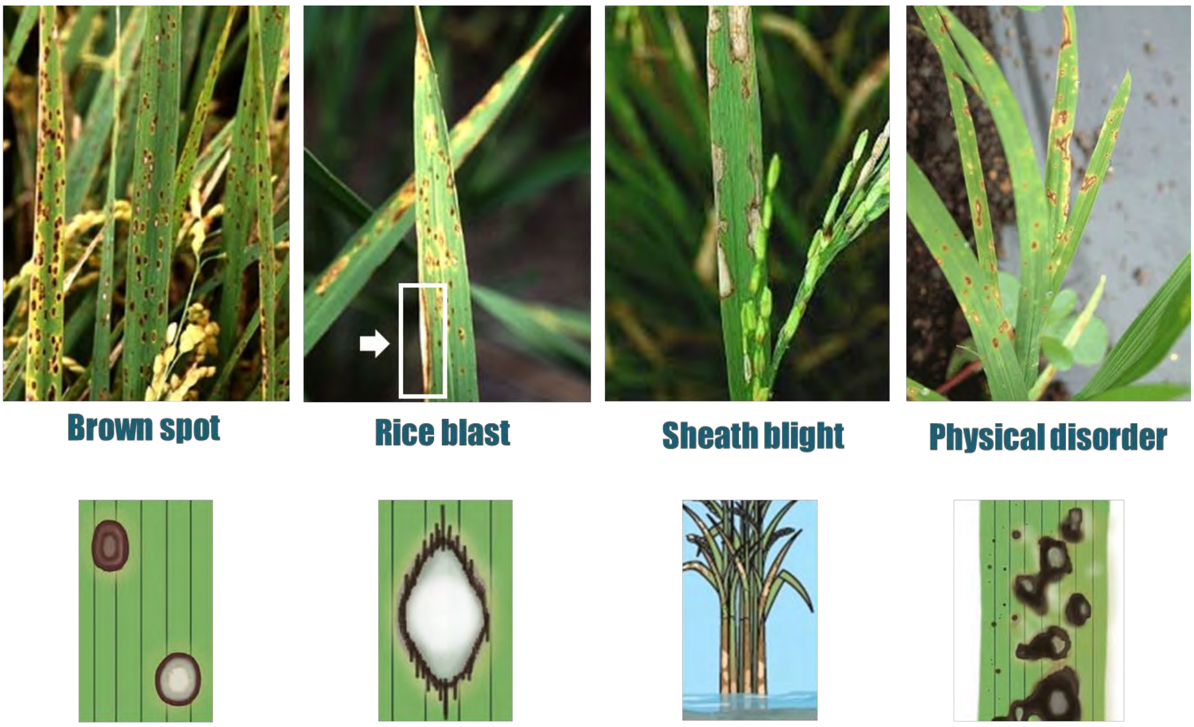
Rice Disease Control

1. Introduction

Several methods can control rice diseases. However, prevention is more important.

- Use pure seeds without disease contamination, in particular seed-borne diseases, such as Brown Spot, Sheath Blight and Rice Blast.
- Consider seed treatment with fungicide before seeding.
- Know the field background, from which it is easy to control diseases and nutrient deficiency that is closely interrelated.
- Monitor field regularly for crop health and nutrient need to prevent or avoid serious diseases.
- Practice transplanting in the field where irrigation is not available.
- Consider limitation of disease infection before taking chemical measurement.
- Do not use the same fungicides many times.

2. Rice Disease Identification



Brown spot — Rounded blotches

Rice blast — Rhombus-shaped blotches

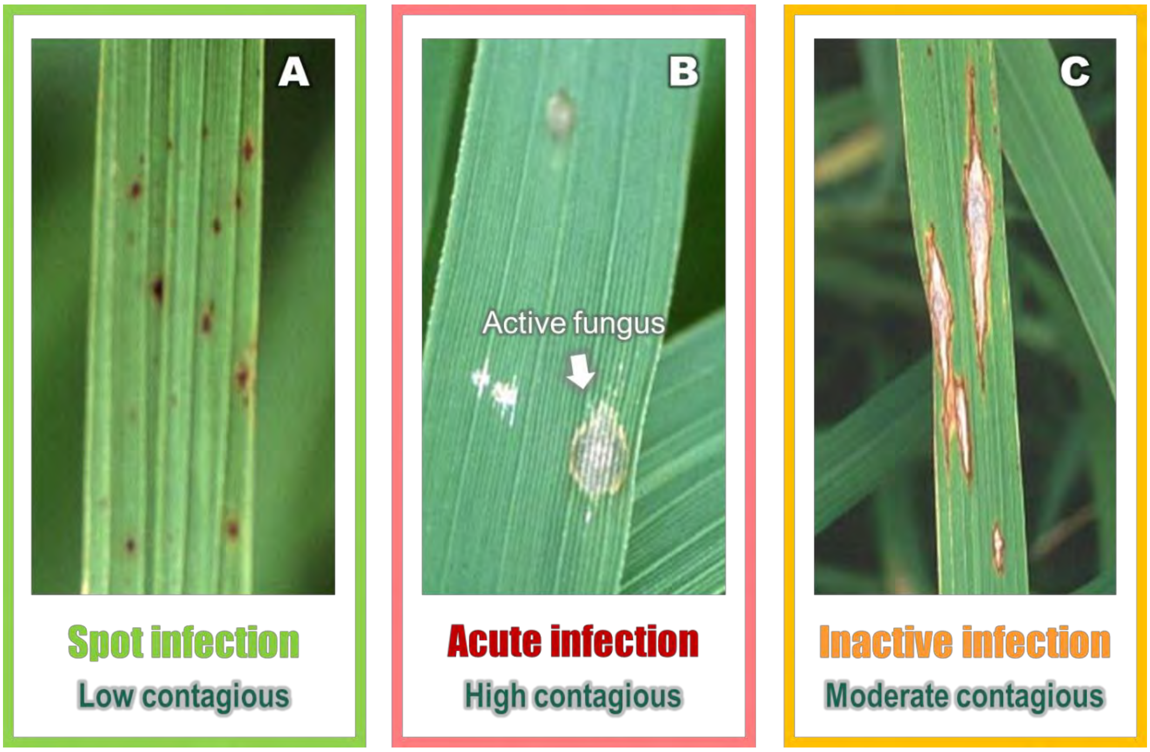
Sheath blight — Infection from the bottom

Physical disorder — Unclear border

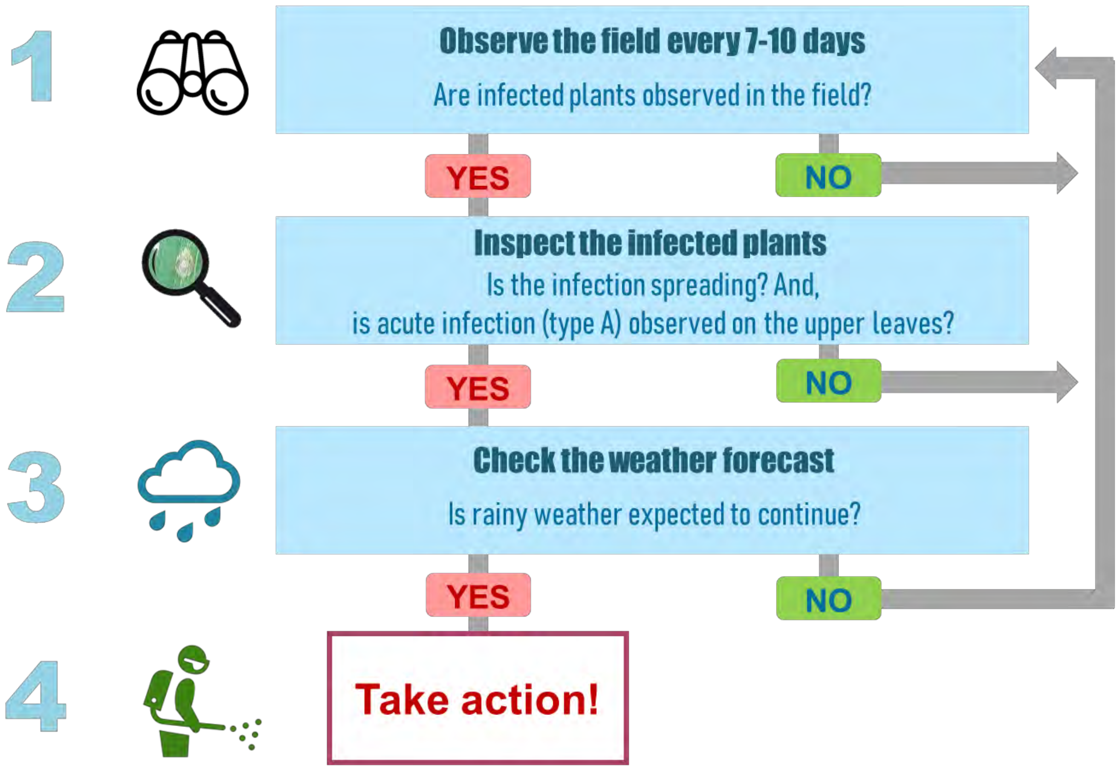
3. Conditions for Rice Blast Infection

1. Average daily temperature during 5 days is from 15^0C to 25^0C.
2. Plants are in moist situation over 20 hours.

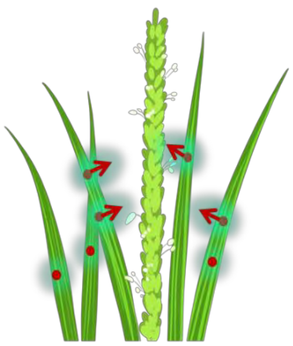
4. Rice Leaf Blast



5. Rice Blast Control



6. Rice Panicle Blast



Contagion of fungus

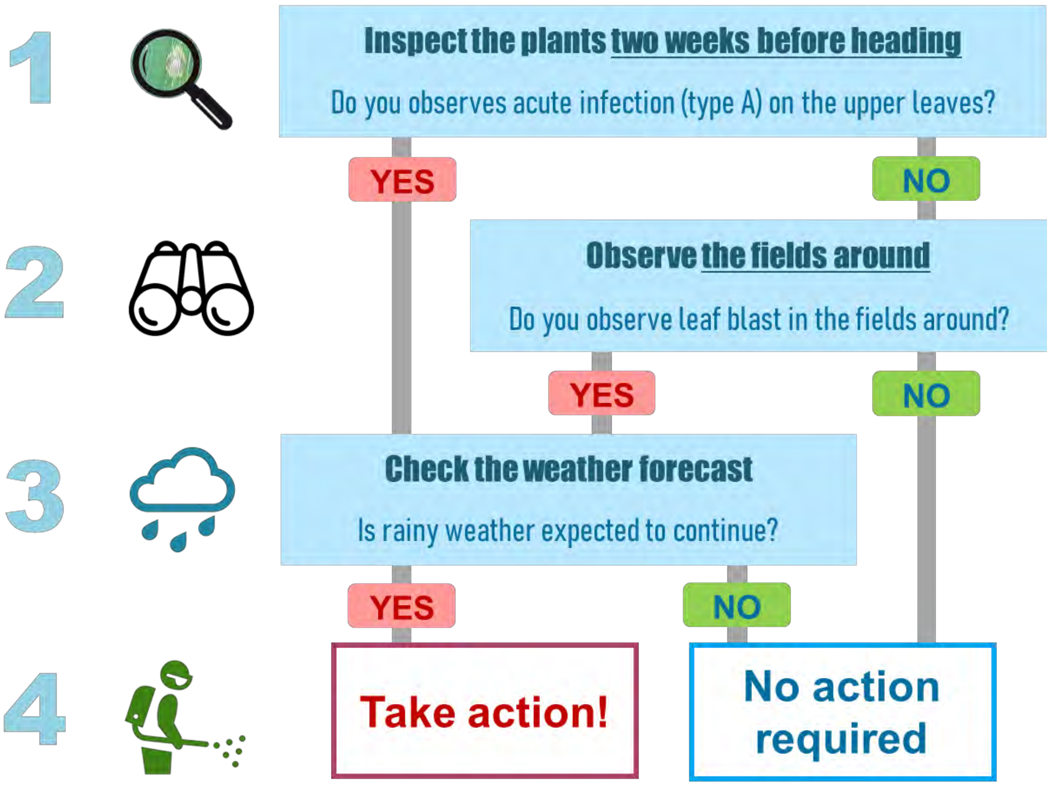
- ✓ Watch the upper leaves (2-3 leaves from the top) if the leaves are infected by blast carefully.
- ✓ Control leaf blast at booting stage, 10 days before heading/flowering.

Infected panicles

- ✓ It is too late to control panicle blast after heading/flowering.
- ✓ Once the panicle is infected by blast, it will not recover.

A preventive action is essential!

7. Rice Panicle Blast Control



8. Conditions for Brown Spot Infection

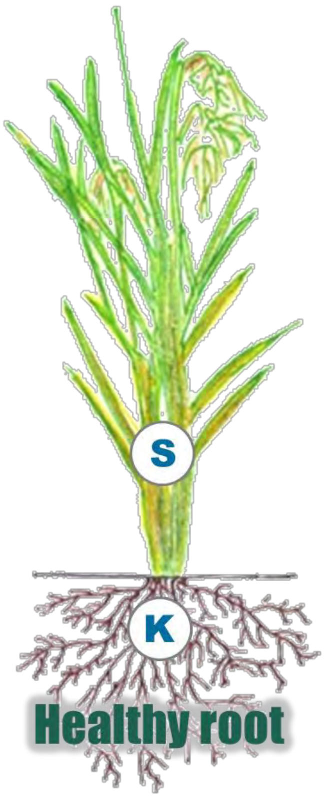
Characteristics

- Poor soil condition and plant nutritional physiology induce the disease.
- The disease tends to occur in the same field every season where the soil is not fertile and the drainage is poor.

Causes and solution

- Deficiency of potassium (K), Silicic acid (S), Magnesium (Mg), Manganese (Mn), Iron (F) and Nitrogen (N)
- Root rot caused by hydrogen sulfide gas.

9. Brown Spot Control

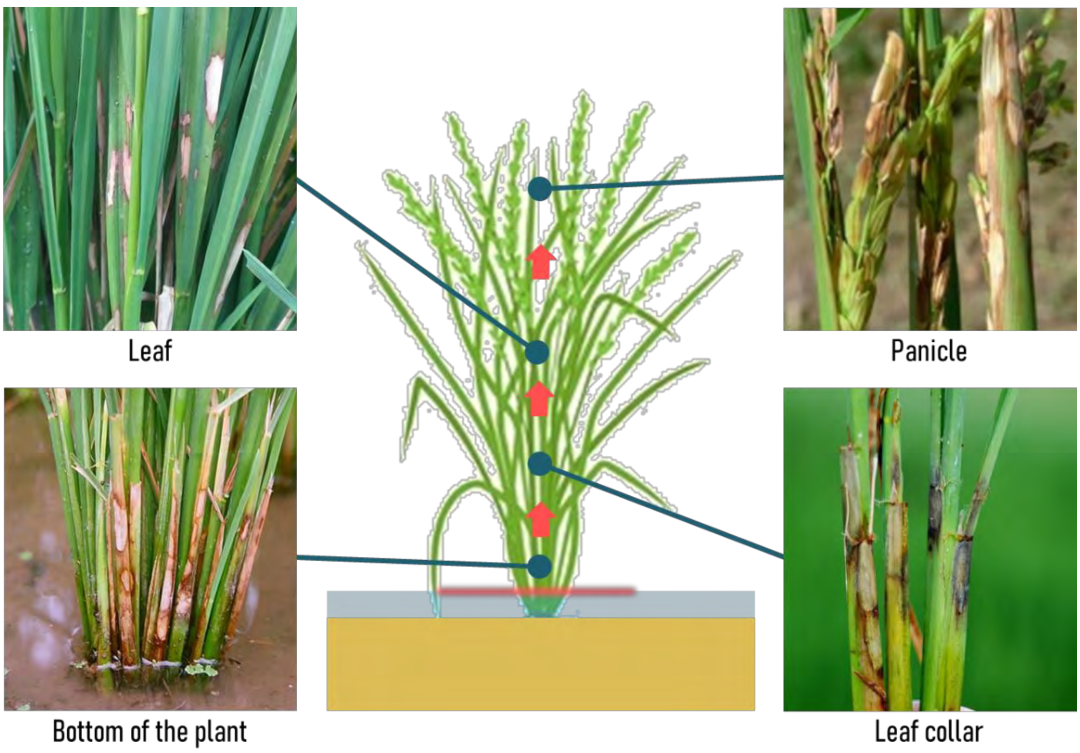


Apply K, S, Mg, Mn, F, and N.

Avoid applying <u>Ammonium sulfate (21-0-0),</u> since it emits the gas in the soil.

Applying the chemicals is not always the best solution.

10. Infection of Rice Sheath Blight



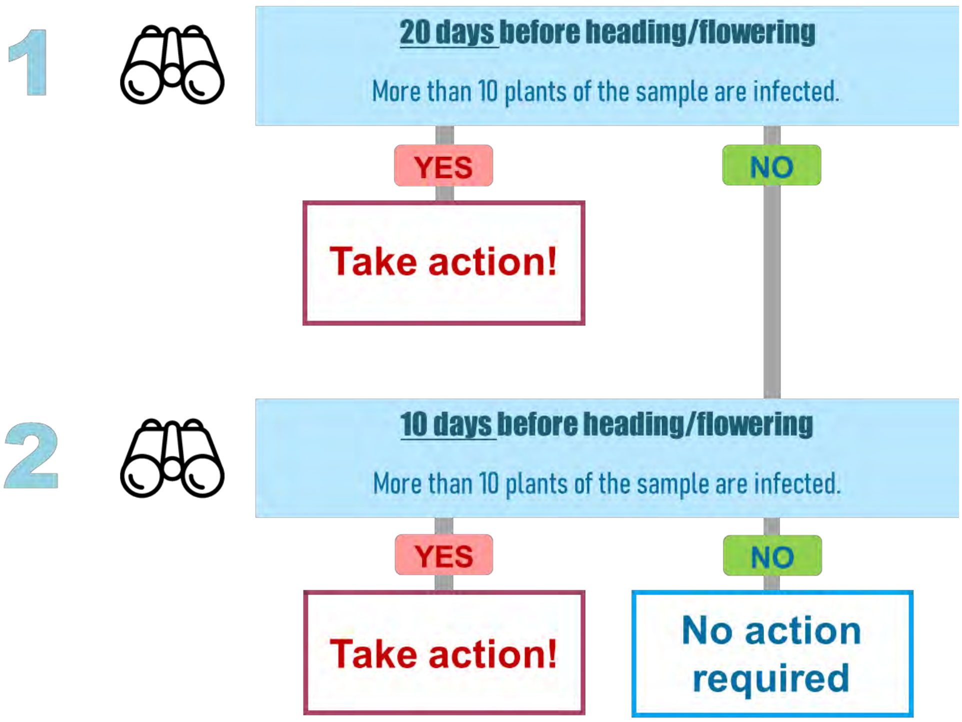
11. Monitoring of Rice Sheath Blight

Inspect 25 plants
near the water inlet.

The fungus are floating and move on the water surface from the inlet to the outlet.

Inspect 25 plants near
the water outlet.

12. Control of Rice Sheath Blight



13. Symptoms Similar to Rice Sheath Blight

Brown sheath blight

Bordered sheath spot

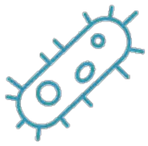
Brown sclerotium disease

Grey sclerotial disease

It is not easy to diagnose the disease by observation.

14. Pathogen Types and Appropriate Chemicals

Viruses
0.01～0.1㎛



Bacteria
1～5㎛

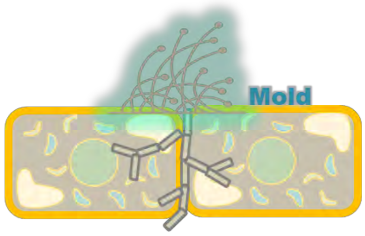
Fungi
5～10㎛

Insecticide
(Controlling vectors)

Antivirus*
(Prevention)

Copper compound
(Prevention)

Antibiotic
(Prevention/Treatment)



Fungicide
(Prevention/Treatment)

15. Pathogens of Rice Diseases

Rice stripe virus

Viruses

Rice stripe tenuivirus

No preventive or curative chemicals available

Control pests/insects that could be a vector of the viruses.

Bacterial leaf blight

Bacteria

Xanthomonas campestris pv. Oryzae

Oxolinic acid
Streptomycine

250WP
(wettable powder)

Antibiotics

Rice blast

Fungi

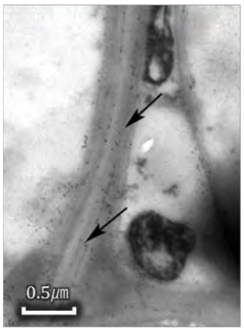
Pyricularia oryzae

Pyraclostrobin

250EC
(emulsifiable
concentrate)

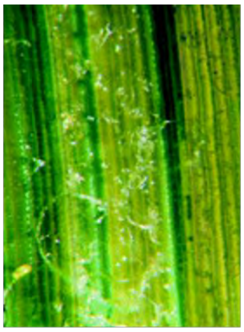
Fungicide

16. Vectors Caused Disease Infection



Rice stripe virus

Rice stripe tenuivirus



Bacterial leaf blight

Xanthomonas campestris pv. Oryzae

Rice blast

Pyricularia oryzae

17. Rice Diseases

- Rice dwarf,stunt
- Rice stripe
- Rice black-streaked dwarf
- Rice necrosis mosaic
- Rice waika
- Rice grassy stunt
- Rice ragged stunt
- Rice transitory yellowing

Viruses

- Bacterial foot rot of rice
- Halo blight of rice
- Bacterial brown stripe of rice
- Bacterial grain rot of rice
- Bacterial seedling blight of rice
- Bacterial palea browning of rice
- Bacterial leaf blight of rice
- Sheath brown rot of rice
- Yellow dwarf of rice

Bacteria

★ Restricted in the QDS

- Scab, Fusarium blight
- Bakanae disease
- Helminthosporium leaf spot,brown spot, Helminthos
- Phytophthora japonica Waterhouse
- Eye spot
- Curvularia senegalense (Spegazzini) Subramanian
- Phaeosphaeria oryzae Miyake
- Hendersonia oryzae Miyake
- Grey sclerotial disease
- Cladosporium miyakei Saccardo et Trotter
- Helminthosporium spot blotch
- Epicoccum hyalopes Miyake
- Blast, neck-rot ★
- False smut
- Fusarium blight
- Brown leaf spot ★
- Brown sclerotium disease
- Waitea circinata Warcup et Talbot
- Brown sheath blight
- Khuskia oryzae Hudson
- Pyrenochaeta oryzae Shirai
- Stem-rot, culm rot
- Mold, black mold
- Reddish-brown sheath rot
- Leaf smut
- Globular sclerotial disease
- Fusarium roseum Link : Fries
- Glume blight
- Sheath blight ★
- Seed and seedling rot
- Seedling blight
- Gray mold of glumes
- False blast
- Downy mildew
- Sclerotium sp.
- Sphaerulina miyakei Hara
- Bordered sheath spot, Rhizoctonia sheath spot
- Southern blight
- Kernel smut
- Sooty mold
- Brachysporium blotch, glume mold
- Cercospora leaf spot
- Stem rot, culm rot
- Take-all
- Sheath net-blotch
- Sheath rot
- Phytophthora megasperma Drechsler var. sojae Hildebrand

Fungus

18. Other Physical Disorders


Nematode

Infection by Aphelenchoides besseyi


Red blight

Nitrogen deficiency and acid gas by immature compost


Root rot

Insufficient oxygen and hydrogen sulfide, organic acid

19. Points to Be Checked at Field Inspection

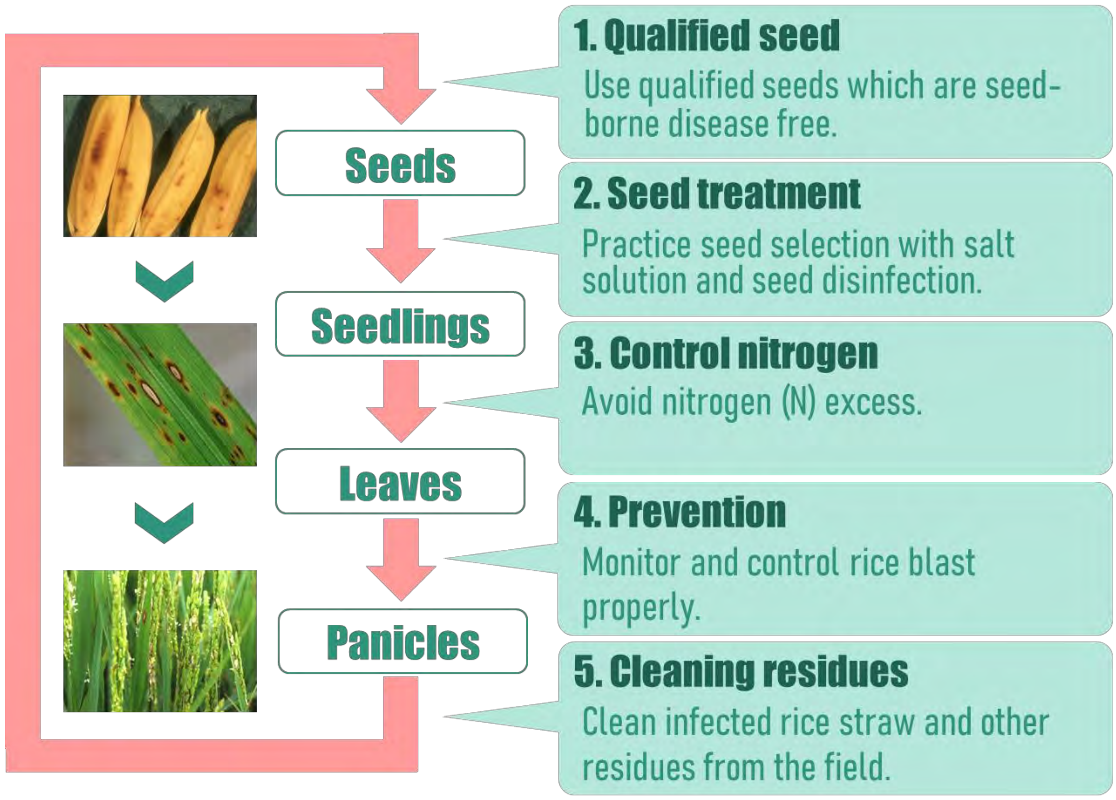
Rice Blast/Brown Spot
Check the top 2-3 leaves.

Sheath Blight
Check the plants near the inlet and outlet of the field.

All diseases
Check the panicles if it is infected with the diseases soon after heading. If the plant is infected, remove it.

All diseases
Even though the leaves and stems are infected, if the panicles/grains are not infected, the plant is acceptable.

20. Seed Borne Diseases



21. Integrated Pest Management

Integrated Pest/Disease Management

Cultural control

Crop rotation, plant management

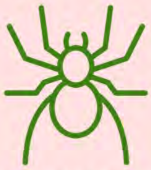
Physical control

Insect traps, insect sweep nets, infectious plant rooting up

Genetic control

Disease resistant variety

Biological control



Beneficial insect, Effective micro-organism

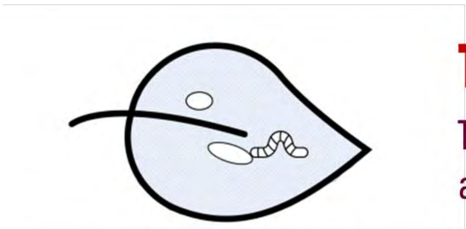
Chemical control

Insecticide, bactericide, fungicide

22. Types of Insecticide

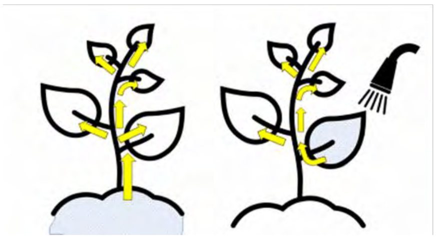
Contact insecticide

The chemicals directly or indirectly contact and kill insects.



Toxic insecticide

The chemicals adhere to the surface of the leaves and kill insects, when the insects eat the leaves.



Systemic insecticide

The chemicals go into the plant and kill insects, when the insects eat the leaves.

23. Types of Bactericide and Fungicide

Healthy plant

Preventive chemical

It prevents the plant from disease infections.

Infected plant

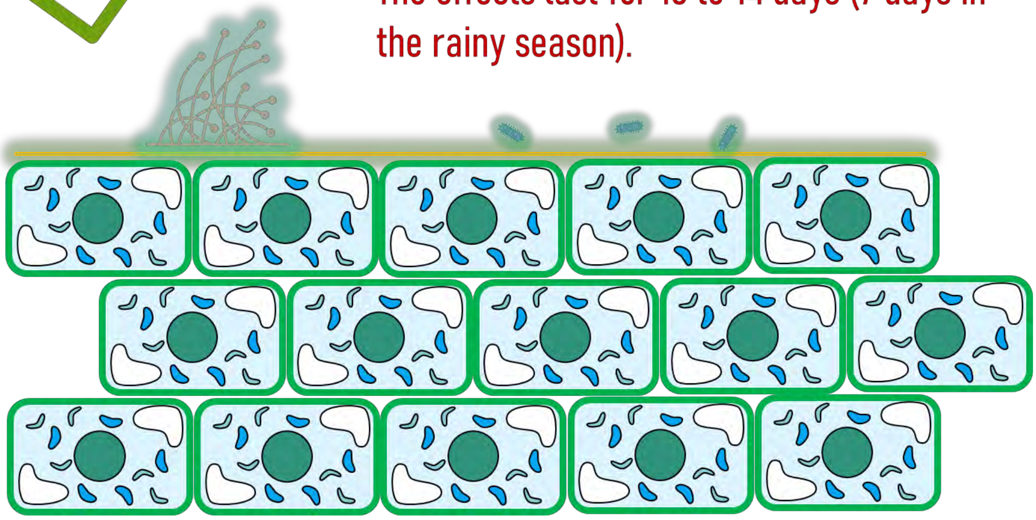
Curative chemical

It stops the spread of the disease infection.

Curative chemicals are also effective for prevention.

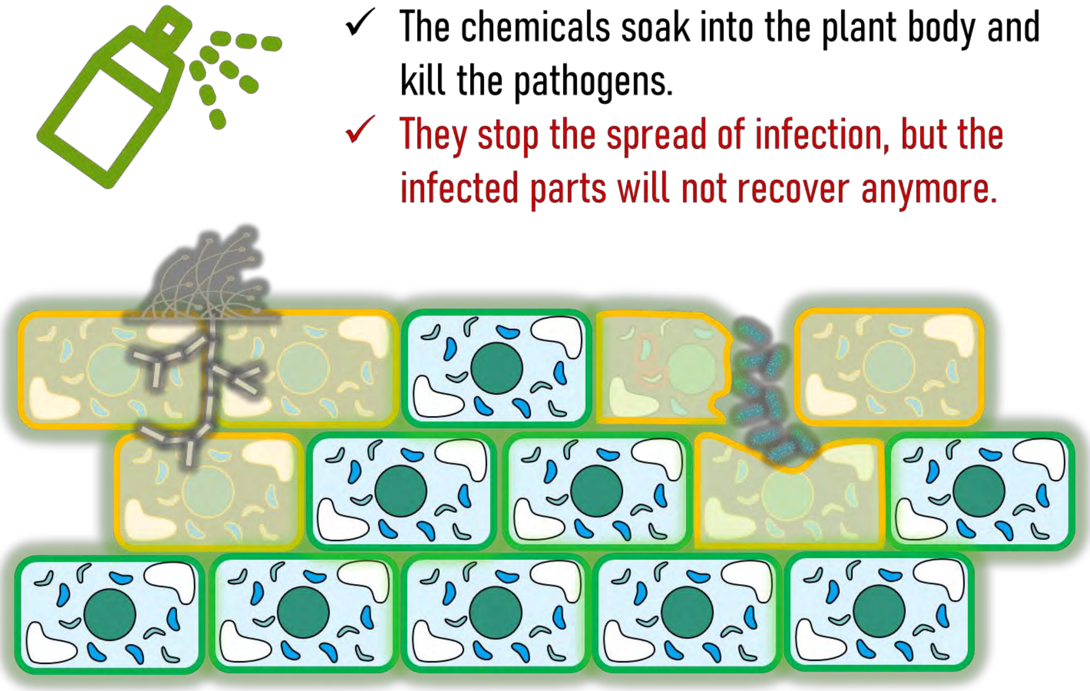
24. Preventive Bactericides and Fungicides

- ✓ The chemicals adhere to the surface of the plant and protect it from infections.
- ✓ The effects last for 10 to 14 days (7 days in the rainy season).

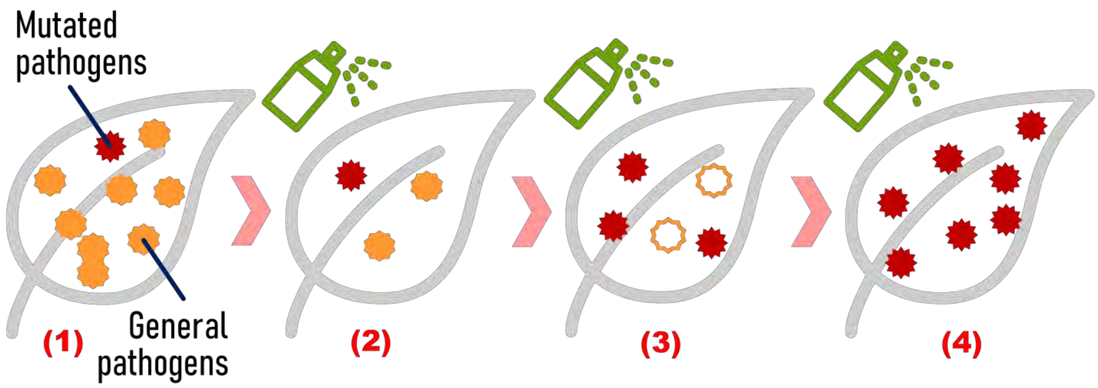


25. Curative Bactericides and Fungicides

- ✓ The chemicals soak into the plant body and kill the pathogens.
- ✓ They stop the spread of infection, but the infected parts will not recover anymore.



26. Chemical Resistance



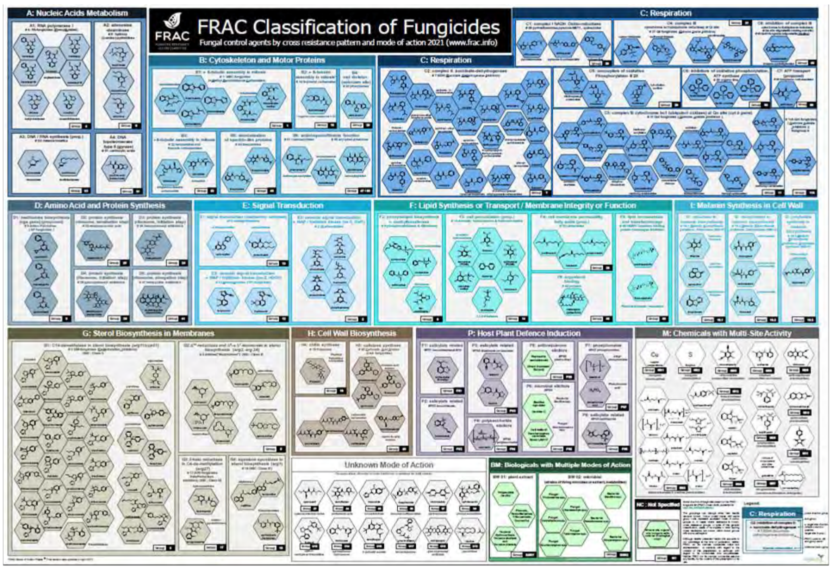
(1) Mutation of bacteria and fungus happen

(2) Mutated pathogen survive the chemical. Some general pathogens also survive because of improper splaying.

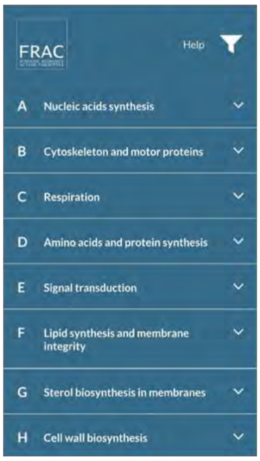
(3) General pathogens are killed by the second application, but mutated ones survive it.

(4) Mutated pathogens spread and demerge the plant. The chemical does not work anymore.

27. Modes of Action for Crop Chemicals



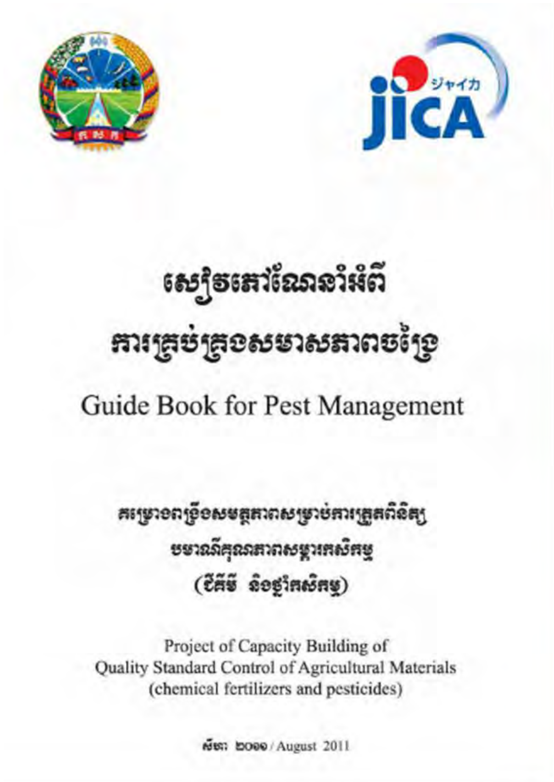
FRAC/IRAC
Mode of Action



Fungicide Resistance Action Committee
www.frac-online.org

Insecticide Resistance Action Committee
www.irac-online.org

28. Proper Use of Chemicals



Self-inspection and Seed Quality Control

1. Introduction

The customers' confidence and increasing a number of customers repeatedly, will sustainably help in rice seed business. Therefore, seed quality assurance is certainly important. Even if the seeds are certified by QDS system, the seed quality would gradually get worse, so timely self-inspection is needed till sales finish. Here is a guideline for quality self-inspection and appropriate measurements.

2. Moisture Control

Measure the moisture content of the product three times and calculate the average (Table 1). If an abnormal value is detected, measure the moisture content twice more. Then, eliminate two abnormal values and estimate the average (Table 2).

Table 1

1st	2nd	3rd	4th	5th	Average
13.2	13.5	13.4	-	-	13.4

Table 2

1st	2nd	~~3rd~~	4th	~~5th~~	Average
13.6	13.5	18.8	13.4	12.9	13.5

3. Purity Control (Physical)

Remove stones, rice straw, unfilled rice husk, broken grain and other dust by a cleaner. The weight of the inert matters should be less than 2% of the product. Excessing inert matters can be removed by re-cleaning the seed before packing.

Seed purity 98%

Inert Matter 2%

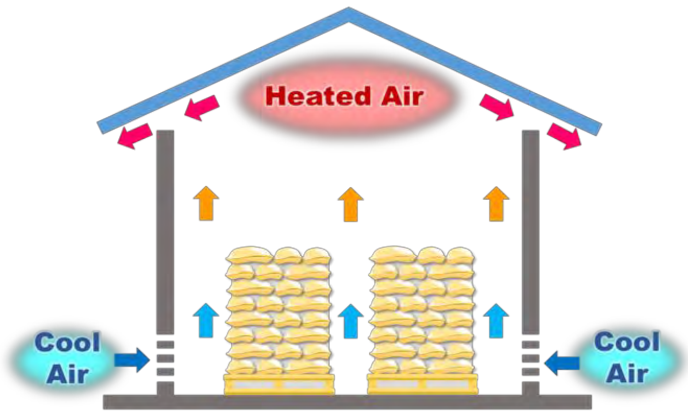
4. Genetic Control (Varietal)

Identify the characteristics of the shape and color of the target seed. Then, count the number of off-types and red rice in the seed. If off-types and red rice are detected exceeding the standard below, do not use the product as a seed.

Seed class	Off-types	Red rice
Registered Seed	5 grains/500g	2 grains/500g
Certified Seed	15 grains/500g	5 grains/500g

5. Molds and Fungus Prevention

Ventilation is important to avoid heat and moisture that cause mold and fungus propagation. Keep at least 50cm between the piles of the products.

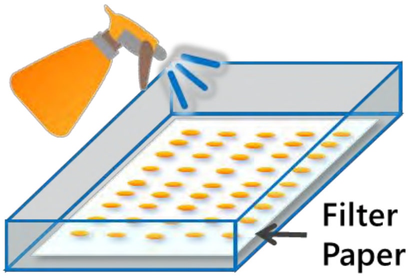


6. Insect Damage Prevention

Use the inner plastic bag to prevent the propagation of insects such as weevils and rice moths. Check the seed quality from time to time and if you find many insects in a product, do not use it as a seed since it may affect the germination rate.

7. Germination Capacity Control

Conduct germination tests of stocked seeds once a month. Test 300 grains for self-inspection and count the number of germinated seeds after seven days.



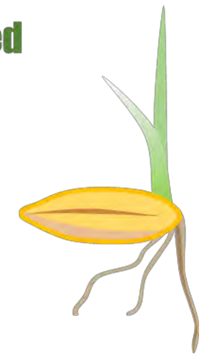
Germinated seeds ÷ Tested seeds × 100 = Germination Rate (%)

Registered Seed

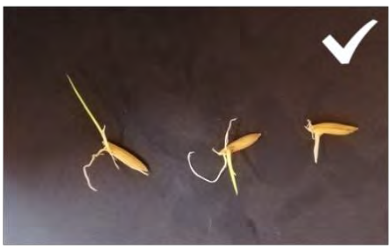
85% ↑

Certified Seed

80% ↑



Non-germination



Normal germination

Good germination

QDS Rice Seed Production Check List for Seed Growers and AC Technical Officers

1. Decision before selecting seed grower and field		Tick ✓
1-1	The last season's crop is the same variety of seed or other small grain crops.	☐
1-2	The field size is larger than the minimum requirement. (RS: 0.5 ha, CS: 0.5 ha)	☐
2. Field Preparation		**Tick ✓**
2-1	The field is level enough.	☐
3. Sowing		**Tick ✓**
3-1	The field is free from weeds at the time of sowing.	☐
3-2	The seeds are authorized with proper class for seed production.	☐
3-3	Two persons check the seed variety and the field codes.	☐
3-4	The seed grower uses a seeder for direct sowing.	☐
3-5	The seed grower sows only one variety on the same day.	☐
4. Field Management		**Tick ✓**
4-1	The seed grower checks the field more than twice a week.	☐
4-2	The seed grower consults the agricultural cooperative if she/he finds diseases or pests in the field.	☐
4-3	The seed grower removes noxious weeds and off-types frequently.	☐
5. Self-Field Inspection		**Tick ✓**
5-1	The number of noxious weeds, diseases, and off-types does not exceed the QDS field standard.	☐
6. Harvesting		**Tick ✓**
6-1	The other grain does not remain in a harvester.	☐
6-2	The crops on the edge of the field are harvested first.	☐
6-3	The products on the edge of the field are not used as seeds.	☐
6-4	New bags are used for fresh seeds.	☐
6-5	Bags are stored by lot in gathering points and warehouses.	☐
7. Drying Seeds		**Tick ✓**
7-1	Only one variety seeds are dried at once.	☐
7-2	A tarpaulin sheet is placed under the fresh seeds during the drying process.	☐
7-3	The temperature setting of a dryer is lower than 45℃, if you use a dryer.	☐
8. Cleaning and Warehousing Seeds		**Tick ✓**
8-1	The other grains do not remain in a whole seed cleaner before changing other variety seeds or classes.	☐
8-2	Grains do not remain on the screen of a seed cleaner after every use.	☐
8-3	Grains, trash, and dead animals are not found on a warehouse floor.	☐
8-4	A Pallet is placed under the pile of bags.	☐
8-5	The distance between the piles is more than 50 cm.	☐

សៀវភៅណែនាំស្តីពីផលិតកម្មគ្រាប់ពូជស្រូវ

តាមប្រព័ន្ធធានាគុណភាពពូជដំណាំកម្ពុជា (ប.គ.ព)

មករា ២០២៣

សហការគាំទ្រ និងឧបត្ថម្ភដោយ

គម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ

អគ្គនាយកដ្ឋានកសិកម្ម

ទីភ្នាក់ងារកិច្ចសហប្រតិបត្តិការអន្តរជាតិនៃប្រទេសជប៉ុន

RSPP

Quality Seed, Quality Rice

JICA

អារម្ភកថា

នៅក្នុងខែឧសភា ឆ្នាំ២០២២ អគ្គនាយកដ្ឋានកសិកម្មបានអនុញ្ញាតដាក់ឱ្យប្រើប្រាស់ជាផ្លូវការនូវប្រព័ន្ធធានាគុណភាពពូជដំណាំ (ប.គ.ព) សម្រាប់ផលិតកម្មនិងធ្វើអាជីវកម្មគ្រាប់ពូជស្រូវ។ យោងតាម ប.គ.ព ក្រុមជំនាញមកពីគម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ ដែលផ្តល់ថវិកាដោយទីភ្នាក់ងារកិច្ចសហប្រតិបត្តិការនៃប្រទេសជប៉ុន បានច្រងក្រងជាសៀវភៅនេះឡើង។

គោលបំណងនៃសៀវភៅនេះ គឺដើម្បីចែករំលែកនូវចំណេះដឹងនិងបទពិសោធន៍ជាក់ស្តែងនៅក្នុងផលិតកម្មគ្រាប់ពូជស្រូវតាម ប.គ.ព ទៅដល់ផលិតករគ្រាប់ពូជស្រូវ ជាពិសេសអ្នកដែលកំពុងធ្វើអាជីវកម្មគ្រាប់ពូជស្រូវ។

សៀវភៅនេះចែកចេញជាពីរផ្នែក គឺផ្នែកផលិតកម្មគ្រាប់ពូជស្រូវ និងផ្នែកគ្រប់គ្រងក្រោយពេលប្រមូលផល ហើយក៏ចង់បង្ហាញអំពីជំហានតាមលំដាប់លំដោយនៅក្នុងផ្នែកនីមួយៗដែលធ្វើឱ្យអ្នកអនុវត្តងាយស្រួលប្រតិបត្តិតាម។

លើសពីនេះ សៀវភៅនេះក៏ជាឯកសារបំពេញបន្ថែមទៅលើឯកសារមួយចំនួនស្តីពីផលិតកម្មគ្រាប់ពូជស្រូវដែលមានស្រាប់នៅអគ្គនាយកដ្ឋានកសិកម្ម។

អគ្គនាយកដ្ឋានកសិកម្ម សូមថ្លែងអំណរគុណយ៉ាងជ្រាលជ្រៅចំពោះទីភ្នាក់ងារកិច្ចសហប្រតិបត្តិការអន្តរជាតិនៃប្រទេសជប៉ុន និងអ្នកឯកទេសសម្រាប់កិច្ចប្រឹងប្រែងនេះ ជាពិសេសទីប្រឹក្សារបស់គម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ ព្រមទាំងមន្ត្រីបច្ចេកទេសនៃនាយកដ្ឋានដំណាំស្រូវ។

អគ្គនាយកដ្ឋានកសិកម្ម សូមឧទ្ទិសស្នាដៃនេះក្នុងការចូលរួមអភិវឌ្ឍន៍វិស័យពូជដំណាំនៅក្នុងព្រះរាជាណាចក្រកម្ពុជា។

ថ្ងៃ ខែ ឆ្នាំខាល ចត្វាស័ក ព.ស២៥៦៦

ជានីភ្នំពេញ ថ្ងៃទី ខែ ឆ្នាំ២០២៣

អគ្គនាយកដ្ឋានកសិកម្ម

ក្រុមការងារបច្ចេកទេស

ល.រ	ឈ្មោះ	តួនាទី	ស្ថាប័ន
១	ឯកឧត្តមបណ្ឌិត ងិន ឆាយ	ប្រតិភូរាជរដ្ឋាភិបាលកម្ពុជាទទួលបន្ទុកជាអគ្គនាយកនៃអគ្គនាយកដ្ឋានកសិកម្ម	អគ្គនាយកដ្ឋានកសិកម្ម
២	បណ្ឌិត គង់ គា	ប្រធាននាយកដ្ឋានដំណាំស្រូវ	អគ្គនាយកដ្ឋានកសិកម្ម
៣	បណ្ឌិត ស៊្រុន ខេម៉ា	អនុប្រធាននាយកដ្ឋានពូជដំណាំ	អគ្គនាយកដ្ឋានកសិកម្ម
៤	លោក តែ ច័ន្ទតារា	អនុប្រធាននាយកដ្ឋានពូជដំណាំ	អគ្គនាយកដ្ឋានកសិកម្ម
៥	លោក ជា សុខលី	អនុប្រធានការិយាល័យស្រាវជ្រាវ និងបណ្ដុះបណ្ដាល	អគ្គនាយកដ្ឋានកសិកម្ម
៦	លោកស្រី ទឹម សាវ៉ាន់	អនុប្រធានការិយាល័យគ្រប់គ្រង និងអភិវឌ្ឍន៍ពូជដំណាំស្រូវ	អគ្គនាយកដ្ឋានកសិកម្ម
៧	លោក ព្រុំ វុទ្ធី	អនុប្រធានការិយាល័យប្រព័ន្ធកសិកម្មដំណាំស្រូវជាមូលដ្ឋាន	អគ្គនាយកដ្ឋានកសិកម្ម
៨	លោក សុវណ្ណ តារា	អនុប្រធានបច្ចេកវិទ្យាក្រោយពេលប្រមូលផល និងទីផ្សារស្រូវ	អគ្គនាយកដ្ឋានកសិកម្ម
៩	លោក ង៉ែត សុវណ្ណ	អនុប្រធានការិយាល័យគ្រប់គ្រង និងអភិវឌ្ឍន៍ពូជដំណាំស្រូវ	អគ្គនាយកដ្ឋានកសិកម្ម
១០	លោក ជីម ធួក	អនុប្រធានការិយាល័យចុះបញ្ជីប្រភេទពូជដំណាំ និងបញ្ជាក់គុណភាពពូជដំណាំ	អគ្គនាយកដ្ឋានកសិកម្ម
១១	លោក ម៉ៅ រតនា	អនុប្រធានការិយាល័យចុះបញ្ជីប្រភេទពូជដំណាំ និងបញ្ជាក់គុណភាពពូជដំណាំ	អគ្គនាយកដ្ឋានកសិកម្ម
១២	លោកស្រី ង៉ែត ច័ន្ទបូ	មន្ត្រីការិយាល័យគ្រប់គ្រងនិងអភិវឌ្ឍន៍ពូជដំណាំស្រូវ	អគ្គនាយកដ្ឋានកសិកម្ម
១៣	លោក សាក់ ជឿន	ទីប្រឹក្សា	គម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ (RSPP)
១៤	Mr. Masaru YAMAZAKI	ទីប្រឹក្សា	គម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ (RSPP)
១៥	លោកស្រី សាក់ សុខីណា	ជំនួយការទីប្រឹក្សា	គម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ (RSPP)

សេចក្ដីផ្ដើម

តើអ្វីទៅជាគ្រាប់ពូជមានគុណភាពល្អ?

ក. គ្រាប់ពូជមានភាពសុទ្ធខ្ពស់

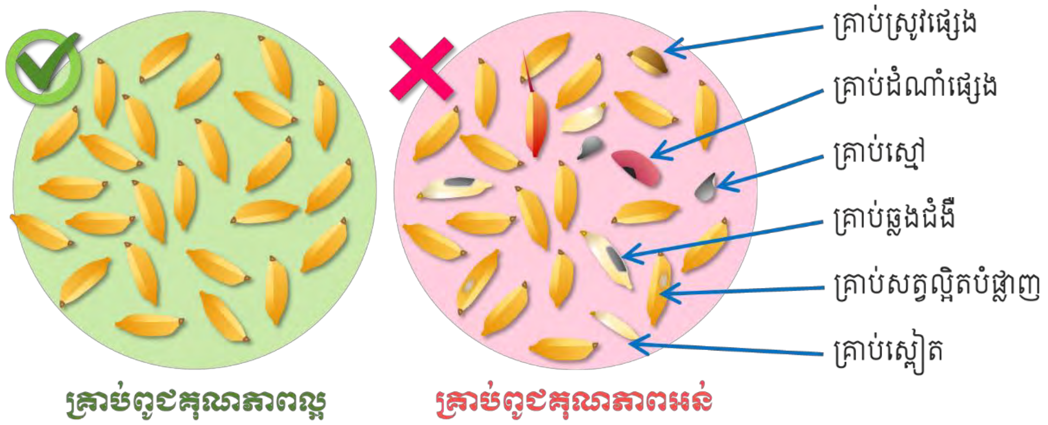
គ្រាប់គ្មានលាយឡំជាមួយប្រភេទពូជផ្សេងឬដំណាំផ្សេង និងមានចរិតលក្ខណៈពន្ធុនៃប្រភេទពូជ។

ខ. គ្រាប់ពូជមានសុខភាពល្អ

គ្រាប់គ្មានរងផលប៉ះពាល់ដោយជំងឺឬសត្វល្អិត។

គ. គ្រាប់ពូជមានដំណុះល្អ

គ្រាប់ទុំល្អ និងមានសមត្ថភាពដំណុះខ្ពស់។



តើអ្វីទៅជាប្រព័ន្ធធានាគុណភាពពូជដំណាំ (ប.គ.ព)?

ស្លាក ប.គ.ព ជំរុញទីផ្សារគ្រាប់ពូជគួរឱ្យទុកចិត្តរវាងផលិតករគ្រាប់ពូជ អាជីវករលក់គ្រាប់ពូជ និងកសិករផលិតស្រូវចំណី។ ប.គ.ព បញ្ជាក់គុណភាពគ្រាប់ពូជតាមរយៈការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល និងការធ្វើតេស្ដ៏គុណភាពគ្រាប់ពូជផ្អែកតាមស្តង់ដារដែលមានចែងនៅក្នុងឯកសារ ប.គ.ព សម្រាប់ផលិតកម្មនិងអាជីវកម្មគ្រាប់ពូជស្រូវ។ ស្ថាប័នមានសមត្ថកិច្ចនឹងផ្តល់ស្លាក ប.គ.ព ចំពោះគ្រាប់ពូជស្រូវគុណភាពល្អ។

មាតិកា

ផ្នែកទី១៖ ការផលិតគ្រាប់ពូជស្រូវ

ផ្នែកទី២៖ ការគ្រប់គ្រងក្រោយពេលប្រមូលផល

ផ្នែកទី៣៖ ឧបសម្ព័ន្ធ

ផ្នែកទី១៖ ការផលិតគ្រាប់ពូជស្រូវ

សកម្មភាពទាំង១០ សម្រាប់អនុវត្តការផលិតគ្រាប់ពូជស្រូវតាម ប.គ.ព

១. ប្រើគ្រាប់ពូជថ្នាក់ខ្ពស់សមស្របដែលបានអនុញ្ញាត
២. រំងាប់មេរោគលើគ្រាប់ពូជដោយថ្នាំសម្លាប់មេរោគផ្សិតមុនដាំ
៣. បញ្ជាក់ប្រវត្តិដាំដុះស្រែរបស់លោកអ្នក
៤. វាស់វែងទំហំស្រែរបស់លោកអ្នកឱ្យបានត្រឹមត្រូវ
៥. បញ្ជាក់គម្លាតស្រែរបស់លោកអ្នកពីស្រែដទៃ
៦. អនុវត្តវិធីដាំដុះទៅតាមថ្នាក់គ្រាប់ពូជ
៧. គ្រប់គ្រងស្មៅហាមឃាត់ក្នុងស្រែផលិតកម្មរបស់លោកអ្នក
៨. ដកពូជលាយចេញពីស្រែផលិតកម្មរបស់លោកអ្នក
៩. គ្រប់គ្រងជំងឺរលាកគ្រាប់ពូជមុនដំណាក់កាលចេញកួរ
១០. សម្អាតម៉ាស៊ីនច្រូតមុនច្រូតគ្រាប់ពូជ

១. ប្រើគ្រាប់ពូជថ្នាក់ខ្ពស់សមស្របដែលបានអនុញ្ញាត

១.១. ថ្នាក់គ្រាប់ពូជ

ត្រូវប្រើគ្រាប់ពូជថ្នាក់ខ្ពស់សមស្របសម្រាប់ផលិតកម្មគ្រាប់ពូជថ្នាក់ទាបជាង។ ផលិតកម្មគ្រាប់ពូជវិញ្ញាបនបត្រត្រូវការគ្រាប់ពូជចុះបញ្ជី និងផលិតកម្មគ្រាប់ពូជចុះបញ្ជីត្រូវការគ្រាប់ពូជគ្រឹះ។

១.២. ថ្នាក់គ្រាប់ពូជគ្រឹះ

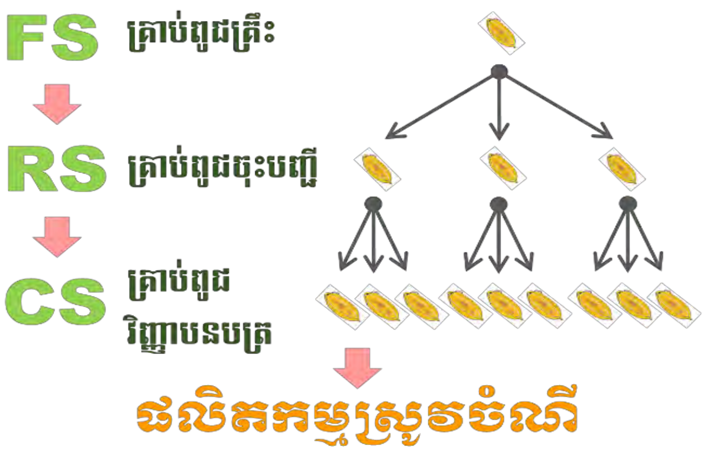
មានតែស្ថាប័នទទួលស្គាល់ជាផ្លូវការប៉ុណ្ណោះ ដូចជាវិទ្យាស្ថានស្រាវជ្រាវនិងអភិវឌ្ឍន៍កសិកម្មកម្ពុជា (កាឌី)និងស្ថាប័នផ្សេងទៀត ដែលទទួលបានសិទ្ធិអាចផលិតគ្រាប់ពូជគ្រឹះ ដើម្បីរក្សាអត្តសញ្ញាណនិងភាពសុទ្ធពន្ធុ។

១.៣. ថ្នាក់គ្រាប់ពូជចុះបញ្ជី

គ្រាប់ពូជចុះបញ្ជី គឺជាកូនចៅជំនាន់ក្រោយនៃគ្រាប់ពូជគ្រឹះ។ កាឌី និងផលិតករគ្រាប់ពូជមានសិទ្ធិផ្សេងទៀតត្រូវបានអនុញ្ញាតឱ្យផលិតគ្រាប់ពូជចុះបញ្ជី។ គុណភាពគ្រាប់ពូជត្រូវតែស្របទៅតាមស្តង់ដារ ប.គ.ព។

១.៤. ថ្នាក់គ្រាប់ពូជវិញ្ញាបនបត្រ

គ្រាប់ពូជវិញ្ញាបនបត្រ គឺជាកូនចៅជំនាន់ក្រោយនៃគ្រាប់ពូជចុះបញ្ជីដែលផលិតដោយផលិតករគ្រាប់ពូជស្របច្បាប់។ គុណភាពគ្រាប់ពូជត្រូវតែស្របទៅតាមស្តង់ដារ ប.គ.ព។



គំនូសបង្ហាញ ១-១៖ ប្រព័ន្ធរីកសាយគ្រាប់ពូជ

១.៥. ស្តង់ដារគុណភាពគ្រាប់ពូជ

ប.គ.ព កំណត់ស្តង់ដារគុណភាពគ្រាប់ពូជក្នុងតារាង ១-១។

តារាង ១-១៖ ស្តង់ដារគុណភាពគ្រាប់ពូជស្រូវ ប.គ.ព

កត្តា	ថ្នាក់គ្រាប់ពូជ		
	គ្រឹះ	ចុះបញ្ជី	វិញ្ញាបនបត្រ
១. គ្រាប់ពូជសុទ្ធ (អប្បបរមា %)	៩៨	៩៨	៩៨
២. កម្ទេចកម្ទីរ (អតិបរមា %)	២	២	២
• គ្រាប់ស្មៅ (ចំនួនគ្រាប់អតិបរមាក្នុង៥០០ក្រាមគ្រាប់ពូជ)	៣	៥	១០
• គ្រាប់ដំណាំដទៃ (ចំនួនគ្រាប់អតិបរមាក្នុង៥០០ក្រាមគ្រាប់ពូជ)	២	៣	៥
• គ្រាប់ស្រូវផ្សេង (ចំនួនគ្រាប់អតិបរមាក្នុង៥០០ក្រាមគ្រាប់ពូជ)	១	៥	១៥
• គ្រាប់ស្រូវអង្ករក្រហម (ចំនួនគ្រាប់អតិបរមាក្នុង៥០០ក្រាមគ្រាប់ពូជ)	០	២	៥
៣. ដំណុះគ្រាប់ (អប្បបរមា %)	៨៥	៨៥	៨០
៤. សំណើមគ្រាប់ (អតិបរមា %)	១២	១៣	១៤

១.៦. ការបញ្ជាក់ប្រភពគ្រាប់ពូជ

ត្រូវប្រើគ្រាប់ពូជថ្នាក់ខ្ពស់ជាថ្មីរៀងរាល់រដូវដាំដុះទៅតាមលក្ខខណ្ឌតម្រូវរបស់ ប.គ.ព និងត្រូវរក្សាទុកនូវស្លាកឬស្លាកសញ្ញា បាវវេចខ្ចប់ និងវិក្កយបត្រឬបង្កាន់ដៃទិញគ្រាប់ពូជថ្នាក់ខ្ពស់ទុកជាព័ស្តុតាងនៃប្រភពគ្រាប់ពូជ និងត្រូវបង្ហាញវាចំពោះមន្ត្រីត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលទៅតាមសំណើ។

ស្លាកសញ្ញា និង សម្បកបាវវេចខ្ចប់ វិក្កយបត្រ

គំនូសបង្ហាញ ១-២៖ ព័ស្តុតាងនៃប្រភពគ្រាប់ពូជ

២. រំងាប់មេរោគលើគ្រាប់ពូជដោយថ្នាំសម្លាប់មេរោគផ្សិតមុនដាំ

២.១. ការរំងាប់មេរោគលើគ្រាប់ពូជ

ត្រូវចាក់គ្រាប់ពូជចូលទៅក្នុងទឹក រួចស្រង់យកគ្រាប់ស្អៀតអណ្តែតចេញ ព្រោះជំងឺអាចឆ្លងតាមរយៈគ្រាប់ពូជទាំងនេះ។ បន្ទាប់មក ត្រូវរំងាប់មេរោគនៅលើគ្រាប់ពូជជាមួយថ្នាំសម្លាប់មេរោគផ្សិត ដើម្បីបង្ការជំងឺលោកគ្រាប់ពូជ។

ថ្នាំសម្លាប់មេរោគផ្សិតណែនាំសម្រាប់ការរំងាប់មេរោគផ្សិត

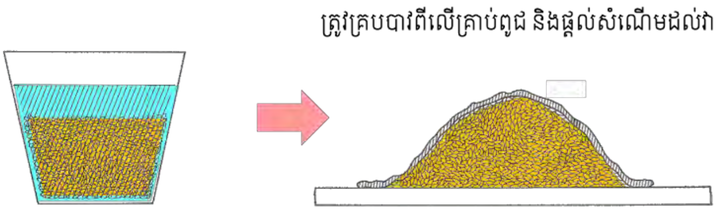
គ្រុយហ្សើផ្លាស ១០ម.ល (Thiametoxam, Difenoconazole, Fludioxinil)

ត្រូវលាយថ្នាំគ្រុយហ្សើផ្លាស ៣០ម.ល ជាមួយទឹក ៣លីត្រ រួចប្រឡាក់ជាមួយគ្រាប់ពូជស្ងួតចំនួន ១០០គ.ក្រ។ បន្ទាប់មក ត្រូវដាក់សំដិលវាចោលប្រហែល ៣ម៉ោង។

២.២. ការផ្តាប់គ្រាប់ពូជ

ត្រូវត្រាំគ្រាប់ពូជក្នុងទឹកប្រហែល ២៤ម៉ោង ដើម្បីឱ្យមានដំណុះល្អ។ បន្ទាប់ពីត្រាំគ្រាប់ពូជរួច ត្រូវគ្របវានឹងក្រណាត់ ឬតង់ប្លាស្ទិក រួចរក្សាទុកនៅក្នុងម្លប់រយៈពេលពី ១២ ទៅ ២៤ម៉ោង ដោយផ្អែកទៅតាមវិធីសាស្ត្រនៃការដាំ។

ការរំងាប់មេរោគលើគ្រាប់ពូជ **ការផ្តាប់គ្រាប់ពូជ**



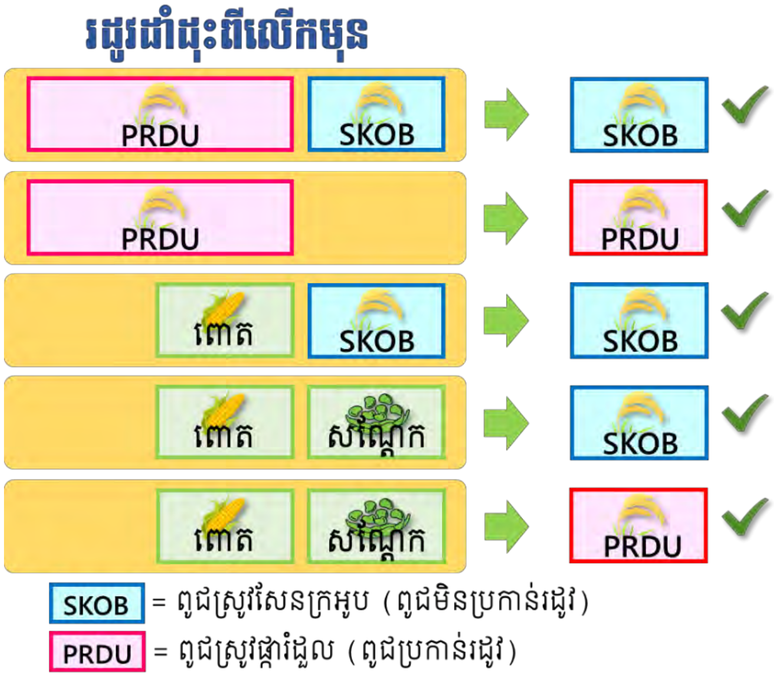
ត្រាំគ្រាប់ពូជ ២៤ម៉ោងនៅក្នុងម្លប់ **ផ្តាប់គ្រាប់ពូជ ២៤ម៉ោងនៅក្នុងម្លប់**

គំនូសបង្ហាញ ២-១៖ វិធីរំងាប់មេរោគលើគ្រាប់ពូជ

៣. បញ្ជាក់ប្រវត្តិដាំដុះស្រែរបស់លោកអ្នក

៣.១. លក្ខខណ្ឌតម្រូវសម្រាប់ស្រែផលិតកម្ម

ស្តង់ដារ ប.គ.ព តម្រូវឱ្យស្រែផលិតកម្មគ្រាប់ពូជដាំប្រភេទពូជតែមួយ ឬដាំដំណាំគ្រាប់តូចៗកាលពីរដូវមុន។



គំនូសបង្ហាញ ៣-១៖ លក្ខខណ្ឌតម្រូវប្រវត្តិដាំដុះនៃស្រែផលិតកម្មគ្រាប់ពូជ

៣.២. ការបង្ការម្លូរស្រូវ សាស្រូវ និងរុក្ខជាតិផ្សេងទៀត

ស្រែផលិតកម្មគ្រាប់ពូជរបស់លោកអ្នក គួរតែគ្មានម្លូរស្រូវ សាស្រូវ និងរុក្ខជាតិផ្សេងទៀត។ ត្រូវប្រមូលយកចេញរាល់ម្លូរស្រូវ សាស្រូវ និងរុក្ខជាតិផ្សេងទៀត បន្ទាប់មកភ្ជួរស្រែឱ្យបានល្អមុនដាំសម្រាប់ផលិតកម្មគ្រាប់ពូជ។

៤. វាស់វែងទំហំស្រែរបស់លោកអ្នកឱ្យបានត្រឹមត្រូវ

៤.១. លក្ខខណ្ឌតម្រូវសម្រាប់ទំហំផ្ទៃដីផលិតកម្ម

ទំហំផ្ទៃដីផលិតកម្មគ្រាប់ពូជវិញ្ញាបនបត្រសរុប គួរតែចាប់ពី ៥ហិកតាឡើងទៅ សម្រាប់ប្រភេទពូជ និងថ្នាក់គ្រាប់ពូជនីមួយៗក្នុងមួយរដូវ ដើម្បីស្របតាម ប.គ.ព។ សម្រាប់ផលិតកម្មគ្រាប់ពូជចុះបញ្ជី តម្រូវឱ្យមានយ៉ាងហោចណាស់ចាប់ពី ០,៥ហិកតាឡើងទៅ។

៤.២. ទំហំស្រែអប្បបរមា

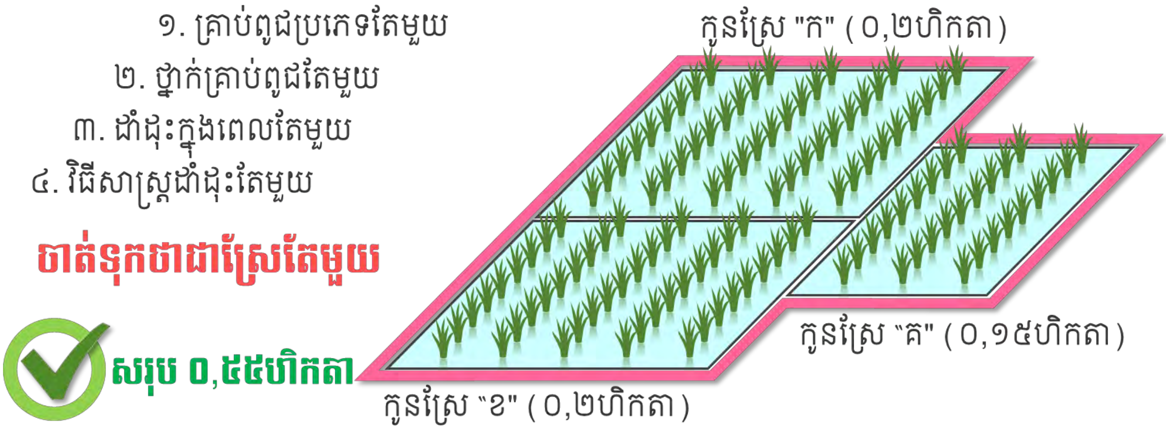
ស្រែផលិតកម្មគ្រាប់ពូជនីមួយៗគួរតែមានទំហំចាប់ពី ០,៥ហិកតាឡើងទៅសម្រាប់ផលិតកម្មគ្រាប់ពូជវិញ្ញាបនបត្រនិងគ្រាប់ពូជចុះបញ្ជី ហើយចាប់ពី ០,២ហិកតាឡើងទៅសម្រាប់ផលិតកម្មគ្រាប់ពូជគ្រឹះ។

តារាង ៤-១៖ លក្ខខណ្ឌតម្រូវនៃទំហំផ្ទៃដី និងទំហំស្រែផលិតកម្ម

ថ្នាក់គ្រាប់ពូជ	ពូជគ្រឹះ	ពូជចុះបញ្ជី	ពូជវិញ្ញាបនបត្រ
ទំហំផ្ទៃដីស្រែផលិតកម្មអប្បបរមាក្នុងមួយរដូវ សម្រាប់ប្រភេទពូជមួយ និងថ្នាក់គ្រាប់ពូជមួយ	០,២ហ.ត	០,៥ហ.ត	៥,០ហ.ត
ទំហំអប្បបរមានៃស្រែផលិតកម្មគ្រាប់ពូជនីមួយៗ	០,២ហ.ត	០,៥ហ.ត	០,៥ហ.ត

៤.៣. ការរួមបញ្ចូលស្រែ

ប្រសិនបើប្រភេទពូជនិងថ្នាក់គ្រាប់ពូជដូចគ្នាត្រូវបានដាំដុះក្នុងស្រែតូចៗ(កូនស្រែឬអំពក)ជាប់គ្នាក្នុងពេលតែមួយ នោះគេអាចចាត់ទុកវាថាជាស្រែតែមួយ។

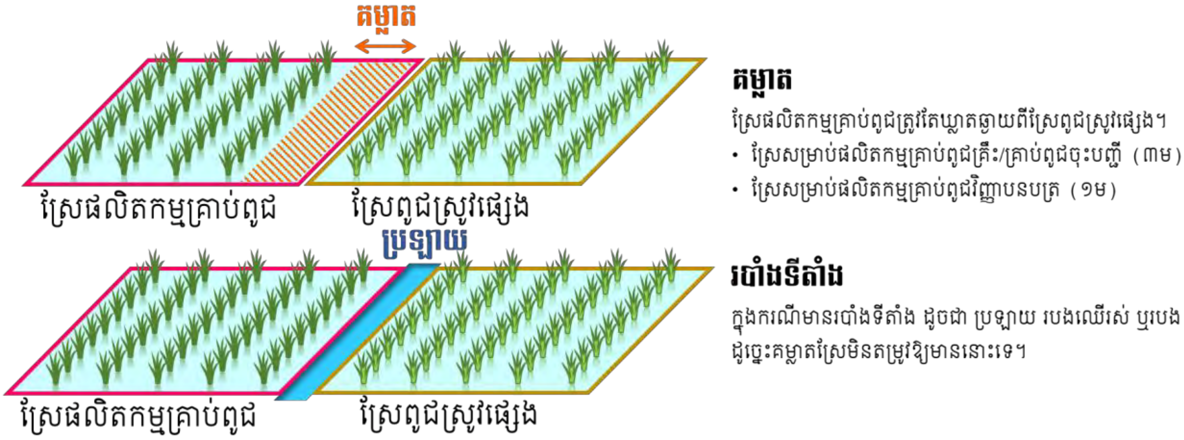


គំនូសបង្ហាញ ៤-១៖ លក្ខខណ្ឌតម្រូវសម្រាប់ស្រែផលិតកម្មគ្រាប់ពូជ

៥. បញ្ជាក់គម្លាតស្រែរបស់លោកអ្នកពីស្រែដទៃ

៥.១. គម្លាតស្រែ

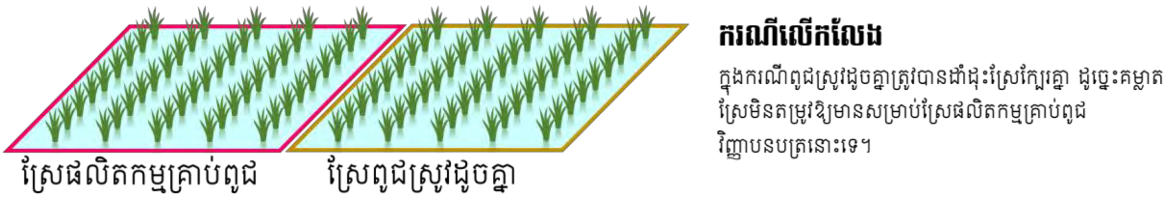
ត្រូវរក្សាគម្លាតពីស្រែដទៃចាប់ពី ១ម៉ែត្រ ឬដោយរបាំងទីតាំង ដូចជា ប្រឡាយ របងឈើរស់ និងរបង។



គំនូសបង្ហាញ ៥-១៖ លក្ខខណ្ឌតម្រូវគម្លាតពីស្រែដទៃ

៥.២. ករណីលើកលែង

គម្លាតស្រែ គឺមិនតម្រូវឱ្យមានទេ ប្រសិនបើប្រភេទពូជស្រូវតែមួយត្រូវបានដាំដុះក្នុងស្រែក្បែរគ្នា។



គំនូសបង្ហាញ ៥-២៖ ករណីលើកលែងគម្លាតពីស្រែដទៃ

វិធីជ្រើសរើសស្រែផលិតកម្មគ្រាប់ពូជស្រូវ

១. ភាពងាយចូលដល់៖ ត្រូវជ្រើសរើសស្រែក្បែរផ្លូវ ដើម្បីងាយស្រួលចុះត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។

២. មានប្រភពទឹក៖ ត្រូវបញ្ជាក់អំពីភាពមានទឹកគ្រប់គ្រាន់អំឡុងពេលផលិតកម្មគ្រាប់ពូជ។

៣. ភាពរាបស្មើនៃស្រែ៖ ត្រូវជ្រើសរើសស្រែរាបស្មើ ដើម្បីងាយស្រួលគ្រប់គ្រងស្មៅចង្រៃ។

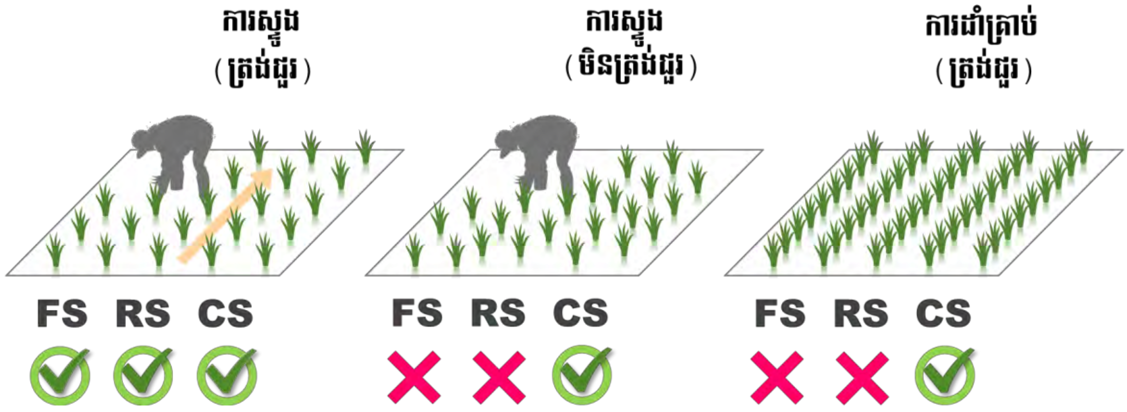
៦. អនុវត្តវិធីដាំដុះទៅតាមថ្នាក់គ្រាប់ពូជ

៦.១. វិធីសាស្ត្រដាំដុះសម្រាប់ផលិតកម្មគ្រាប់ពូជគ្រឹះ (FS) និងគ្រាប់ពូជចុះបញ្ជី (RS)

ត្រូវស្ទូងត្រង់ជួរដោយដៃឬម៉ាស៊ីន គឺតម្រូវសម្រាប់ផលិតកម្មគ្រាប់ពូជគ្រឹះ និងគ្រាប់ពូជចុះបញ្ជី។ ការស្ទូងឬការដាំមិនត្រង់ជួរមិនអនុញ្ញាតសម្រាប់ផលិតកម្មគ្រាប់ពូជគ្រឹះ និងគ្រាប់ពូជចុះបញ្ជីឡើយ។

៦.២. វិធីសាស្ត្រដាំដុះសម្រាប់ផលិតកម្មគ្រាប់ពូជវិញ្ញាបនបត្រ (CS)

គ្រាប់ពូជវិញ្ញាបនបត្រអាចផលិតបានដោយការស្ទូងមិនត្រង់ជួរឬការដាំគ្រាប់ត្រង់ជួរ ប៉ុន្តែការព្រោះគ្រាប់ពូជមិនត្រូវបានអនុញ្ញាតឡើយ។



គំនូសបង្ហាញ ៦-១៖ វិធីសាស្ត្រដាំដុះសម្រាប់ផលិតកម្មគ្រាប់ពូជចុះបញ្ជី និងគ្រាប់ពូជវិញ្ញាបនបត្រ

ឧបករណ៍សម្រាប់ដាំគ្រាប់ជាជួរ

១. ម៉ាស៊ីនស្ទូងខ្នាតតូច (លេខទូរស័ព្ទទាក់ទង៖ 023 666 0337 / 011 447 725)។ វាអាចដំណើរការដោយមិនចាំបាច់អូសជាមួយត្រាក់ទ័រ ឬគោយន្តទេ។

២. ឧបករណ៍ដាំ អ៊ីឡាយស៊ីដឌ័រ (លេខទូរស័ព្ទទាក់ទង៖ 023 666 0337 / 011 447 725)។ អ៊ីឡាយស៊ីដឌ័រត្រូវបានគេប្រើជាមួយគោយន្ត។

៣. ឧបករណ៍ដាំ ម៉ាក លន់ ហេង (លេខទូរស័ព្ទទាក់ទង៖ 061 664 947 / 097 797 4545)។ ឧបករណ៍ដាំ ម៉ាក លន់ ហេង គឺជាប្រភេទឧបករណ៍ស្រដៀងទៅនឹងជ្រាំស៊ីដឌ័រ ប៉ុន្តែគេប្រើគោយន្តអូសវាពីក្រោយ ហើយមិនតម្រូវឱ្យប្រើម៉ាស៊ីនផ្សេងទៀតសម្រាប់អូសវានោះទេ។

៤. ឧបករណ៍ថៃឃីត គឺជាប្រភេទឧបករណ៍ដាំគ្រាប់ស្ងួត ប្រើគោយន្ត ឬត្រាក់ទ័រអូសវាពីក្រោយ។

៥. ឧបករណ៍ជ្រាំស៊ីដឌ័រ គឺជាប្រភេទផ្សេងៗមួយចំនួននៃជ្រាំស៊ីដឌ័រដែលប្រើប្រាស់នៅក្នុងប្រទេសកម្ពុជា។ វាអាចដំណើរការដោយប្រើកម្លាំងមនុស្ស។ វាសមស្របសម្រាប់ស្រែមានទំហំតូចៗ។

៧. គ្រប់គ្រងស្មៅហាមឃាត់ក្នុងស្រែផលិតកម្មរបស់លោកអ្នក

៧.១. ស្មៅហាមឃាត់

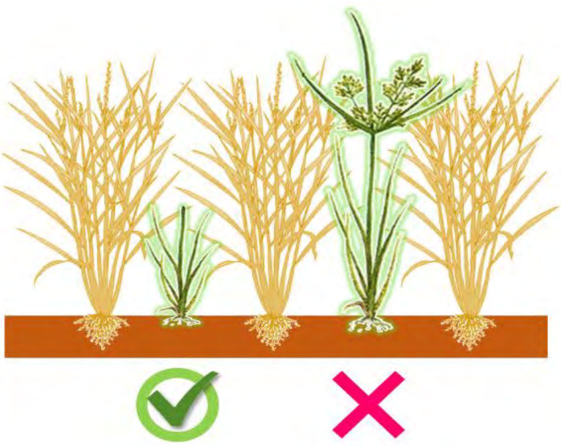
ស្តង់ដារទីវាល ប.គ.ព កំណត់ប្រភេទស្មៅចំនួនបី រួមមាន ស្មៅបែកក្បាល ស្មៅកន្ទុយក្ងោក និង កក់ធ៌ត្រជំ ដែលជាប្រភេទរុក្ខជាតិប៉ះពាល់ដល់គុណប្រយោជន៍។ វាត្រូវតែកម្ចាត់ចេញពីស្រែជាដាច់ខាត។

ស្មៅបែកក្បាល	ស្មៅកន្ទុយក្ងោក	កក់ធ៌ត្រជំ
		
Genus: Echinochloa	*Genus: Leptochloa*	*Genus: Cyperus*

គំនូសបង្ហាញ ៧-១៖ ស្មៅហាមឃាត់ក្នុងស្តង់ដារទីវាល ប.គ.ព

៧.២. ស្តង់ដារទីវាល ប.គ.ព

ស្មៅហាមឃាត់ទាំងអស់នោះមិនត្រូវមានលើស ១០ដើម ក្នុង១០ម^{២} សម្រាប់ផលិតកម្មគ្រាប់ពូជវិញ្ញាបនបត្រ និងមិនត្រូវមានលើស ៥ដើម សម្រាប់ផលិតកម្មគ្រាប់ពូជចុះបញ្ជី ដើម្បីស្របតាមស្តង់ដារទីវាល ប.គ.ព។



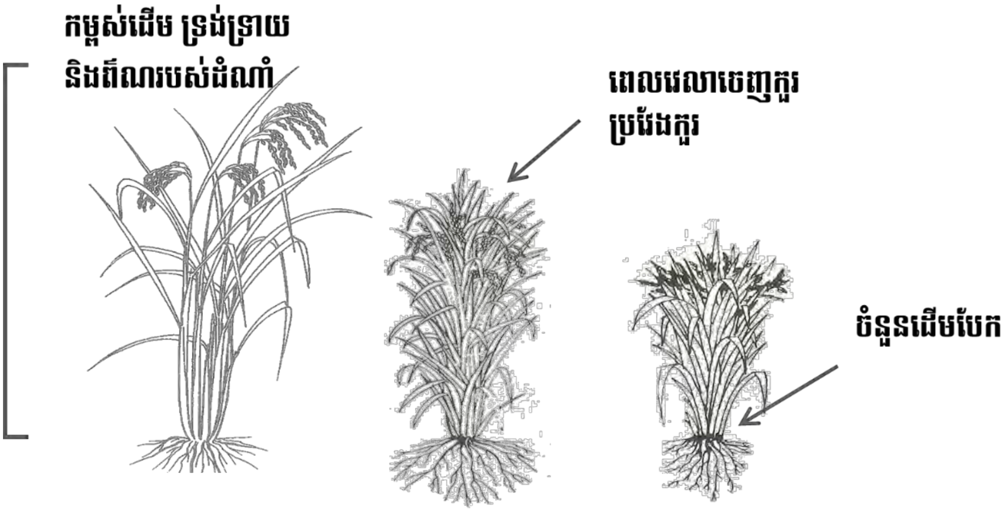
ប្រភេទស្មៅតូចៗគ្មានផ្កាមិនជះឥទ្ធិពលដល់គុណភាពគ្រាប់ពូជទេ ហើយក៏មិនចាត់ទុកជាស្មៅហាមឃាត់ដែរ។ ផ្ទុយទៅវិញ ស្មៅហាមឃាត់ដែលមានផ្កា គឺមិនត្រូវឱ្យមានជាដាច់ខាត។

គំនូសបង្ហាញ ៧-២៖ ការវិនិច្ឆ័យស្មៅហាមឃាត់នៅទីវាល

៨. ដកពូជលាយចេញពីស្រែផលិតកម្មរបស់លោកអ្នក

៨.១. ការដកពូជលាយ

ត្រូវដកពូជលាយជាប្រចាំ។ វាត្រូវកំណត់ដោយការសង្កេតលើកម្ពស់ដើម ទ្រង់ទ្រាយ ពណ៌ ចំនួនដើមបែក ពេលវេលាចេញកួរ កួរ និងគ្រាប់។



គំនូសបង្ហាញ ៨-១៖ អត្តសញ្ញាណនៃពូជលាយ

៨.២. ស្តង់ដារទីវាល ប.គ.ព

ពូជលាយមិនត្រូវមានលើស ១ដើម ក្នុង១០ម^{២} សម្រាប់ផលិតកម្មគ្រាប់ពូជចុះបញ្ជី និង ៣ដើម សម្រាប់ផលិតកម្មគ្រាប់ពូជវិញ្ញាបនបត្រ ដើម្បីស្របតាមស្តង់ដារទីវាល ប.គ.ព។

តារាង ៨-១៖ ស្តង់ដារទីវាល ប.គ.ព

ថ្នាក់គ្រាប់ពូជ	គ្រាប់ពូជចុះបញ្ជី	គ្រាប់ពូជវិញ្ញាបនបត្រ
ស្មៅហាមឃាត់	មិនលើស ៥ដើម ក្នុង១០ម^{២}	មិនលើស ១០ដើម ក្នុង១០ម^{២}
ពូជលាយ	មិនលើស ១ដើម ក្នុង១០ម^{២}	មិនលើស ៣ដើម ក្នុង១០ម^{២}

៩. គ្រប់គ្រងជំងឺលោកគ្រាប់ពូជមុនដំណាក់កាលចេញកួរ

៩.១. ជំងឺលោកគ្រាប់ពូជបីប្រភេទ

ប្រភេទទាំងបីនៃជំងឺលោកគ្រាប់ពូជត្រូវតែគ្រប់គ្រងឱ្យបានដាច់ខាតនៅក្នុងស្រែផលិតកម្មគ្រាប់ពូជដែលរួមមាន ជំងឺប្លាស់ ជំងឺអុចត្នោត និងជំងឺលោកស្រទបស្លឹក។

ក. ជំងឺប្លាស់

- មុនចេញកួរ៖ សណ្ឋានរាងស្រួចត្រង់ មានពណ៌ត្នោតនិងលឿងលេចឡើងតាមបណ្ដោយស្លឹក។
- មុនប្រមូលផល៖ ការបំផ្លាញភាគច្រើនរកឃើញនៅលើចង្កុំស្លឹកក្រោមកួរ។

ខ. ជំងឺអុចត្នោត

- មុនចេញកួរ៖ សណ្ឋានរាងមូលពណ៌ត្នោតចាស់និងលឿងលេចឡើងនៅលើស្លឹក។
- មុនប្រមូលផល៖ កួរស្រូវប្រែជាពណ៌ត្នោតព្រលែត។ ការបំផ្លាញក៏រកឃើញមាននៅលើស្លឹកដែរ។

គ. ជំងឺលោកស្រទបស្លឹក

- មុនចេញកួរ៖ ការបំផ្លាញចាប់ផ្ដើមពីផ្នែកខាងក្រោមនៃស្រទបស្លឹក។
- មុនប្រមូលផល៖ ស្លឹកទង់ជ័យឡើងស្វិតរញុម។ ការបំផ្លាញក៏រកឃើញមាននៅលើស្រទបស្លឹកដែរ។

ឃ. ការបំផ្លាញមិនមែនជាជំងឺ

- មុនចេញកួរ៖ រុក្ខជាតិរងបំផ្លាញដោយដង្កូវស៊ីរូងដើម។
- មុនប្រមូលផល៖ កួរស្រូវងាយដកចេញដោយដៃ។

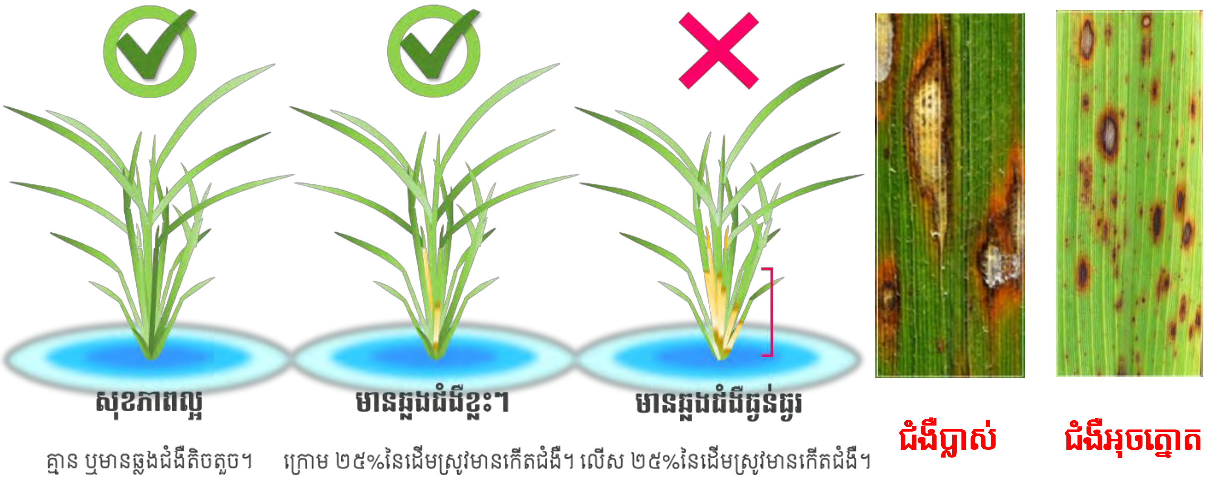
គំនូសបង្ហាញ ៩-១៖ អត្តសញ្ញាណនៃជំងឺលោកគ្រាប់ពូជ

៩.២. ការវិនិច្ឆ័យរុក្ខជាតិកើតជំងឺ

ជំងឺរលាកគ្រាប់ពូជ ត្រូវតែគ្រប់គ្រងឱ្យបានមុនដំណាក់កាលចេញផ្កា ដើម្បីបញ្ចៀសការបំផ្លាញនៅលើក្តួរ។ នៅពេលលើសសារធាតុអាស៊ូត គឺជំរុញឱ្យកើតជំងឺប្លាស់ តែបើខ្វះវា គឺបង្កឱ្យកើតជំងឺអុចត្នោត។

ក. ជំងឺប្លាស់ និងជំងឺអុចត្នោត

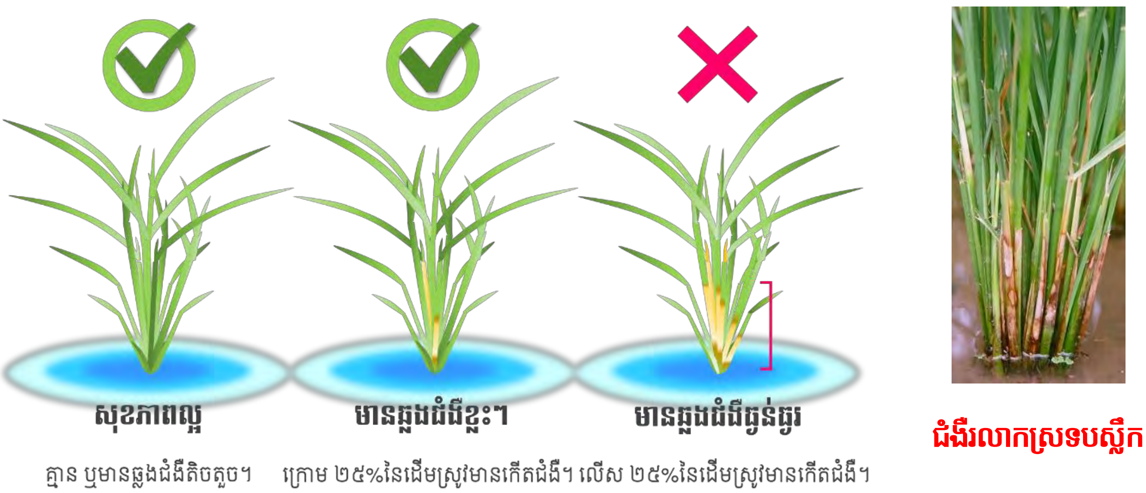
ដើមកើតជំងឺមិនគួរលើស ២៥%ទេ បន្ទាប់ពីដំណាក់ផើម។



គំនូសបង្ហាញ ៩-២៖ ការវិនិច្ឆ័យការកើតជំងឺប្លាស់ និងជំងឺអុចត្នោត

ខ. ជំងឺរលាកស្រទបស្លឹក

ដើមកើតជំងឺមិនគួរលើស ២៥%ទេ បន្ទាប់ពីដំណាក់កាលចេញក្តួរ។

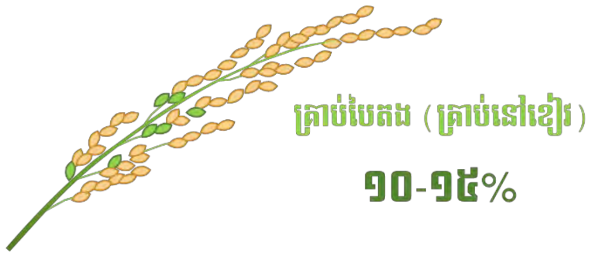


គំនូសបង្ហាញ ៩-៣៖ ការវិនិច្ឆ័យការកើតជំងឺរលាកស្រទបស្លឹក

១០. សម្អាតម៉ាស៊ីនច្រូតមុនច្រូតគ្រាប់ពូជ

១០.១. ការប្រមូលផល

នៅពេលគ្រាប់ទុំប្រហែល ៨៥-៩០% វាគឺជាពេលវេលាប្រមូលផលហើយ។



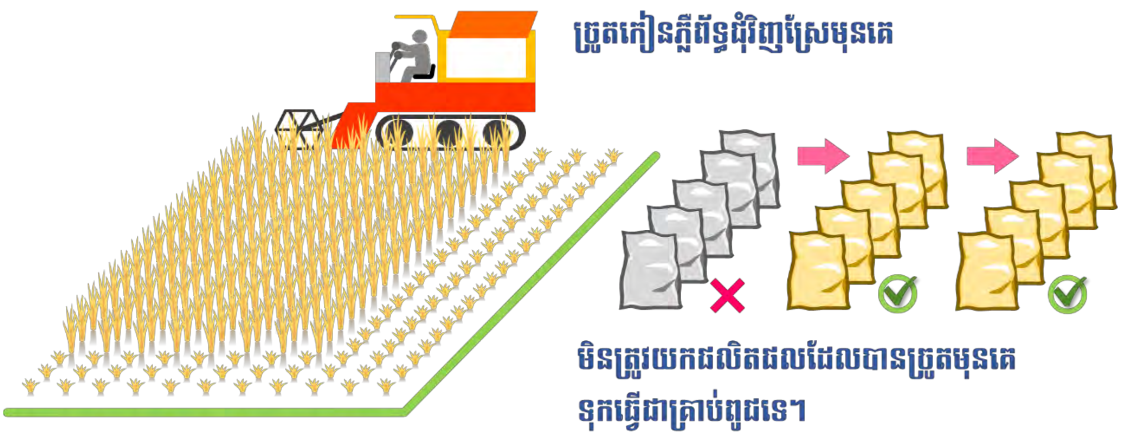
គំនូសបង្ហាញ ១០-១៖ ពេលវេលានៃការប្រមូលផល

១០.២. ការបញ្ចៀសការលាយឡំប្រភេទពូជផ្សេង

ដើម្បីបញ្ចៀសការលាយឡំប្រភេទពូជផ្សេង ត្រូវសម្អាតម៉ាស៊ីនច្រូតឱ្យបានស្អាតមុនច្រូត រួចហើយត្រូវប្រើបាវស្អាតសម្រាប់ច្រកគ្រាប់ពូជ។

គំនូសបង្ហាញ ១០-២៖ របៀបសម្អាតម៉ាស៊ីនច្រូត

ត្រូវច្រូតផ្នែកខាងក្រៅជាប់ភ្លឺស្រែជាមុន ហើយមិនត្រូវទុកវាជាពូជទេ ព្រោះថា គ្រាប់ពូជផ្សេងអាចមាននៅក្នុងម៉ាស៊ីនច្រូតនៅឡើយ។



គំនូសបង្ហាញ ១០-៣៖ ការគ្រប់គ្រងគុណភាពបន្ទាប់ពីប្រមូលផលរួច

ផ្នែកទី២៖ ការគ្រប់គ្រងក្រោយពេលប្រមូលផល

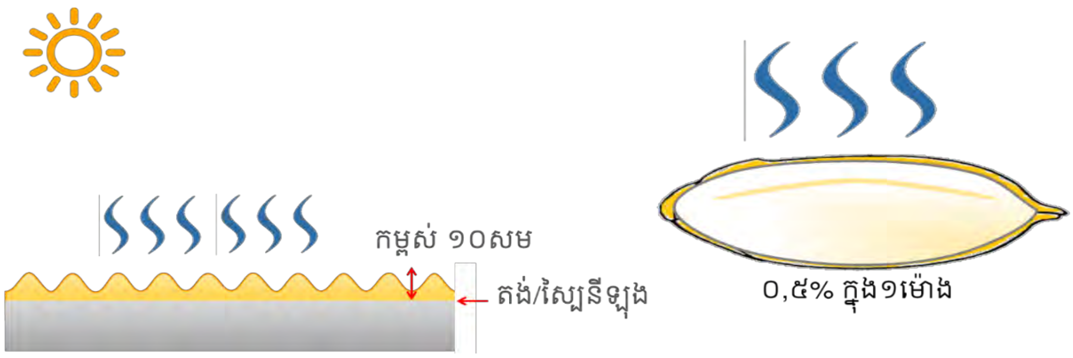
សកម្មភាពទាំង៦ សម្រាប់គ្រប់គ្រងក្រោយពេលប្រមូលផលតាម ប.គ.ព

១. ពិនិត្យអត្រាសំណើមដោយឧបករណ៍វាស់សំណើម
២. យកកម្ទេចកម្ទីរចេញដោយប្រើប្រាស់ម៉ាស៊ីនសម្អាតគ្រាប់ពូជ
៣. ពិនិត្យអត្រាដំណុះបន្ទាប់ពីសម្ងិតសម្រាំងគ្រាប់ពូជរួច
៤. រៀបចំកូដឡូត៏គ្រាប់ពូជទៅតាមផលិតផលគ្រាប់ពូជនីមួយៗ
៥. ប្រើបាវបោះពុម្ពដែលមានភ្ជាប់ព័ត៌មានផលិតផលជាក់លាក់
៦. រក្សាផលិតផលនៅក្នុងលក្ខខណ្ឌស្ងួតនិងត្រជាក់

១. ពិនិត្យអត្រាសំណើមដោយឧបករណ៍វាស់សំណើម

១.១. ការគ្រប់គ្រងសំណើម

បន្ទាប់ពីប្រមូលផលរួចភ្លាម ត្រូវសម្ងួតគ្រាប់ពូជស្រូវស្រស់ភ្លាម។ មិនត្រូវទុកវាឱ្យនៅសើមលើសពី ១ថ្ងៃនោះទេ។ ត្រូវសម្ងួតគ្រាប់ពូជជាបន្តបន្ទាប់ ដើម្បីបញ្ចៀសការបាក់គ្រាប់។ ល្បឿននៃការសម្ងួតគ្រាប់ពូជ គួរតែថយសំណើម ០,៥% ក្នុងមួយម៉ោង។ ត្រូវសម្ងួតគ្រាប់ពូជឱ្យបានសព្វល្អ។ ត្រូវធ្វេតគ្រាប់ពូជជាចង្អូរ បន្ទាប់មករីត្រឡប់ជាទៀងទាត់នៅពេលដែលហាលគ្រាប់ពូជក្រោមកំដៅថ្ងៃ។



គំនូសបង្ហាញ ១-១៖ របៀបសម្ងួតផលិតផលគ្រាប់ពូជ

១.២. របៀបប្រើឧបករណ៍វាស់សំណើម

ត្រូវវាស់អត្រាសំណើមគ្រាប់ពូជបីដង រួចគណនារកតម្លៃមធ្យម។ ប្រសិនបើរកឃើញតម្លៃមួយមិនប្រក្រតី ត្រូវវាស់អត្រាសំណើមពីរដងថែមទៀត។ បន្ទាប់មក ត្រូវលុបតម្លៃមិនប្រក្រតីពីរចោល រួចគណនារកតម្លៃមធ្យម។

គំនូសបង្ហាញ ១-២៖ ឧបករណ៍វាស់សំណើមអេឡិចត្រូនិក

២.៣. ស្តង់ដារគ្រាប់ពូជ ប.គ.ព

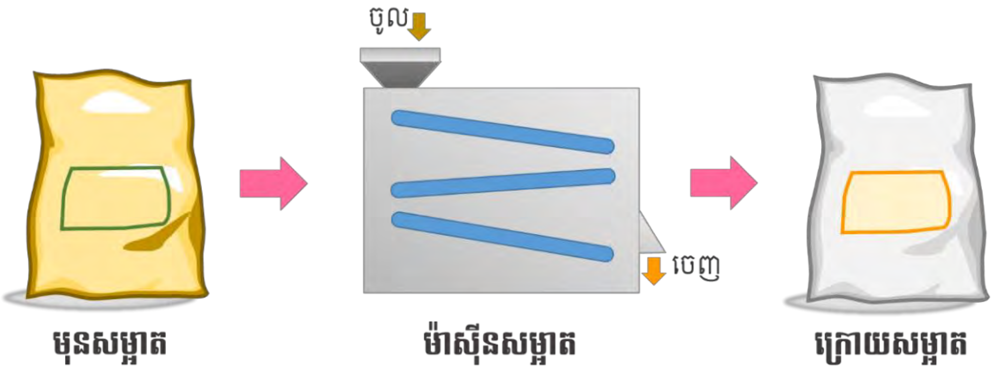
ត្រូវរក្សាកម្រិតសំណើមមិនលើសពី ១៣% សម្រាប់គ្រាប់ពូជចុះបញ្ជី និងមិនលើសពី ១៤% សម្រាប់គ្រាប់ពូជវិញ្ញាបនបត្រ ដូចមានចែងនៅក្នុងស្តង់ដារគ្រាប់ពូជ ប.គ.ព។

គំនូសបង្ហាញ ១-៣៖ ស្តង់ដារអត្រាសំណើមគ្រាប់ពូជ

២. យកកម្ទេចកម្ទីចេញដោយប្រើប្រាស់ម៉ាស៊ីនសម្អាតគ្រាប់ពូជ

២.១. ការសម្អាតផលិតផលគ្រាប់ពូជ

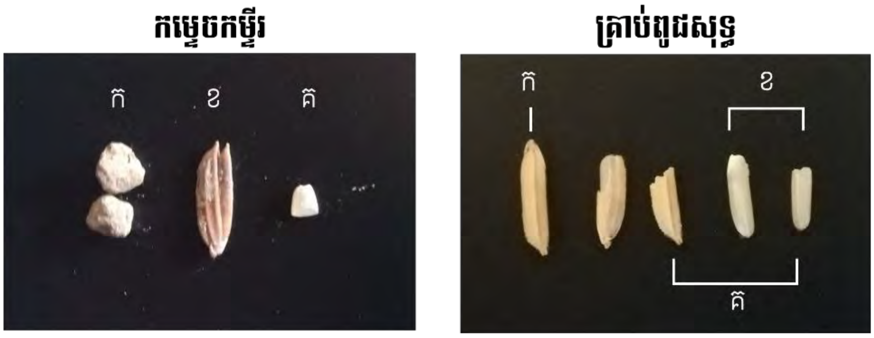
បន្ទាប់ពីសម្ងួតរួច ត្រូវយកកម្ទេចកម្ទីចេញដោយប្រើប្រាស់ម៉ាស៊ីនសម្អាតគ្រាប់ពូជ ដើម្បីបញ្ចៀសការលាយឡំជាមួយប្រភេទពូជផ្សេង និងដើម្បីទទួលបានភាពសុទ្ធ។ ត្រូវប្រើបាវវេចខ្ចប់ដែលបានត្រៀមជាស្រេចសម្រាប់ច្រកផលិតផលគ្រាប់ពូជមុននិងក្រោយសម្អាតផ្សេងពីគ្នា។



គំនូសបង្ហាញ ២-១៖ ដំណើរការនៃការសម្អាតគ្រាប់ពូជ

២.២. ស្តង់ដារគ្រាប់ពូជ ប.គ.ព

បន្ទាប់ពីសម្អាតគ្រាប់ពូជរួច ត្រូវពិនិត្យគុណភាពគ្រាប់ពូជ។ ប្រសិនបើរកឃើញមានកម្ទេចកម្ទីដូចជា កម្ទេចចំបើង ថ្ម ស្មៅ និងគ្រាប់ស្អៀតលើសកំណត់នៅក្នុងស្តង់ដារ ប.គ.ព ត្រូវសម្អាតគ្រាប់ពូជសាជាថ្មី។ ស្តង់ដារ ប.គ.ព កំណត់ថា គ្រាប់ពូជសុទ្ធ គឺមិនក្រោម ៩៨% នៃទម្ងន់ផលិតផលគ្រាប់ពូជសរុប។



ក. ដុំថ្ម និងវត្ថុធាតុផ្សេងទៀត
ខ. គ្រាប់ខ្វី
គ. គ្រាប់បាក់ (បំណែកគ្រាប់នៅសល់ខ្លីជាង៥០%)

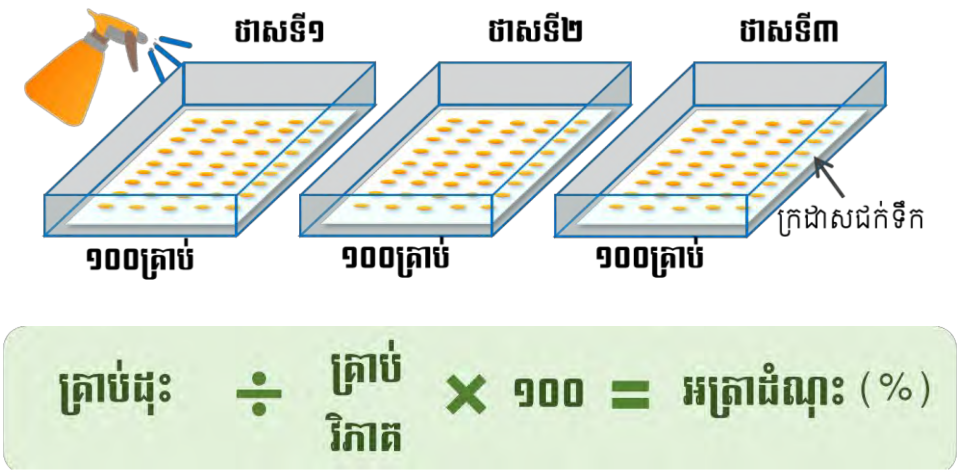
ក. គ្រាប់ពេញ
ខ. គ្រាប់គ្មានសម្បក
គ. គ្រាប់បាក់ (បំណែកគ្រាប់នៅសល់វែងជាង៥០%)

គំនូសបង្ហាញ ២-២៖ ភាពខុសគ្នារវាងកម្ទេចកម្ទី និងគ្រាប់ពូជសុទ្ធ

៣. ពិនិត្យអត្រាដំណុះបន្ទាប់ពីសម្ងួតសម្រាំងគ្រាប់ពូជរួច

៣.១. តេស្តដំណុះគ្រាប់ពូជ

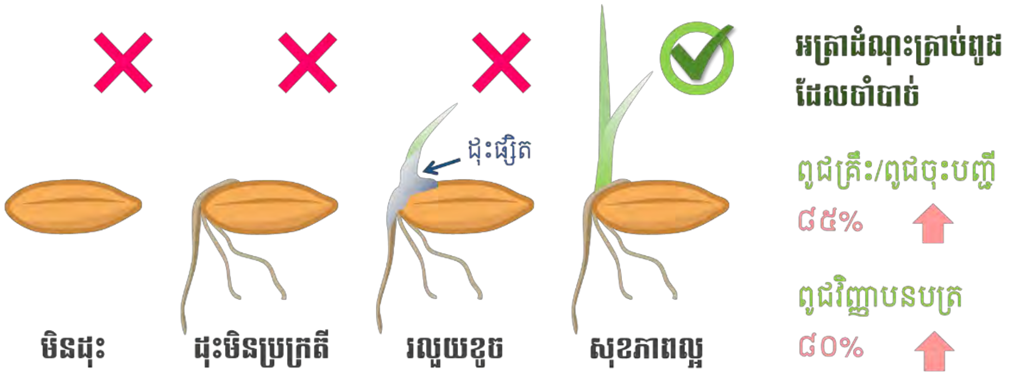
រៀបគ្រាប់ពូជចំនួន ៣០០គ្រាប់នៅលើក្រដាសសើមជក់ទឹក និងបាញ់ទឹកឱ្យគ្រាប់ពូជសើមជាទៀងទាត់។ បន្ទាប់ពីរយៈពេល ៧ថ្ងៃ ត្រូវរាប់ចំនួនគ្រាប់ពូជដែលដុះ រួចហើយគណនាអត្រាដំណុះ។



គំនូសបង្ហាញ ៣-១៖ តេស្តដំណុះគ្រាប់ពូជ

៣.២. ស្តង់ដារគ្រាប់ពូជ ប.គ.ព

គ្រាប់ពូជដែលងាប់ ដុះមិនប្រក្រតី ឬរលួយ បន្ទាប់ពីធ្វើដំណុះ មិនត្រូវរាប់ជាគ្រាប់ពូជដុះទេ។ ស្តង់ដារគ្រាប់ពូជ ប.គ.ព តម្រូវឱ្យមានអត្រាដំណុះគ្រាប់ពូជមិនក្រោម ៨៥% សម្រាប់គ្រាប់ពូជគ្រឹះ និងគ្រាប់ពូជចុះបញ្ជី និងមិនក្រោម ៨០% សម្រាប់គ្រាប់ពូជវិញ្ញាបនបត្រ។ តេស្តដំណុះគ្រាប់ពូជគួរធ្វើក្នុងរយៈពេលបីសប្តាហ៍ក្រោយពេលប្រមូលផលរួច ដែលអាចជារយៈពេលដំណេករបស់គ្រាប់ពូជ។



គំនូសបង្ហាញ ៣-២៖ របៀបកំណត់គ្រាប់ពូជដុះ

៤. រៀបចំកូដឡូតិ៍គ្រាប់ពូជទៅតាមផលិតផលគ្រាប់ពូជនីមួយៗ

៤.១. ការរៀបចំឡូតិ៍គ្រាប់ពូជ

ទំហំឡូតិ៍គ្រាប់ពូជនីមួយៗមិនគួរលើស ១០តោននោះទេ។ ប្រសិនបើបរិមាណផលិតផលគ្រាប់ពូជលើសពី ១០តោន ត្រូវបំបែកផលិតផលគ្រាប់ពូជជាពីរឬបីឡូតិ៍។ ប្រសិនបើផលិតផលគ្រាប់ពូជត្រូវបានប្រមូលផលចេញពីស្រែផ្សេងៗជិតគ្នា គេក៏អាចដាក់វាបញ្ចូលគ្នាជាឡូតិ៍គ្រាប់ពូជតែមួយបានដែរ។

សូមកត់សម្គាល់ចំណុចខាងក្រោមមុននឹងដាក់បញ្ចូលផលិតផលគ្រាប់ពូជជាឡូតិ៍តែមួយ។

១. ប្រភេទផលិតផលគ្រាប់ពូជដូចគ្នា
២. ថ្នាក់ផលិតផលគ្រាប់ពូជដូចគ្នា (ពូជគ្រឹះ/ពូជចុះបញ្ជី/ពូជវិញ្ញាបនបត្រ)
៣. ផលិតផលគ្រាប់ពូជផលិតនៅក្នុងរដូវកាលដាំដុះដូចគ្នា
៤. អត្រាសំណើមរបស់ផលិតផលគ្រាប់ពូជគឺប្រហែលគ្នា (±១%)

៤.២. ការបង្កើតឡូតិ៍គ្រាប់ពូជ

ត្រូវបង្កើតឡូតិ៍គ្រាប់ពូជនៃផលិតផលគ្រាប់ពូជនីមួយៗទៅតាមលំដាប់ ដែលបង្ហាញជាឧទាហរណ៍ក្នុងគំនូសបង្ហាញ ៤-១។

G0051322.02

(1) (2) (3) (4) (5) (6)

(1) កូដកសិករផលិតគ្រាប់ពូជ (G001, G002, G003....)
(2) ប្រភេទពូជ (1. សែនក្រអូប, 2. សែនពិដោរ, 3. អូអឹម៥៤៥១, 4. អ៊ីអ៊ែ៦៦,
5. អ៊ីអ៊ែ៥០៤, 6. ផ្ការំដួល, 7. រាំងជ័យ
(3) ថ្នាក់គ្រាប់ពូជ (1. ពូជគ្រឹះ, 2. ពូជចុះបញ្ជី, 3. ពូជវិញ្ញាបនបត្រ)
(4) រដូវកាលផលិតកម្ម (1. ដើមរដូវវស្សា, 2. រដូវវស្សា, 3. រដូវប្រាំង)
(5) ឆ្នាំផលិតកម្ម (0=២០២០, 1=២០២១, 2=២០២២....)
(6) លេខរៀងឡូតិ៍គ្រាប់ពូជ (01, 02, 03...)

គំនូសបង្ហាញ ៤-១៖ ឧទាហរណ៍នៃការបង្កើតឡូតិ៍គ្រាប់ពូជ

៥. ប្រើបាវបោះពុម្ពដែលមានភ្ជាប់ព័ត៌មានផលិតផលជាក់លាក់

៥.១. ព័ត៌មាននៅលើបាវវេចខ្ចប់

ត្រូវរៀបចំបាវបោះពុម្ពសម្រាប់ច្រកផលិតផលគ្រាប់ពូជដែលបានជាប់ ប.គ.ព។ បាវបោះពុម្ពគួរតែបង្ហាញអំពីព័ត៌មានសំខាន់របស់ផលិតផលគ្រាប់ពូជ។

ព័ត៌មានផលិតផល

ឡូតិ៍គ្រាប់ពូជ	G0051322.02
ប្រភេទពូជ	សែនក្រអូប០១
ថ្នាក់គ្រាប់ពូជ	វិញ្ញាបនបត្រ
ផលិតករគ្រាប់ពូជ	សហគមន៍កសិកម្មបាភ្នំ
តំបន់ផលិត	ខេត្តព្រៃវែង
កាលបរិច្ឆេទប្រមូលផល	២ កុម្ភៈ ២០២២
អត្រាសំណើម	ក្រោម ១៣%
អត្រាដំណុះ	លើស ៨០%
កាលបរិច្ឆេទផុតសុពលភាព	២ តុលា ២០២២

គំនូសបង្ហាញ ៥-១៖ ឧទាហរណ៍បាវបោះពុម្ពសមស្រប

៥.២. គ្រាប់ពូជគ្មានវិញ្ញាបនកម្ម (មិនជាប់ស្តង់ដារ)

គ្រាប់ស្រូវដែលមិនបានជាប់ការត្រួតពិនិត្យ គួរតែដាក់ដាច់ដោយឡែកពីគ្រាប់ពូជដែលបានជាប់។ ប្រសិនបើរកឃើញមានកម្ទេចកម្ទីលើសពីស្តង់ដារកំណត់ ត្រូវសម្អាតផលិតផលគ្រាប់ពូជនោះសាជាថ្មី រួចហើយដាក់ពាក្យម្តងទៀតសម្រាប់ការធ្វើតេស្តគុណភាពសាឡើងវិញ។

គ្រាប់ពូជវិញ្ញាបនបត្រ ប.គ.ព	គ្រាប់ពូជត្រូវបានបញ្ជាក់ជាផ្លូវការតាម ប.គ.ព
គ្រាប់ពូជគ្មានវិញ្ញាបនកម្ម	គ្រាប់ពូជមិនបានបញ្ជាក់ជាផ្លូវការតាម ប.គ.ព
ស្រូវចំណី	គ្រាប់ស្រូវដែលមិនសមស្របយកមកប្រើជាគ្រាប់ពូជ
ស្រូវចំណីសត្វ	គ្រាប់ស្រូវដែលមិនសមស្របយកមកប្រើជាអាហារសម្រាប់មនុស្ស

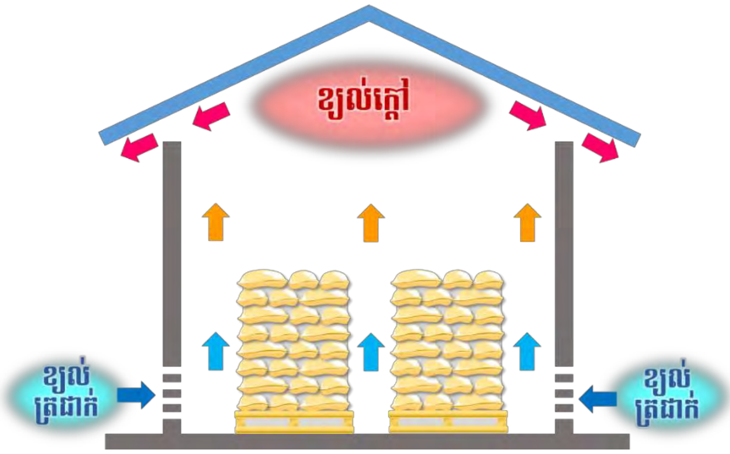
ព័ត៌មានគុណភាព គួរតែជម្រាបជូនអ្នកទិញអំពីការលក់គ្រាប់ពូជមិនស្របតាមស្តង់ដារ។

គំនូសបង្ហាញ ៥-២៖ ចំណាត់ថ្នាក់កម្រិតគុណភាពគ្រាប់ពូជ

៦. រក្សាផលិតផលនៅក្នុងលក្ខខណ្ឌស្ងួតនិងត្រជាក់

៦.១. ការគ្រប់គ្រងឃ្លាំងស្តុកគ្រាប់ពូជ

ត្រូវរក្សាឃ្លាំងឱ្យបិតក្នុងលក្ខខណ្ឌត្រជាក់ និងត្រូវសម្អាតវាដើម្បីបញ្ចៀសការខូចខាតនិងការបំផ្លាញរបស់កណ្តុរ សត្វចាប និងសត្វល្អិត។ ត្រូវរក្សាលំហរ ឬចន្លោះរវាងផលិតផលគ្រាប់ពូជនិងជញ្ជាំងឃ្លាំងសម្រាប់ខ្យល់បក់ចេញចូល និងដើម្បីបញ្ចៀសសំណើម ឬកំដៅពីជញ្ជាំង។

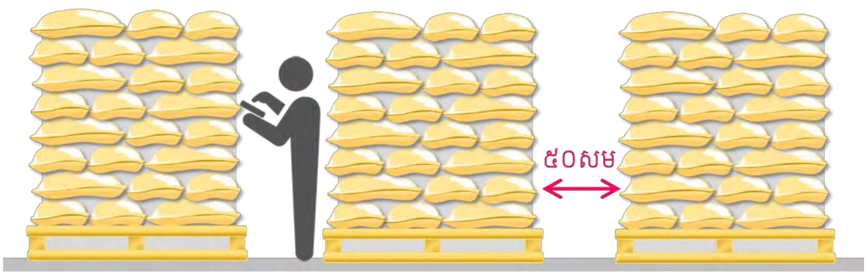


គំនូសបង្ហាញ ៦-១៖ ប្រព័ន្ធខ្យល់បក់ចេញចូលក្នុងឃ្លាំង

៦.២. ការគ្រប់គ្រងសន្និធិ (ស្តុក)

ត្រូវទុកដាក់ផលិតផលទៅតាមឡូតិ៍គ្រាប់ពូជ។ ត្រូវប្រើកំណល់(ប៉ាឡែត)ដើម្បីរក្សាផលិតផលឱ្យស្ងួត។ មិនត្រូវដាក់ផលិតផលគ្រាប់ពូជនិងថ្នាក់គ្រាប់ពូជផ្សេងគ្នាលើកំណល់ជាមួយគ្នានោះទេ។ ត្រូវរក្សាលំហឬចន្លោះសមល្មមរវាងពំនូកផលិតផលសម្រាប់មន្ត្រីត្រួតពិនិត្យគុណភាពយកសំណាក។

ត្រូវកត់ត្រារាល់ប្រតិបត្តិការ ឬចលនាស្តុកចេញចូលទៅតាមកូដឡូតិ៍គ្រាប់ពូជ។ ព័ត៌មានផលិតផលគ្រាប់ពូជ ដូចជា គ្រាប់ពូជ ថ្នាក់គ្រាប់ពូជ ឈ្មោះកសិករផលិត កាលបរិច្ឆេទប្រមូលផល និងអត្រាសំណើម គួរតែអាចតាមដានបានតាមរយៈឡូតិ៍គ្រាប់ពូជ។



គំនូសបង្ហាញ ៦-២៖ ការរក្សាផលិតផលគ្រាប់ពូជទុកក្នុងឃ្លាំង

ឧបសម្ព័ន្ធ

ឧបសម្ព័ន្ធទី១

ការប្រើប្រាស់ថ្នាំសម្លាប់ស្មៅត្រឹមត្រូវ

១. ការណែនាំ

វិធីសាស្ត្រមួយចំនួនអាចគ្រប់គ្រងស្មៅបាន។ យ៉ាងណាក៏ដោយ ការបង្ការ គឺមានសារៈសំខាន់ជាង។

- ត្រូវប្រើប្រាស់គ្រាប់ពូជសុទ្ធ ដែលគ្មានលាយគ្រាប់ពូជស្មៅ
- ត្រូវពិចារណាអំពីពេលវេលាដាំដុះមុនពេលដាំ
- ត្រូវពង្រាបស្រែឱ្យបានស្មើល្អ និងរក្សាទឹកក្នុងស្រែឱ្យបានគ្រប់គ្រាន់
- ត្រូវបញ្ចៀសការជ្រើសយកស្រែផលិតកម្មដែលមានហានីភ័យខ្ពស់នៃគ្រោះរាំងស្ងួត
- ត្រូវអនុវត្តការស្ទូងនៅក្នុងស្រែដែលគ្មានប្រព័ន្ធស្រោចស្រព
- ត្រូវពិចារណាអំពីពេលវេលាសម្លាប់ស្មៅ។ នៅពេលស្លឹកស្រូវគ្របដណ្តប់ពេញស្រែហើយ ភាគច្រើនស្មៅមិនអាចដុះក្រោមម្លប់បានទេ
- មិនត្រូវប្រើថ្នាំសម្លាប់ស្មៅដដែលច្រើនដងឡើយ។

២. វិធានការចម្រុះគ្រប់គ្រងស្មៅចង្រៃ

វិធានការដាំដុះ

- ✓ ការដកដោយដៃ
- ✓ ការដាំត្រង់ជួរ
- ✓ ពូជមានគុណភាពខ្ពស់

វិធានការមេកានិក

- ✓ ការប្រើឧបករណ៍ចិញ្ច្រាំស្មៅ
- ✓ ការកៀរដីឱ្យស្មើល្អ
- ✓ ការភ្ជួរលប់ស្មៅដោយត្រាក់ទ័រក្នុងរដូវមិនដាំដុះ

វិធានការគីមី

- ✓ ការប្រើថ្នាំសម្លាប់ស្មៅ
- ✓ ការប្រើកំបោរអាសូត

ផែនការគ្រប់គ្រងស្មៅត្រឹមត្រូវ គឺត្រូវអនុវត្តជាប់ខាត

៣. ប្រភេទស្មៅចង្រៃ

ស្មៅថ្នាំងនិងកក់

Grass and sedge weeds

ស្មៅបែកក្បាល
ស្មៅហាមឃាត់

ស្មៅកន្ទុយក្ងោក
ស្មៅហាមឃាត់

កក់ឆ័ត្រធំ
ស្មៅហាមឃាត់

ស្មៅស្លឹកធំ

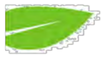
Broadleaf weeds

ប្រាច់
Monochoria vaginalis
Pontederiaceae

ត្រកួន
Ipomoea aquatica
Convolvulaceae

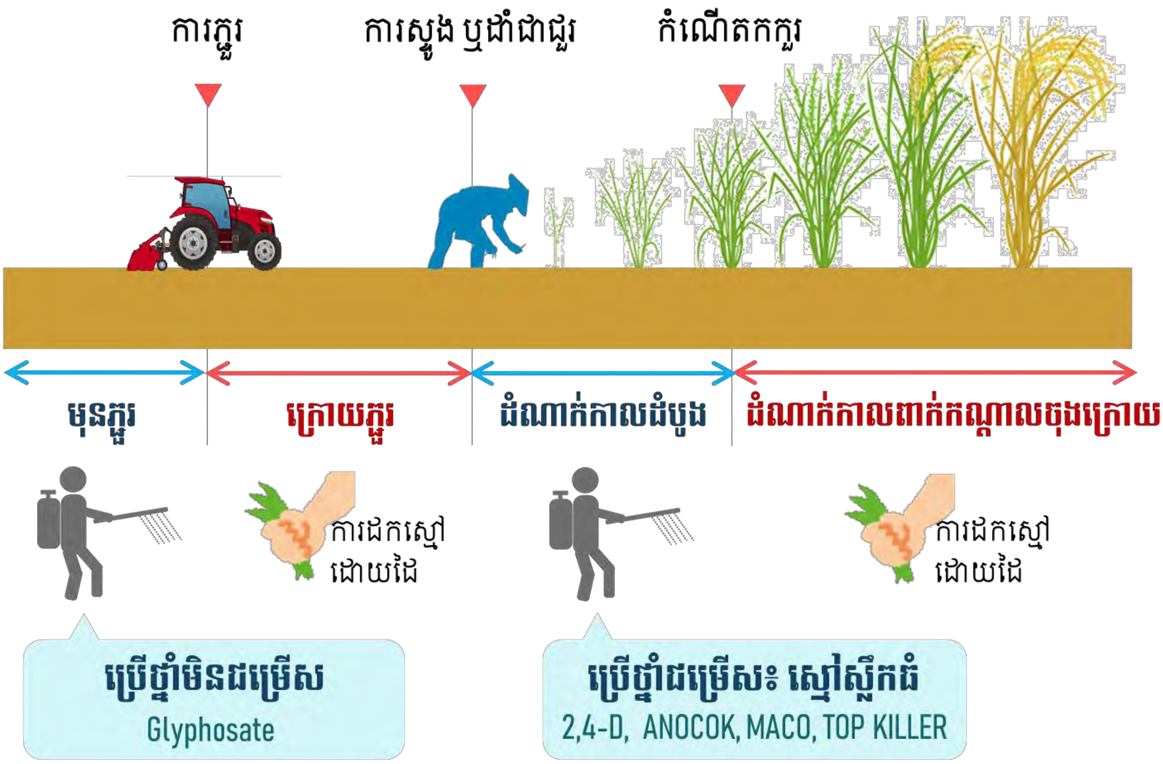
កំពីងពួយ
Ludwigia adscendens
Onagraceae

៤. មុខសញ្ញាថ្នាំសម្លាប់ស្មៅ

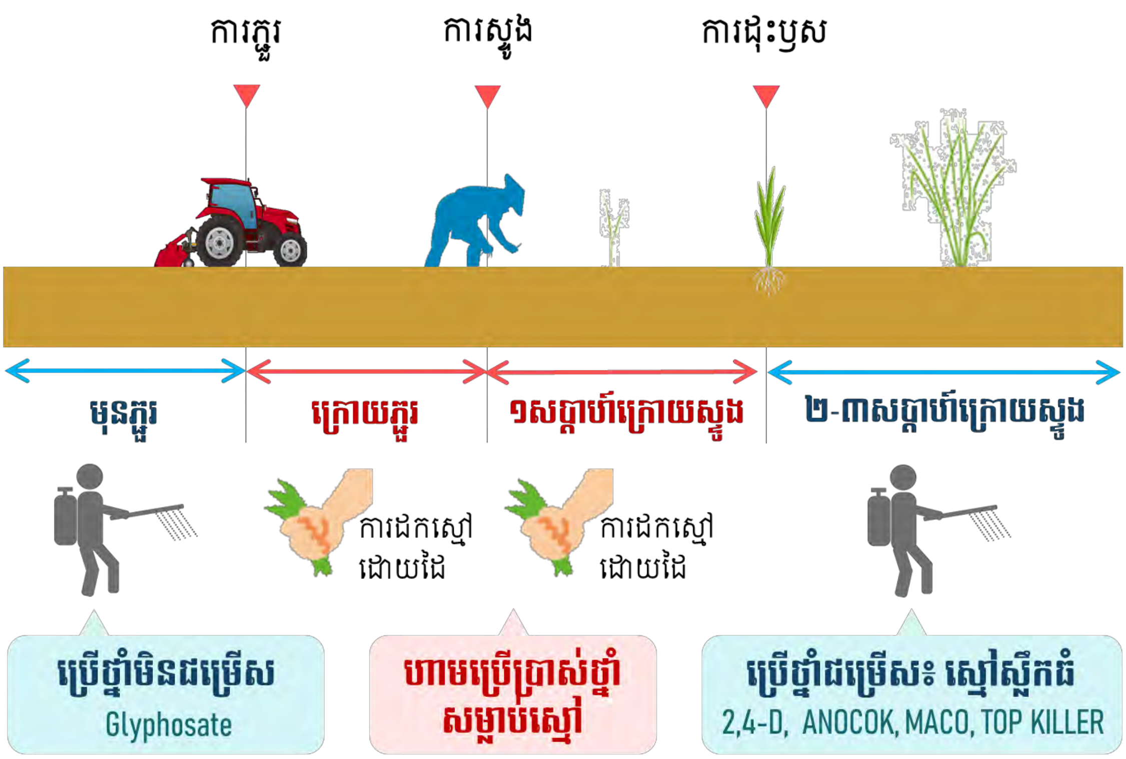
ប្រភេទថ្នាំសំលាប់ស្មៅ	 ស្មៅថ្នាំង	 ស្មៅស្លឹកធំ	 គ្រាប់ស្មៅ	 ស្រូវ
មិនជម្រើស Glyphosate	✓	✓	✗	✓
ជម្រើស៖ ស្មៅថ្នាំង Xevelo, Apsara, Giant Force, NEWRIUS	✓	△	✗	✗
ជម្រើស៖ ស្មៅស្លឹកធំ 2,4-D, ANOCOK, MACO, TOP KILLER	✗	✓	✗	✗
ជម្រើស៖ ស្មៅថ្នាំងនិងគ្រាប់ស្មៅ MECO	✓	△	✓	✗

✓ មានប្រសិទ្ធភាព △ ប្រសិទ្ធភាពតិច ✗ គ្មានប្រសិទ្ធភាព

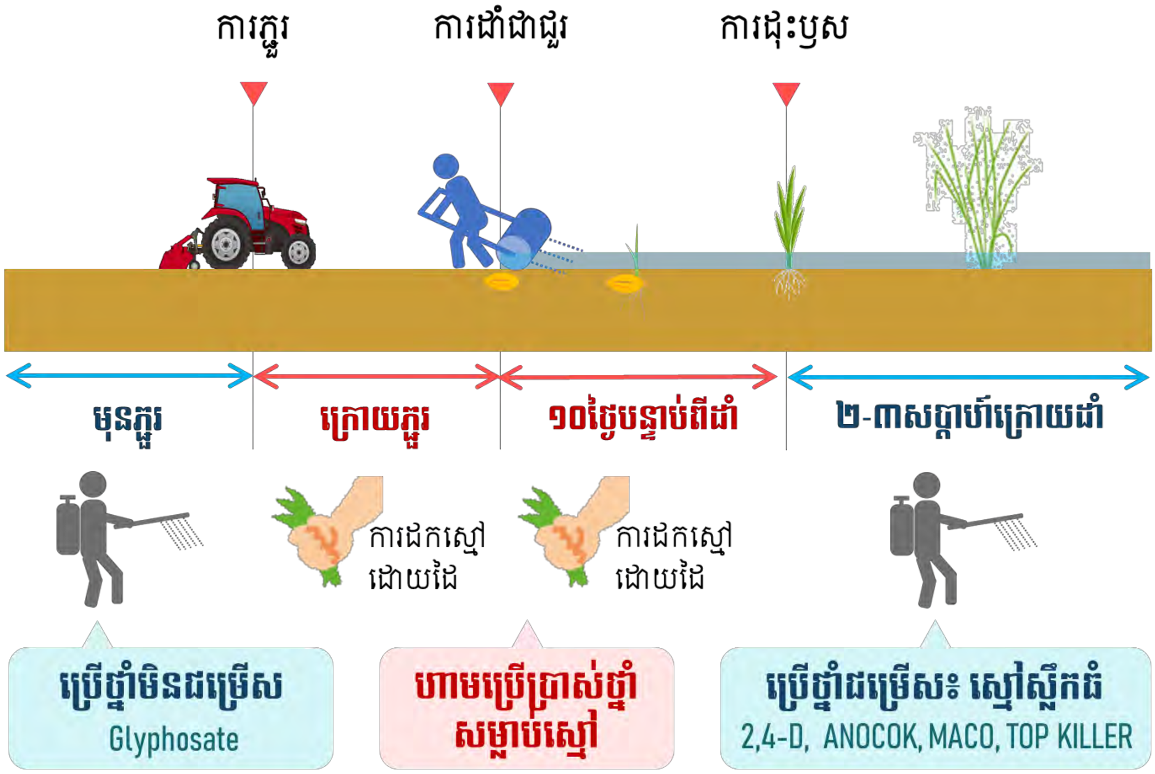
៥. ចំណុចសំខាន់ៗសម្រាប់គ្រប់គ្រងស្មៅសមស្រប



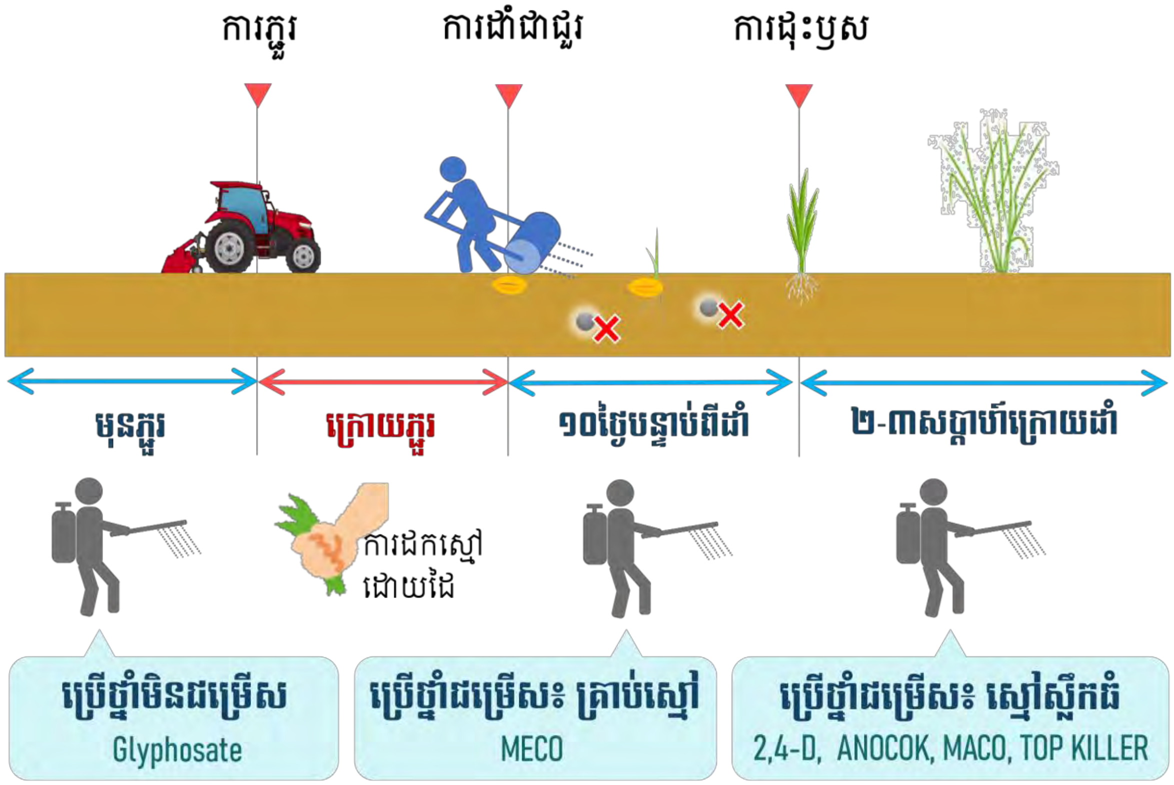
៦. ការគ្រប់គ្រងស្មៅសម្រាប់ស្រូវសន្ទូង



៧. ការគ្រប់គ្រងស្មៅសម្រាប់ស្រូវដាំជាជួរនៅក្នុងស្រែសើម



៨. ការគ្រប់គ្រងស្មៅសម្រាប់ស្រូវដាំជាជួរនៅក្នុងស្រែស្ងួត



៩. ប្រភេទថ្នាំសម្លាប់ស្មៅ

ថ្នាំសម្លាប់ស្មៅមិនជ្រាប

- ✓ មានប្រសិទ្ធភ្លាមៗ (ស្មៅងាប់ក្រោយពេលបាញ់បាន ២-៣ថ្ងៃ
- ✓ មានប្រសិទ្ធភាពចំពោះស្មៅដែលបានប៉ះថ្នាំតែប៉ុណ្ណោះ
- ✓ មានប្រសិទ្ធភាពចំពោះតែស្មៅខ្ពស់ៗ (កម្ពស់ចាប់ពី ១០០ស.ម ឡើងទៅ)

ថ្នាំសម្លាប់ស្មៅជ្រាប

- ✓ មានប្រសិទ្ធភាពភ្លាមៗ (ស្មៅងាប់ក្រោយបានញ់បាន ២-៣ថ្ងៃ
- ✓ មានប្រសិទ្ធភាពមានរយៈពេល ៣-៦ខែ
- ✓ មានប្រសិទ្ធភាពចំពោះតែស្មៅទាបៗ (កម្ពស់ខ្ពស់បំផុតត្រឹម ៣០ស.ម)

ថ្នាំសម្លាប់ស្មៅដែលមានសំណល់

- ✓ មានប្រសិទ្ធភាពយឺត (ស្មៅងាប់ក្រោយបាញ់បាន ១សប្តាហ៍)
- ✓ មានប្រសិទ្ធភាពយូររហូត ៣-៦ខែ
- ✓ មានប្រសិទ្ធភាពសម្រាប់ស្មៅទាបៗ (កម្ពស់ខ្ពស់បំផុតត្រឹម ៣០ស.ម)

១០. ព័ត៌មានមូលដ្ឋាននៃថ្នាំសម្លាប់ស្មៅ

MECO
ឈ្មោះផលិតកម្ម

60
ធាតុសកម្ម%

EC
ប្រភេទថ្នាំ

Butachlor
ធាតុផ្សំសកម្ម

ធាតុផ្សំសកម្មសម្រាប់
កំណត់ប្រភេទថ្នាំ

១១. មុខសញ្ញានៃថ្នាំសម្លាប់ស្មៅ

ឈ្មោះផលិតកម្ម	ប្រភេទថ្នាំ	ធាតុផ្សំសកម្ម	មុខសញ្ញា
Glyphosate (S)	S	Glyphosate	N
2,4-D 720 W/V SL MACO 720 ANOCOK 600SL	S	2,4-D 72% 2,4-D 72% 2,4-D 60%	B
Xevelo	S	Florpyrauxifen-benzyl 1.2% Cyhalofop-butyl 16.0%	G B
MECO 60EC	EC	Butachlor 60%	G B W
Apsara 99	SC	Bispyribac 40%	G B
TOP KILLER 155WP	WP	Pyrazosulfuron-ethyl 0.14.8% Metsulfuron-methl 0.7%	B
Giant Force 888	WP	Bensulfuron 6% Quinclorac 34%	G B
NEWRIUS 155WP	WP	Quinclorac 430g/kg Pyrazosulfuron 70g/kg	G B

N មិនជម្រើស G ជម្រើស៖ ស្មៅថ្នាំង B ជម្រើស៖ ស្មៅស្លឹកធំ W ជម្រើស៖ ស្មៅនិងគ្រាប់ស្មៅ

១២. រូបមន្តនិងលំដាប់នៃការលាយ

ប្រភេទ **លំដាប់នៃការលាយ**

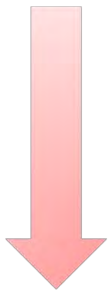
1 **Solutions (S or CS)**
2,4-D, MACO, ANOCOK

2 **Emulsifiable Concentrate (E or EC)**
MECO

3 **Flowables (F, L, or SC)**
Apsara

4 **Wettable Powders (WP or W)**
Giant Force, NEWRIUS, TOP KILLER

ងាយ



ពិបាក

១៣. ចំណុចគន្លឹះនៃការប្រើប្រាស់ថ្នាំសម្លាប់ស្មៅ

១៤. សុវត្ថិភាពនៃការប្រើប្រាស់ថ្នាំសម្លាប់ស្មៅ

ស្បែករលាកដោយសារជាតុគីមី

ឧបសម្ព័ន្ធទី២

ការគ្រប់គ្រងជំងឺស្រូវ

១. ការណែនាំ

វិធីសាស្ត្រមួយចំនួនអាចគ្រប់គ្រងជំងឺបាន។ យ៉ាងណាក៏ដោយ ការបង្ការ គឺមានសារៈសំខាន់ជាង។

- ត្រូវប្រើប្រាស់គ្រាប់ពូជសុទ្ធល្អ ដែលគ្មានជិតជាមជំងឺ ជាពិសេសជំងឺរលាកគ្រាប់ពូជ ដូចជា ជំងឺអុចត្នោត ជំងឺរលាកស្រទបស្លឹក និងជំងឺប្លាស់
- ត្រូវពិចារណាអំពីការប្រឡាក់គ្រាប់ពូជជាមួយថ្នាំកម្ចាត់រោគផ្សិតមុនដាំ
- ត្រូវដឹងអំពីប្រវត្តិស្រែ ដែលអាចងាយស្រួលក្នុងការតាមដានជំងឺនិងកង្វះជីជាតិ ដែលមានទំនាក់ទំនងយ៉ាងជិតស្និតជាមួយគ្នា
- ត្រូវតាមដានស្រែជាប្រចាំ ដើម្បីពិនិត្យសុខភាពដំណាំនិងតម្រូវការជីជាតិ ដើម្បីបង្ការ ឬបញ្ចៀសការលេចឡើងជំងឺធ្ងន់ធ្ងរ
- ត្រូវអនុវត្តការស្ទូងនៅក្នុងស្រែដែលគ្មានប្រព័ន្ធស្រោចស្រព
- ត្រូវពិចារណាអំពីកម្រិតធ្ងន់នៃជំងឺ មុននឹងចាត់វិធានការបាញ់ថ្នាំគីមី
- មិនត្រូវប្រើថ្នាំកំចាត់ជំងឺដដែលច្រើនដងឡើយ។

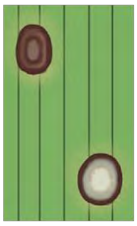
២. វិធីកំណត់សម្គាល់ជំងឺស្រូវ


ជំងឺអុចត្នោត

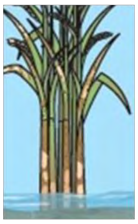

ជំងឺប្លាស់


ជំងឺរលាកស្រទបស្លឹក


ការខូចខាតមិនមែនជាជំងឺ


ស្នាមជាំរាងមូល


ស្នាមជាំរាង
ចតុកោណព្នាយ


រោគឆ្លងរាលដាល
ពីក្រោមមក


គែមព្រាលៗ

៣. លក្ខខណ្ឌនៃការផ្ទុះជំងឺប្លាស់

១. សីតុណ្ហភាពមធ្យមប្រចាំថ្ងៃរយៈពេល ៥ថ្ងៃ នៅចន្លោះពី១៥អង្សារទៅ២៥អង្សារ
២. ដំណាំស្ថិតក្នុងស្ថានភាពសើមលើសពី១០ម៉ោង

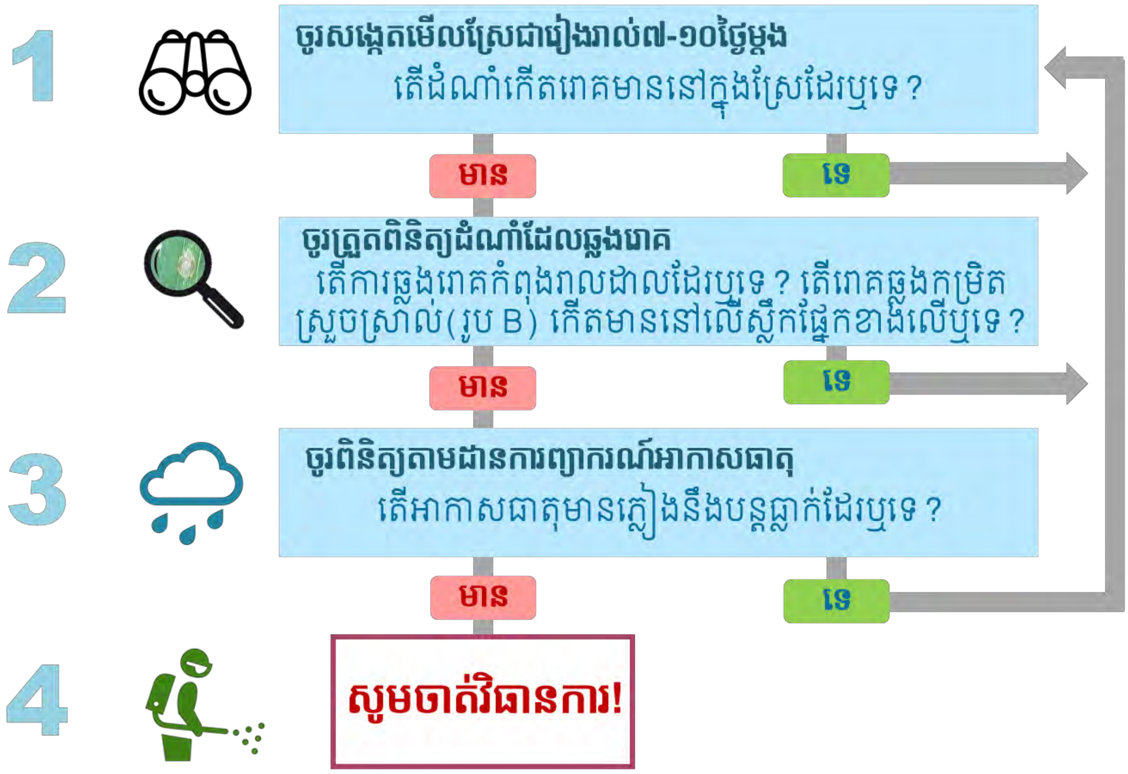
៤. ជំងឺប្លាស់លើស្លឹក

រោគឆ្លងដោយដុំៗ
កម្រិតឆ្លងទាប

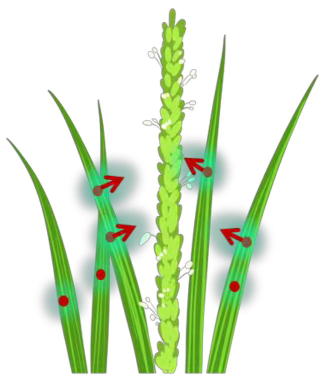
រោគឆ្លងស្រួចស្រាល់
កម្រិតឆ្លងខ្ពស់

រោគឆ្លងអកម្ម
កម្រិតឆ្លងថយចុះ

៥. ការត្រួតពិនិត្យជំងឺប្លាស់



៦. ជំងឺប្លាស់លើកួរ



ការរាលដាលនៃជំងឺផ្សិត

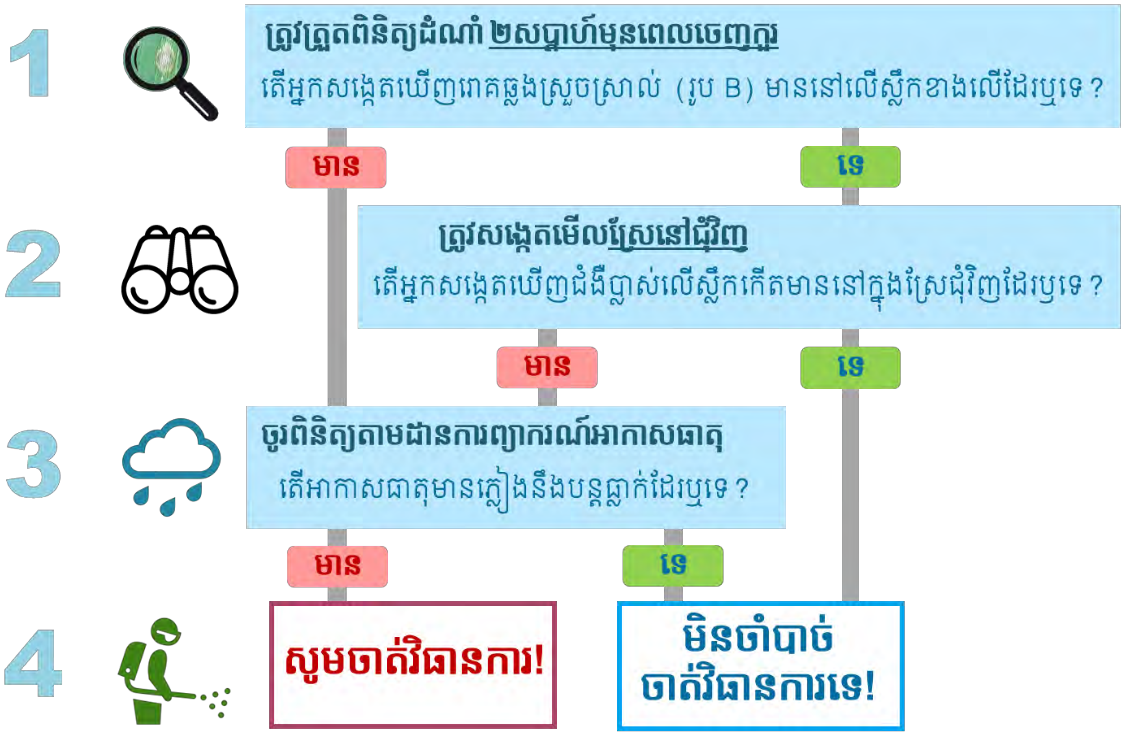
- ✓ ត្រូវពិនិត្យមើលស្លឹកខាងលើ (២-៣សន្លឹកខាងចុង) ដោយប្រុងប្រយ័ត្ន ប្រសិនជាមានស្លឹកបានឆ្លងជំងឺប្លាស់។
- ✓ ត្រូវគ្រប់គ្រងជំងឺប្លាស់លើស្លឹកនៅដំណាក់កាលផើម គឺ១០ថ្ងៃមុនពេលចេញកួរចេញផ្កា។

កួរស្រូវឆ្លងរោគ

- ✓ វាយឺតពេលហើយក្នុងការគ្រប់គ្រងជំងឺប្លាស់បន្ទាប់ពីចេញកួរចេញផ្កា។
- ✓ នៅពេលដែលកួរឆ្លងជំងឺប្លាស់ វានឹងមិនជាសះស្បើយមកវិញទេ។

វិធានការបង្ការ គឺមានសារៈសំខាន់ណាស់!

៧. ការគ្រប់គ្រងជំងឺប្លាស់លើគួរ



៨. លក្ខខណ្ឌនៃការផ្ទុះជំងឺអុចត្នោត

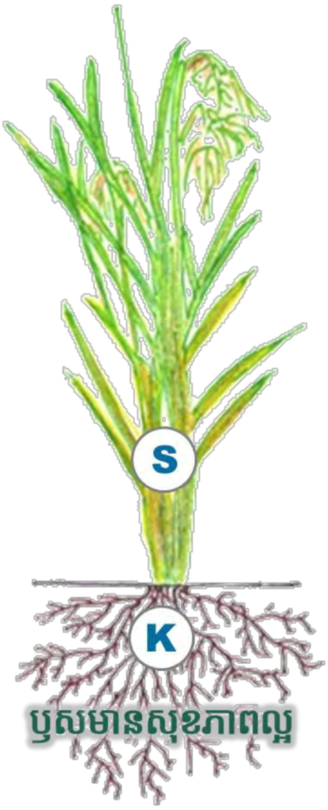
ចរិតលក្ខណៈ

- លក្ខខណ្ឌដីនិងប្រព័ន្ធសរីរៈស្រូបយកជីជាតិរបស់ដំណាំអន់ខ្សោយបង្កឱ្យកើតមានជំងឺនេះ។
- ជំងឺនេះតែងតែកើតឡើងក្នុងស្រែដដែលជារៀងរាល់រដូវ ដោយសារដីខ្សោះជីជាតិ និងពិបាកបង្ហូរទឹកចេញ។

មូលហេតុ និងដំណោះស្រាយ

- កង្វះជាតិប៉ូតាស (K), ស៊ីលីស្យូម (S), ម៉ាញ៉េស្យូម (Mg), ម៉ង់កាណែស (Mn), ដែក (F) និង អាស៊ូត (N)។
- ការរលួយឫសបណ្តាលមកពីឧស្ម័នអ៊ីដ្រូសែនស៊ុលហ្វីដ។

៩. ការគ្រប់គ្រងជំងឺអុចត្នោត

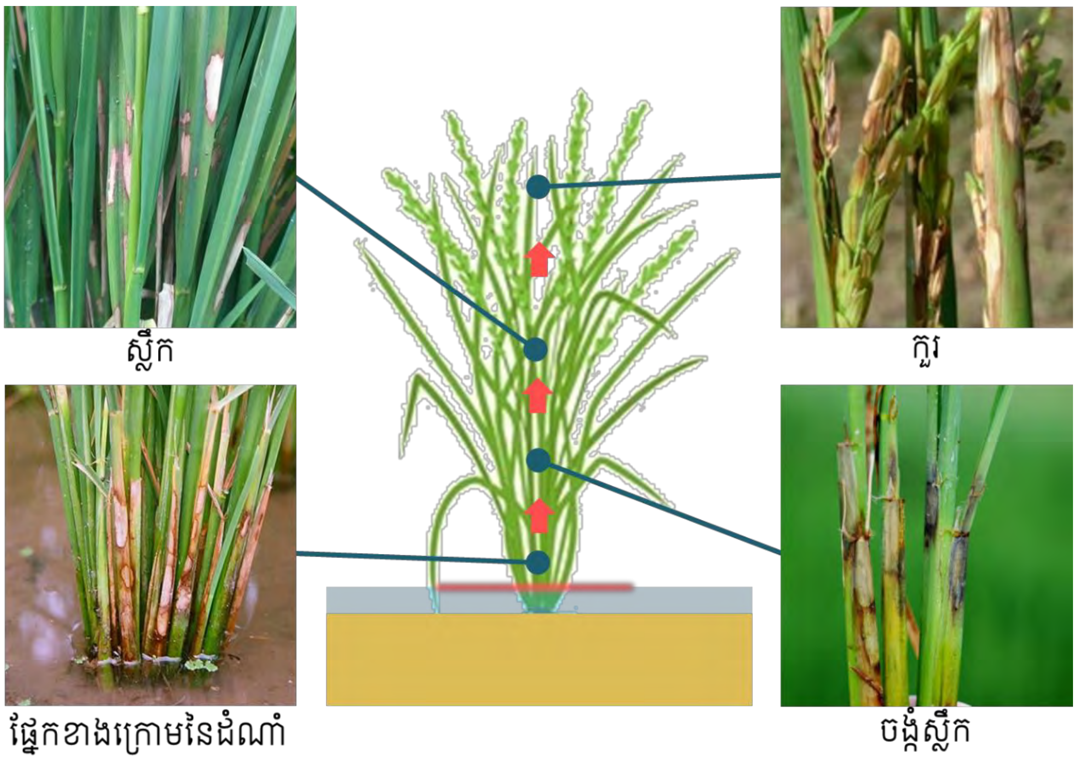


ប្រើសារធាតុ K, S, Mg, Mn, F, និង N ។

ត្រូវបញ្ចៀសការប្រើ <u>អាម៉ូញ៉ូមស៊ុលហ្វាត (21-0-0)</u> ពីព្រោះវាបង្កឱ្យមានឧស្ម័ននៅក្នុងដី។

ការប្រើប្រាស់សារធាតុគីមីជានិច្ចកាល មិនមែនជាដំណោះស្រាយល្អទេ។

១០. ការឆ្លងរាលដាលនៃជំងឺរលាកស្រទបស្លឹក



១១. ការពិនិត្យតាមដានជំងឺរលាកស្រទបស្លឹក

ត្រូវត្រួតពិនិត្យដំណាំ ២៥គុម្ព
នៅក្បែរផ្លូវទឹកចូលក្នុងស្រែ។

ផ្សិតកំពុងអណ្តែត និងផ្លាស់ទីលើផ្ទៃទឹកចេញពីផ្លូវទឹកចូលក្នុងស្រែ ឆ្ពោះទៅផ្លូវទឹកចេញពីស្រែ។

ត្រូវត្រួតពិនិត្យដំណាំ ២៥គុម្ព
នៅក្បែរផ្លូវទឹកចេញពីស្រែ។

១២. ការគ្រប់គ្រងជំងឺរលាកស្រទបស្លឹក

1 **២០ថ្ងៃមុនពេលចេញក្បួរចេញផ្កា**
លើស ១០គុម្ពនៃសំណាកបានជ្រើសរើស បានឆ្លងជំងឺ។

- ឆ្លង → **សូមចាត់វិធានការ!**
- ទេ → 2

2 **១០ថ្ងៃមុនពេលចេញក្បួរចេញផ្កា**
លើស ១០គុម្ពនៃសំណាកបានជ្រើសរើស បានឆ្លងជំងឺ។

- ឆ្លង → **សូមចាត់វិធានការ!**
- ទេ → **មិនចាំបាច់ចាត់វិធានការទេ!**

១៣. រោគសញ្ញាស្រដៀងគ្នាទៅនឹងជំងឺរលាកស្រទបស្លឹក

ជំងឺរលាកស្រទបស្លឹកព៌ណត្នោត
Brown sheath blight

ជំងឺអុចគែមស្រទប
Bordered sheath spot

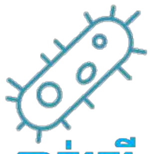
ជំងឺរលាកដើមព៌ណត្នោត
Brown sclerotium disease

ជំងឺរលាកដើមព៌ណប្រផេះ
Grey sclerotial disease

វាមិនងាយស្រួលក្នុងការធ្វើរោគវិនិច្ឆ័យជំងឺនេះដោយការសង្កេតនោះទេ។

១៤. ប្រភេទមេរោគបង្កជំងឺ និងសារធាតុគីមីសមស្រប

វីរុស
$0.01 \sim 0.1 \mu m$



បាក់តេរី
$1 \sim 5 \mu m$

ផ្សិត
$5 \sim 10 \mu m$

ថ្នាំសម្លាប់សត្វល្អិត
(សម្រាប់គ្រប់គ្រងភ្នាក់ងារចម្លង)

ថ្នាំប្រឆាំងវីរុស*
(សម្រាប់បង្ការ)

សមាសភាពទង់ដែង
(សម្រាប់បង្ការ)

ថ្នាំប្រឆាំងជីវសាស្ត្រ
(សម្រាប់បង្ការ/ព្យាបាល)

ថ្នាំសម្លាប់មេរោគផ្សិត
(សម្រាប់បង្ការ/ព្យាបាល)

១៥. មេរោគបង្កជំងឺ

ជំងឺវីរុសឆ្នូតស្លឹក

វីរុស

Rice stripe tenuivirus

សារធាតុគីមីមិនមែនសម្រាប់បង្ការ ឬព្យាបាល ដែលអាចរកបាន

សម្រាប់គ្រប់គ្រងសមាសភាពចង្រៃ ឬសត្វល្អិត ដែលអាចជាភ្នាក់ងារចម្លងជំងឺវីរុស

ជំងឺបាក់តេរីលាកស្លឹក

បាក់តេរី

Xanthomonas campestris pv. Oryzae

Oxolinic acid
Streptomycine

250WP
(wettable powder)

ថ្នាំប្រឆាំងជីវសាស្ត្រ

ជំងឺប្លាស់

ផ្សិត

Pyricularia oryzae

Pyraclostrobin

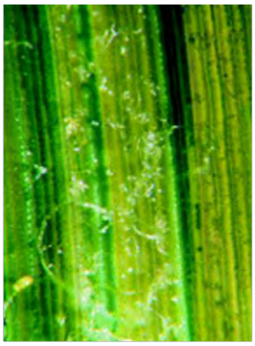
250EC
(emulsifiable
concentrate)

ថ្នាំសម្លាប់មាគផ្សិត

១៦. ភ្នាក់ងារចម្លងរោគ

ជំងឺវីរុសឆ្នូតស្លឹក

Rice stripe tenuivirus



ជំងឺបាក់តេរីលាកស្លឹក

Xanthomonas campestris pv. Oryzae

ជំងឺប្លាស់

Pyricularia oryzae

១៧. ជំងឺស្រូវ

- Rice dwarf,stunt
- Rice stripe
- Rice black-streaked dwarf
- Rice necrosis mosaic
- Rice waika
- Rice grassy stunt
- Rice ragged stunt
- Rice transitory yellowing

ជំងឺបង្កដោយវីរុស

- Bacterial foot rot of rice
- Halo blight of rice
- Bacterial brown stripe of rice
- Bacterial grain rot of rice
- Bacterial seedling blight of rice
- Bacterial palea browning of rice
- Bacterial leaf blight of rice
- Sheath brown rot of rice
- Yellow dwarf of rice

ជំងឺបង្កដោយបាក់តើ

★ ជាកំហិតនៅក្នុង ប.គ.ព

- Scab, Fusarium blight
- Bakanae disease
- Helminthosporium leaf spot,brown spot, Helminthos
- Phytophthora japonica Waterhouse
- Eye spot
- Curvularia senegalense (Spegazzini) Subramanian
- Phaeosphaeria oryzae Miyake
- Hendersonia oryzae Miyake
- Grey sclerotial disease
- Cladosporium miyakei Saccardo et Trotter
- Helminthosporium spot blotch
- Epicoccum hyalopes Miyake
- Blast, neck-rot ★
- False smut
- Fusarium blight
- Brown leaf spot ★
- Brown sclerotium disease
- Waitea circinata Warcup et Talbot
- Brown sheath blight
- Khuskia oryzae Hudson
- Pyrenochaeta oryzae Shirai
- Stem-rot, culm rot
- Mold, black mold
- Reddish-brown sheath rot
- Leaf smut
- Globular sclerotial disease
- Fusarium roseum Link : Fries
- Glume blight
- Sheath blight ★
- Seed and seedling rot
- Seedling blight
- Gray mold of glumes
- False blast
- Downy mildew
- Sclerotium sp.
- Sphaerulina miyakei Hara
- Bordered sheath spot, Rhizoctonia sheath spot
- Southern blight
- Kernel smut
- Sooty mold
- Brachysporium blotch, glume mold
- Cercospora leaf spot
- Stem rot, culm rot
- Take-all
- Sheath net-blotch
- Sheath rot
- Phytophthora megasperma Drechsler var. sojae Hildebrand

ជំងឺបង្កដោយផ្សិត

១៨. ការខូចខាតរូបសាស្ត្រ

ណេម៉ាតូដ

បង្កដោយ

Aphelenchoides besseyi

រលាកក្រហម

កង្វះអាសូត និងមានឧស្ម័នអាស៊ីដ ដែលបង្កដោយសារដីកំប៉ុស្តិ៍មិនពុកផុយ

រលួយឫស

កង្វះអុកស៊ីសែន និងអាស៊ីដសរីរាង្គ អ៊ីដ្រូសែនស៊ុលហ្វីដកើនឡើង

១៩. ចំណុចត្រូវពិនិត្យនៅពេលត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល

ជំងឺប្លាស់/ជំងឺអុចត្នោត
ពិនិត្យ ២-៣សន្លឹកខាងលើ។

ជំងឺរលាកស្រទបស្លឹក
ពិនិត្យដំណាំនៅក្បែរផ្លូវទឹកចូលចេញនៃស្រែ។

គ្រប់ជំងឺ
ពិនិត្យកួរស្រូវប្រសិនជាមានឆ្លងជំងឺភ្លាមៗបន្ទាប់ពីចេញកួរ។ ប្រសិនជាដំណាំឆ្លងរោគហើយ ដូច្នេះត្រូវដកវាចេញ។

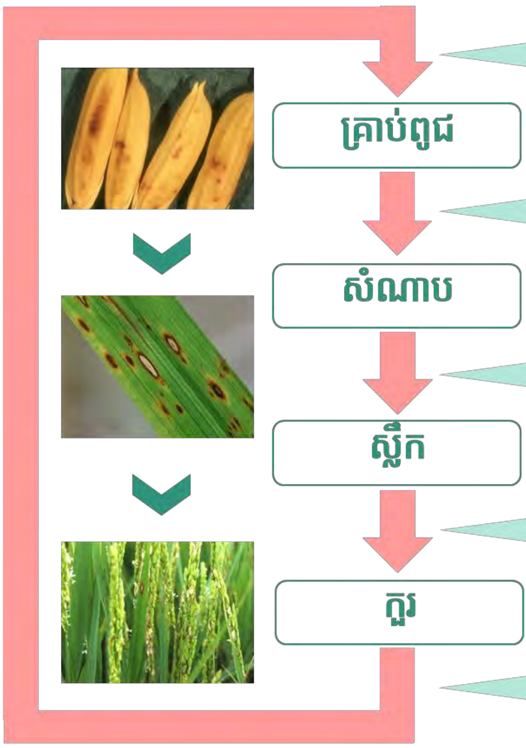
គ្រប់ជំងឺ
ទោះបីស្លឹកនិងដើមឆ្លងជំងឺក៏ដោយ ប្រសិនជាកួរ ឬគ្រាប់មិនឆ្លងជំងឺទេ ដំណាំអាចអនុគ្រោះបាន។

ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី១

ស្វ័យត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល

ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី២

២០. ជំងឺរលាកគ្រាប់ពូជ



១. គ្រាប់ពូជគុណភាពល្អ
ត្រូវប្រើគ្រាប់ពូជគុណភាពល្អ ដែលគ្មានដិតដាមជំងឺរលាកគ្រាប់ពូជ។

២. ការរំងាប់មេរោគលើគ្រាប់ពូជ
ត្រូវអនុវត្តជ្រើសរើសគ្រាប់ពូជដោយប្រើល្បាយទឹកអំបិល និងរំងាប់មេរោគ។

៣. ការគ្រប់គ្រងសារធាតុអាសូត
ត្រូវចៀសវាងប្រើប្រាស់អាសូត(N)ច្រើនជ្រុល។

៤. ការបង្ការ
ត្រូវត្រួតពិនិត្យតាមដាន និងគ្រប់គ្រងជំងឺប្លាស់ឱ្យបានត្រឹមត្រូវ។

៥. ការសម្អាតសំណល់
ត្រូវសម្អាតចំបើងឆ្លងរោគ និងសំណល់ផ្សេងៗចេញពីវាលស្រែ។

២១. វិធានការគ្រប់គ្រងចម្រុះ

វិធានការចម្រុះ គ្រប់គ្រងសមាសភាពចង្រៃ/ជំងឺ សម្រាប់ការពារដំណាំ

ការគ្រប់គ្រងតាមវិធីដាំដុះ

ការដាំវិលជុំ
ការគ្រប់គ្រងដំណាំ

ការគ្រប់គ្រងតាមរូបសាស្ត្រ

ដាក់អន្ទាក់សត្វល្អិត
ដករុក្ខជាតិកើតជំងឺ
កន្ត្រងសំណាញ់បក់សត្វល្អិត

ការគ្រប់គ្រងតាមពន្ធុ

ពូជធន់នឹងជំងឺ

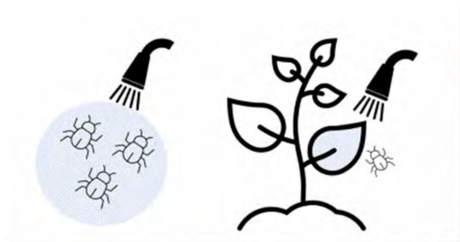
ការគ្រប់គ្រងតាមជីវសាស្ត្រ

សត្វល្អិតមានប្រយោជន៍
មីក្រូសរីរាង្គមានប្រយោជន៍

ការគ្រប់គ្រងតាមគីមីសាស្ត្រ

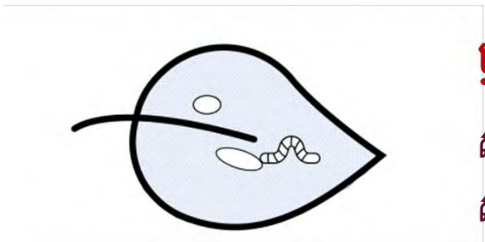
ថ្នាំសម្លាប់សត្វល្អិត
ថ្នាំសម្លាប់បាក់តេរី
ថ្នាំសម្លាប់រោគផ្សិត

២២. ប្រភេទថ្នាំសម្លាប់សត្វល្អិត



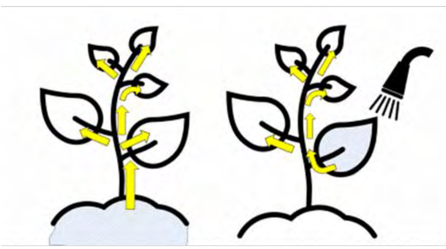
ថ្នាំសម្លាប់សត្វល្អិតមិនជ្រាប

សារធាតុគីមីប៉ះដោយផ្ទាល់ ឬដោយប្រយោល ដែលសម្លាប់សត្វល្អិត។



ថ្នាំសម្លាប់សត្វល្អិតពុលខ្លាំង

សារធាតុគីមីជាប់នៅលើផ្ទៃស្លឹក អាចសម្លាប់សត្វល្អិតនៅពេលដែលវាស៊ីស្លឹកដំណាំ។



ថ្នាំសម្លាប់សត្វល្អិតជម្រាប

សារធាតុគីមីជ្រាបចូលទៅក្នុងដំណាំ អាចសម្លាប់សត្វល្អិតនៅពេលដែលវាស៊ីដំណាំ។

២៣. ប្រភេទថ្នាំសម្លាប់បាក់តេរី និងថ្នាំសម្លាប់រោគផ្សិត

ដំណាំមានសុខភាពល្អ

សារធាតុគីមីសម្រាប់បង្ការ

វាបង្ការដំណាំពីការឆ្លងនៃជំងឺ

ដំណាំកើតរោគ

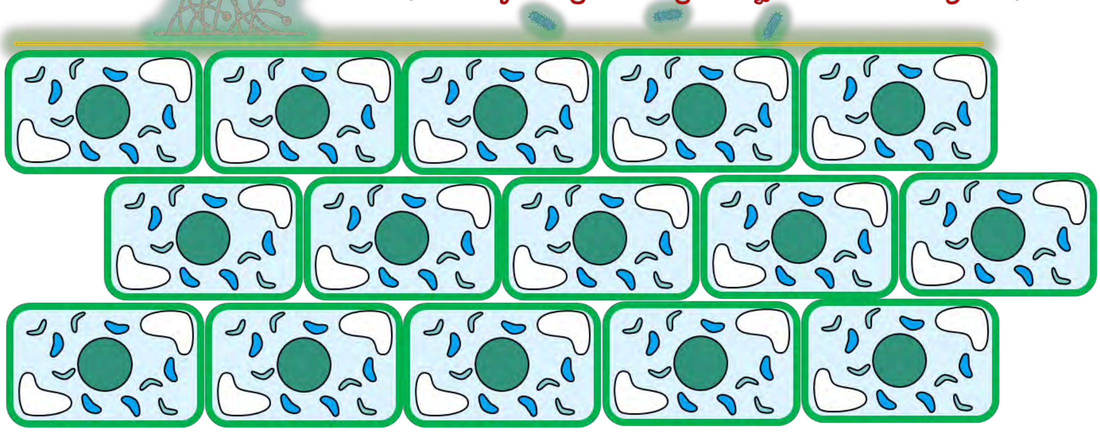
សារធាតុគីមីសម្រាប់ព្យាបាល

វាបញ្ឈប់ការឆ្លងរាលដាលនៃជំងឺ

សារធាតុគីមីសម្រាប់ព្យាបាលក៏មានប្រសិទ្ធភាពក្នុងការបង្ការផងដែរ។

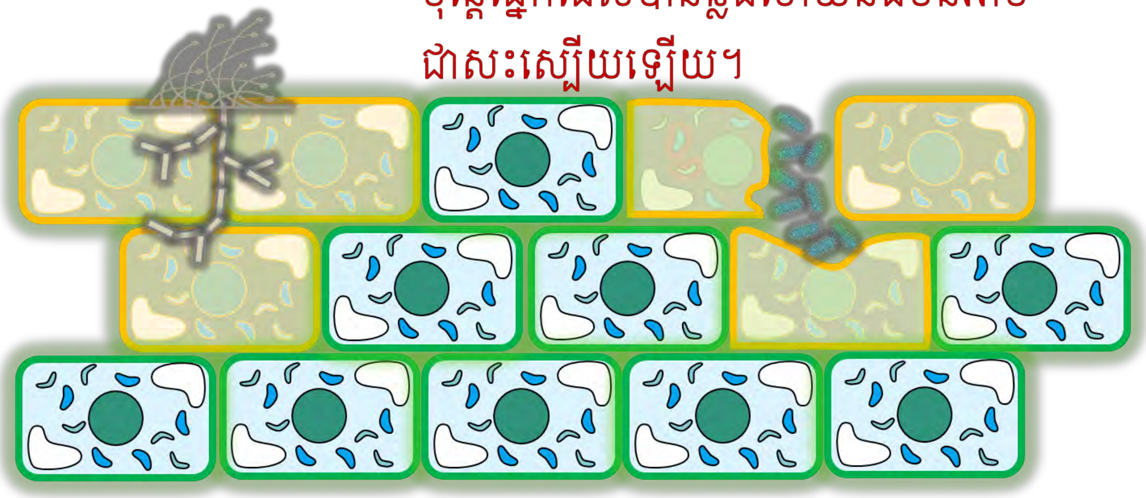
២៤. ថ្នាំបង្ការរោគបាក់តេរី និងរោគផ្សិត

- ✓ សារធាតុគីមីជាប់នៅលើដំណាំ នឹងការពារវាពីការឆ្លងជំងឺ
- ✓ ប្រសិទ្ធភាពអាចមានចាប់ពី ១០ ទៅ ១៤ថ្ងៃ (នៅរដូវវស្សាមានប្រសិទ្ធភាពតែ ៧ថ្ងៃទេ)។

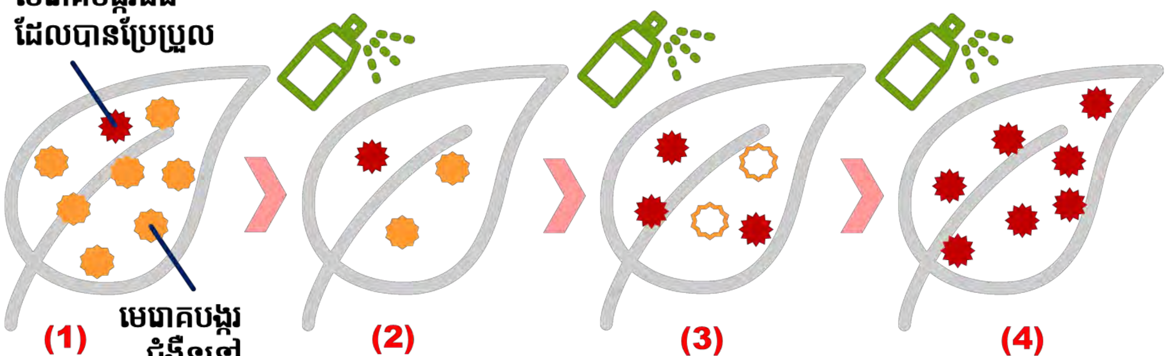


២៥. ថ្នាំព្យាបាលជំងឺបាក់តេរី និងជំងឺផ្សិត

- ✓ សារធាតុគីមីបាញ់ផ្សើមលើដំណាំ និង សម្លាប់មេរោគ
- ✓ សារធាតុគីមីបញ្ឈប់ការឆ្លងរាលដាលជំងឺ ប៉ុន្តែផ្នែកដែលបានឆ្លងហើយនឹងមិនអាចជាសះស្បើយឡើយ។



២៦. ភាពធន់ទៅនឹងសារធាតុគីមី



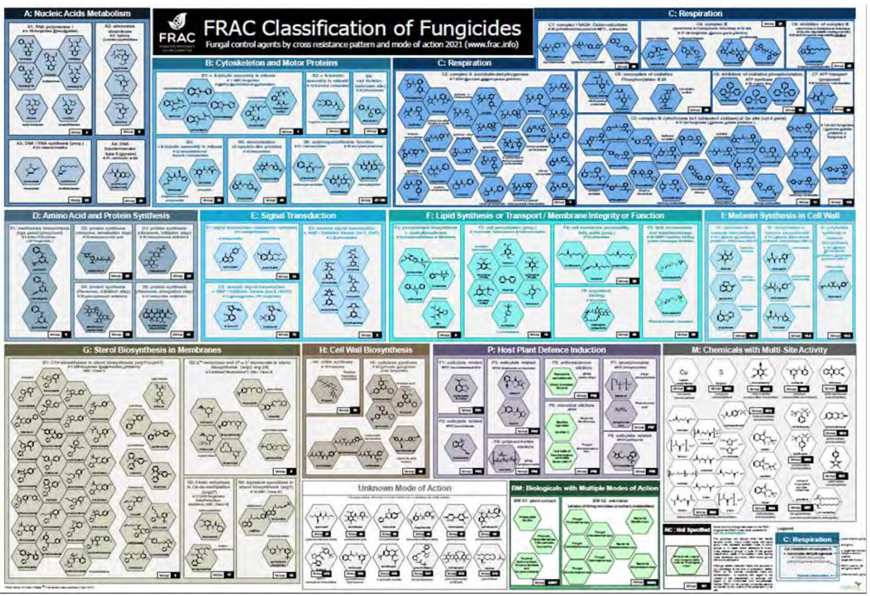
(1) ការប្រែប្រួលនៃបាក់តេរី និងផ្សិតលេចឡើង។

(2) មេរោគបង្ករជំងឺដែលបានប្រែប្រួលអាចរស់នៅធន់ជាមួយសារធាតុគីមី។ មេរោគបង្ករជំងឺទូទៅមួយចំនួនក៏រស់នៅផងដែរ ដោយសារតែការបាញ់ថ្នាំមិនបានត្រឹមត្រូវ។

(3) មេរោគបង្ករជំងឺទូទៅត្រូវបានសម្លាប់នៅពេលបាញ់ថ្នាំលើកទី២ ប៉ុន្តែមេរោគបង្ករជំងឺដែលបានប្រែប្រួលអាចរស់មានជីវិតជាមួយសារធាតុគីមី។

(4) មេរោគបង្ករជំងឺដែលបានប្រែប្រួលរាលដាលនិងបំបែកខ្លួននៅក្នុងដំណាំ។ សារធាតុគីមីមិនមានឥទ្ធិពលទៀតឡើយ។

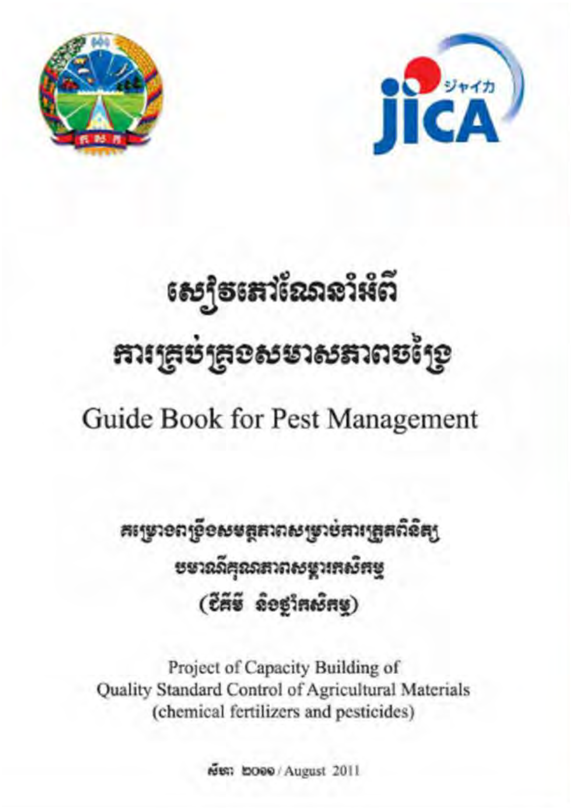
២៧. ទម្រង់ភាពសកម្មនៃសារធាតុគីមីប្រើលើដំណាំ



Fungicide Resistance Action Committee
www.frac-online.org

Insecticide Resistance Action Committee
www.irac-online.org

២៨. ការប្រើប្រាស់សារធាតុគីមីត្រឹមត្រូវ



ឧបសម្ព័ន្ធទី៣

ស្វ័យត្រួតពិនិត្យ និងការគ្រប់គ្រងគុណភាពគ្រាប់ពូជ

១. ការណែនាំ

ការទទួលបានទំនុកចិត្តពីអតិថិជន និងការបង្កើនអតិថិជនដដែលៗ នឹងជួយឱ្យដំណើរការអាជីវកម្មគ្រាប់ពូជមានស្ថេរភាព។ ដូច្នេះការធានាគុណភាពគ្រាប់ពូជពិតជាមានសារៈសំខាន់ខ្លាំងណាស់។ ទោះបីគ្រាប់ពូជត្រូវបានបញ្ជាក់ដោយ ប.គ.ព ក៏ដោយ គុណភាពអាចនឹងថយចុះ ដូច្នេះការត្រួតពិនិត្យគុណភាពដោយខ្លួនឯងតាមកាលកំណត់ គឺជាការចាំបាច់រហូតដល់លក់វាអស់។ នេះគឺជាគោលការណ៍ណែនាំស្តីពីការត្រួតពិនិត្យគុណភាពដោយខ្លួនឯង និងវិធីសាស្ត្រត្រូវអនុវត្តឱ្យបានត្រឹមត្រូវ។

២. ការគ្រប់គ្រងសំណើមគ្រាប់ពូជ

ត្រូវវាស់សំណើមគ្រាប់ពូជបីដង រួចគណនារកតម្លៃមធ្យម(តារាងទី១)។ បើតម្លៃរកឃើញមិនធម្មតា ត្រូវវាស់សំណើមថែមពីរដងទៀត។ បន្ទាប់មកលុបតម្លៃមិនធម្មតាទាំងពីរនោះចោល រួចហើយគណនារកតម្លៃមធ្យម (តារាងទី២)។

តារាងទី១

ទី១	ទី២	ទី៣	ទី៤	ទី៥	មធ្យម
13.2	13.5	13.4	-	-	13.4

តារាងទី២

ទី១	ទី២	~~ទី៣~~	ទី៤	~~ទី៥~~	មធ្យម
13.6	13.5	18.8	13.4	12.9	13.5

១៤%

គ្រាប់ពូជវិញ្ញាបនបត្រ

១៣%

គ្រាប់ពូជចុះបញ្ជី

៣. ការគ្រប់គ្រងភាពសុទ្ធ (លក្ខណៈរូបសាស្ត្រ)

ត្រូវយកគ្រួស ថ្ម កម្ទេចចំបើង គ្រាប់ស្មៅ គ្រាប់បាក់ និងកម្ទេចដីចេញដោយប្រើឧបករណ៍សម្អាត។ ទម្ងន់កម្ទេចកម្ទីរត្រូវតែតិចជាង ២% នៃទម្ងន់ផលិតផលគ្រាប់ពូជ។ កម្ទេចកម្ទីរដែលលើស ត្រូវយកចេញតាមរយៈសម្អាតគ្រាប់ពូជម្តងទៀតមុនពេលប្រកចូលបាវសម្រេច។

គ្រាប់ពូជសុទ្ធ ៩៨%

កម្ទេចកម្ទីរ ២%

៤. ការគ្រប់គ្រងពន្ទុ (លក្ខណៈខាងក្នុង)

ត្រូវកំណត់ចរិតលក្ខណៈនៃទ្រង់ទ្រាយនិងពណ៌គ្រាប់ពូជគោល។ បន្ទាប់មក ត្រូវរាប់ចំនួនគ្រាប់ពូជលាយ និងគ្រាប់ស្រូវក្រហមដែលលាយជាមួយគ្រាប់ពូជ។ បើរកឃើញលើសពីស្តង់ដារដែលបង្ហាញខាងក្រោម មិនត្រូវប្រើប្រាស់ផលិតផលជាគ្រាប់ពូជនោះទេ។

ថ្នាក់គ្រាប់ពូជ

គ្រាប់ពូជចុះបញ្ជី
គ្រាប់ពូជវិញ្ញាបនបត្រ

គ្រាប់ពូជលាយ

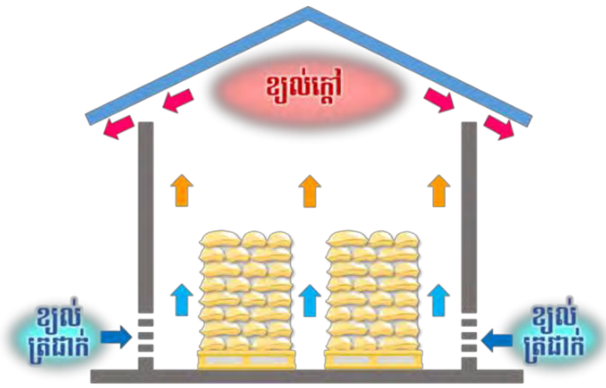
៥គ្រាប់/៥០០ក្រាម
១៥គ្រាប់/៥០០ក្រាម

ស្រូវក្រហម

២គ្រាប់/៥០០ក្រាម
៥គ្រាប់/៥០០ក្រាម

៥. ការបង្ការការដុះផ្សិតនិងជំងឺផ្សិត

ខ្យល់បក់ចេញចូល មានសារៈសំខាន់សម្រាប់បញ្ចៀសកំដៅ និងសំណើមដែលធ្វើឱ្យដុះផ្សិតនិងរាលដាលជំងឺផ្សិត។ ត្រូវរក្សាចន្លោះយ៉ាងហោចណាស់ ៥០សម រវាងពំនូកនីមួយៗ នៃផលិតផលគ្រាប់ពូជ។

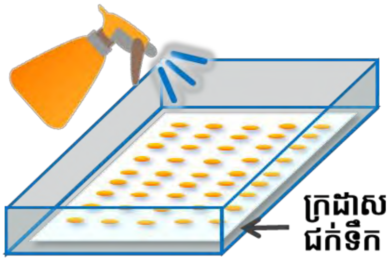


៦. ការបង្ការការបំផ្លាញរបស់សត្វល្អិត

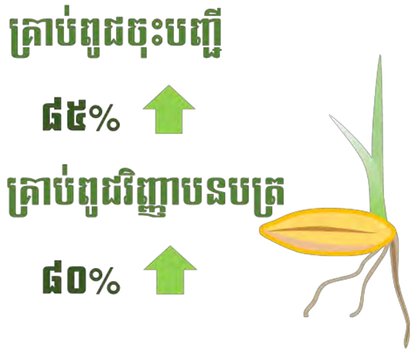
ត្រូវប្រើបាវអ៊ុតប្លាស្ទិកខាងក្នុងដើម្បីបង្ការការរាលដាលពពួកសត្វល្អិត ដូចជា ខ្មូត និងមេអំបៅខ្មូត។ ត្រូវពិនិត្យមើលគុណភាពគ្រាប់ពូជជាទៀងទាត់ ប្រសិនរកឃើញវត្តមានសត្វល្អិតច្រើននៅក្នុងផលិតផល មិនត្រូវប្រើវាជាគ្រាប់ពូជទេ ព្រោះថាវាអាចរងឥទ្ធិពលដល់អត្រាដំណុះគ្រាប់ពូជ។

៧. ការគ្រប់គ្រងសមត្ថភាពដំណុះ

ត្រូវធ្វើតេស្តដំណុះគ្រាប់ពូជផ្ទុកក្នុងឃ្លាំងមួយខែម្តង។ ត្រូវតេស្ត ៣០០គ្រាប់សម្រាប់ស្វ័យត្រួតពិនិត្យគុណភាព រួចរាប់ចំនួនគ្រាប់ដុះបន្ទាប់ពីបណ្តុះបាន ៧ថ្ងៃ។

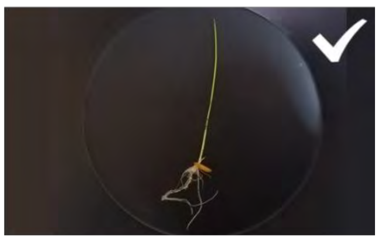


គ្រាប់ដុះ ÷ គ្រាប់បណ្តុះ × ១០០ = អត្រាដំណុះ (%)



មិនដុះ

ដុះធម្មតា



ដុះល្អ

តារាងផ្ទៀងផ្ទាត់ផលិតកម្មគ្រាប់ពូជស្រូប ប.គ.ព

សម្រាប់កសិករផលិតគ្រាប់ពូជនិងមន្ត្រីបច្ចេកទេសសហគមន៍កសិកម្ម

១. ការសម្រេចមុនជ្រើសរើសកសិករផលិតគ្រាប់ពូជនិងស្រែផលិតកម្ម		**គូស ✓**
១-១	ដំណាំវេជ្ជមុន គឺជាប្រភេទពូជស្រូវតែមួយ ឬជាប្រភេទដំណាំមានគ្រាប់តូច	☐
១-២	ទំហំស្រែផលិតកម្មអប្បបរមាសម្រាប់ថ្នាក់គ្រាប់ពូជចុះបញ្ជី គឺ ០,២ ហ.ត និងថ្នាក់គ្រាប់ពូជវិញ្ញាបនបត្រ គឺ ០,៥ហ.ត	☐
២. ការរៀបចំដីស្រែផលិតកម្ម		**គូស ✓**
២-១	ដីស្រែផលិតកម្មគ្រាប់ពូជស្រូវរាបស្មើល្អ	☐
៣. ការដាំ		**គូស ✓**
៣-១	ស្រែផលិតកម្មគ្មានស្មៅនៅពេលដាំ	☐
៣-២	គ្រាប់ពូជត្រូវបានអនុញ្ញាតនិងចិតក្នុងថ្នាក់គ្រាប់ពូជត្រឹមត្រូវសម្រាប់យកមកប្រើក្នុងផលិតកម្ម	☐
៣-៣	មន្ត្រី២រូបពិនិត្យប្រភេទគ្រាប់ពូជនិងកូដស្រែ	☐
៣-៤	កសិករផលិតគ្រាប់ពូជប្រើប្រាស់ឧបករណ៍ដាំសម្រាប់ការដាំគ្រាប់ពូជដោយផ្ទាល់	☐
៣-៥	កសិករផលិតគ្រាប់ពូជដាំប្រភេទពូជតែមួយក្នុងពេលតែមួយ	☐
៤. ការគ្រប់គ្រងស្រែផលិតកម្មគ្រាប់ពូជ		**គូស ✓**
៤-១	កសិករផលិតគ្រាប់ពូជពិនិត្យស្រែផលិតកម្មយ៉ាងតិច២ដងក្នុង១សប្តាហ៍	☐
៤-២	កសិករផលិតគ្រាប់ពូជប្រឹក្សាជាមួយសហគមន៍កសិកម្ម ប្រសិនបើគាត់រកឃើញវត្តមានជំងឺ ឬសមាសភាពចង្រៃក្នុងស្រែផលិតកម្មរបស់គាត់	☐
៤-៣	កសិករផលិតគ្រាប់ពូជដកស្មៅហាមឃាត់ និងពូជលាយបានញឹកញាប់	☐
៥. ស្វ័យត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល		**គូស ✓**
៥-១	ស្មៅហាមឃាត់ ជំងឺហាមឃាត់ និងពូជលាយ មិនច្រើនជាងស្តង់ដារទីវាលនៃ ប.គ.ព	☐
៦. ការប្រមូលផល		**គូស ✓**
៦-១	គ្មានគ្រាប់ពូជផ្សេងសេសសល់នៅក្នុងម៉ាស៊ីនច្រូត	☐
៦-២	ដំណាំគ្រាប់ពូជនៅជុំវិញក្បែរភ្លឺស្រែប្រមូលផលមុនគេ	☐
៦-៣	គ្រាប់ពូជបានប្រមូលផលជុំវិញភ្លឺស្រែរួច មិនចាត់ទុកជាគ្រាប់ពូជទេ	☐
៦-៤	<u>**បាវថ្មី**</u> ប្រើប្រាស់សម្រាប់ច្រកគ្រាប់ពូជស្រូវស្រស់	☐
៦-៥	បាវគ្រាប់ពូជរៀបចំទៅតាមឡូត៍នៅទីតាំងប្រមូលផ្តុំ និងនៅក្នុងឃ្លាំងស្តុក	☐
៧. ការសម្ងួតគ្រាប់ពូជស្រូវ		**គូស ✓**
៧-១	ប្រភេទគ្រាប់ពូជស្រូវតែមួយហាលក្នុងពេលព្រមគ្នា	☐
៧-២	តង់ឬស្បៃនីឡុងប្រើសម្រាប់ហាលគ្រាប់ពូជស្រូវស្រស់ពីលើ	☐
៧-៣	សីតុណ្ហភាពនៃឡសម្ងួតចិតក្រោម ៤៥អង្សាសេ (ប្រសិនបើប្រើប្រាស់ឡសម្ងួត)	☐
៨. ការសម្អាតគ្រាប់ពូជ និងការគ្រប់គ្រងឃ្លាំងស្តុក		**គូស ✓**
៨-១	គ្មានគ្រាប់ពូជស្រូវផ្សេងសេសសល់ក្នុងម៉ាស៊ីនសម្អាត មុនពេលផ្លាស់ប្តូរប្រភេទពូជ ឬថ្នាក់គ្រាប់ពូជ	☐
៨-២	គ្មានគ្រាប់ដំណាំផ្សេងសេសសល់លើកញ្ច្រែងម៉ាស៊ីនសម្អាតបន្ទាប់ពីប្រើប្រាស់រួចម្តងៗ	☐
៨-៣	គ្មានគ្រាប់ដំណាំផ្សេង សំរាម និងសំណល់សត្វងាប់នៅក្នុងឃ្លាំងស្តុក	☐
៨-៤	គំនរបាវគ្រាប់ពូជរៀបនៅលើប៉ាឡែតទៅតាមឡូត៍គ្រាប់ពូជនីមួយៗ	☐
៨-៥	គម្លាតពីគំនរគ្រាប់ពូជមួយទៅគំនរមួយ យ៉ាងហោចណាស់ ០,៥ម៉ែត្រ	☐

សៀវភៅណែនាំស្តីពីផលិតកម្មគ្រាប់ពូជស្រូវ
តាមប្រព័ន្ធធានាគុណភាពពូជជំណាំកម្ពុជា (ប.គ.ព)

សហការគាំទ្រ និងឧបត្ថម្ភដោយ

គម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ (RSPP)

អគ្គនាយកដ្ឋានកសិកម្ម (GDA)

ទីភ្នាក់ងារកិច្ចសហប្រតិបត្តិការអន្តរជាតិនៃប្រទេសជប៉ុន (JICA)

ព័ត៌មានបន្ថែម សូមទាក់ទង៖

1. លោកស្រីបណ្ឌិត ស្រ៊ុន ខេម៉ា ទូរសព្ទលេខ៖ ០១៧ ៣៣៧ ៣៣៨
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Appendix 8

Technical cooperation material:

Technical Guideline for Rice Seed Quality Inspection

[English/Khmer]

Technical Guideline for Rice Seed Quality Inspection Conforming to the Quality Declared Seed System (QDS) for Cambodia

May 2021

Preface

This Guideline explains the methodology and standards of the field inspection and laboratory test in the Quality Declared Seed System (QDS). It also describes the roles and responsibilities of the inspector and will be used as a training tool for them and other technical personnel involved in managing the QDS.

This Guideline was created by the technical working group, including the General Directorate of Agriculture (GDA), the Project for Rice Seed Production and Promotion (RSPP), Cambodia-Australia Agricultural Value Chain Program (CAVAC), International Rice Research Institute in Cambodia (IRRI-Cambodia), and Climate-resilient Rice Commercialization Sector Development Program (Rice-SDP). This document results from the dedicated efforts of the teams mentioned and will be a helpful resource for crop seed management in Cambodia.

Abbreviation

CA	Competent Authority
CAVAC	Cambodia Agricultural Value Chain Program
CS	Certified Seed
FS	Foundation Seed
GDA	General Directorate of Agriculture
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
PDAFF	Provincial Department of Agriculture, Forestry, and Fisheries
PRDU	Phka Rumduol Rice Variety
QDS	Quality Declared Seed System
Rice-SDP	Climate-resilient Rice Commercialization Sector Development Program
RS	Registered Seed
RSPP	Project for Rice Seed Production and Promotion
SKOB	Sen Kra Oub Rice Variety

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1. Introduction

1.1. Objective of the manual

This Technical Guideline is produced as courseware for Training of Trainers (TOT) and rice seed inspectors. It also serves as a “bible” for the inspectors from the Department of Crop Seeds (DCS) and the Provincial Departments of Agriculture, Forestry, and Fisheries (PDAFF).

1.2. Course duration

TOT for the rice seed inspector takes approximately three days, including one day of the lecture, one day of the field practice, and one day of the lab practice.

1.3. Course participants

The expected participants of TOT are trainers, in-service inspectors, and pre-service inspectors of the related institutions.

2. Roles and Responsibilities of Inspectors

2.1. Qualifications of inspector

A seed inspector shall have at least one of the following qualifications:

- A member of staff from the national or subnational competent authorities in the agricultural sector.
- A person who is well-trained and qualified on seed inspection, in particular rice seed inspection.
- A person who has a certificate or diploma of agronomy from an educational institution in the agricultural sector.

2.2. Roles of inspector

The inspector plays an essential role in verifying seed crops and seeds produced by the seed producers and whether the products meet the prescribed standards of the QDS. Although the inspector checks the consistency of seed production with the QDS procedure, they are not a rice seed production technician. Therefore, the inspector shall ask for the assistance of the technical staff from the DSC, PDAFF, or other relevant institutions, whenever they face technical problems on seed production.

2.3. Responsibilities of an inspector

2.3.1. Field inspection

Before a field inspection

- After receiving Declaration (A) from the seed producer[1], obtain the list of seed growers and their basic information.
- Review the basic information related to the variety produced, production areas, locations, and field codes.
- Based on the list of seed growers, select at random at least 10% of the total seed production area by variety.
- Verify information with the seed growers, such as the location for field inspection, availability of the seed grower or his/her representative, and schedule for the field inspection.
- Make an appointment with the seed grower for field inspection at least 24 hours in advance.
- Review the previous Field Inspection Report where this is a second or third field inspection.
- Prepare the field inspection tools, including a chemical protection uniform, Field Inspection Report form, and means of transportation to the field.
- Familiarize with the seed crop characteristics, inspection procedure and techniques of field inspection, and field standards described in the QDS Manual and the QDS Technical Guideline.

At field inspection

- Upon arrival at the seed production field, check all information about the rice variety, upstream seed source, seed class, seeded area, boundaries of the field, and cropping history of the field with the seed grower or his/her representative.
- Select the field(s) to be inspected following the field sampling method of the QDS.
- Inspect other varieties (off-types), diseased plants, noxious weeds, the general situation of the

[1] Those who are individuals, groups, companies, ACs, or NGOs who have a desire for rice seed production and business in their respective locations.

crop, and applied field practices. Then, estimate the expected date of harvest and yield. Please note that first and second field inspections shall be conducted in the same field(s) unless there is an exceptional case.

- Complete the Field Inspection Report with the seed grower(s) or his/her representative's signature. Keep one copy for the seed grower(s) and another copy with the PDAFF. The DCS shall keep the original report.
- Give recommendations to the seed grower(s) if any remedial action is needed. Make a note about the recommendations in the Field Inspection Report.

After field inspection

- Inform the seed producer of non-acceptance of the seed production field(s) if the seed crop condition of the field is critically poor against the QDS standard.

2.3.2. Seed inspection

Before seed inspection

- Review Declaration (B) to ensure seed storage location, the volume of seed, varieties, seed class, and the number of seed lots to be inspected.
- Obtain the list of seed lots from the seed producer to conduct random sampling.
- After receiving Declaration (B), make an appointment with the seed producer for seed inspection at least 24 hours in advance.
- Prepare tools for a seed sampling such as grain trier, weighing scale, tray, sticker, plastic bags, marker, mask, gloves, eyeglasses, and transportation measures to the storage.
- Familiarize yourself with the seed characteristics, sampling and inspection procedure, seed inspection techniques, and the seed quality standard.

At seed inspection

- Collect samples for the seed inspection randomly following the QDS sampling method.
- Label the sampled seed with the necessary information for quality analysis.
- Test the quality of the sample at the designated laboratory.

After seed inspection

- Write the Quality Inspection Report and send it to the DCS.

3. Overview of Seed Quality Inspection

3.1. Objectives of inspection

a. To classify and standardize products according to the QDS standard.
b. To promote fair and efficient transaction of products.
c. To show clear quality indicators of products for both producers and users.

3.2. Seed quality control

There are several risks of seed contamination in rice seed production, which an inspector shall consider along with the QDS procedure. A proper inspection shall reduce the chances of seed contamination. The QDS rice seed inspection consists of (1) document review, (2) field inspection, (3) sampling and laboratory inspection, and (4) self-inspection by seed producer. The inspector shall check if the seed producer takes the mitigation measures shown in Table 3-1.

Table 3-1 Risk of seed contamination and mitigation measures

1. Seed Production	
Contamination by other varieties of seeds	• Use qualified Foundation Seed (FS) or Registered Seed (RS), which is not mixed in with other varieties of seeds. • Select the land where the same variety or non-rice small grain crop has been planted in the last two seasons.
Contamination by infected seeds with seed-borne diseases	• Use qualified FS or RS, which is not infected with diseases. • Treat the seed with preventive chemicals. • Control disease in compliance with the QDS standard.
Contamination by noxious weed seeds	• Use qualified FS or RS, which is not mixed in with weed seeds. • Control weeds in compliance with the QDS standard.

2. Harvesting	
Contamination by other products	• Apply isolation between the rice seed production field and other rice fields. • Clean the combine harvester properly before harvesting seed crops.

3. Post-harvesting	
Contamination by other products	• Follow the proper post-harvest and self-inspection process. • Use the correct bags with the product.

4. Sampling and Seed Quality Test	
Mishandling with other products	• Attach a correct label to the test sample. • Check the label with the product during the seed quality test.

5. Storage and Sales	
Mishandling with other products	• Store the products and record them correctly. • Attach the correct label to the product.

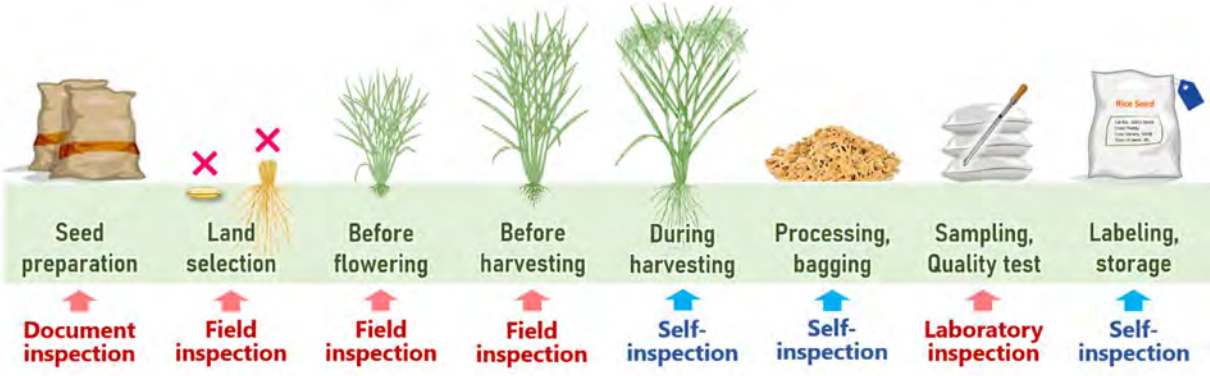


Figure 3-1 Inspection process for seed quality control

3.3. Process of rice seed production with the QDS

The tables below show the process of rice seed production with the QDS. Please refer to the Annex of this Technical Guideline for the forms of the relevant documents.

Table 3-2 Seed production process with the QDS

	Seed production process	Person in charge	Relevant documents
1	**Seed production planning** Contract with seed growers and field verification	Producer	
2	**QDS Seed Producer Registration Application Form** Seed producer's information and production plan (Three months before planting)	Producer >> PDAFF/DSC	Annex 1-A
3	**QDS Rice Seed Production and Business Certificate** (Within one month after receiving the application)	DCS >> Producer	Annex 1-B
4	**Declaration (A): Seasonal Rice Seed Production Plan** Seed origin, area of cultivation, etc. (At least 20 days before planting)	Producer >> PDAFF/DCS	Annex 1-C
5	**Seed production in the registered fields** Self-field management, Self-field inspection	Producer/ Grower	
6	**First Field Inspection and Reporting** Recommendation on the field management if necessary (Before flowering)	Inspector (GDA/PDAFF)	Annex 1-D/1-E
7	**Second Field Inspection and Reporting** Conclusion of the field inspection (At dough stage)	Inspector (GDA/PDAFF)	Annex 1-D/1- E

Table 3-3 Harvesting and Post-harvest Process with the QDS

	Harvesting and post-harvest process	Person in charge	Relevant documents
8	**Harvesting and post-harvest processing** Quality control during harvesting, drying, processing, and storing	Producer	
9	**Self-lot number allocation** By grower, variety, class, season, year, and field	Producer	
10	**Self-quality inspection** Purity, inert matter, weed seed, other variety seeds, other crop seeds, red rice, moisture, and germination rate	Producer	
11	**Declaration (B): Request for Seed Quality Test** Lot No., amount of products, option for the test, etc.	Producer >> PDAFF/DCS	Annex 1-F
12	**Sampling for laboratory inspection** Ensure the samples are correct	Inspector (NAL/PDAFF)	
13	**Laboratory inspection** Purity, inert matter, weed seed, other variety seeds, other crop seeds, red rice, moisture, and germination rate	Inspector (NAL/PDAFF)	
14	**Quality Inspection Report** Results of the test and conclusion	Inspector (NAL/PDAFF)	Annex 1-G/1-F
15	**Notification of the quality test result to producer** Approval, rejection, or request for remedial measure (within five working days after receiving the report)	DCS/PDAFF >> Producer	
16	**Issuance of QDS Tags/Labels** The official QDS tags/labels	DCS >> Producer	

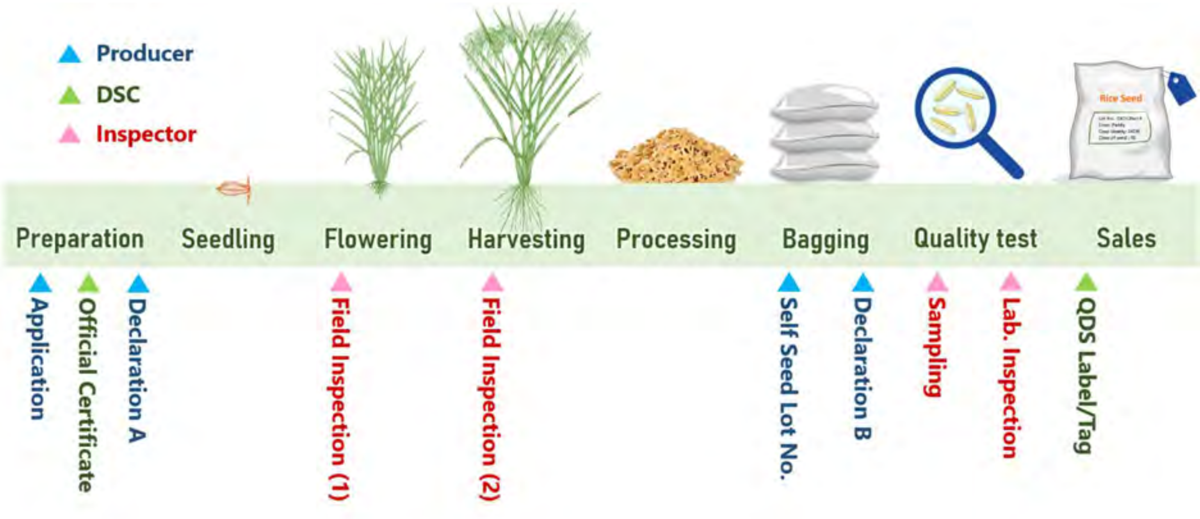


Figure 3-2 Rice Seed Production Process

4. Field Inspection

4.1. Purpose and procedure of field inspections

Field inspections shall be conducted at least twice during seed production. The first field inspection will be undertaken before flowering and the second before harvesting. If the second field inspection result does not fulfill the requirement of the QDS standard, the substitutional field inspection shall be considered.

4.1.1. First Field Inspection (Before flowering)

Purpose:

- To advise a producer on proper production management following the QDS standard.

Checklist:

a. Check the seed source with the information on sacks, tags, invoices, etc.;
b. Check the isolation and cultivation history of the fields;
c. Count the number of off-types in the inspected area (1 m^2 x 10 places);
d. Count the number of tillers of noxious weed plants in the inspected area (1 m^2 x 10 places);
e. Count the number of tillers of infected plants with seed-borne diseases in the inspected area (1 m^2 x 10 places); and
f. Monitor the general condition (including farm management) of the whole inspected field.

4.1.2. Second Field Inspection (At dough stage)

Purpose:

- To check if the seed crop plants and fields meet the QDS standard and determine if the seed crop plants can be harvested as a seed.

Checklist:

a. Count the number of off-type plants in the inspected area (1 m^2 x 10 places);
b. Count the number of panicles of noxious weeds which may affect the seed quality in the inspected area (1 m^2 x 10 places);
c. Count the number of panicles infected by seed-borne diseases (1 m^2 x 10 places); and
d. Evaluate the general condition (including farm management) of the whole inspected field.

4.1.3. Substitutional Field Inspection (Before harvesting)

Purpose:

- If an unexpected situation occurs which causes the first field inspection to be canceled, a substitutable field(s) shall be selected and inspected to determine if the seed crop plants can be harvested as a seed.

Checklist:

a. Count the number of off-type plants in the inspected area (1 m^2 x 10 places);
b. Count the number of panicles of noxious weeds which may affect the seed quality in the inspected area (1 m^2 x 10 places);
c. Count the number of panicles infected by the seed-borne diseases (1 m^2 x 10 places); and
d. Evaluate the general condition (including farm management) of the whole inspected field.

4.2. Verification of Foundation Seed (FS) / Registered Seed (RS) source

a. Advise the seed producer to retain the labels/tags, packing sacks, and invoices for field inspections.
b. Check the labels/tags, packing sacks, and invoices of the FS/RS in the first field inspection. FS/RS should be obtained from authorized institutions such as CARDI.

Figure 4-1 The evidence of seed source

4.3. Field background requirement

a. Confirm the cultivation history of the field with the seed grower. Photoperiodic insensitive rice seed production requires a field where only small grain crops or the same QDS rice variety crop have been planted in the previous two seasons. In contrast, photoperiodic sensitive rice seed production requires the same condition in two straight years.
b. Check the field condition. The field should be free from volunteer and ratoon plants.

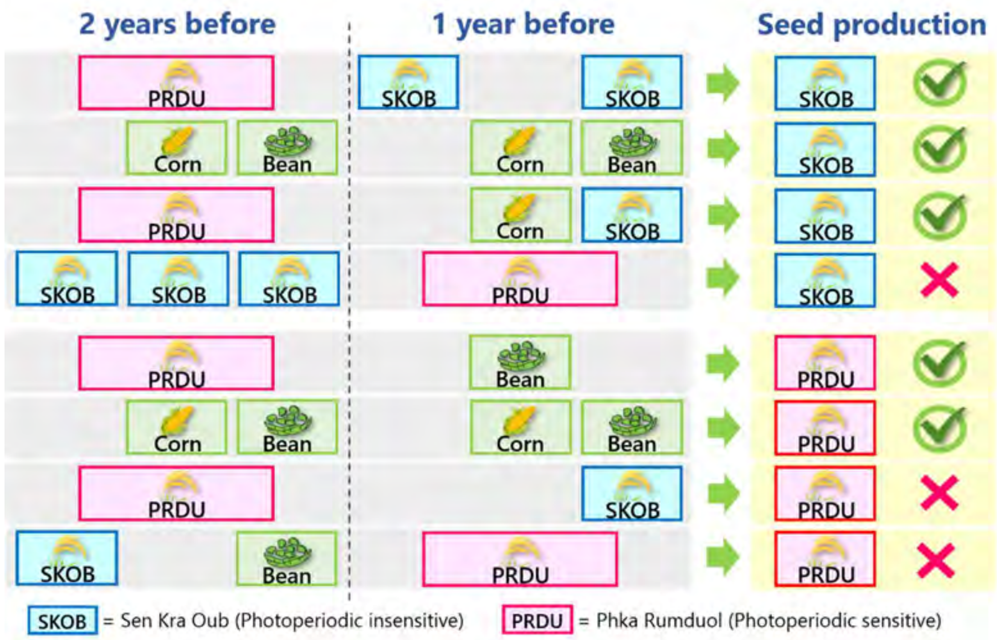


Figure 4-2 Field background requirement

c. Check the total seed production area by variety and planting season. The minimum eligible seed production area by variety and planting season is 0.20 ha for FS production, 0.50 ha for RS production, and 10.00 ha for CS production.

Table 4-1 The minimum seed production area

Seed class	Foundation seed	Registered seed	Certified seed
Minimum Production Area	0.20 ha	0.50 ha	10.00 ha

d. Check the size of each field. The minimum eligible size of a single field is 0.20 ha for FS production, 0.50 ha for RS production, and 10.00 ha for CS production.

Table 4-2 The minimum field size

Seed class	Foundation seed	Registered seed	Certified seed
Minimum Field Size	0.20 ha	0.50 ha	0.50 ha

e. Check the isolation from the other rice fields. A CS production field would have a space of more than one meter to the next field. An FS/RS production field would have a space of more than three meters to the next field. Space is not required where there is a physical barrier (ditch, hedge, fence, etc.) or the same variety of rice is being produced in the next field.

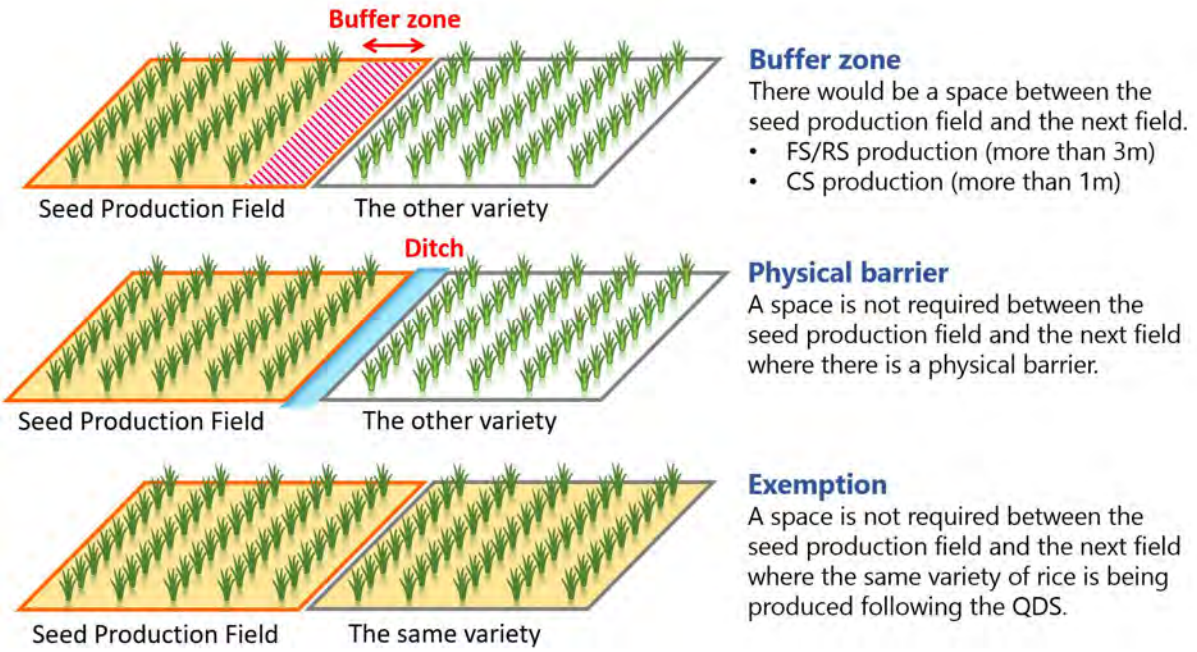


Figure 4-3 Isolation from the other rice fields

f. Check the seedling method of the rice production field. FS production requires a line transplanting method with one seedling per hill, and RS production requires a line transplanting method with 1–3 seedlings per hill. In contrast, random transplanting or line sowing method is allowed for CS production.

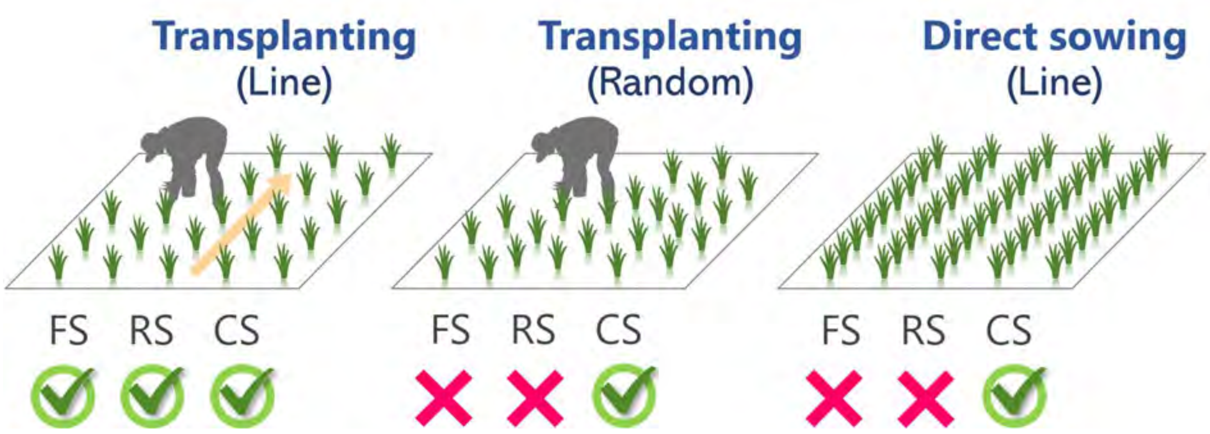


Figure 4-4 Seedling method by seed class

4.4. Selection of sample areas

a. Select a minimum of 10% of the total seed production area by variety and season for the field inspection. The selection of the fields shall be conducted by DCS or PDAFF randomly. The inspection area consists of only one or more fields.

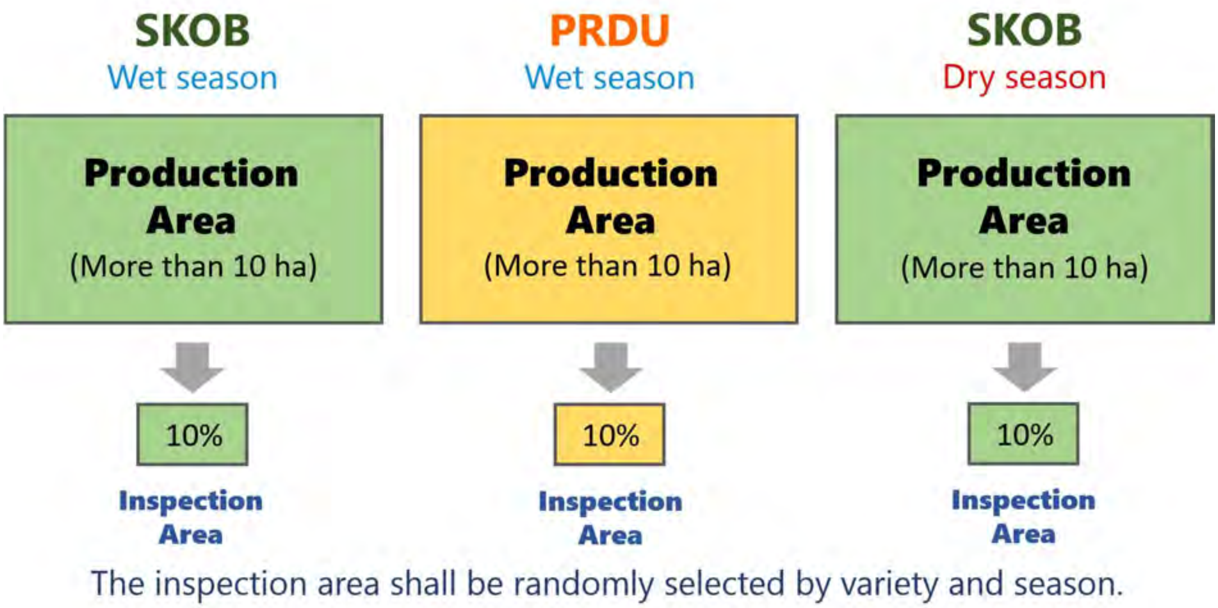


Figure 4-5 Field selection for the field inspection

b. After selecting the inspection field(s), select ten sample areas of 1x1 meter quadrate in each designated inspection field at random. The sample areas should be chosen from the entire field, as shown in Figure 4-7.

Figure 4-6 Example of field selection and sampling

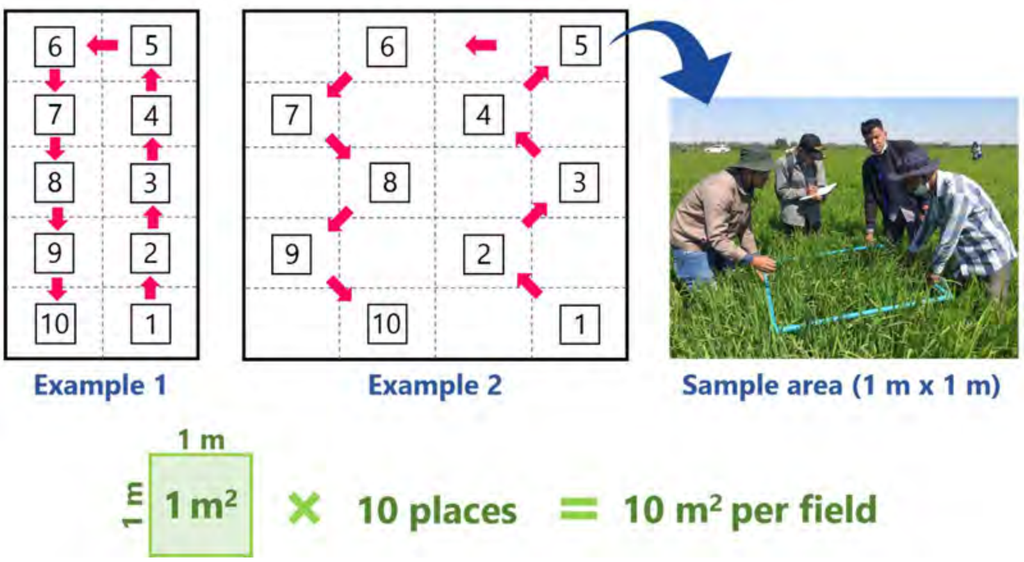


Figure 4-7 Field sampling method

4.5. Standard of field inspection

The QDS defines maximum permissible levels of off-type plants, noxious weed plants, and plants infected with seed-borne diseases, as Table 4-3 shows.

Table 4-3 Field standard of the QDS

Items	Details	Standard (per 10 m^2)		
		FS	RS	CS
Off-type plants	Other variety of rice plants, including red rice	No off-type plant	Maximum one panicle	Maximum three panicles
Noxious weeds	1. *Echinochloa* spp. 2. *Leptochloa chinensis* 3. *Cyperus iria*	No noxious weed	Maximum three panicles	Maximum five panicles
Plants infected with seed-borne diseases	1. Rice Blast 2. Brown spot 3. Sheath blight	No more than 50% of rice plants infected		

4.6. Identification of off-types

4.6.1. First Field Inspection (Before flowering)

To identify off-type plants, including red rice, check (1) plant height, (2) timing of heading, and (3) number of tillers (Figure 4-8). If you find off-type plants, instruct the producer to remove them by uprooting them.

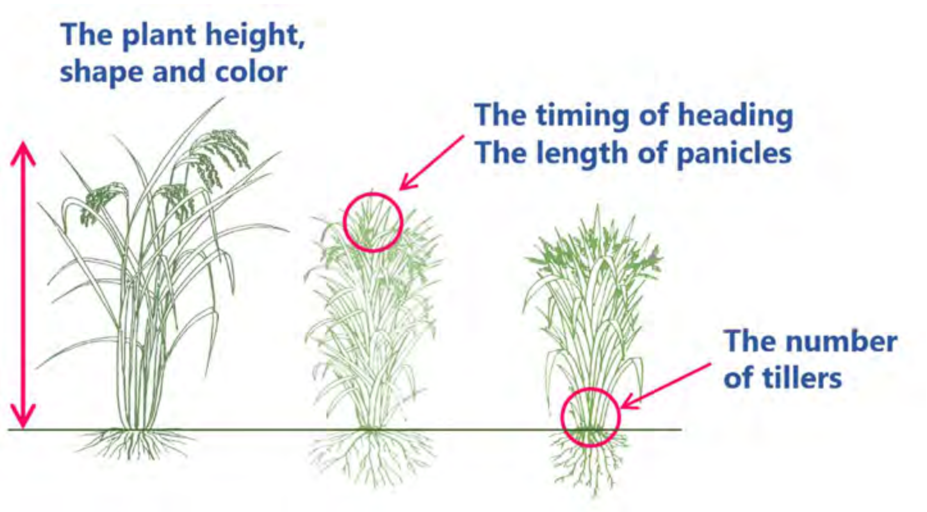


Figure 4-8 Identification of off-type plant

4.6.2. Second Field Inspection (At dough stage)

To identify off-type plants, check (1) the color and maturity of plants, (2) the color and shape of panicles, and (3) the color, shape, and number of paddy grains (Figure 4-9). An off-type plant that does not yet have panicles shall not be counted in the number of off-types since it does not affect the seed quality (Figure 4-10).

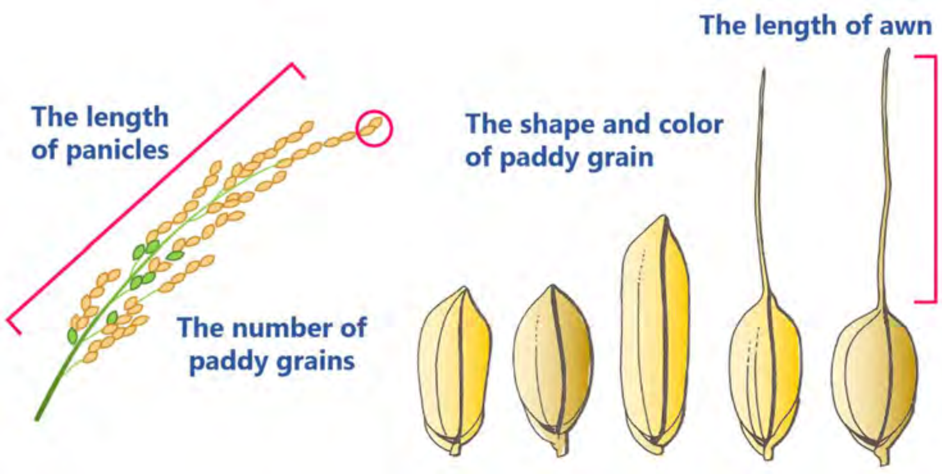


Figure 4-9 Identification of off-type plant

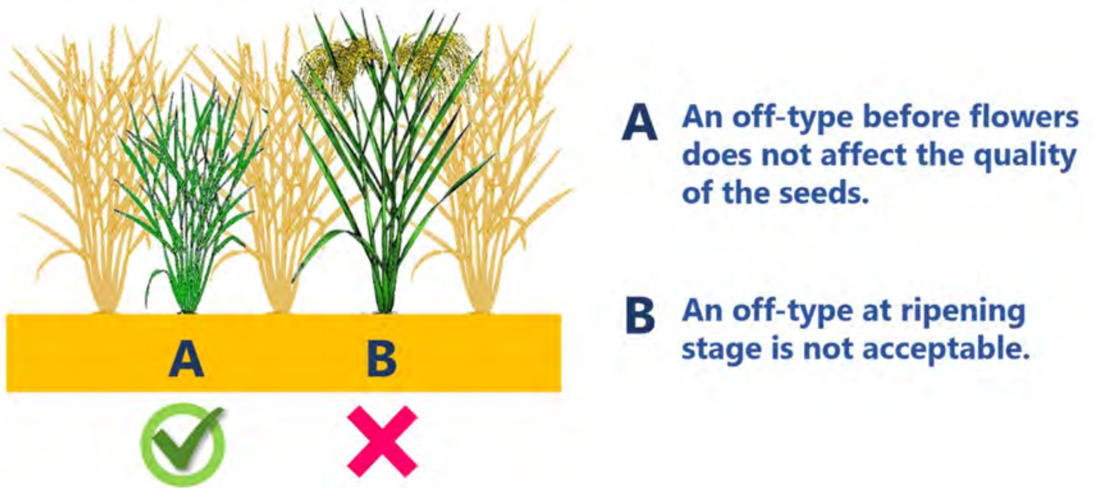


Figure 4-10 Off-type plant which affects the seed quality

4.7. Identification of noxious weeds

The QDS defines three kinds of noxious weeds, as shown in Figure 4-11.

Barnyardgrass	Sprangletop	Rice flatsedge
		
Genus: *Echinochloa*	Genus: *Leptochloa*	Genus: *Cyperus*

Photo: Website of University of Arkansas Cooperative Extension Service

Figure 4-11 Noxious weeds defined by the QDS

4.7.1. First Field Inspection (Before flowering)

Check the weeds in the field and advise the seed grower on proper weed control. Explain which weeds are not acceptable in the second field inspection to the seed grower. Some weeds are confusingly similar to rice. While rice has auricle and ligule, weeds do not have them generally. (Figure 4-12).

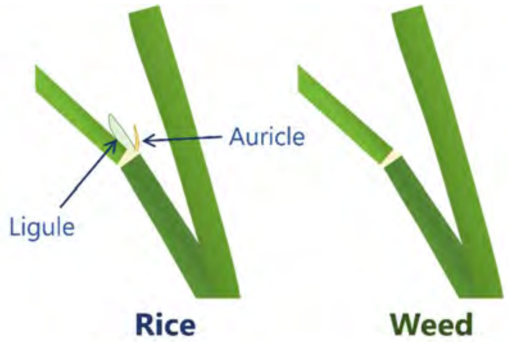


Figure 4-12 Identification of rice from weed

4.7.2. Second Field Inspection (At dough stage)

Check whether the number of unacceptable noxious weeds is within the standard. You should not count a young weed before flowering as a noxious weed if it does not affect the seed quality of rice (Figure 4-13).

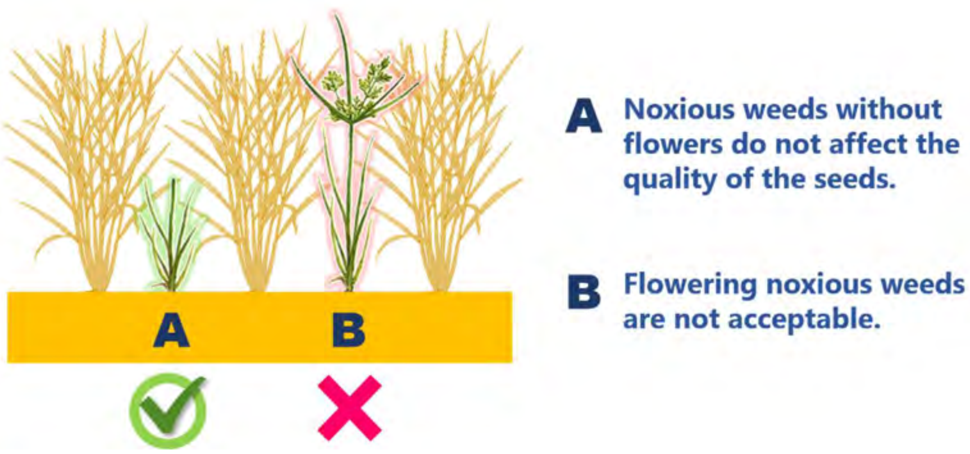


Figure 4-13 Weeds which affect seed quality

4.8. Identification of seed-borne diseases

The QDS defines three kinds of seed-borne diseases, Rice Blast, Brown Spot, and Sheath Blight, as unacceptable noxious weeds.

4.8.1. First Field Inspection (Before flowering)

To identify the disease infection, check the leaves and stems of plants. If you detect disease infections, advise the seed grower on controlling them properly. In general, while excessive use of nitrogen promotes Rice Blast, lack of nitrogen causes Brown Spot.

Rice Blast	Brown Spot	Sheath Blight	Not disease

Vertical diamond shapes with brown and yellow lines appear on leaves.	Dark brown and yellow round shape rings appear on leaves.	The infection starts from the lower part of the sheath.	It is not a disease but a physiological plant disorder.

Figure 4-14 Identification of diseases by leaf and stem

4.8.2. Second Field Inspection (At dough stage)

Insects like stem borer or other reasons may cause abnormal panicles. So, check both the leaves and panicles of the plant to diagnose.

Rice Blast	Brown Spot	Sheath Blight	Not disease

Infection appears on the leaf collar under the panicle.	The panicle turns light brown. Infection appears on the leaves.	Flag leaf withers. Infection also appears on the sheaths.	The plant is affected by a stem borer. You can easily pull out the panicle by hand.

Figure 4-15 Identification of disease by panicle

4.9. Evaluation of the infection

4.9.1. Identification of infected plants

If the seed-borne disease infects more than 25% of the tillers of the plant, the plant should be categorized as an infected plant.

Figure 4-16 Identification of infected plant

4.9.2. Judgment on the field regarding seed-borne disease infection

The percentage of plants infected with seed-borne diseases in the field should be less than 50%. The inspector should evaluate the disease infection in the field by visual inspection.

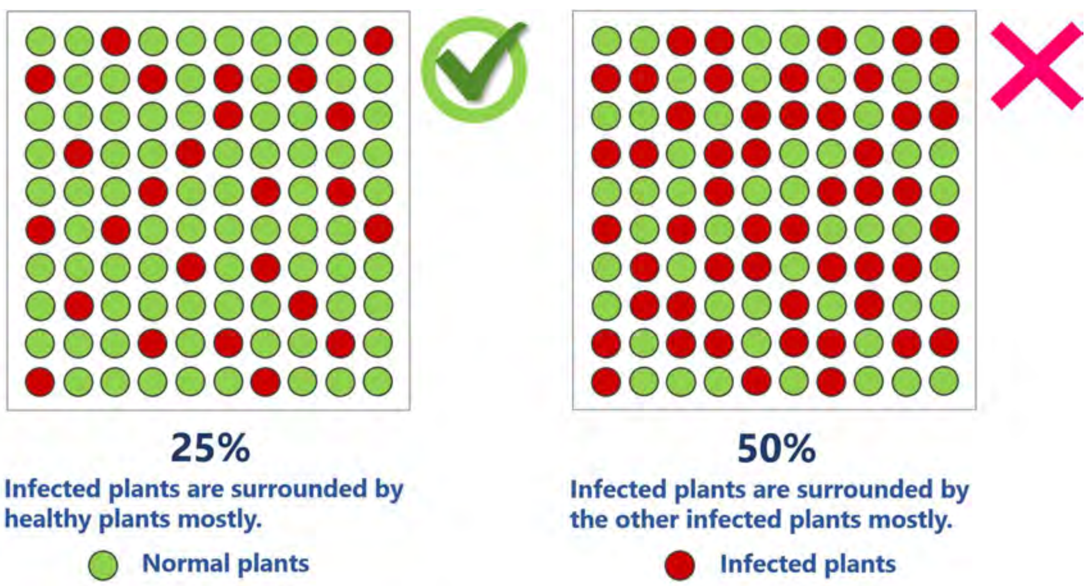


Figure 4-17 Judgment on the field regarding seed-borne disease infection

5. Laboratory Inspection

(Inspection of the final product of seed offered for sale)

5.1. Seed sampling procedure

Take a random sample from the product that the seed producer listed in Declaration (B) following the procedure shown in Figure 5-1.

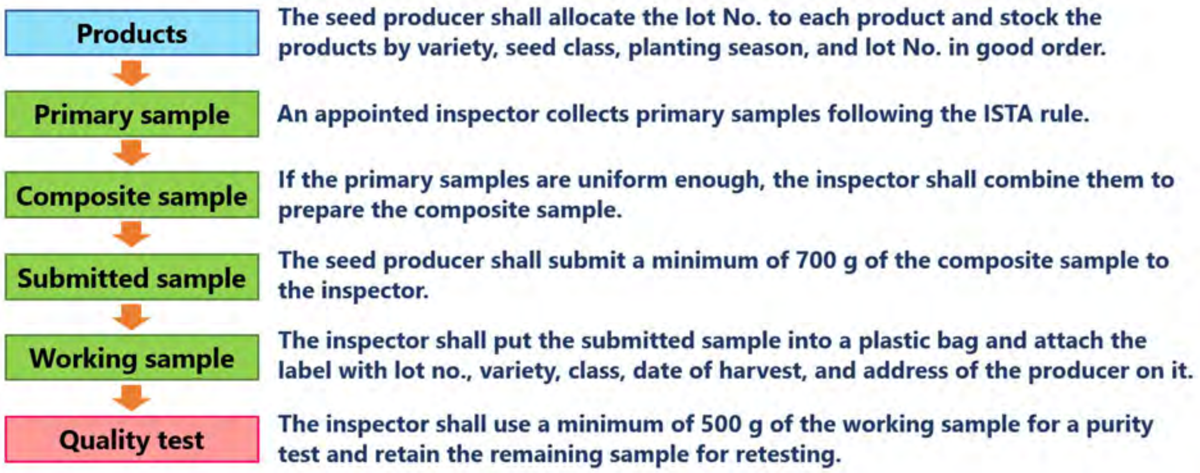
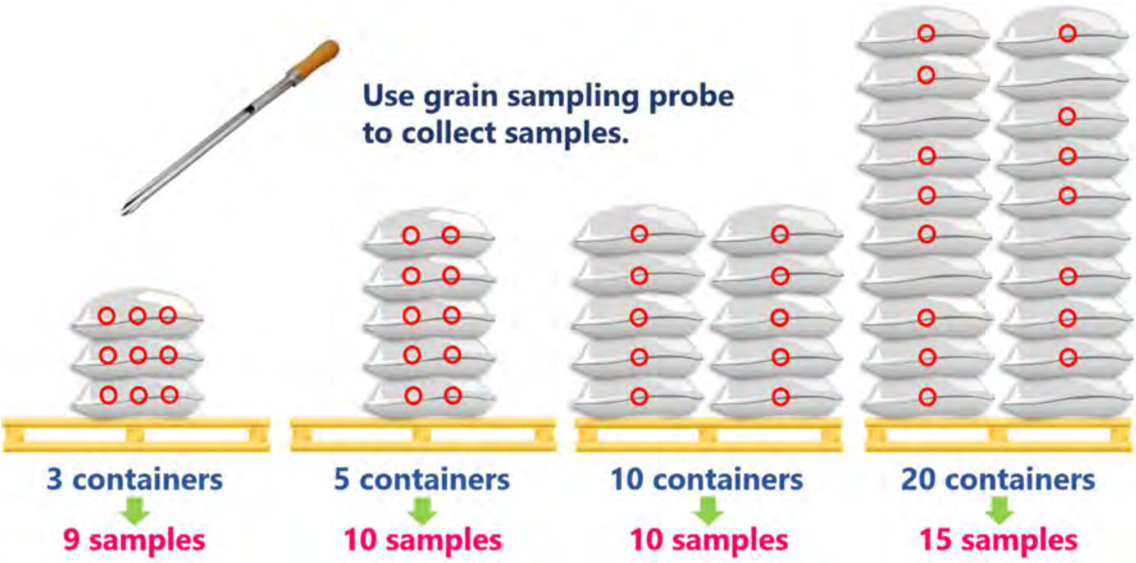


Figure 5-1 Sampling procedure for the seed quality test

5.2. Collecting of primary samples

a. Collect primary samples from the randomly selected containers with roughly equal sizes, following the instructions below (



b. Figure 5-2).

c. Combine the primary samples to the composite sample only when the primary samples are sufficiently uniform.

No. of container	No. of samples required
1-4	Three samples per container
5–8	Two samples per container

No. of container	No. of samples required
16–30	15 samples from different containers
31–59	20 samples from different containers

9–15	One sample per container	>60	30 samples from different containers

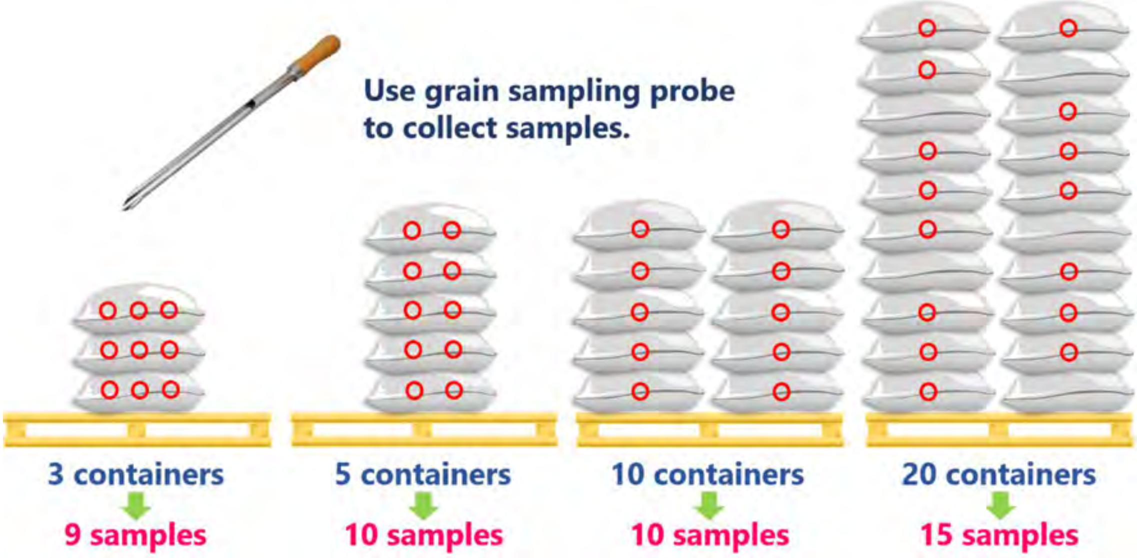


Figure 5-2 How to collect primary samples

5.3. Preparation of submitted samples

a. Mix the composite sample well and extract a minimum of 700 g of the composite sample by the hand halving method to prepare the submitted sample.
b. Retain the remaining sample as the referral sample with the seed producer.

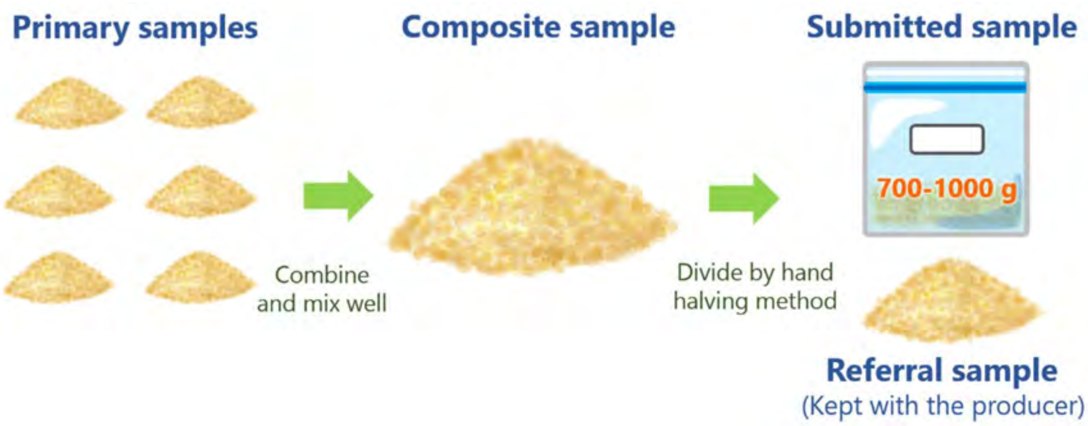


Figure 5-3 Preparation of submitted samples

Box1: Hand halving method

a. Divide the mound into two portions and halve in two to get four portions with a spatula.
b. Combine and retain alternative portions to receive two well-mixed equal mounds.
c. Repeat the procedure to get enough amount of sample.

5.4. Packaging and labeling of submitted samples

a. Pack a minimum of 700 g of the submitted sample into a clean plastic bag.
b. Write basic information, including seed lot no., seed variety, seed class (FS/RS/CS), date of harvest, and address of the producer, on the label and attach it to the plastic bag.

Figure 5-4 Labeling on the package of sample

5.5. Standard of the rice seed quality

The QDS sets the standard for seed quality inspection, as Table 5-1 shows.

Table 5-1 The QDS seed quality standard

Factors	Seed Class		
	FS	RS	CS
1. Pure seed (Min. %)	98	98	98
2. Inert matter (Max. %)	2	2	2
Weed seeds (Max. number of grain/500g)	3	5	10
Other crop seeds (Max. number of grain/500g)	2	3	5
Other rice variety seeds (Max. number of grain/500g)	1	5	15
Red rice (Max. number of grain/500g)	0	2	5
3. Germination rate (Min. %)	85	85	80
4. Moisture content (Max. %)	12	13	14

5.6. Amount of sample for the laboratory inspection

a. The laboratory inspection requires 70 g of the working sample for the physical test, 500 g for the variety test, and 300 grains for the germination test.

b. Retain the remaining as a spare sample in case of reinspection.

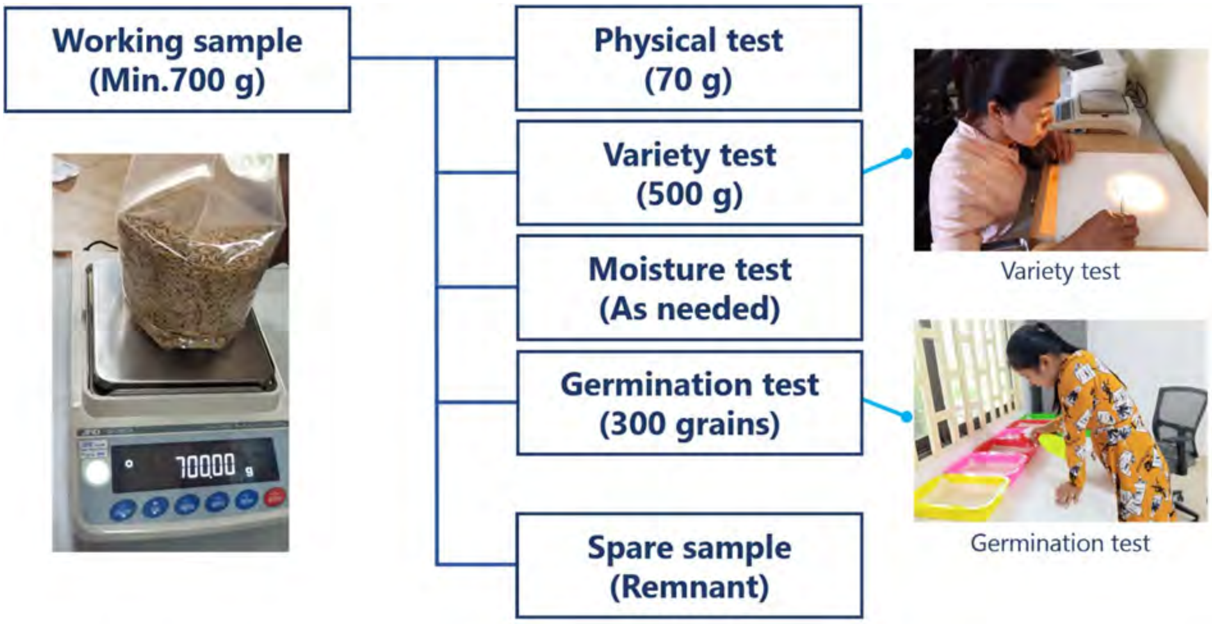


Figure 5-5 Amount of the sample for seed quality test

5.7. Physical test

a. Take 70 g of the working sample and detect the inert matter such as stones, soils, rice straws, weed seeds, other crops, other rice varieties, immature grains, and broken grains (remaining less than 50%).

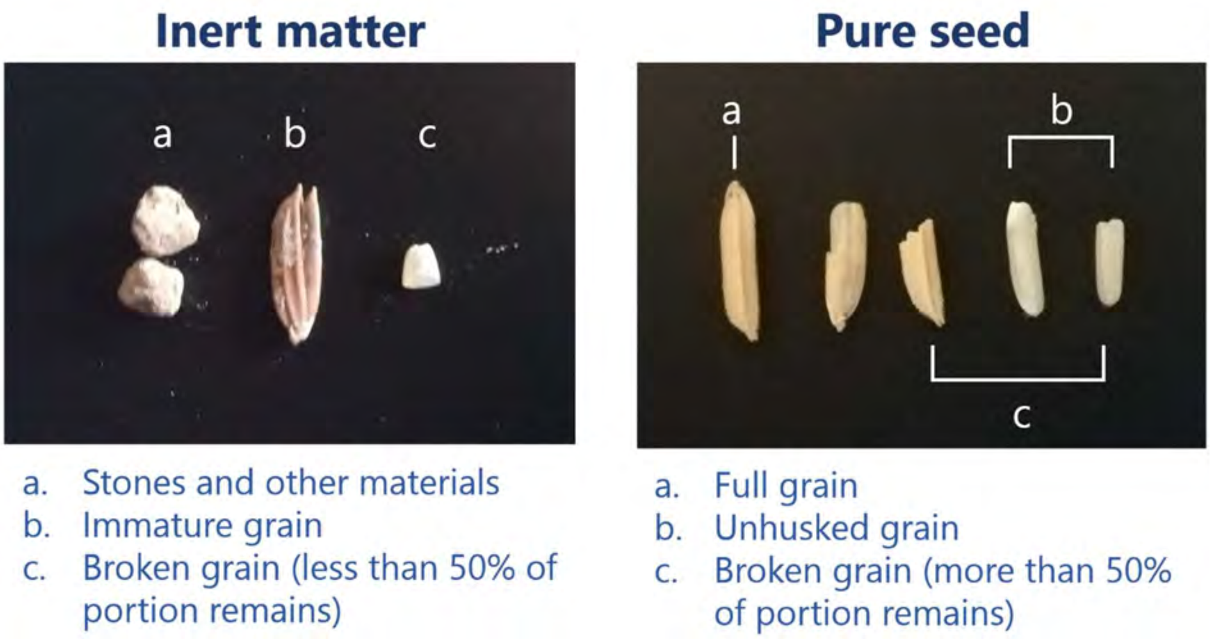


Figure 5-6 Identification of inert matter

b. Measure the weight of the pure seed after removing the inert matter and calculate the percentage of the pure seed or the purity of the sample.

$$\text{Inert matter (\%)} = \frac{\text{Weight of the inert matter (g)}}{\text{Weight of the sample (70g)}} \times 100$$

$$\text{Purity (\%)} = 100\ (\%) - \text{Inert matter (\%)}$$

Ex. The weight of the inert matters = 1.2g.

$$\text{Inert matter: } \frac{1.2\ (g)}{70.0\ (g)} \times 100 = \boxed{1.7\ (\%)}$$

$$\text{Purity: } 100\ (\%) - 1.17\ (\%) = \boxed{98.3\ (\%)}$$

Figure 5-7 How to calculate the purity

5.8. Variety test

a. Count the number of other rice variety seeds, red rice, other crop seeds, and weed seeds in 500 g of the working sample.
b. Check the color and shape to identify other rice variety seeds and red rice on a purity workboard.

Figure 5-8 Examples of other rice variety seeds

5.9. Moisture test (How to use a digital grain moisture meter)

a. Select 'Paddy' for measuring the moisture content of rice seed

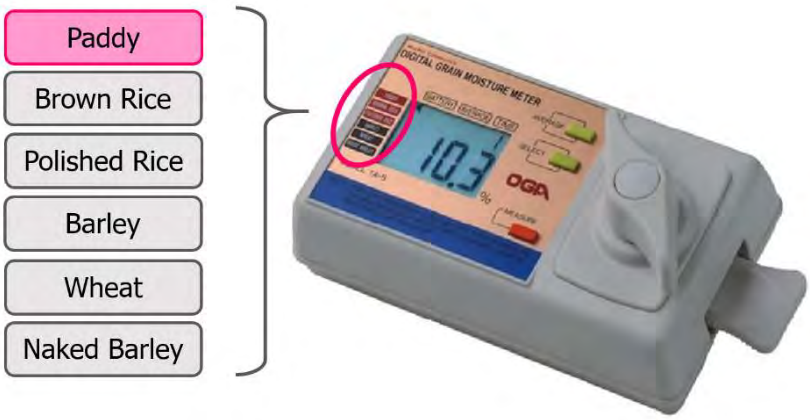


Figure 5-9 Digital grain moisture meter

b. Measure the moisture content three times and calculate the average.
c. If an abnormal value is detected, measure the moisture content twice more. Then, eliminate two abnormal values and calculate the average.

1st	2nd	3rd	4th	5th	Average
13.2	13.5	13.4	-	-	13.4

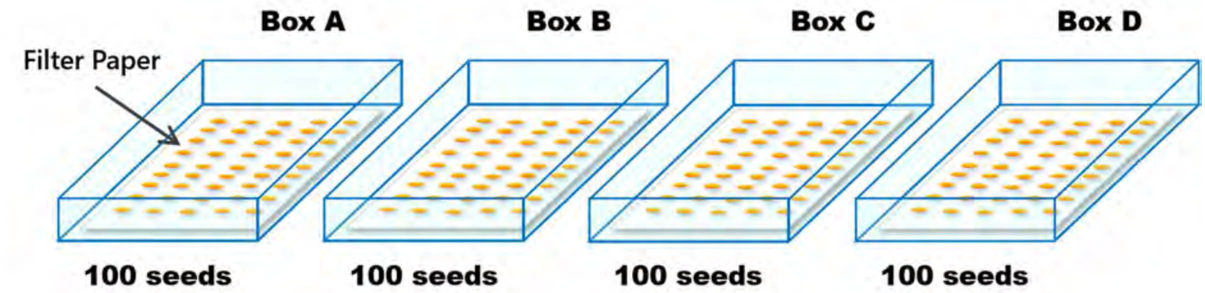
1st	2nd	3rd	4th	5th	Average
13.6	13.5	18.8	13.4	12.9	13.5

Figure 5-10 Calculation of moisture content

5.10. Germination test

a. Prepare germination boxes that can accommodate 400 seeds for the germination test.

b. Put a wet filter paper in the bottom of each box and set the 400 seeds randomly selected from the working sample.



c. After three and seven days, count the germinated seeds and calculate the germination rate. Some germinated seeds may be affected by mold or fungus. In this case, do not count the affected seeds as a germinated seeds.

Figure 5-11 Identification of seed germination

Germination Test Record Form

Days	Good germination (A)	Normal germination (B)	Spoiled seeds* (C)	Died Seeds (D)	Total germination (A)+(B)
Day1	0	0	0	0	0
Day2	36	0	0	0	36
Day3	154	5	0	1	159
Day4	252	129	13	6	381
Day5	274	99	15	12	373
Day6	293	70	15	22	363
Day7	298	65	15	22	363

$$\text{Germination rate (\%)} = \frac{\text{Total germinated seeds}}{\text{Sample seeds (400)}} \times 100$$

$$\frac{159}{400} \times 100 = 39.75\ (\%)$$

$$\frac{363}{400} \times 100 = 90.75\ (\%)$$

*Germinated grains that are affected by mold or died shall not be counted as a germinated seed.

Figure 5-12 Calculation of germination rate

Box2: Seed Dormancy

Rice seeds delay germination for several weeks after harvesting. The duration of the dormant period depends on varieties. Most rice varieties grown in Cambodia have around 21 days of the dormant period, but some local varieties have 1 to 3 months. If the germination rate is very low, conduct a

germination test again after several weeks.

6. Annex 1

Documents and report forms

1-A. QDS Seed Production and Business Application

Applicant's Name: …………………………….……….. Gender: ……….….. Position: ………….…………………..
Address: Village…..… Commune/Sangkat……... District/Khan……….. Province/Municipality………….…
Telephone number: (1) ……………………………..……..   (2) ……………….……………………………..
Email: …………………………………………………..…….   Telegram: ……………………………………………..
Name of responsible person for seed production: …………….…………………………………………..
Number of members involving in seed production: ………………………… (Female #......................)

1. Training

Did you receive rice seed production training? (tick only): ………………(Yes) …..………….(No)

No.	Training organizer	Year	Number of participating members
1.			
2.			
3.			
4.			
5.			

2. Experience

Years of experience with rice seed production (attach the reference): …………..………………………….
Description of seed varieties produced by group members: ……………………….……………………….

3. Rice seed production history

Area and volume of produced seed in last three years:

Variety	20……….		20……….		20……….	
	HA	MT	HA	MT	HA	MT
1.						
2.						
3.						
4.						
5.						
Total:						

4. Equipment

Availability/access to equipment for seed production:

Description of equipment	Own (yes/no)	Rent (yes/no)	Comments
4-wheel tractor			
2-wheel tractor			
Plow			
Rotavator			

Transplanter			
Direct seeder			
Spraying equipment			
Personal protection equipment			
Combine harvester			
Drier (specify type)			
Seed cleaner			
Winnower			
Scale			
Pallets			
Trolley			
Moisture meter			
Warehouse	m^2	m^2	Total: m^2
Other (specify)			

5. Total Planned Seed Production Area for three years: ………………. (ha)

Seed production location	20……….			20……….			20……….		
	EWS	**WS**	**DS**	**EWS**	**WS**	**DS**	**EWS**	**WS**	**DS**
1.									
2.									
3.									
4.									
5.									
Total:									

6. Attached reference

6.1. Training certificate on rice seed production (   )

6.2. Previous contract farming agreement, if any (   )

6.3. Organizational structure for rice seed business (   )

I officially declare that all information provided is true and promise to obey the QDS procedure for the applied rice seed production.

At ………………………………………………………… on ……………………………………………...

Name of Applicant: …………………………………… Signature of Applicant: ……………………..

1-B. Quality Declared Seed Production and Business Certificate

Certificate No.: ………………………..

- Seen the Royal Decree No. នស/រកម/០៥០៨/០១៥ proclamation law dated on May 13th 2008 for crop seed management and rights of breeder.
- Seen the Prakas No. ……… ប្រក/កសក dated on day …………/month …………/year ………… on application model and procedure for Quality Declared Seed System Certificate issuance.
- Seen the application No. ……………… dated on day …………/month …………/year …………

Approved

Mr./Ms.: ………………………………………………………………….. Occupation: ………………………………………………………………………...
Institution or Legislator: ……
Perform conditioned seed business: …………………………………….... with a capacity of producing and processing……………………………… per year.
Physical address of the institution: ………
This certificate is issued to the applicant for use in compliance with QDS standards and shall be valid for a period of three years from the date of issuance on day…………/month…………/year…………, except being withdrawn by the General Directorate of Agriculture before the expiration of validity date in case of serious infringement.

Phnom Penh, Day……. / Month ………. / Year …………….

Director General of GDA

1-C. Declaration A: Seasonal Rice Seed Production Plan

1. Applicant's Name: ………………………………. Gender: ……………. Position: …………………………...
2. Address: Village……... Commune/Sangkat…….. District/Khan………… Province/Municipality…………
3. Telephone number: (1) ……………………………………… (2) …………………………………………..
4. Email: ……………………………………………………. Telegram: ……………………………………………..
5. Certificate number: …………………….…………….... Issued date: ……………..………………………….
6. Production season: …………… Starting date: …………………. Expected harvest date: ……..………..
7. Seed production information:

No.	Variety Name	Seed Class	Planting Area (ha)	No. of Fields	Production Location
1.					
2.					
3.					
4.					
5.					
Total					

8. Information of seed source for seed production:

No.	Variety Name	Seed Class	Volume (kg)	No. of Fields	Lot No.
1.					
2.					
3.					
4.					
5.					
Total					

Note: Seed Producer shall retain all original tags, packing sacks, and buying invoices for verification by the Competent Authority.

9. Additional information (see the attached example)

I officially declare that all information provided is true. In the event of the seed production fields being damaged or changed, on all occasions, I will inform the Competent Authority.

At …….………………..………………………………… on …………………………………………...

Name of Applicant: …………………………………… Signature of Applicant: …………………….

Use for record only

1-D. Field Inspection Record

Name of owner: ______________________ Date: ______________________

Application No.: ______________________ Field No.: ______________________

Variety	Date of Sowing	Date of Field Inspection 1	Expected Date of Heading	Date of Field Inspection 2	Expected Date of Harvesting

Sample No.	Off-types	Noxious weeds	Seed borne disease		
			Rice Blast	Brown spot	Sheath Blight
Sample 1			0 1 2 3	0 1 2 3	0 1 2 3
Sample 2			0 1 2 3	0 1 2 3	0 1 2 3
Sample 3			0 1 2 3	0 1 2 3	0 1 2 3
Sample 4			0 1 2 3	0 1 2 3	0 1 2 3
Sample 5			0 1 2 3	0 1 2 3	0 1 2 3
Sample 6			0 1 2 3	0 1 2 3	0 1 2 3
Sample 7			0 1 2 3	0 1 2 3	0 1 2 3
Sample 8			0 1 2 3	0 1 2 3	0 1 2 3
Sample 9			0 1 2 3	0 1 2 3	0 1 2 3
Sample 10			0 1 2 3	0 1 2 3	0 1 2 3
Total			0 1 2 3	0 1 2 3	0 1 2 3

▼ ▼ ▼

$10m^2$			Overall Disease Judgement	0 1 2 3

1-E. Field Inspection Report

Field Code: ……………………………….….. Report No.: ……………………………………….

Date of inspection: …………..……………….. Time: From:………………To:……………………...

Rice variety: ………………………………… Certification Class (Certified/Registered seeds)

Date of seeding: ……..…/…………/………… Intended date of harvest: ………/………/…………

1. Name of grower: ....…………………………. Gender: ………. Grower code: ...………………..…

2. Address: Village…………… Commune…………… District…………… Province………………

3. Field location: ...…………………………………………………………………………………

4. Seed source: ...……………….……………… Date of Purchase: ...……………….……………….

5. Total area under this seed crop production (ha): …………………………………………………

6. Area of the inspected field (ha): ...……………………………..………………………………

7. Previous crop in the field: ………………………... Isolation distance in the field: ……………..…

8. Stage of seed crop at this inspection: ...………………………………….……………………...

9. Result from counting (Take field counts as directed in the guidelines)

Sample no.	Off-types	Noxious weeds	Diseased plant
	For the 1st inspection: No. of tillers For the 2nd inspection: No. of heads		Percentage(%)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total			

10. Name(s) of

(a) Seed-borne diseases: Blast ( ), Brown Spot ( ), Sheath Blight ( )

(b) Noxious weed plants: ……………………………..…………………………

11. Condition of seed crop: ………………………………………………………………….

12. Does this seed crop conform to the field standard? ……………………..…………………..

13. Quality of seed production work: …………………………………….…………………...

14. Is this the final report? …………………………………………………………………

15. Estimated seed yield (mt/ha): ………………………………………………………….

16. Was the grower or his/her representative present at inspection time? ……………….……….

17. Notifications/Conclusion/Recommendation...…………………………………………………

………………………………………………………………………………………………...

………………………………………………………………………………………………...

Signature of grower or his/her representative Signature of Inspector

Name: ……………………………………. Name: ……………………………………

1-F. Declaration B: Request for Seed Quality Test

1. Applicant's Name: ………………………….. Gender: ………. Position: ……………………...
2. Address: Village…… Commune/Sangkat…... District/Khan…… Province/Municipality……….
3. Telephone number: (1) ………………………….. (2) …………………………………………..
4. Email: ……………………………………………... Telegram: ……………………………….
5. QDS Certificate number: ……………………….. Issued date: ………/………/………………
6. Options for seed quality test (tick one only):

   (a). 10% of total seed lots of each variety ☐

   (b). All seed lots of each variety ☐

No.	Lot no.	Volume (kg)	Variety name	Seed class	No. sacks for QDS Labels
1.					
2.					
3.					
4.					
5.					
Total					

Note: In case more seed lots to be inspected, insert an additional table as above.

7. The seed was fumigated on the day ……. /month ……. /year………...) by using …………. (name of the product) for the duration of ……….hours or ……….days).

I hereby declare that each seed lot has been produced in accordance with the requirements of the Quality Declared Seed System.
I request that the competent officer carries out an inspection of our seeds.

At: ……………………………………………... Requesting Date: …………………………………

Name of applicant: ………………………….. Signed by: …………………………………………...

Use for record only

1-G. Germination Test Record Form

Name of producer .... Code No. ....

Sample No. ....

Day	Date (DD/MM/YY)	Good germination (A)	Normal germination (B)	Spoiled after germination (C)*	Total germination (A)+(B)
Day1					
Day2					
Day3					
Day4					
Day5					
Day6					
Day7					

*** A spoiled or died germinated grain shall not be counted in total germination.**

Germination ratio of Day 3

$$\frac{\text{Total germination} \;\boxed{}}{\text{Total tested grains} \;\boxed{300}} = \boxed{}\ \%$$

Germination ratio of Day 7

$$\frac{\text{Total germination} \;\boxed{}}{\text{Total tested grains} \;\boxed{300}} = \boxed{}\ \%$$

1-H. Quality Inspection Report

Report No. ....

1. Information on applicants

Name of producer .... Code No. ....

Date of submission of the sample ....

2. Date and place of inspection

Purity test: ..../............./.............. Moisture test: ..../............./..............

Germination test: from ..../.........../........... to ..../............/............(Total .... days)

Place of inspection: ....

Name of inspector: .... Organization: ....

3. Information of inspected sample

Type of Crop: ......Rice...... Variety: .... Class: ....RS.../....CS....

Date of harvest: .... Amount of sample: .... g

4. Result of inspection

Factors		Tested value	Standard		Result Pass/Fail
			RS	CS	
1. Pure seed (Min, %)			98	98	P / F
2. Inert matter (Max, %)			2	2	P / F
Weed seeds (Max, number of grain/500g)			5	10	P / F
Other crop seeds (Max, number of grain/500g)			3	5	P / F
Other rice variety seeds (Max, number of grain/500g)			5	15	P / F
Red rice (Max, number of grain/500g)			2	5	P / F
3. Germination rate (Min, %)	3 days		-	-	-
	7days		85	80	P / F
4. Moisture content (Max, %)			13	14	P / F

5. Remarks/conclusion

....

....

....

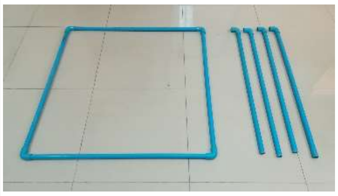
Date:

Signature of Inspector

7. Annex 2

Tools and kits for inspection

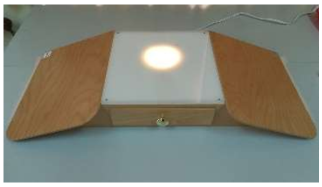
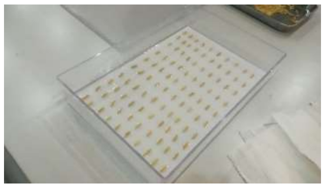
1. Tools for Field Inspection

Measure (more than 3 m) To check the isolation of the field, use a measure and check the distance between the field and other fields properly.	
Quadrate frame (1 m x 1 m) To set sampling areas for field inspections, use a quadrate frame. It can be prepared by PVC pipes and joints, which are available in the local market.	
Clipboard It is helpful to record the result of an inspection in the field.	
Proper uniform for rice field Producers may use chemicals in their field. Therefore, wear the proper uniform to protect yourself.	

2. Tools for Sampling

Grain trier To avoid damage to the sacks, use a grain trier for sampling. Insert a grain trier into a sack and turn it gently to collect the sample.	
Plastic bags To avoid mixing samples, use a plastic bag to hold the sample. The sample should be dry before putting it into the plastic bag.	
Labels for sampling After packing the sample into the plastic bag, attach the label to it immediately with the necessary information to avoid confusion of samples.	

3. Tools and Kits for Laboratory Inspection

Electric balance The purity is calculated based on weight. Therefore, the weight of the sample should be appropriately measured. An electric balance is a delicate instrument, and should be handled carefully.	
Workboard for a purity test To identify red rice, use a workboard with light. It requires electricity.	
Wood stick To avoid scratching the surface of the workboard, use wood sticks to inspect samples.	
Moisture meter To check the moisture content of the sample, use a digital grain moisture meter.	
Germination box Any plastic box can be used for the germination test.	
Paper for germination test Papers, such as kitchen paper or tissues, should be laid at the bottom of germination boxes to keep the grains wet during the germination test.	
Tweezer Use a tweezer to arrange grains in the germination box neatly to observe and count grains easily.	
Water sprayer To keep grains wet during the germination test, spray water from time to time with a water sprayer.	

8. Annex 3

Terminologies

Quality Declared Seed System (QDS)

FAO, after expert consultation, published the guidelines for the Quality Declared Seed System (QDS) in 2003. The QDS is, in particular, helpful in countries where no seed quality systems existed before and the public sector is hampered by human and financial resources to implement a fully comprehensive quality control system. Since its introduction, the QDS has successfully been implemented in, among others, Zambia, Tanzania, Uganda, Bangladesh, Nepal, and India. At present, Cambodia adopts the QDS as its own system for managing seed quality and certification.

Competent Authority (CA)

In the implementation of the QDS for Cambodia, the Department of Crop Seeds (DSC) under the General Directorate of Agriculture (GDA) shall be the Competent Authority (CA).

Competent Officer

In the QDS, the competent officer in the DCS is responsible for issuing the QDS Rice Seed Production and Business Certificate to an eligible Seed Producer and the QDS Labels to the Seed Producer based on his/her request. The competent officer receives and keeps all relevant documents and notifies and validates the applicant for the QDS Certificate issuance.

Seed Producer

An individual producer, seed company, agricultural cooperative (AC), non-governmental organization (NGO), and other private producers shall be a Seed Producer. An eligible Seed Producer shall receive a certificate indicating his/her rights in producing and marketing the QDS rice seed.

Nucleus seed (NS)

Refers to the crop seed that is retained by the breeder for breeding purposes and is not seed for commercial purposes.

Breeder seed (BS)

Refers to the crop seed produced by the plant breeder from the nucleus seed through a row transplanting method with a single seedling per hill. This seed is formally recognized by the original institution, in which the breeder is based. Breeder seed is a hundred percent physically and genetically a pure seed source for the production of different seed classes, in particular, foundation seed.

Foundation seed (FS)

Refers to the progeny of breeder seed through a row transplanting method with a single seedling per hill under the supervision of a plant breeder or an eligible Seed Producer. The foundation seed shall be produced under the rule recognized by the seed certification agencies so that its genetic purity and identity are maintained in compliance with the QDS standards.

Registered seed (RS)

Refers to the progeny of foundation seed produced by either the public sector or a private sector (eligible Seed Producer) through a row seeding method or a row transplanting method with 1–3 seedlings per hill, which is under the rule recognized by the seed certification agencies so that its genetic purity and identity are maintained in compliance with the QDS standard.

Certified seed (CS)

Refers to the progeny of registered seed produced by an eligible Seed Producer mainly for a commercial purpose or by the public development station through a row seeding method or a random transplanting method, which is under the rule recognized by the seed certification agencies so that its genetic purity and identity are maintained in compliance with the QDS standard.

Primary sample

A primary sample shall be taken from the randomly selected containers of roughly equal sizes. A primary sample shall be taken from the top, middle, and bottom of each container. The required number of primary samples depends on the total number of containers of the lot.

Composite sample

A composite sample shall be taken from the primary sample on the condition that the primary samples are sufficiently uniform.

Referral sample

A referral sample is the remaining sample of the composite sample after taking the submitted sample. The producer shall keep the referral sample as a spare sample and for an internal quality test.

Submitted sample

A submitted sample shall be extracted from the composite sample for testing. The minimum size of a submitted sample is 700g. If the composite sample is smaller but close to 700g, the composite sample may be submitted in its entirety as the submitted sample. If the composite sample is large, it shall be divided using the hand halving method.

Working sample

A working sample shall be extracted from the submitted sample by the hand halving method. The minimum size of the working sample shall be 500g. The sample shall be used for a purity test, determination of other seeds, and weed seeds. The remaining 200g of the submitted sample shall be retained for a retest in case it is needed.

ISTA (2018)

ISTA is an abbreviation of the International Seed Testing Association. The QDS employs its rule for sampling for the test.

គោលការណ៍ណែនាំបច្ចេកទេសស្តីពីការត្រួតពិនិត្យគុណភាព គ្រាប់ពូជស្រូវតាមប្រព័ន្ធធានាគុណភាពពូជដំណាំ (ប.គ.ព)

រៀបចំដោយនាយកដ្ឋានពូជដំណាំ នៃអគ្គនាយកដ្ឋានកសិកម្ម

ខែឧសភា ឆ្នាំ២០២២

សហការគាំទ្រ និងឧបត្ថម្ភដោយ

Australian Aid CAVAC Innovation in Agriculture JICA RSPP Quality Seed, Quality Rice

បោះពុម្ពលើកទី១

អារម្ភកថា

ប្រព័ន្ធធានាគុណភាពពូជដំណាំ សរសេរអក្សរកាត់ **ប.គ.ព** ត្រូវបានរៀបចំឡើងដោយផ្អែកលើសៀវភៅគោលការណ៍ណែនាំមួយរបស់អង្គការស្បៀងអាហារនិងកសិកម្មនៃសហប្រជាជាតិក្នុងឆ្នាំ២០០៦ ហើយត្រូវបានយកទៅអនុវត្តប្រកបដោយជោគជ័យក្នុងបណ្ដាប្រទេសមួយចំនួនដែលវិស័យសាធារណៈនៅមិនទាន់មានភាពរឹងមាំ ខ្វះខាតធនធានមនុស្សនិងហិរញ្ញវត្ថុសម្រាប់អនុវត្តប្រព័ន្ធធានាគុណភាពពូជដំណាំ ដូចជាប្រទេសហ្សាំបៀ តង់សានី អ៊ុយហ្គង់ដា បង់ក្លាដែស នេប៉ាល់ និងឥណ្ឌា។

ដោយមើលឃើញអំពីអត្ថប្រយោជន៍នេះ និងភាពជោគជ័យនៅបណ្ដាប្រទេសខាងលើ ព្រមទាំងកង្វះខាតមន្ត្រីជំនាញ និងមធ្យោបាយនាពេលបច្ចុប្បន្ន អគ្គនាយកដ្ឋានកសិកម្មបានសម្រេចជ្រើសរើស **ប.គ.ព** ជាឧបករណ៍សម្រាប់ត្រួតពិនិត្យផលិតកម្មនិងបញ្ជាក់គុណភាពគ្រាប់ពូជស្រូវនៅក្នុងព្រះរាជាណាចក្រកម្ពុជា។ សៀវភៅគោលការណ៍ណែនាំបច្ចេកទេសស្ដីពីការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវតាម **ប.គ.ព** ត្រូវបានរៀបចំ កែសម្រួល និងចងក្រង ដើម្បីឱ្យស្របទៅនឹងលក្ខខណ្ឌនៃប្រទេសកម្ពុជា ដែលទទួលបានការគាំទ្រផ្នែកបច្ចេកទេសនិងថវិកាពីកម្មវិធីខ្សែសង្វាក់តម្លៃកសិកម្មកម្ពុជា-អូស្ត្រាលី(CAVAC) និងគម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ(RSPP)។ ឯកសារនេះនឹងប្រើប្រាស់ជាគោលប្រតិបត្តិសម្រាប់ការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវនៅក្នុងផលិតកម្ម សកម្មភាពបណ្ដុះបណ្ដាល ការងារផ្សព្វផ្សាយ និងប្រើប្រាស់តាមស្ថានភាពជាក់ស្ដែងរបស់គ្រប់ភាគីពាក់ព័ន្ធនៅក្នុងវិស័យនេះ។

សៀវភៅបច្ចេកទេសនេះក៏បង្ហាញនូវព័ត៌មានលម្អិតអំពីតួនាទី និងលក្ខខណ្ឌតម្រូវរបស់មន្ត្រីត្រួតពិនិត្យគុណភាព ដំណើការត្រួតពិនិត្យគុណភាពសម្រាប់ផលិតកម្មក្នុងអាជីវកម្មគ្រាប់ពូជស្រូវ ឧបករណ៍និងសម្ភារចាំបាច់សម្រាប់ការត្រួតពិនិត្យគុណភាព និងឯកសារពាក់ព័ន្ធមួយចំនួនដែលមានភ្ជាប់ ដើម្បីងាយស្រួលយល់និងប្រតិបត្តិដោយគ្រប់ភាគីពាក់ព័ន្ធស្របតាមស្ថានភាព និងលទ្ធភាពជាក់ស្ដែង។

អគ្គនាយកដ្ឋានកសិកម្មសង្ឃឹមយ៉ាងមុតមាំថា សៀវភៅបច្ចេកទេសនេះនឹងផ្ដល់នូវចំណេះដឹងថ្មីៗ បទពិសោធន៍ល្អៗ និងគោលការណ៍បច្ចេកទេសជាមូលដ្ឋានសម្រាប់មន្ត្រីត្រួតពិនិត្យគុណភាពថ្នាក់ជាតិ និងថ្នាក់ក្រោមជាតិ ព្រមទាំងផលិតករគ្រាប់ពូជស្រូវផងដែរ។ អគ្គនាយកដ្ឋានកសិកម្មសូមស្វាគមន៍ និងទទួលយកនូវមតិយោបល់កែលម្អទាំងឡាយពីសំណាក់អ្នកអាន ដែលចាប់អារម្មណ៍លើគោលការណែនាំបច្ចេកទេសនេះ ដើម្បីឱ្យសៀវភៅបច្ចេកទេសនេះ កាន់តែល្អប្រសើរ មានប្រសិទ្ធភាព និងសុក្រឹតភាពថែមទៀត។

ថ្ងៃ ខែ ឆ្នាំឆ្លូវ ត្រីស័ក ព.ស២៥៦

រាជធានីភ្នំពេញ ថ្ងៃទី ខែ ឆ្នាំ២០២

អគ្គនាយកដ្ឋានកសិកម្ម

ពាក្យបំព្រួញ

CA	អង្គភាពមានសមត្ថកិច្ច
CAVAC	កម្មវិធីខ្សែសង្វាក់តម្លៃកសិកម្មកម្ពុជា-អូស្ត្រាលី (កាវ៉ាក់)
CS	គ្រាប់ពូជវិញ្ញាបនបត្រ
FS	គ្រាប់ពូជគ្រឹះ
GDA	អគ្គនាយកដ្ឋានកសិកម្ម
ISTA	សមាគមវិភាគពូជដំណាំអន្តរជាតិ
PDAFF	មន្ទីរកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទរាជធានី-ខេត្ត
PRD	ពូជស្រូវផ្ការំដួល
QDS	ប្រព័ន្ធធានាគុណភាពពូជដំណាំ (**ប.គ.ព**)
RS	គ្រាប់ពូជចុះបញ្ជី
RSPP	គម្រោងជំរុញផលិតកម្មនិងការប្រើប្រាស់គ្រាប់ពូជស្រូវ
SKO-01	ពូជស្រូវសែនក្រអូប០១
SP	ផលិតករគ្រាប់ពូជស្រូវ

មាតិកា

១. សេចក្តីផ្តើម

១.១. គោលបំណង

សៀវភៅគោលការណ៍ការណែនាំបច្ចេកទេសស្តីពី **ការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវ តាមប្រព័ន្ធធានាគុណភាពពូជដំណាំ (ប.គ.ព)** ត្រូវបានរៀបចំឡើងក្នុងគោលបំណងប្រើប្រាស់ជាឯកសារបច្ចេកទេសសម្រាប់ការបណ្តុះបណ្តាលគ្រូបង្គោល និងបណ្តុះបណ្តាលបន្តគ្រប់ភាគីពាក់ព័ន្ធ ហើយក៏ប្រើជាឯកសារយោងដ៏សំខាន់សម្រាប់មន្ត្រីត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវនៃអង្គភាពមានសមត្ថកិច្ចក្នុងកិច្ចប្រតិបត្តិការ **ប.គ.ព** សម្រាប់ផលិតកម្ម និងអាជីវកម្មគ្រាប់ពូជស្រូវ។

១.២. តួនាទី និងភារកិច្ចរបស់មន្ត្រីត្រួតពិនិត្យគុណភាព

១.២.១. តួនាទីរបស់មន្ត្រីត្រួតពិនិត្យគុណភាព

តួនាទីសំខាន់របស់មន្ត្រីត្រួតពិនិត្យគុណភាព គឺចុះវាយតម្លៃលើគុណភាពផលិតកម្មគ្រាប់ពូជស្រូវនៅទីវាលធៀបទៅនឹងពាក្យស្នើសុំក្នុងទម្រង់(ក) គោលការណ៍បច្ចេកទេសធៀបទៅនឹងស្តង់ដារទីវាលនៃ **ប.គ.ព** ការយកសំណាកគ្រាប់ពូជស្រូវសម្រាប់វិភាគគុណភាពនៅមន្ទីរពិសោធន៍ និងការវិភាគគុណភាពគ្រាប់ពូជ។

ចំណាំ៖ មន្ត្រីត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលមិនមែនជាអ្នកវិភាគគុណភាពគ្រាប់ពូជស្រូវនៅមន្ទីរពិសោធន៍ទេ និងមិនមែនជាមន្ត្រីបច្ចេកទេសក្នុងផលិតកម្មគ្រាប់ពូជស្រូវដែរ។

១.២.២. ភារកិច្ចរបស់មន្ត្រីត្រួតពិនិត្យគុណភាព

ក. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល

មុនពេលត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល៖

- រៀបចំជាស្រេចនូវបញ្ជីព័ត៌មានសំខាន់ៗដែលផ្តល់ជូនដោយផលិតករគ្រាប់ពូជ [1] សម្រាប់យកសំណាកក្នុងដំណើរការវាយតម្លៃ បន្ទាប់ពីទទួលបានពាក្យស្នើសុំក្នុងទម្រង់(ក)
- ណាត់ជួបជាមួយផលិតករគ្រាប់ពូជ ដើម្បីត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលយ៉ាងហោចណាស់ ២៤ម៉ោងជាមុន មុនពេលចុះត្រួតពិនិត្យស្រែផលិតកម្មគ្រាប់ពូជ
- ផ្ទៀងផ្ទាត់ព័ត៌មានសំខាន់ៗ ទាក់ទងទៅនឹងប្រភេទពូជ ផ្ទៃដីដាំដុះ ទីតាំង និងកូដស្រែសម្រាប់យកសំណាក
- ជ្រើសរើសដោយចៃដន្យយ៉ាងហោចណាស់១០%នៃផ្ទៃដីផលិតកម្មគ្រាប់ពូជស្រូវសរុបនៃប្រភេទពូជនិងថ្នាក់ពូជនីមួយៗ សម្រាប់ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល
- ផ្ទៀងផ្ទាត់ព័ត៌មានអំពីទីតាំងស្រែ និងកំណត់ពេលវេលាសមស្របសម្រាប់ចុះត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលជាមួយផលិតករគ្រាប់ពូជ ឬអ្នកតំណាង
- ពិនិត្យរបាយការណ៍ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលពីលើកមុនឡើងវិញ ក្នុងករណីត្រួតពិនិត្យ

[1] ផលិតករគ្រាប់ពូជស្រូវ សំដៅដល់ បុគ្គល ក្រុម ក្រុមហ៊ុន សហគមន៍កសិកម្ម សមាគម ឬអង្គការក្រៅរដ្ឋាភិបាល ដែលមានគោលបំណងផលិត និងធ្វើអាជីវកម្មគ្រាប់ពូជស្រូវ។

គុណភាពលើកទី១បានធ្វើរួចហើយ

• ត្រៀមជាស្រេចនូវឧបករណ៍និងសម្ភារចំបាច់ដូចជា ឯកសណ្ឋានការពារថ្នាំកសិកម្ម មធ្យោបាយធ្វើដំណើរ ឧបករណ៍យកសំណាក និងទម្រង់របាយការណ៍ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។

អំឡុងពេលត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល៖

• ពិនិត្យនិងសាកសួររាល់ព័ត៌មានសំខាន់ៗពីផលិតករគ្រាប់ពូជ ឬអ្នកតំណាង ទាក់ទងនឹងព្រំប្រទល់ស្រែ ប្រភេទពូជ ថ្នាក់គ្រាប់ពូជ ប្រភពគ្រាប់ពូជ ផ្ទៃដីដាំដុះ និងប្រវត្តិដាំដុះនៃស្រែផលិតកម្ម

• ត្រួតពិនិត្យស្រែផលិតកម្មដោយអនុវត្តតាមវិធីសាស្រ្តយកសំណាកតាម **ប.គ.៣**

• វាយតម្លៃប្រភេទពូជផ្សេង(**ពូជលាយ**) ស្មៅហាមឃាត់ កម្រិតបំផ្លាញដោយជំងឺហាមឃាត់ ស្ថានភាពទូទៅនៃស្រែផលិតកម្ម ការអនុវត្តជាក់ស្តែងនៅស្រែផលិតកម្ម និងការប៉ាន់ស្មានទិន្នផលដែលអាចទទួលបាន។ **<u>សម្គាល់៖</u>** ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី១ និងលើកទី២ត្រូវតែអនុវត្តក្នុងស្រែដដែល លើកលែងតែស្រែដែលបានត្រួតពិនិត្យគុណភាពផលិតកម្មរួចហើយជួបប្រទះប្រធានស័ក្តដូចជា ខូចខាតដោយគ្រោះទឹកជំនន់ គ្រោះរាំងស្ងួត ការបំផ្លាញដោយសត្វល្អិតឬជំងឺធ្ងន់ធ្ងរ ។ល។

• ផ្តល់អនុសាសន៍ជូនផលិតករគ្រាប់ពូជសម្រាប់សកម្មភាពកែលម្អប្រសិនបើចាំបាច់ ហើយត្រូវបញ្ចូលអនុសាសន៍ទាំងនោះទៅក្នុងរបាយណ៍ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។

• បំពេញរបាយការណ៍ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល ដោយមានចុះហត្ថលេខារបស់ផលិតករគ្រាប់ពូជ ឬអ្នកតំណាង និងរក្សាទុក**១(មួយ)ច្បាប់**សម្រាប់ផលិតករកម្មគ្រាប់ពូជ **១(មួយ)ច្បាប់**សម្រាប់មន្ទីរកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទរាជធានី-ខេត្ត និង**១(មួយ)ច្បាប់**សម្រាប់នាយកដ្ឋានពូជដំណាំនៃអគ្គនាយកដ្ឋានកសិកម្ម។

ក្រោយពេលត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល៖

• ជូនដំណឹងផលិតករគ្រាប់ពូជ អំពីការបដិសេធស្រែផលិតកម្មគ្រាប់ពូជ ប្រសិនបើស្រែផលិតកម្មនោះ មានគុណភាពក្រោមស្តង់ដារទីវាលធ្ងន់ធ្ងរ។

<u>ខ. ការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជ</u>

មុនពេលត្រួតពិនិត្យគុណភាពគ្រាប់ពូជ៖

• ពិនិត្យពាក្យស្នើសុំក្នុងទម្រង់(**ខ**) និងណាត់ជួបជាមួយផលិតករគ្រាប់ពូជយ៉ាងហោចណាស់២៤ម៉ោងមុនពេលចុះត្រួតពិនិត្យគុណភាព

• ផ្ទៀងផ្ទាត់ទម្រង់(**ខ**) ដើម្បីប្រាកដអំពីទីតាំងឃ្លាំង បរិមាណគ្រាប់ពូជ ប្រភេទពូជ ថ្នាក់គ្រាប់ពូជ និងចំនួនឡូត៍គ្រាប់ពូជដែលត្រូវត្រួតពិនិត្យ

- កំណត់ឡូត៍គ្រាប់ពូជសម្រាប់យកសំណាក បន្ទាប់ពីទទួលបានបញ្ជីឡូត៍គ្រាប់ពូជពីផលិតករគ្រាប់ពូជ ដែលមានក្នុងទម្រង់(ខ)
- ត្រៀមជាស្រេចនូវមធ្យោបាយធ្វើដំណើរ និងឧបករណ៍ត្រួតពិនិត្យគុណភាពគ្រាប់ពូជ ដូចជា ដែកឆាំគ្រាប់ពូជ ជញ្ជីងថ្លឹង ថាសដាក់គ្រាប់ពូជ ក្រដាសស្អិតកត់បិទ ថង់ប្លាស្ទិច ហ្វឺតសរសេរ ម៉ាស់ពាក់ការពារស្រោមដៃ និងវ៉ែនតាការពារភ្នែក។

<u>អំឡុងពេលត្រួតពិនិត្យគុណភាពគ្រាប់ពូជ៖</u>

- យកសំណាកដោយចៃដន្យ ដោយអនុលោមទៅតាមវិធានរបស់អ៊ីសតា (ISTA)
- បិទស្លាកសម្គាល់គ្រាប់ពូជដែលបានយកសំណាកឱ្យបានត្រឹមត្រូវសម្រាប់ការវិភាគគុណភាព
- វិភាគគុណភាពគ្រាប់ពូជនៅមន្ទីរពិសោធន៍។

<u>ក្រោយពេលត្រួតពិនិត្យគុណភាពគ្រាប់ពូជ៖</u>

- សរសេររបាយការណ៍លទ្ធផលនៃការវិភាគ រួចបញ្ជូនទៅនាយកដ្ឋានពូជដំណាំនៃអគ្គនាយកដ្ឋានកសិកម្ម។

២. សេចក្តីសង្ខេបនៃដំណើរការត្រួតពិនិត្យគុណភាព

២.១. គោលបំណងនៃការត្រួតពិនិត្យគុណភាព

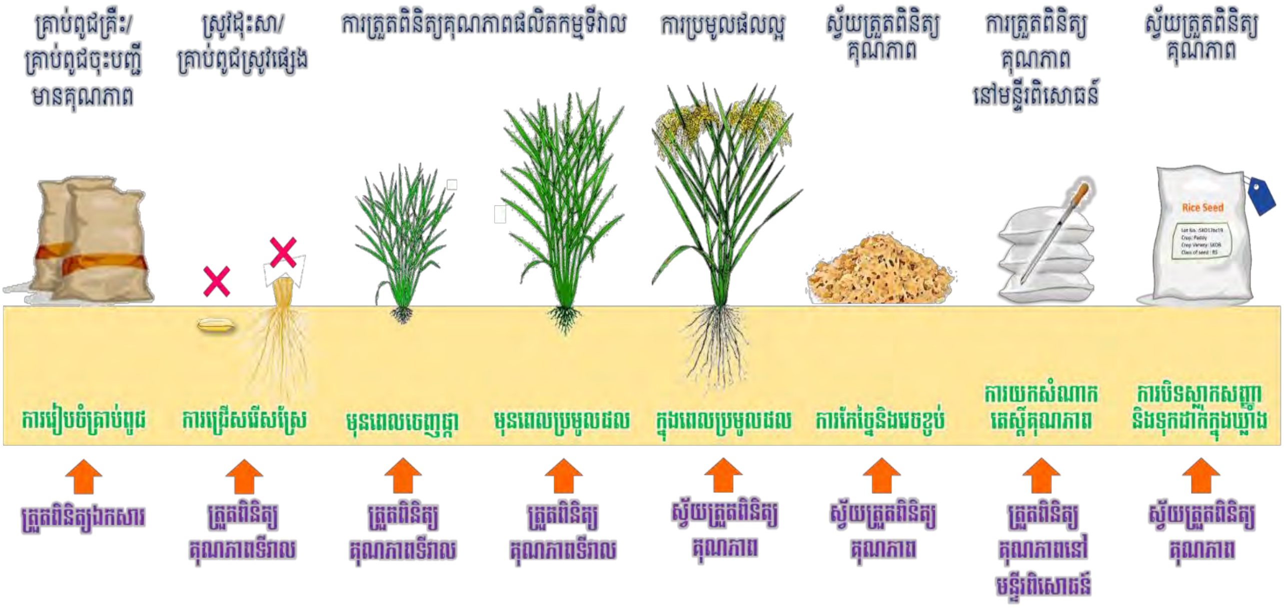
- ធ្វើចំណាត់ថ្នាក់ និងជាគំរូផលិតផលធៀបទៅនឹងស្តង់ដារគុណភាពគ្រាប់ពូជ
- ជំរុញធុរកិច្ចផលិតផលគ្រាប់ពូជស្រូវប្រកបដោយយុត្តិធម៌មនិងប្រសិទ្ធភាព
- បង្ហាញសូចនាករជាក់លាក់អំពីគុណភាពនៃផលិតផលគ្រាប់ពូជដល់អ្នកទិញយកទៅផលិត។

២.២. វិធានការគ្រប់គ្រងគុណភាពគ្រាប់ពូជ

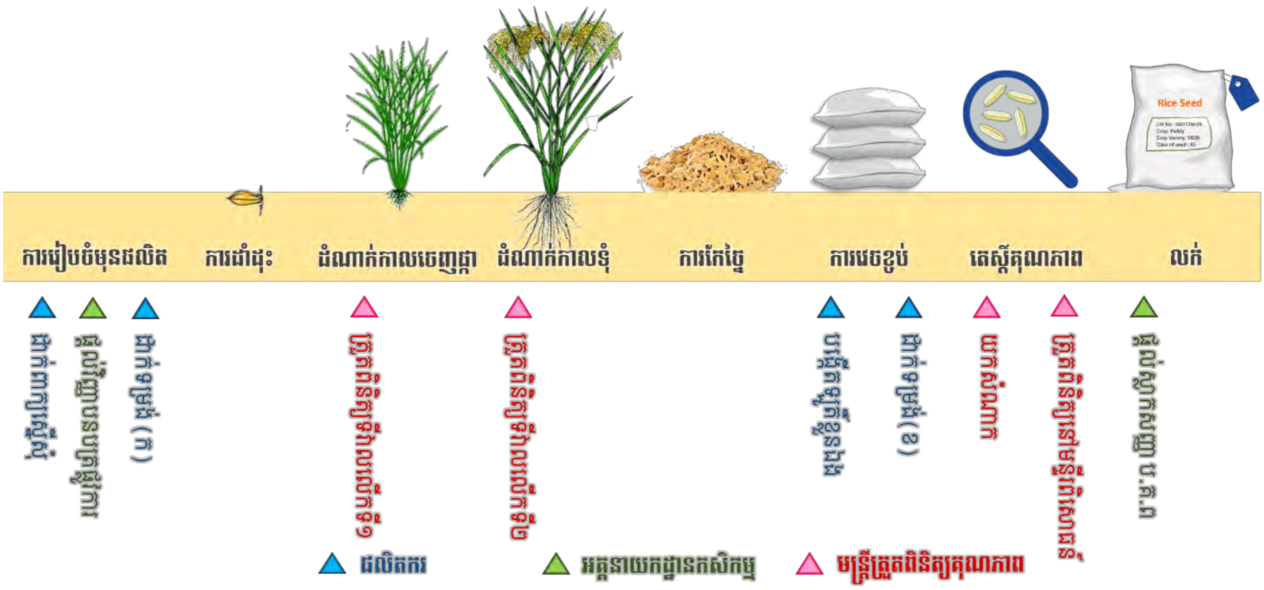
ហានីភ័យមួយចំនួនមានជាប់ឬលាយឡំជាមួយគ្រាប់ពូជនៅក្នុងដំណើរការផលិតកម្មគ្រាប់ពូជស្រូវ ដែលមន្ត្រីត្រួតពិនិត្យគុណភាពគួរពិចារណាស្របតាមនីតិវិធី **ប.គ.៣**។ ការត្រួតពិនិត្យគុណភាពត្រឹមត្រូវនឹងអាចបន្ថយហានីភ័យនៃការលាយឡំទាំងនោះបាន។ ដំណើរការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវ រួមមាន៖ (១)ការពិនិត្យឯកសារ (២)ការត្រួតពិនិត្យគុណភាពផលិតកម្មនៅទីវាល (៣)ការយកសំណាកនិងការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជនៅមន្ទីរពិសោធន៍ និង (៤)ស្វ័យត្រួតពិនិត្យគុណភាពនៃផលិតករគ្រាប់ពូជ ដើម្បីប្រាកដថាភាពសុទ្ធនៃគ្រាប់ពូជត្រូវបានបញ្ជាក់ ឬធានា។

ហានីភ័យ		វិធានការ
១	ការលាយឡំមកជាមួយគ្រាប់ពូជគ្រឹះ ឬគ្រាប់ពូជចុះបញ្ជី	• ប្រើប្រាស់គ្រាប់ពូជគ្រឹះ ឬគ្រាប់ពូជចុះបញ្ជីដែលស្របតាមស្តង់ដារត្រឹមត្រូវ និងមានប្រភពច្បាស់លាស់។
២	សំណល់គ្រាប់ពូជផ្សេងក្នុងស្រែកាលពីរដូវដាំដុះមុន	• ជ្រើសរើសដីស្រែដែលធ្លាប់ដាំប្រភេទពូជដដែល ឬដំណាំផ្សេងគ្រាប់តូចៗមិនមែនជាស្រូវឱ្យបានយ៉ាងហោច(១)រដូវ និង • សម្អាតដីស្រែដោយទុកឱ្យគ្រាប់ពូជផ្សេងដុះអស់ រួចប្រើប្រាស់ថ្នាំស្មៅប្រភេទមិនជ្រើសរើស ដើម្បីសម្លាប់មួរ ឬសាស្រូវ និងប្រើប្រាស់វិធានការក្សេត្រសាស្ត្រផ្សេងទៀត។
៣	ការលាយឡំជាមួយគ្រាប់ពូជមានជំងឺហាមឃាត់	• ប្រើប្រាស់ថ្នាំកសិកម្មដោយប្រឡាក់គ្រាប់ពូជមុនដាំ • គ្រប់គ្រងជំងឺហាមឃាត់ឱ្យបានត្រឹមត្រូវទៅតាមស្តង់ដារទីវាល។
៤	ការលាយឡំជាមួយគ្រាប់ពូជស្មៅហាមឃាត់	• គ្រប់គ្រងស្មៅឱ្យបានត្រឹមត្រូវទៅតាមស្តង់ដារទីវាល។
៥	ការលាយឡំជាមួយគ្រាប់ពូជស្រូវផ្សេងក្នុងពេលប្រមូលផល	• ទុកគម្លាតស្រែផលិតកម្មគ្រាប់ពូជស្រូវឱ្យឆ្ងាយពីស្រែផលិតកម្មស្រូវផ្សេង

		• សម្អាតម៉ាស៊ីនច្រូតឱ្យបានត្រឹមត្រូវមុនពេលប្រមូលផលគ្រាប់ពូជស្រូវ។
៦	ការលាយជាមួយគ្រាប់ពូជផ្សេងក្នុងអំឡុងពេលកែច្នៃគ្រាប់ពូជ និងវេចខ្ចប់	• ពិនិត្យដំណើរការអនុវត្តសកម្មភាពក្រោយការប្រមូលផលនិងស្វ័យត្រួតពិនិត្យគុណភាពគ្រាប់ពូជឱ្យបានត្រឹមត្រូវ • ពិនិត្យសាឡើងវិញសំបកបាវវេចខ្ចប់ជាមួយឈ្មោះពូជស្រូវ។
៧	ការច្រឡំអំឡុងពេលយកសំណាក និងវិភាគគ្រាប់ពូជស្រូវ	• ដាក់ស្លាកសម្គាល់ឱ្យបានត្រឹមត្រូវបន្ទាប់ពីយកសំណាកគ្រាប់ពូជរួច។
៨	ការវេចខ្ចប់និងបិទស្លាកសញ្ញាខុស	• ពិនិត្យសំបកវេចខ្ចប់គ្រាប់ពូជសម្រាប់លក់ ព្រមទាំងស្លាកសញ្ញាបញ្ជាក់គុណភាព **ប.គ.ព** ដែលត្រូវបិទភ្ជាប់។



២.៣. ដំណើរការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវតាម ប.គ.ព



គំនូសបំព្រួញក្នុងដំណើរការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវតាម ប.គ.ព

អ្នកទទួលបន្ទុក		ឯកសារពាក់ព័ន្ធ
ផលិតករ/ កសិករចុះកិច្ចសន្យា	**ការធ្វើផែនការផលិតកម្មគ្រាប់ពូជ** ចុះកិច្ចសន្យាជាមួយកសិករផលិតគ្រាប់ពូជ និងពិនិត្យស្រែផលិតកម្ម	
ផលិតករ >>> PDAFF/GDA	**ការដាក់ពាក្យស្នើសុំលិខិតអនុញ្ញាតធ្វើអាជីវកម្មពូជដំណាំ** ព័ត៌មាននៃផលិតករគ្រាប់ពូជ និងផែនការរបស់ផលិតករគ្រាប់ពូជ (ដាក់៣(បី)ខែមុនពេលដំណើរការផលិតកម្មគ្រាប់ពូជ)	ឧបសម្ព័ន្ធ 1-A
GDA	**ការផ្តល់លិខិតអនុញ្ញាតធ្វើអាជីវកម្មពូជដំណាំ** ផ្តល់ជូនដោយ GDA (អំឡុងពេល២០ថ្ងៃបន្ទាប់ពីទទួលពាក្យស្នើសុំ)	ឧបសម្ព័ន្ធ 1-B
ផលិតករ >>> PDAFF/GDA	**ការដាក់ទម្រង់(ក)៖ ផែនការផលិតកម្មគ្រាប់ពូជស្រូវប្រចាំរដូវ** ប្រភពគ្រាប់ពូជ, ផ្ទៃដីដាំដុះ។ល។ (យ៉ាងហោចណាស់២០ថ្ងៃមុនផលិតកម្មគ្រាប់ពូជស្រូវ)	ឧបសម្ព័ន្ធ 1-C
ផលិតករ/ កសិករចុះកិច្ចសន្យា	**ដំណើរការផលិតកម្មគ្រាប់ពូជក្នុងស្រែដែលបានកំណត់** ស្វ័យគ្រប់គ្រងត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល	
មន្ត្រីត្រួតពិនិត្យ PDAFF/DCS	**ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី១ និងការធ្វើរបាយការណ៍** ត្រួតពិនិត្យមុនពេលចេញផ្កា និងធ្វើរបាយការណ៍ភ្លាមបន្ទាប់ពីត្រួតពិនិត្យគុណភាព	ឧបសម្ព័ន្ធ 1-D/1-E
មន្ត្រីត្រួតពិនិត្យ PDAFF/DCS	**ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី២ និងការធ្វើរបាយការណ៍** ត្រួតពិនិត្យក្នុងដំណាក់កាលស្រូវដាក់ម្សៅ និងធ្វើរបាយការណ៍ភ្លាមបន្ទាប់ពីត្រួតពិនិត្យគុណភាព	ឧបសម្ព័ន្ធ 1-D/1-E
ផលិតករ/	**ការងារប្រមូលផល និងក្រោយប្រមូលផល**	

គំនូសបំព្រួញក្នុងដំណើរការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវតាម ប.គ.ព

អ្នកទទួលបន្ទុក		ឯកសារពាក់ព័ន្ធ
កសិករចុះកិច្ចសន្យា	ត្រួតពិនិត្យគុណភាពក្នុងពេលប្រមូលផល សម្ងួត កែច្នៃ វេចខ្ចប់ និងរក្សាទុក	
ផលិតករ/ កសិករចុះកិច្ចសន្យា	**ស្វ័យចាត់ចែងឡូត៍គ្រាប់ពូជ** ចាត់ចែងឡូត៍គ្រាប់ពូជផ្អែកលើកសិករចុះកិច្ចសន្យា ពូជ ថ្នាក់គ្រាប់ពូជ រដូវកាល/ឆ្នាំផលិត និងស្រែ	
ផលិតករ/ កសិករចុះកិច្ចសន្យា	**ស្វ័យត្រួតពិនិត្យគុណភាពគ្រាប់ពូជបឋម** ភាពសុទ្ធ កម្ទេចកម្ទី គ្រាប់ស្មៅ គ្រាប់ពូជស្រូវផ្សេង គ្រាប់ដំណាំផ្សេង ស្រូវក្រហម សំណើមគ្រាប់ និង ដំណុះគ្រាប់ពូជ	
ផលិតករ >>> PDAFF/GDA	**ការដាក់ទម្រង់(ខ)៖ សំណើសុំត្រួតពិនិត្យគុណភាពគ្រាប់ពូជ** ដាក់ជូន PDAFF/GDA	ឧបសម្ព័ន្ធ 1-F
មន្ត្រីត្រួតពិនិត្យ PDAFF/DCS	**ការយកសំណាកសម្រាប់ត្រួតពិនិត្យគុណភាពនៅមន្ទីរពិសោធន៍** ត្រូវយកសំណាកឱ្យបានត្រឹមត្រូវ	
មន្ត្រីត្រួតពិនិត្យ NAL/PDAFF	**ការវិភាគគុណភាពគ្រាប់ពូជនៅមន្ទីរពិសោធន៍** ភាពសុទ្ធ កម្ទេចកម្ទី គ្រាប់ស្មៅ គ្រាប់ពូជស្រូវផ្សេង គ្រាប់ដំណាំផ្សេង ស្រូវក្រហម សំណើមគ្រាប់ និង ដំណុះគ្រាប់ពូជ	
មន្ត្រីត្រួតពិនិត្យ NAL/PDAFF	**របាយការណ៍វិភាគគុណភាពគ្រាប់ពូជ** បង្ហាញលទ្ធផលវិភាគ និងសេចក្តីសន្និដ្ឋាន	ឧបសម្ព័ន្ធ 1-G/1-F
GDA >>> ផលិតករ	**ការជូនព័ត៌មានអំពីលទ្ធផលនៃការវិភាគគុណភាពគ្រាប់ពូជដល់ផលិតករគ្រាប់ពូជ** សម្រេច បដិសេធ ឬស្នើឱ្យចាត់វិធានការកែលម្អក្នុងអំឡុងពេល ៥(ប្រាំ)ថ្ងៃនៃថ្ងៃធ្វើការ	
GDA >>> ផលិតករ	**ការផ្តល់ស្លាកសញ្ញាបញ្ជាក់គុណភាព ប.គ.ព** ផ្តល់ស្លាកសញ្ញាបញ្ជាក់គុណភាព ប.គ.ព ជូនផលិតករទៅតាមការដាក់ពាក្យទម្រង់(ខ)	

៣. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល

៣.១. គោលបំណង និងទិដ្ឋភាពត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល

ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលត្រូវធ្វើឡើងយ៉ាងហោចណាស់ចំនួន**២(ពីរ)ដង**ក្នុងអំឡុងពេលផលិតកម្មគ្រាប់ពូជ។ ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី១ធ្វើឡើងមុនដំណាក់កាលចេញផ្កា និងលើកទី២នៅដំណាក់កាលស្រូវដាក់ម្សៅ។ ក្នុងករណីលទ្ធផលនៃការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី២ មិនបានស្របតាមស្តង់ដារទីវាល ប៉ុន្តែអាចកែលម្អបាន ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលគួរតែធ្វើសាឡើងវិញ ដូចមានចែងនៅចំណុច **២.៧.៥** ក្នុងសៀវភៅ **ប.គ.៣** សម្រាប់ផលិតកម្មនិងអាជីវកម្មគ្រាប់ពូជស្រូវ។

៣.១.១. ការត្រួតពិនិត្យគុណភាពផលិតកម្មនៅទីវាលលើកទី១ នៅដំណាក់កាលចេញផ្កា

<u>គោលបំណងនៃការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល</u>

- ដើម្បីផ្តល់ប្រឹក្សាសមស្របដល់ផលិតករគ្រាប់ពូជឱ្យអនុវត្តស្របទៅតាមស្តង់ដារទីវាល។

<u>ទិដ្ឋភាពត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល</u>

១. ពិនិត្យប្រភពគ្រាប់ពូជយកមកប្រើប្រាស់ក្នុងផលិតកម្ម ដូចជាព័ត៌មានលើសំបកបាវចេចខ្ចប់ ស្លាកបិទភ្ជាប់ វិក្កយបត្រ ជាដើម។ល។

២. ពិនិត្យគម្លាត និងប្រវត្តិដាំដុះនៃស្រែផលិតកម្ម

៣. រាប់ចំនួនដើមពូជលាយក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ ចំនួន១០កន្លែង

៤. រាប់ចំនួនស្មៅហាមឃាត់ក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ ចំនួន១០កន្លែង

៥. វាយតម្លៃស្ថានភាពជំងឺក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ ចំនួន១០កន្លែង និង

៦. ត្រួតពិនិត្យស្ថានភាពទូទៅនិងការគ្រប់គ្រងផលិតកម្មនៃស្រែដែលបានត្រួតពិនិត្យគុណភាព។

៣.១.២. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី២ នៅដំណាក់កាលដាក់ម្សៅ

<u>គោលបំណងនៃការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល</u>

- ដើម្បីពិនិត្យមើលថាតើស្រែផលិតកម្មគ្រាប់ពូជស្រូវស្របទៅតាមស្តង់ដារទីវាលដែរឬទេ ដើម្បីអនុញ្ញាតឱ្យអ្នកផលិតគ្រាប់ពូជប្រមូលផលសម្រាប់ការកែច្នៃជាផលិតផលគ្រាប់ពូជស្រូវសម្រេច។

<u>ទិដ្ឋភាពត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលៈ</u>

១. រាប់ចំនួនដើមពូជលាយក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ ចំនួន១០កន្លែង

២. រាប់ចំនួនស្មៅហាមឃាត់ ក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ និងចំនួន១០កន្លែង

៣. វាយតម្លៃស្ថានភាពជំងឺក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ និងចំនួន១០កន្លែង

៤. វាយតម្លៃភាគរយនៃការបំផ្លាញដោយជំងឺហាមឃាត់ក្នុងស្រែផលិតកម្មគ្រាប់ពូជទាំងមូលដែលបានត្រួតពិនិត្យ។

៣.១.៣. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលសម្រាប់ស្រែជំនួស ក្នុងករណីចាំបាច់

<u>គោលបំណងនៃការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល</u>

- ដើម្បីពិនិត្យមើលថាតើស្រែផលិតកម្មគ្រាប់ពូជស្រូវស្របទៅតាមស្តង់ដារទីវាលដែរឬទេសម្រាប់ជំនួសស្រែផលិតកម្មដែលរងការបំផ្លាញដោយសារប្រធានស័ក្តដូចជា៖ គ្រោះធម្មជាតិ ការបំផ្លាញពីសមាសភាពចង្រៃ។ល។ បន្ទាប់ពីការត្រួតពិនិត្យគុណភាពផលិតម្មទីវាលលើកទី១។

<u>**ទិដ្ឋភាពត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល**</u>

១. រាប់ចំនួនដើមពូជលាយក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ ចំនួន១០កន្លែង

២. រាប់ចំនួនស្មៅហាមឃាត់ដែលអាចជះឥទ្ធិពលលើគុណភាពគ្រាប់ពូជក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ ចំនួន១០កន្លែង

៣. វាយតម្លៃស្ថានភាពជំងឺក្នុងផ្ទៃដីដែលបានត្រួតពិនិត្យលើផ្ទៃដី១ម៉ែត្រការ៉េ ចំនួន១០កន្លែង

៤. វាយតម្លៃភាគរយនៃការបំផ្លាញដោយជំងឺហាមឃាត់ក្នុងស្រែផលិតកម្មគ្រាប់ពូជទាំងមូលដែលបានត្រួតពិនិត្យ។

៣.២. ផ្ទៀងផ្ទាត់ប្រភពគ្រាប់ពូជគ្រឹះ ឬគ្រាប់ពូជចុះបញ្ជី

១. នៅក្នុងដំណាក់កាលត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី១ ត្រូវពិនិត្យស្លាកឬស្លាកសញ្ញា បាវវេចខ្ចប់គ្រាប់ពូជ និងវិក្កយបត្រលក់គ្រាប់ពូជគ្រឹះ ឬគ្រាប់ពូជចុះបញ្ជី។

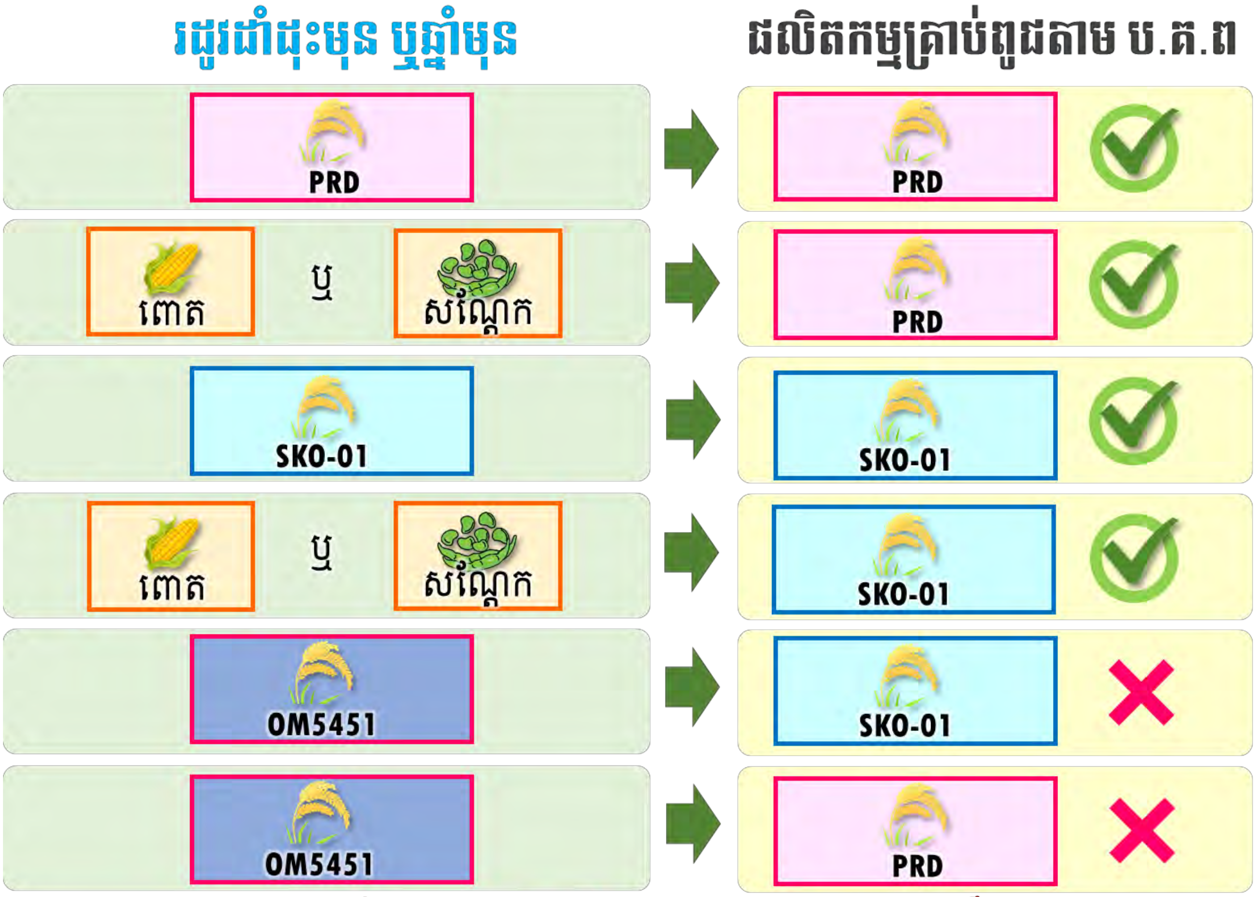
២. គ្រាប់ពូជគ្រឹះ ឬគ្រាប់ពូជចុះបញ្ជីគួរតែមានប្រភពច្បាស់លាស់ពីអង្គភាពឬគ្រឹះស្ថានផលិតគ្រាប់ពូជដែលមានការអនុញ្ញាតស្របច្បាប់ដូចជា វិទ្យាស្ថានស្រាវជ្រាវ និងអភិវឌ្ឍន៍កសិកម្មកម្ពុជា(CARDI) និងស្ថានីយកសិកម្មដែលមានការទទួលស្គាល់ និងក្រុមហ៊ុននាំចូល ។ល។

៣. ណែនាំផលិតករគ្រាប់ពូជឱ្យរក្សាទុកស្លាកឬស្លាកសញ្ញា បាវវេចខ្ចប់គ្រាប់ពូជ និងវិក្កយបត្រសម្រាប់គោលបំណងនៃការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។

ស្លាកសញ្ញា/សំបកវេចខ្ចប់ វិក្កយបត្រ

៣.៣. លក្ខខណ្ឌតម្រូវសម្រាប់ជ្រើសរើសស្រែផលិតកម្ម

១. ប្រភេទពូជស្រូវតែមួយ ឬប្រភេទដំណាំផ្សេង ត្រូវបានដាំដុះនៅក្នុងស្រែកាលពី**១(មួយ)ឆ្នាំ**ជាប់គ្នាកន្លងមកសម្រាប់ពូជស្រូវប្រកាន់រដូវ ឬ**១(មួយ)រដូវ**ជាប់គ្នាកន្លងមកសម្រាប់ពូជស្រូវមិនប្រកាន់រដូវ។



PRD=ពូជស្រូវផ្ការំដួល, SKO-01=ពូជស្រូវសែនក្រអូប០១, OM5451=ពូជស្រូវអូអឹម

២. ស្រែមិនត្រូវមានស្រូវដុះសា ឬដុះមួរ។

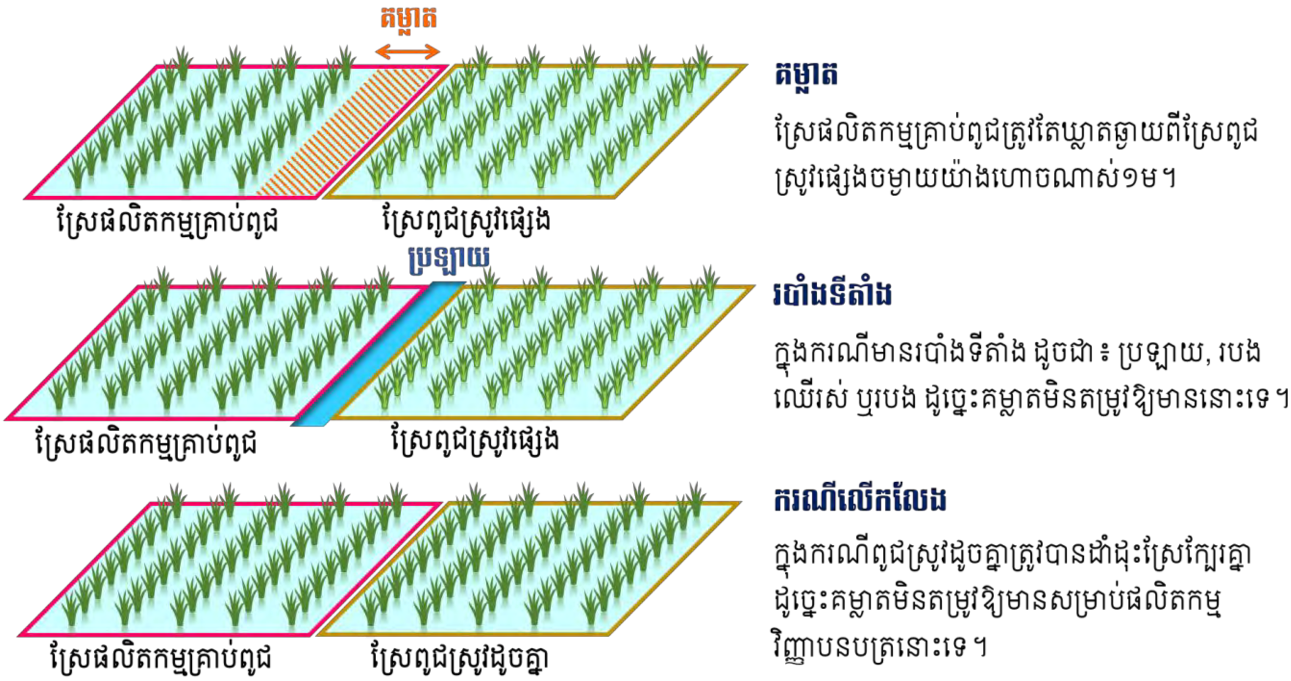
៣. ទំហំផ្ទៃដីផលិតកម្មអប្បបរមាសមស្របដែលអនុញ្ញាតសម្រាប់ថ្នាក់គ្រាប់ពូជមួយ និងប្រភេទពូជមួយ មានចែងដូចខាងក្រោម៖

ថ្នាក់គ្រាប់ពូជ	គ្រាប់ពូជគ្រឹះ	គ្រាប់ពូជចុះបញ្ជី	គ្រាប់ពូជវិញ្ញាបនបត្រ
ទំហំស្រែអប្បបរមា	០.២០ ហ.ត	០.៥០ ហ.ត	៥.០០ ហ.ត

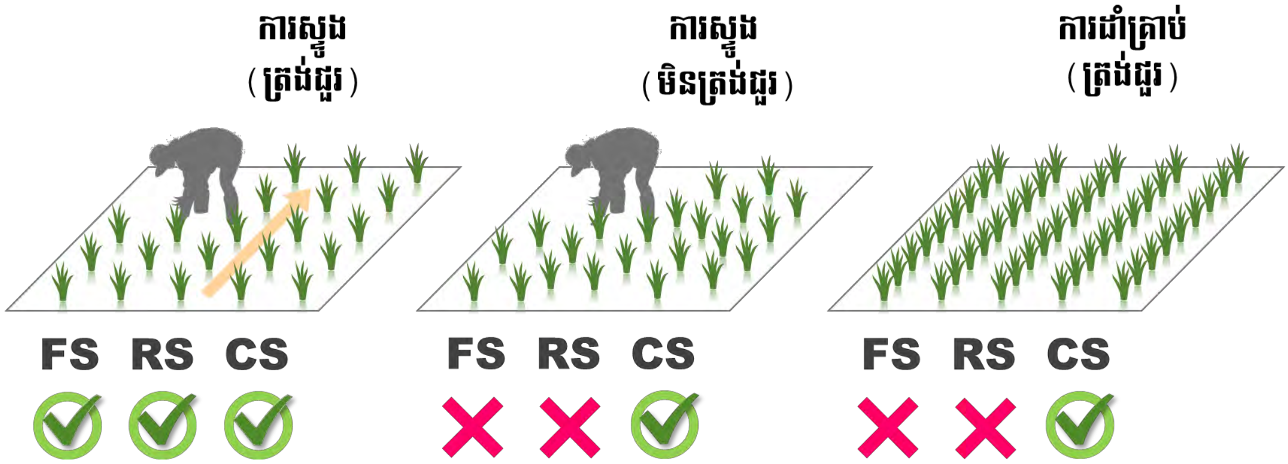
៤. ទំហំស្រែផលិតកម្មអប្បបរមាដែលអាចអនុញ្ញាតសម្រាប់ថ្នាក់គ្រាប់ពូជមួយ និងប្រភេទពូជមួយ មានចែងដូចខាងក្រោម៖

ថ្នាក់គ្រាប់ពូជ	គ្រាប់ពូជគ្រឹះ	គ្រាប់ពូជចុះបញ្ជី	គ្រាប់ពូជវិញ្ញាបនបត្រ
ទំហំស្រែអប្បបរមា	០.២០ ហ.ត	០.៥០ ហ.ត	០.៥០ ហ.ត

៥. ស្រែផលិតកម្មគ្រាប់ពូជត្រូវតែឃ្លាតពីស្រែប្រភេទពូជស្រូវផ្សេងទៀតចម្ងាយ**១(មួយ)ម៉ែត្រ** ឬដោយរបាំងទីតាំង ដូចជា៖ ប្រឡាយ របងឈើរស់ របង។ល។



៦. វិធីសាស្ត្រស្ទូងជាជួរ ១ដើម ក្នុងមួយដំណោត ត្រូវអនុវត្តសម្រាប់ផលិតកម្មគ្រាប់ពូជគ្រឹះ និង១-៣ ដើមក្នុងមួយដំណោតសម្រាប់ផលិតកម្មគ្រាប់ពូជចុះបញ្ជី។ វិធីសាស្ត្រស្ទូងធម្មតា ឬដាំគ្រាប់ត្រង់ជួរ ត្រូវអនុវត្តសម្រាប់ផលិតកម្មគ្រាប់ពូជវិញ្ញាបនបត្រ។



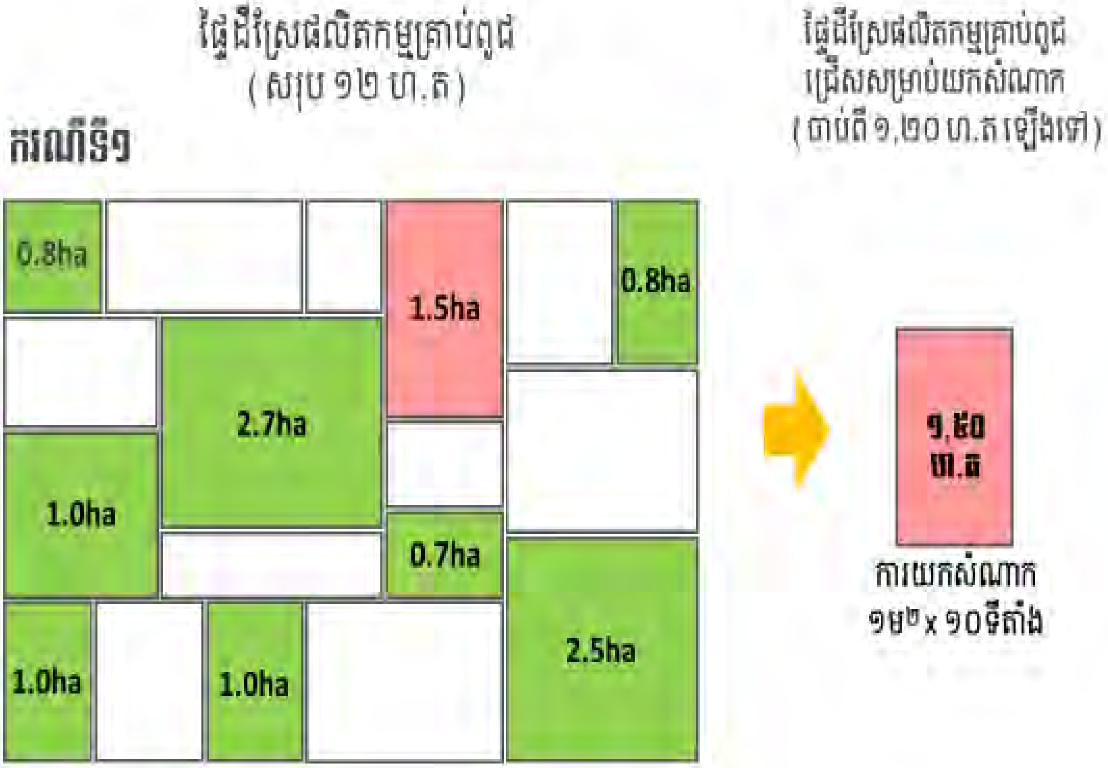
៣.៤. ការជ្រើសរើសផ្ទៃដីយកសំណាក

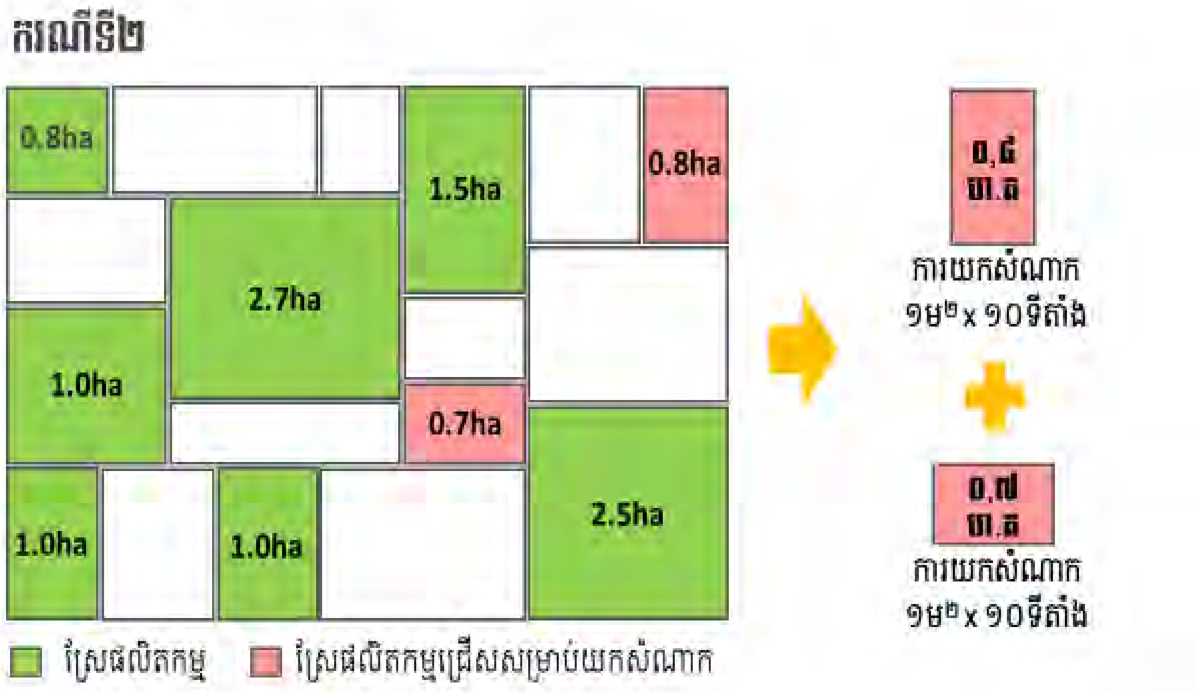
១. ផ្ទៃដីអប្បបរមា១០%នៃផ្ទៃដីផលិតកម្មគ្រាប់ពូជសរុបនៃប្រភេទពូជនីមួយៗត្រូវបានជ្រើសរើសដោយចៃដន្យដោយមន្ត្រីត្រួតពិនិត្យគុណភាពនៃនាយកដ្ឋានពូជដំណាំនៃអគ្គនាយកដ្ឋានកសិកម្ម ឬមន្ទីរកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទរាជធានី-ខេត្ត សម្រាប់ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។ ផ្ទៃដីសម្រាប់យក

សំណាកត្រូវតែជ្រើសរើសទៅតាមអ្នកផលិតគ្រាប់ពូជ រដូវដាំដុះ ឈ្មោះពូជ និងថ្នាក់គ្រាប់ពូជ។

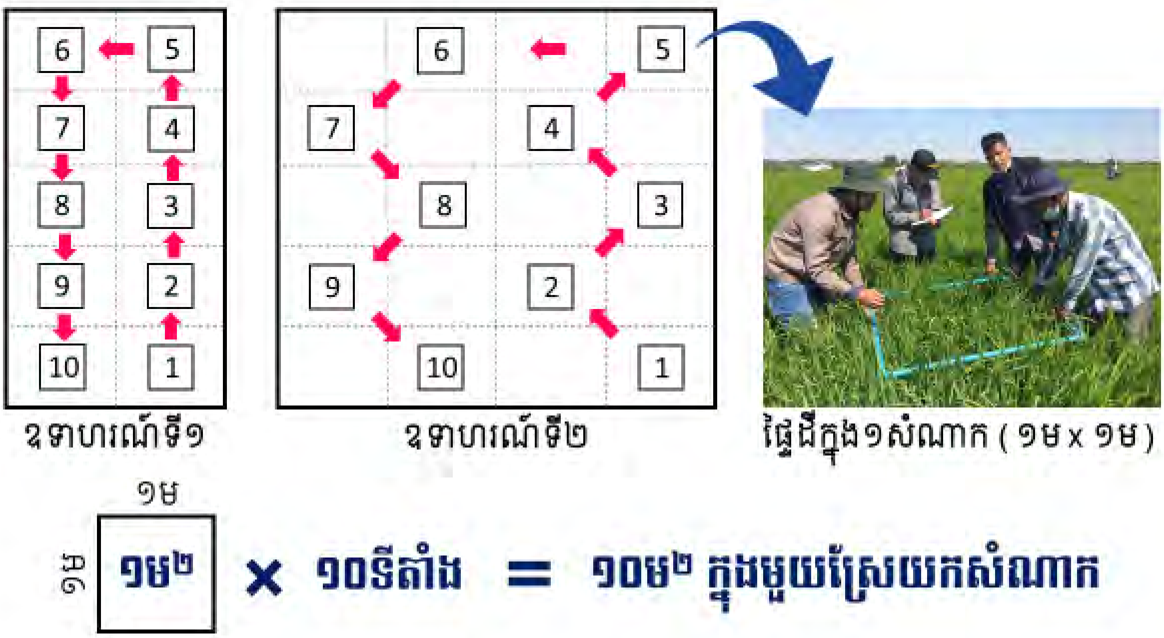
ផ្ទៃដីត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលត្រូវបានជ្រើសរើសដោយចៃដន្យទៅតាមប្រភេទពូជ ថ្នាក់គ្រាប់ពូជ និងរដូវកាលដាំដុះ។

២. ផ្ទៃដីស្រែសម្រាប់ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល អាចតែ១ស្រែ ឬច្រើនស្រែ។ បន្ទាប់ពីការជ្រើសរើសស្រែសម្រាប់ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលរួច ត្រូវជ្រើសរើសផ្ទៃដីសំណាកទំហំ១ម៉ែត្របួនជ្រុងចំនួន១០កន្លែងចេញពីស្រែនីមួយៗ ដែលបានជ្រើសរើសដោយចៃដន្យរួចដើម្បីត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។





៣. ផ្ទៃដីយកសំណាកត្រូវជ្រើសរើសដោយចៃដន្យចេញពីស្រែដែលបានកំណត់រួចសម្រាប់ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។



៣.៥. ស្តង់ដារគុណភាពផលិតកម្មទីវាល

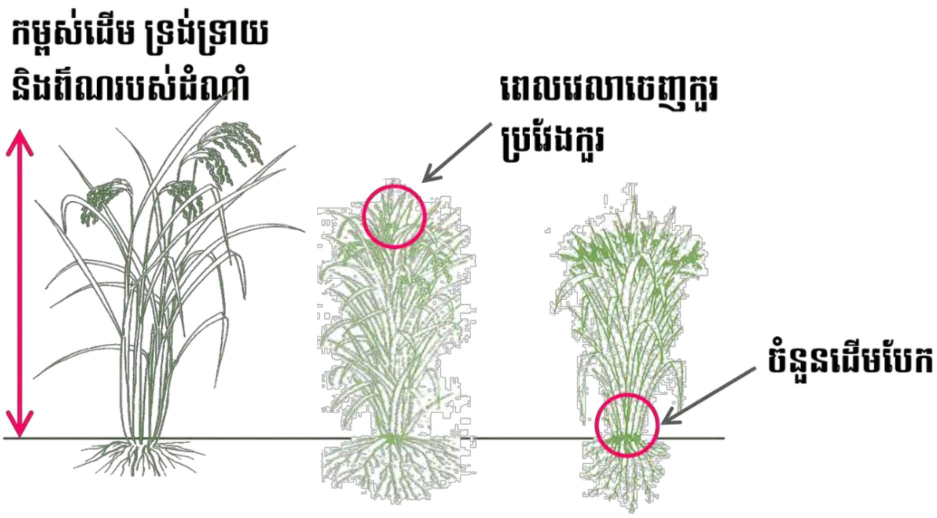
ពូជលាយ ស្មៅហាមឃាត់ និងជំងឺហាមឃាត់ត្រូវរាប់នៅក្នុងទំហំផ្ទៃដីយកសំណាកនៃស្រែត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។ ស្តង់ដារទីវាលបានកំណត់កម្រិតអនុញ្ញាតអតិបរមាដូចខាងក្រោម៖

ប្រភេទ	បរិយាយលម្អិត	ស្តង់ដារក្នុងផ្ទៃដីទំហំ១០ម^{២}		
		ពូជគ្រឹះ	ពូជ ចុះបញ្ជី	ពូជ វិញ្ញាបនបត្រ
ពូជលាយ	ពូជស្រូវផ្សេង រាប់បញ្ចូលទាំងស្រូវក្រហម	០	មិនលើសពី ១ដើម ឬ១ កួរ	មិនលើសពី ៣ដើម ឬ៣ កួរ
ស្មៅហាមឃាត់	១. ស្មៅបែកក្បាល (*Echinochloa* spp.) ២. ស្មៅកន្ទុយក្ងោក (*Leptochloa chinensis*) ៣. កក់ធ័ត្រធំ (*Cyperus iria*)	០	មិនលើសពី ៥ដើម ឬ៥ កួរ	មិនលើសពី ១០ដើម ឬ ១០កួរ
ជំងឺហាមឃាត់	១. ប្លាស់ (Blast) ២. អុចត្នោត (Brown spot) ៣. រលាកស្រទបស្លឹក (Sheath blight)	មិនលើសពី៥០%នៃផ្ទៃដីស្រែផលិតកម្មដែលបានត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល។		

៣.៦. ការកំណត់ប្រភេទពូជលាយ

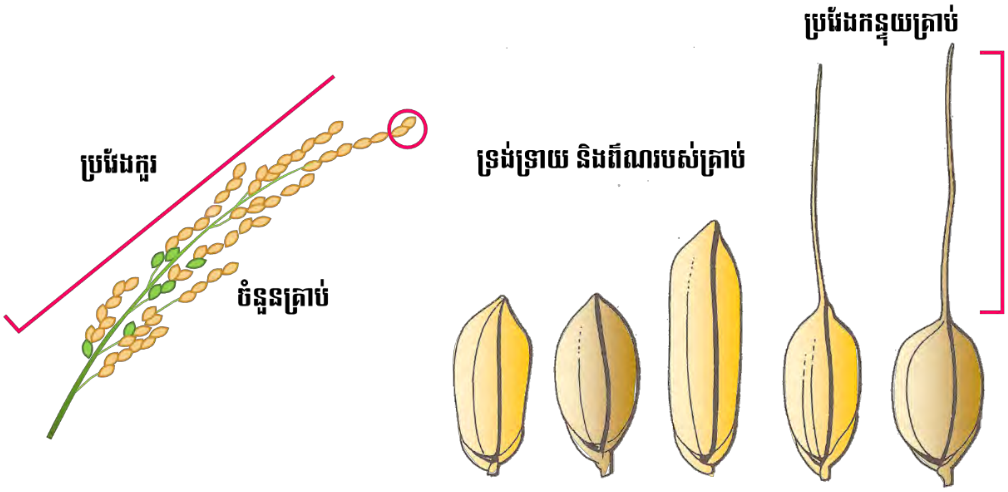
៣.៦.១. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី១នៅមុនដំណាក់កាលចេញផ្កា

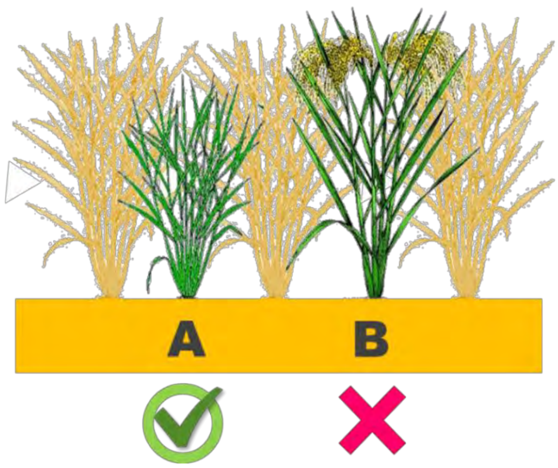
ដើម្បីកំណត់ពូជលាយ ដោយរាប់បញ្ចូលទាំងស្រូវក្រហមផង ត្រូវពិនិត្យ ១)កម្ពស់រុក្ខជាតិ ២)ពេលវេលាចេញកួរ និង៣)ចំនួនដើមបែក។ ប្រសិនបើរកឃើញមានប្រភេទពូជលាយត្រូវណែនាំអ្នកផលិតឱ្យដកវាចោល។ ប្រសិនបើចំនួនពូជលាយរកឃើញលើសពីស្តង់ដារកំណត់ត្រូវណែនាំអ្នកផលិតឱ្យដកវាចោល រួចហើយត្រួតពិនិត្យម្តងទៀតនៅពេលក្រោយ។



៣.៦.២. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី២នៅដំណាក់កាលដាក់ម្សៅ

ដើម្បីកំណត់ពូជលាយ ត្រូវពិនិត្យ ១)ព៌ណនិងការទុំនៃដំណាំ ២)ព៌ណនិងទម្រង់កួរ និង៣)ព៌ណទម្រង់និងចំនួនគ្រាប់ស្រូវ។



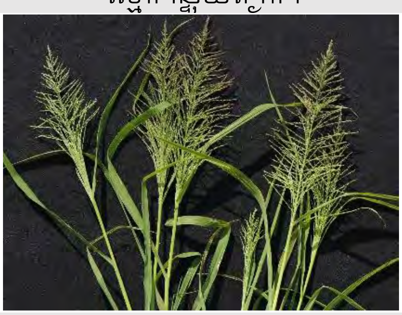


A ពូជលាយមុនចេញផ្កា មិនជះឥទ្ធិពលដល់គុណភាពគ្រាប់ពូជទេ។

B ពូជលាយក្នុងដំណាក់កាលទុំ មិនត្រូវឱ្យមានទេ។

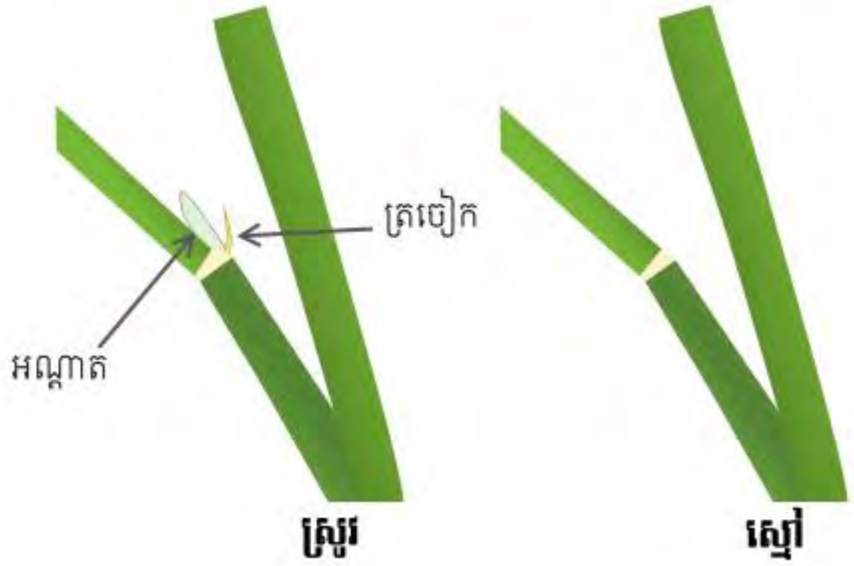
៣.៧. ការកំណត់ស្មៅហាមឃាត់

ស្មៅ**៣(បី)ប្រភេទ**ត្រូវបានកំណត់ជាប្រភេទស្មៅហាមឃាត់ក្នុងផលិតកម្មគ្រាប់ពូជស្រូវតាម **ប.គ.៣**។

ស្មៅបែកក្បាល	ស្មៅកន្ទុយក្ងោក	កក់ឆត្រធំ
		
Echinochloa	*Leptochloa*	*Cyperus*

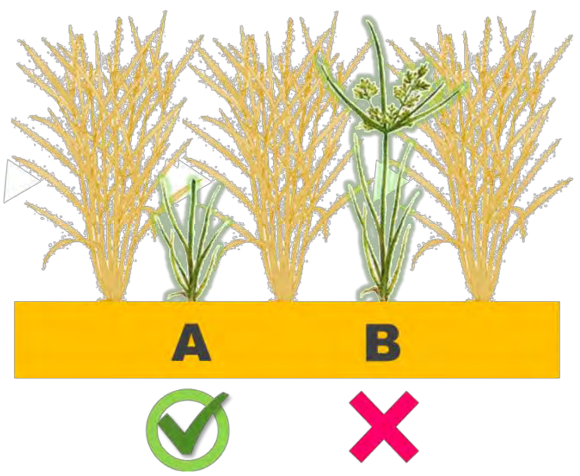
៣.៧.១. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី១នៅមុនដំណាក់កាលចេញផ្កា

ពិនិត្យស្ថានភាពស្មៅនៅក្នុងស្រែ បន្ទាប់មកផ្តល់ប្រឹក្សាដល់អ្នកផលិតស្តីពីបច្ចេកទេសគ្រប់គ្រងស្មៅ។ មន្ត្រីត្រួតពិនិត្យត្រូវពន្យល់ថាតើស្មៅប្រភេទណាមិនអាចទទួលយកបានក្នុងការត្រួតពិនិត្យគុណភាពទីវាលលើកទី២។



៣.៧.២. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី២នៅដំណាក់កាលដាក់ម្សៅ

ពិនិត្យមើលថាតើស្មៅហាមឃាត់ដែលបានរកឃើញអាចទទួលយកបានទេធៀបទៅនឹងស្តង់ដារទីវាល។ ប្រភេទស្មៅតូចៗគ្មានផ្កា គួរតែមិនបាច់យកចិត្តទុកដាក់ទេ ព្រោះវាមិនធ្វើឱ្យប៉ះពាល់ដល់គុណភាពគ្រាប់ពូជស្រូវ។



A ស្មៅហាមឃាត់គ្មានផ្កា មិនជះឥទ្ធិពលដល់គុណភាពគ្រាប់ពូជទេ។

B ស្មៅហាមឃាត់ដែលមានផ្កា មិនត្រូវឱ្យមានទេ។

៣.៨. ការកំណត់ជំងឺហាមឃាត់

ជំងឺហាមឃាត់៣(**បី**)**ប្រភេទ** ដូចជា៖ ជំងឺប្លាស់ ជំងឺអុចត្នោត និងជំងឺរលាកស្រទបស្លឹកត្រូវតែគ្រប់គ្រងឱ្យបានត្រឹមត្រូវនៅក្នុងស្រែផលិតកម្ម។

៣.៨.១. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី១នៅមុនដំណាក់កាលចេញផ្កា

ដើម្បីកំណត់វត្តមានជំងឺត្រូវពិនិត្យមើលរោគសញ្ញាជំងឺលើស្លឹក និងដើមរបស់ដំណាំស្រូវ។ ប្រសិនបើរកឃើញវត្តមានជំងឺត្រូវផ្តល់ប្រឹក្សាដល់អ្នកផលិតស្តីពីបច្ចេកទេសគ្រប់គ្រងជំងឺ។ ជាទូទៅ នៅពេលប្រើប្រាស់ជីអាសូតលើសលុបអាចបណ្តាលឱ្យកើតមានជំងឺប្លាស់ ចំណែកកង្វះអាសូតគឺបង្កឱ្យកើតមានជំងឺអុចត្នោត។

ជំងឺប្លាស់	ជំងឺអុចត្នោត	ជំងឺរលាកស្រទបស្លឹក	ការខូចមិនមែនជាជំងឺ
			
សណ្ឋានរាងស្រួចត្រង់មានពណ៌ត្នោតនិងលឿងលេចឡើងតាមបណ្តោយស្លឹក	សណ្ឋានរាងមូលមានពណ៌ត្នោតចាស់និងលឿងលេចឡើងនៅលើស្លឹក	ជំងឺចាប់ផ្តើមបំផ្លាញពីផ្នែកខាងក្រោមនៃស្រទបស្លឹក	រូបភាពនេះមិនមែនជាជំងឺទេ ប៉ុន្តែជាភាពមិនប្រក្រតីនៃសរីសាស្ត្ររបស់រុក្ខជាតិ

៣.៨.២. ការត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាលលើកទី២នៅដំណាក់កាលដាក់ម្សៅ

រោគសញ្ញាបំផ្លាញខ្លះនៅកួរស្រូវគឺអាចបណ្តាលមកពីដង្កូវស៊ីរូងដើម ឬហេតុផលផ្សេងទៀត។ ដូច្នេះត្រូវពិនិត្យទាំងស្លឹកនិងទាំងកួររបស់ស្រូវ។

ជំងឺប្លាស់	ជំងឺអុចត្នោត	ជំងឺរលាកស្រទបស្លឹក	ការខូចមិនមែនជាជំងឺ
			
ការបំផ្លាញភាគច្រើនរកឃើញនៅលើចង្កំស្លឹកក្រោមកួរស្រូវ	កួរស្រូវប្រែជាពណ៌ត្នោតព្រលែត។ ការបំផ្លាញក៏រកឃើញដែរនៅលើស្លឹក	ស្លឹកទង់ជ័យឡើងស្វិតរញម។ ការបំផ្លាញរកឃើញដែរនៅលើស្រទបស្លឹក	ដំណាំរងការបំផ្លាញដោយដង្កូវស៊ីរូងដើម។ កួរស្រូវងាយដកចេញដោយដៃ

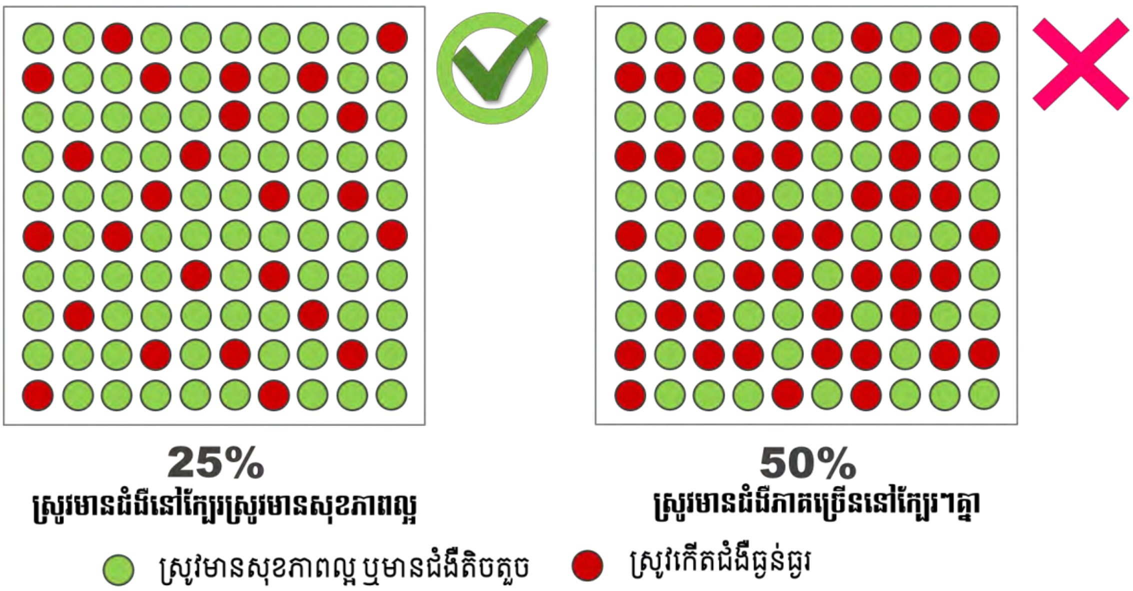
៣.៩. ការវិនិច្ឆ័យលើដំណាំស្រូវទទួលរងផលប៉ះពាល់

៣.៩.១. ការកំណត់ដំណាំស្រូវទទួលរងផលប៉ះពាល់

ប្រសិនបើដើមស្រូវរងផលប៉ះពាល់ដោយជំងឺហាមឃាត់លើស២៥% ស្រែផលិតកម្មនោះត្រូវចាត់ទុកថាមានជំងឺ។

៣.៩.២. ការវាយតម្លៃផលប៉ះពាល់ដោយសារជំងឺហាមឃាត់

ចំនួនគុម្ពស្រូវដែលរងការបំផ្លាញពីជំងឺហាមឃាត់ត្រូវតែតិចជាង៥០% នៅក្នុងស្រែផលិតកម្មគ្រាប់ពូជដែលបានត្រួតពិនិត្យ។ មន្ត្រីត្រួតពិនិត្យគុណភាពត្រូវវាយតម្លៃស្ថានភាពនៃផលប៉ះពាល់ដោយភ្នែក។



៤. ការត្រួតពិនិត្យគុណភាពគ្រាប់ពូជនៅមន្ទីរពិសោធន៍សម្រាប់ផលិតផលគ្រាប់ពូជស្រូវសម្រេច

៤.១. គំនូសបំព្រួញដំណើរការយកសំណាកគ្រាប់ពូជស្រូវ

ផលិតផល (គ្រាប់ពូជ)

មន្ត្រីត្រួតពិនិត្យគុណភាពយកសំណាកដោយអនុលោមទៅតាមវិធានរបស់អ៊ីសតា (ISTA)

សំណាកបឋម

ប្រសិនបើសំណាកបឋមមានឯកសណ្ឋានភាពពេញលេញ គេត្រូវដាក់វាបញ្ចូលគ្នា

សំណាករួម

សំណាករួមអប្បបរមា៧០០ក្រាមត្រូវបញ្ជូនសម្រាប់ការត្រួតពិនិត្យគុណភាព

សំណាកបញ្ជូន

វេចខ្ចប់/បិទស្លាកសញ្ញា (ឡូត៍គ្រាប់ពូជ ឈ្មោះពូជ ថ្នាក់គ្រាប់ពូជ កាលបរិច្ឆេទប្រមូលផល និងអាសយដ្ឋាននៃអ្នកផលិតគ្រាប់ពូជ)

សំណាកវិភាគ

សំណាកអប្បបរមា៥០០ក្រាមត្រូវបានប្រើសម្រាប់វិភាគភាពសុទ្ធ និងបរិមាណនៅសល់ទុកសម្រាប់វិភាគគុណភាពសាជាថ្មីក្នុងករណីចាំបាច់។

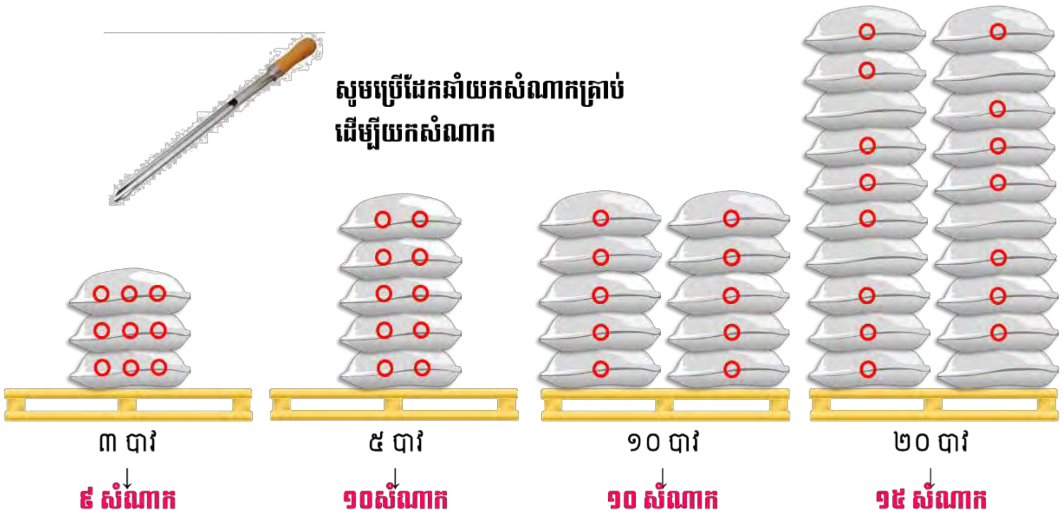
ការវិភាគគុណភាព

៤.២. ការយកសំណាកបឋម

- យកសំណាកបឋមចេញពីបាវបានជ្រើសរើសដោយចៃដន្យដែលមានបរិមាណប្រហាក់ប្រហែលគ្នា
- ដាក់សំណាកបឋមចូលគ្នាទៅជាសំណាករួមតែមួយប៉ុណ្ណោះ នៅពេលសំណាកបឋមមានឯកសណ្ឋានភាពពេញលេញ។

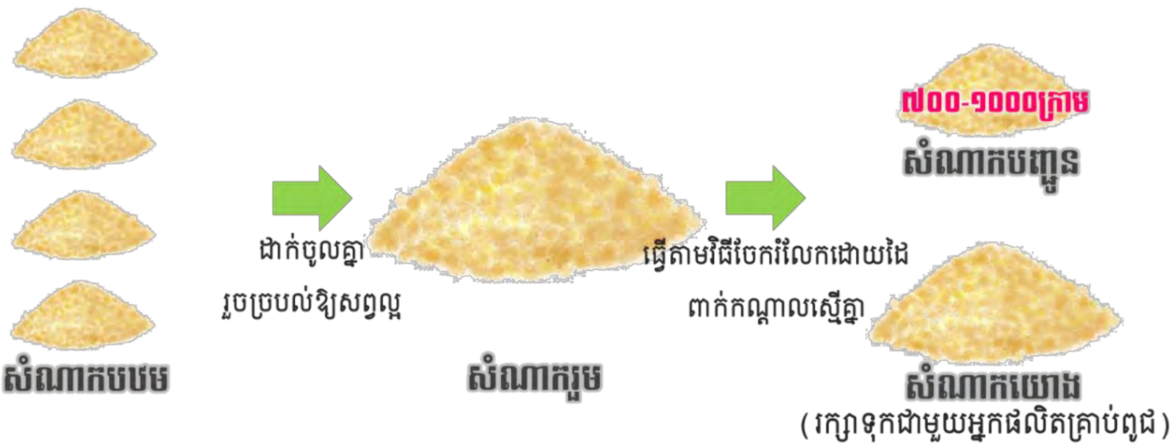
ចំនួនបាវ	ចំនួនសំណាកត្រូវការ
១-៤	៣ សំណាកក្នុង១បាវ
៥-៨	២ សំណាកក្នុង១បាវ
៩-១៥	១ សំណាកក្នុង១បាវ

ចំនួនបាវ	ចំនួនសំណាកត្រូវការ
១៦-៣០	១៥ សំណាកពីបាវផ្សេងៗគ្នា
៣១-៥៩	២០ សំណាកពីបាវផ្សេងៗគ្នា
>៦០	៣០ សំណាកពីបាវផ្សេងៗគ្នា



៤.៣. ការរៀបចំសំណាកបញ្ជូន

- លាយសំណាករួមបញ្ចូលគ្នាឱ្យបានសព្វល្អ
- ដកយកបរិមាណអប្បបរមា៧០០ក្រាមពីសំណាករួមតាមវិធីរំលែកដោយដៃពាក់កណ្តាលស្មើគ្នា
- រក្សាសំណាកដែលនៅសល់ទុកជាសំណាកយោងនៅជាមួយអ្នកផលិតគ្រាប់ពូជ។

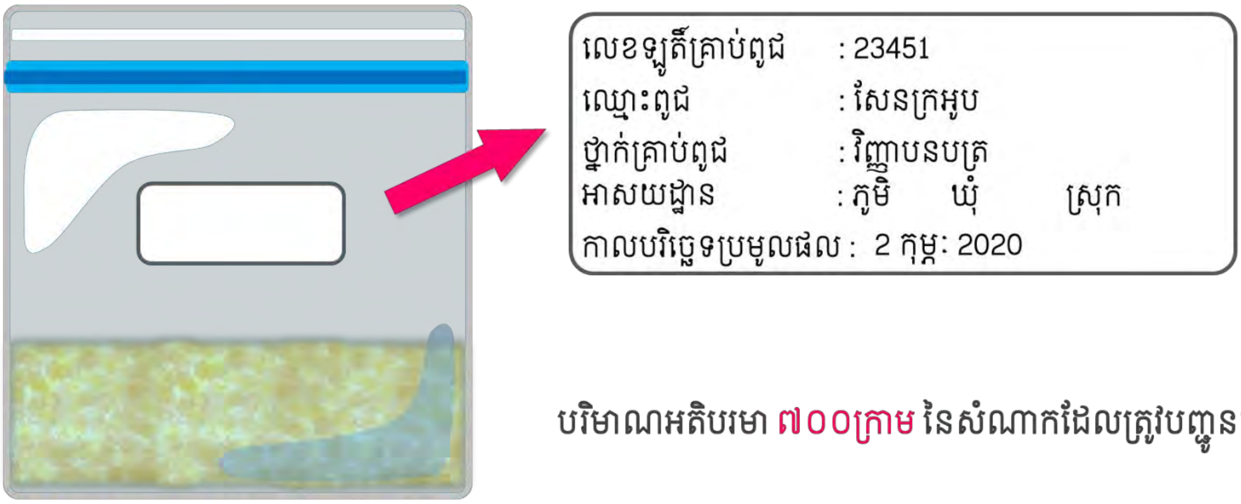


វិធីរំលែកដោយដៃពាក់កណ្តាលស្មើគ្នា

- ចែកពំនូកជា២(**ពីរ**)**ចំណែក** បន្ទាប់មកចែកចំណែកទាំង២នោះ ដើម្បីទទួលបាន៤(បួន)ចំណែកប្រហាក់ប្រហែលគ្នាដោយប្រើបន្ទះឈើសម្រាប់កៀរញែក។
- បន្ទាប់មកដាក់ចំណែកឈមគ្នាបញ្ចូលគ្នា ដើម្បីទទួលបានល្បាយសព្វស្មើគ្នា២ពំនូក។
- ធ្វើសាជាថ្មីនូវនីតិវិធីនេះ ដើម្បីទទួលបានបរិមាណគ្រប់គ្រាន់នៃសំណាក។

៤.៤. ការវេចខ្ចប់ និងបិទស្លាកសំណាកបញ្ជូន

- បរិមាណ៧០០ក្រាមនៃសំណាកបញ្ជូនត្រូវវេចខ្ចប់ដែលមានបិទស្លាកព័ត៌មាន
- សរសេរព័ត៌មានលើស្លាកសញ្ញា រួមមាន៖ ឡូត៍គ្រាប់ពូជ ឈ្មោះពូជ ថ្នាក់គ្រាប់ពូជ កាលបរិច្ឆេទប្រមូលផល និងអាសយដ្ឋានរបស់អ្នកផលិត



បរិមាណអតិបរមា ៧០០ក្រាម នៃសំណាកដែលត្រូវបញ្ជូន។

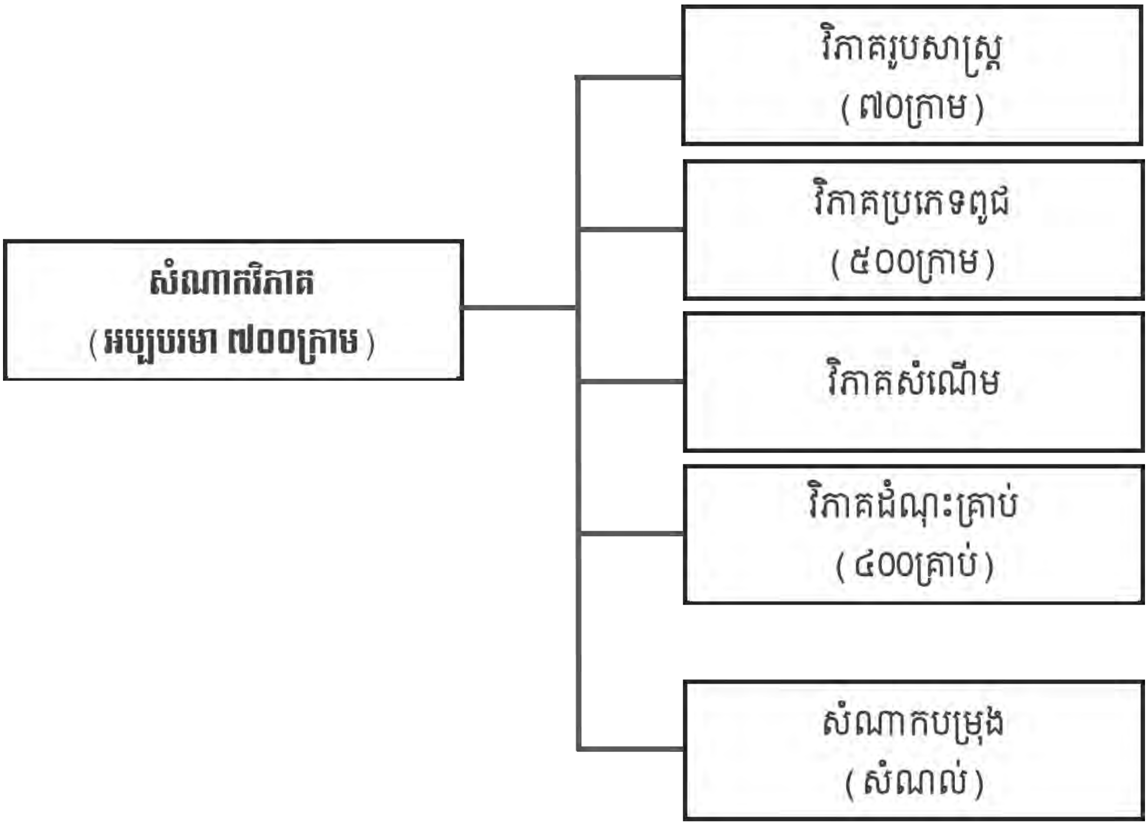
៤.៥. ស្តង់ដារគុណភាពគ្រាប់ពូជស្រូវ

ស្តង់ដារគុណភាពគ្រាប់ពូជស្រូវខាងក្រោមត្រូវបានប្រើប្រាស់សម្រាប់ការវិភាគគុណភាពគ្រាប់ពូជស្រូវនៃផលិតផលគ្រាប់ពូជស្រូវសម្រេច។

កត្តា	ថ្នាក់គ្រាប់ពូជ		
	គ្រាប់ពូជគ្រឹះ	គ្រាប់ពូជចុះបញ្ជី	គ្រាប់ពូជវិញ្ញាបនបត្រ
១. គ្រាប់ពូជសុទ្ធ (អប្បបរមា, %)	**៩៨**	**៩៨**	**៩៨**
២. កម្ទេចកម្ទី (អតិបរមា, %)	**២**	**២**	**២**
គ្រាប់ពូជស្មៅ (អតិបរមា, ចំនួនគ្រាប់/៥០០ក្រាម)	៣	៥	១០
គ្រាប់ពូជដំណាំផ្សេង (អតិបរមា, ចំនួនគ្រាប់/៥០០ក្រាម)	២	៣	៥
គ្រាប់ពូជស្រូវផ្សេង (អតិបរមា, ចំនួនគ្រាប់/៥០០ក្រាម)	១	៥	១៥
ស្រូវក្រហម (អតិបរមា, ចំនួនគ្រាប់/៥០០ក្រាម)	០	២	៥
៣. អត្រាដំណុះ (អប្បបរមា, %)	**៨៥**	**៨៥**	**៨០**
៤. សំណើមគ្រាប់ពូជ (អតិបរមា, %)	**១២**	**១៣**	**១៤**

៤.៦. ដំណើរការត្រួតពិនិត្យគុណភាពក្នុងមន្ទីរពិសោធន៍

វិភាគរូបសាស្ត្រ ប្រភេទពូជ ដំណុះគ្រាប់ និងសំណើមគ្រាប់ត្រូវធ្វើដោយប្រើប្រាស់សំណាកវិភាគ។ សំណាកដែលនៅសល់ត្រូវរក្សាទុកជាសំណាកបម្រុង។



៤.៧. វិភាគរូបសាស្ត្រ

- យក៧០ក្រាមនៃសំណាកវិភាគ រួចរើសយកកម្ទេចកម្ទីរចេញ ដូចជា៖ ដុំថ្ម ដី ចំបើង គ្រាប់ស្មៅ គ្រាប់ពូជដំណាំផ្សេង គ្រាប់ពូជស្រូវផ្សេង គ្រាប់ខ្ចី គ្រាប់បាក់ដែលនៅសល់តិចជាង ៥០%

កម្ទេចកម្ទីរ

a. ដុំថ្ម និងវត្ថុធាតុផ្សេងទៀត
b. គ្រាប់ខ្ចី
c. គ្រាប់បាក់ (បំណែកនៅសល់តិចជាង 50%)

គ្រាប់ពូជសុទ្ធ

a. គ្រាប់ពេញ
b. គ្រាប់គ្មានសំបក
c. គ្រាប់បាក់ (បំណែកនៅសល់លើស 50%)

- ថ្លឹងទម្ងន់កម្ទេចកម្ទីសរុបនៃសំណាក បន្ទាប់មកគណនាភាគរយនៃគ្រាប់ពូជសុទ្ធ។

$$\textbf{កម្ទេចកម្ទី}\ (\%) = \frac{\text{ទម្ងន់កម្ទេចកម្ទី (ក្រាម)}}{\text{ទម្ងន់សំណាក (៧០ក្រាម)}} \times ១០០$$

$$\textbf{គ្រាប់ពូជសុទ្ធ}\ (\%) = ១០០ (\%) - \text{កម្ទេចកម្ទី}\ (\%)$$

ឧ. ទម្ងន់កម្ទេចកម្ទី គឺ <u>១,២ក្រាម។</u>

$$\textbf{កម្ទេចកម្ទី}: \quad \frac{\text{១,២ (ក្រាម)}}{\text{៧០ (ក្រាម)}} \times ១០០ = \boxed{\text{១,៧ (\%)}}$$

$$\textbf{គ្រាប់ពូជសុទ្ធ}: \quad ១០០ (\%) - \text{១,៧} (\%) = \boxed{\text{៩៨,៣ (\%)}}$$

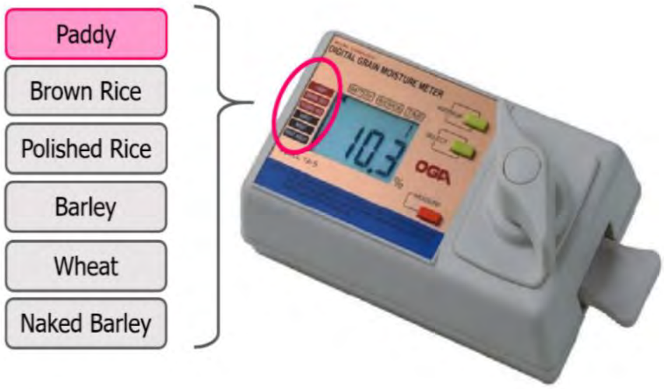
៤.៨. វិភាគប្រភេទពូជ

- រាប់ចំនួនគ្រាប់ពូជស្រូវផ្សេង និងស្រូវក្រហមក្នុងសំណាកវិភាគ៥០០ក្រាម
- ពិនិត្យមើលពណ៌ និងទ្រង់ទ្រាយដើម្បីកំណត់គ្រាប់ពូជស្រូវផ្សេង និងស្រូវក្រហមនៅលើបន្ទះក្ដារវិភាគគ្រាប់ពូជ
- ពិនិត្យមើលកម្ទេចកម្ទីដទៃទៀត ដូចជា៖ គ្រាប់អង្ករបាក់ដែលនៅសល់ក្រោម ៥០% គ្រាប់ខ្ចី គ្រាប់ស្មៅ ដុំថ្ម ឬវត្ថុធាតុផ្សេងទៀត។

ឧទាហរណ៍នៃគ្រាប់ពូជស្រូវផ្សេង

៤.៩. វិភាគសំណើមគ្រាប់

- ជ្រើសរើសពាក្យ 'Paddy' សម្រាប់វាស់សំណើមរបស់គ្រាប់ពូជស្រូវ
- វាស់ចំនួន៣ដង រួចគណនារកតម្លៃមធ្យម
- ក្នុងករណីរកឃើញតម្លៃមិនប្រក្រតី ត្រូវវាស់២ដងថែមទៀត រួចហើយលុបចោលតម្លៃមិនប្រក្រតី បន្ទាប់មកគណនារកតម្លៃមធ្យម។

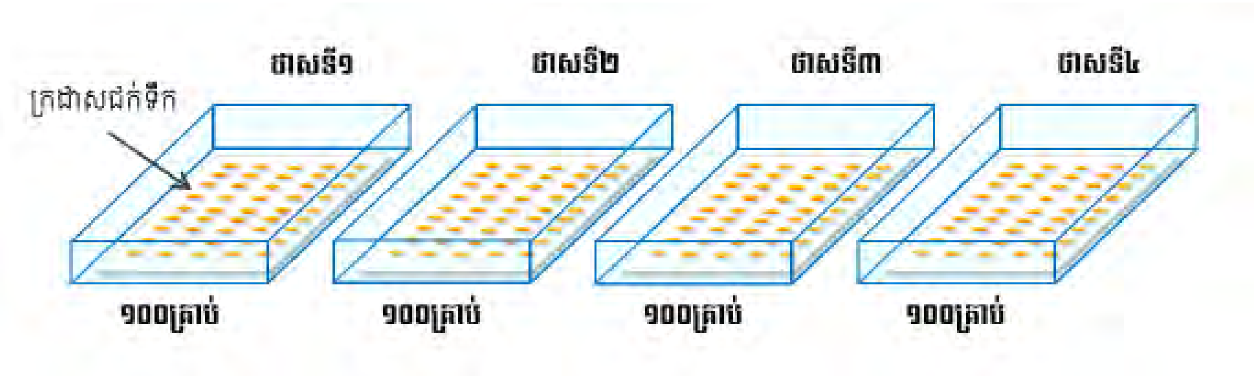


លើកទី១	លើកទី២	លើកទី៣	លើកទី៤	លើកទី៥	មធ្យម
១៣,២	១៣,៥	១៣,៤	-	-	១៣,៤

លើកទី១	លើកទី២	លើកទី៣	លើកទី៤	លើកទី៥	មធ្យម
១៣,៦	១៣,៥	១៨,៨	១៣,៤	១២,៩	១៣,៥

៤.១០. វិភាគដំណុះគ្រាប់

- រៀបចំប្រអប់សម្រាប់ដាក់បណ្ដុះសាកដែលអាចដាក់បាន៤០០គ្រាប់សម្រាប់វិភាគដំណុះគ្រាប់
- ដាក់ក្រដាសជក់ទឹកនៅបាតរបស់ប្រអប់នីមួយៗ រួចរៀបគ្រាប់ពូជចំនួន៤០០គ្រាប់ ដែលចាប់យកដោយចៃដន្យពីសំណាកវិភាគ



- បន្ទាប់ពីរយៈពេល៣(បី)ថ្ងៃ និង៧(ប្រាំពីរ)ថ្ងៃ ត្រូវរាប់ចំនួនគ្រាប់ពូជដែលដុះសរុប រួចគណនាអត្រាដំណុះ។ គ្រាប់ពូជខ្លះដែលដុះអាចរងការបំផ្លាញដោយសារជំងឺផ្សិត ឬងាប់។ ក្នុងករណីនេះ មិនត្រូវរាប់គ្រាប់ពូជទាំងនោះជាគ្រាប់ពូជដុះទេ។

មិនដុះ

ដុះធម្មតា

ដុះល្អ

ទម្រង់កត់ត្រាតេស្តដំណុះ

ថ្ងៃ	ដុះធម្មតា (A)	ដុះខ្សោយ (B)	គ្រាប់រឹង (C)	ងាប់ ឬ ខូច * (D)	ដុះសរុប (A)+(B)
ថ្ងៃទី១	០	០	០	០	០
ថ្ងៃទី២	៣៦	០	០	០	៣៦
ថ្ងៃទី៣	១៥៤	៥	០	១	១៥៩
ថ្ងៃទី៤	២៥២	១២៩	១៣	៦	៣៨១
ថ្ងៃទី៥	២៧៤	៩៩	១៥	១២	៣៧៣
ថ្ងៃទី៦	២៩៣	៧០	១៥	២២	៣៦៣
ថ្ងៃទី៧	២៩៨	៦៥	១៥	២២	៣៦៣

អត្រាដំណុះ (%)

គ្រាប់ពូជដុះសរុប / គ្រាប់ពូជសំណាក (៤០០) X ១០០

ថ្ងៃទី៣: ១៥៩ / ៤០០ X ១០០ = ៣៩,៧៥%

ថ្ងៃទី៧: ៣៦៣ / ៤០០ X ១០០ = ៩០,៧៥%

* គ្រាប់ដុះដែលរងការបំផ្លាញដោយសារផ្សិត ឬងាប់ មិនត្រូវរាប់បញ្ចូលជាគ្រាប់ពូជដុះទេ។

ដំណេកគ្រាប់ពូជ៖

ជាទូទៅ គ្រាប់ពូជស្រូវមិនអាចដុះលូតលាស់ភ្លាមៗបន្ទាប់ពីប្រមូលផលរួច។ រយៈពេលដំណេកគ្រាប់ពូជអាស្រ័យទៅតាមប្រភេទពូជនីមួយៗ។ ជាធម្មតា រយៈពេលដំណេកគ្រាប់ពូជនៃប្រភេទពូជនីមួយៗ ដែលត្រូវបានដាំដុះក្នុងប្រទេសកម្ពុជា គឺថិតក្នុងរង្វង់**២១(ម្ភៃមួយ)ថ្ងៃ** ប៉ុន្តែពូជក្នុងស្រុកខ្លះអាចមានដំណេកគ្រាប់ពី**១(មួយ)ខែ**ទៅ**៣(បី)ខែ**។ ប្រសិនបើអត្រាដំណុះទាបពេក ត្រូវវិភាគដំណុះគ្រាប់ពូជម្តងទៀតបន្ទាប់ពី ៣-៤សប្តាហ៍ក្រោយមក។

ឧបសម្ព័ន្ធទី១

ឯកសារ និងទម្រង់របាយការណ៍ផ្សេងៗ

1-A. **ពាក្យស្នើសុំលិខិតអនុញ្ញាតធ្វើអាជីវកម្មពូជដំណាំ**

ឈ្មោះអ្នកស្នើសុំ៖ .... ភេទ៖ ....

ឈ្មោះអង្គភាព/គ្រឹះស្ថាន៖..តួនាទី៖ ....

អាសយដ្ឋាន៖ ភូមិ............ឃុំ/សង្កាត់...............ស្រុក/ខណ្ឌ..................ខេត្ត/រាជធានី.......................

លេខទូរស័ព្ទ៖ (ទី១)...(ទី២)...

អ៊ីម៉ែល៖.. តេឡេក្រាម៖...

ឈ្មោះអ្នកទទួលខុសត្រូវចំពោះផលិតកម្មគ្រាប់ពូជ៖ ....

ចំនួនសមាជិកចូលរួមនៅក្នុងផលិតកម្មគ្រាប់ពូជ៖...........................នាក់ ក្នុងនោះស្ត្រីមាន៖...........នាក់

១.ការបណ្តុះបណ្តាល

វគ្គបណ្តុះបណ្តាលស្តីពីផលិតកម្មគ្រាប់ពូជ (✓)៖ ធ្លាប់បានទទួល ☐ មិនធ្លាប់បានទទួល ☐

លរ.	អង្គភាពផ្តល់វគ្គបណ្តុះបណ្តាល	ឆ្នាំ	ចំនួនសមាជិក
១			
២			
៣			
៤			
៥			

២. បទពិសោធន៍

ចំនួនឆ្នាំនៃបទពិសោធន៍ក្នុងផលិតកម្មគ្រាប់ពូជស្រូវ (ដូចមានឯកសារជូនភ្ជាប់មកជាមួយ)៖.....................

ប្រភេទគ្រាប់ពូជស្រូវដែលសមាជិកក្រុមធ្លាប់ផលិត៖...

៣. ប្រវត្តិនៃការផលិតគ្រាប់ពូជស្រូវ

ផ្ទៃដីនិងបរិមាណគ្រាប់ពូជបានផលិតក្នុងរយៈពេលបីឆ្នាំចុងក្រោយ៖

ឈ្មោះពូជ	ឆ្នាំ២០.........		ឆ្នាំ២០.........		ឆ្នាំ២០.........	
	ហ.ត	តោន	ហ.ត	តោន	ហ.ត	តោន
១.						
២.						
៣.						
៤.						
៥.						
សរុប						

៤. គ្រឿងបរិក្ខារ

មានឬអាចរកជួលបានសម្រាប់ផលិតកម្មគ្រាប់ពូជ៖

គ្រឿងបរិក្ខា	ផ្ទាល់ខ្លួន (✓)	ជួលគេ (✓)	កំណត់សម្គាល់
ត្រាក់ទ័រ			
គោយន្ត			
នង្គ័ល			
ម៉ាស៊ីនវាយដី (រ៉ូតាវ៉ាទ័រ)			
ម៉ាស៊ីនស្ទូង			
ឧបករណ៍/ម៉ាស៊ីនដាំគ្រាប់ពូជជាជួរ			
ឧបករណ៍/ម៉ាស៊ីនបាញ់ថ្នាំ			
សម្ភារការពារខ្លួន			
ម៉ាស៊ីនច្រូត			
ឡសម្ងួត (សូមបញ្ជាក់ប្រភេទ)			
ម៉ាស៊ីនសម្អាតគ្រាប់ពូជ			
ម៉ាស៊ីនបក់គ្រាប់ពូជ			
ជញ្ជីង			
កំណាល់(ប៉ាឡែត)			
រទេះរុញ			
ឧបករណ៍វាស់សំណើម			
ឃ្លាំងសម្រាប់រក្សាគ្រាប់ពូជ	..............ម^{២}	..............ម^{២}	សរុប៖............................ម^{២}
ផ្សេងទៀត (សូមបញ្ជាក់)			

៥. ផែនការផលិតកម្មគ្រាប់ពូជស្រូវសរុបសម្រាប់៣ឆ្នាំ៖..(ហ.ត)

ទីតាំងផលិតកម្ម	ឆ្នាំ២០...........................			ឆ្នាំ២០...........................			ឆ្នាំ២០..........................		
	ដើមរដូវវស្សា	រដូវវស្សា	រដូវប្រាំង	ដើមរដូវវស្សា	រដូវវស្សា	រដូវប្រាំង	ដើមរដូវវស្សា	រដូវវស្សា	រដូវប្រាំង
១.									
២.									
៣.									
៤.									
៥.									
សរុប									

៦. ឯកសារជូនភ្ជាប់៖

ក. វិញ្ញាបនបត្រវគ្គបណ្តុះបណ្តាលផលិតកម្មគ្រាប់ពូជស្រូវ ☐

ខ. កិច្ចសន្យាផលិតកម្មកន្លងមក (ប្រសិនបើមាន) ☐

គ. របនាសម្ព័ន្ធធុរកិច្ចគ្រាប់ពូជស្រូវ ☐

ខ្ញុំសូមធានាអះអាងចំពោះអង្គភាពមានសមត្ថកិច្ចថា រាល់ព័ត៌មានខាងលើពិតជាត្រឹមត្រូវ និងសូមសន្យាអនុវត្តផលិតកម្មគ្រាប់ពូជស្រូវតាមគោលការណ៍ប្រព័ន្ធធានាគុណភាពពូជដំណាំ (**ប.គ.ព**)។

ធ្វើនៅ ....ថ្ងៃទី ..../.........../...........

ហត្ថលេខានិងឈ្មោះអ្នកស្នើសុំ

....

1-B. **គម្រូលិខិតអនុញ្ញាតធ្វើអាជីវកម្មពូជដំណាំ**

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ
អគ្គនាយកដ្ឋានកសិកម្ម

លិខិតអនុញ្ញាត
ធ្វើអាជីវកម្មផលិត កែច្នៃពូជដំណាំ

អគ្គនាយកដ្ឋានកសិកម្ម

លេខ៖...អ.ន.ក

- បានឃើញព្រះរាជក្រម លេខ នស/រកម/០៥០៨/០១៥ ចុះថ្ងៃទី១៣ ខែឧសភា ឆ្នាំ២០០៨ ប្រកាសឱ្យប្រើច្បាប់ស្តីពីការគ្រប់គ្រងពូជដំណាំនិងសិទ្ធិអ្នកបង្កាត់ពូជដំណាំ
- បានឃើញប្រកាស លេខ**៣៧៥ ប្រក.កសក** ចុះថ្ងៃទី០៦ ខែកក្កដា ឆ្នាំ២០១៧ ស្តីពីគំរូពាក្យស្នើសុំនិងនីតិវិធីនៃការផ្តល់វិញ្ញាបនបត្របញ្ជាក់គុណភាពពូជដំណាំ
- បានឃើញពាក្យស្នើសុំលេខ...ចុះថ្ងៃទី..................ខែ...............ឆ្នាំ២០.............

សម្រេច

អនុញ្ញាតឱ្យ៖ លោក/លោកស្រី ....មុខងារ...

ក្រុមហ៊ុនឬនីតិបុគ្គល..

ធ្វើអាជីវកម្មផលិតកែច្នៃពូជដំណាំ. ....ដែលមានសមត្ថភាពផលិតកែច្នៃពូជដំណាំប្រចាំឆ្នាំ..

អាសយដ្ឋានរបស់គ្រឹះស្ថាន..

សុពលភាព៖ លិខិតអនុញ្ញាតនេះត្រូវបានប្រគល់ជូនសាមីអ្នកស្នើសុំ ដើម្បីប្រើប្រាស់ដោយអនុលោមតាមច្បាប់ស្តីពីការគ្រប់គ្រងពូជដំណាំនិងសិទ្ធិអ្នកបង្កាត់ពូជដំណាំជាធរមានក្នុងសុពលភាពរយៈពេល **៣**ឆ្នាំ ដោយគិតចាប់ពីថ្ងៃចេញលិខិតអនុញ្ញាតនេះ និងត្រូវផុតសុពលភាពនៅថ្ងៃទី...............ខែ...........ឆ្នាំ២០.....លើកលែងតែមានការដកហូតដោយអគ្គនាយកដ្ឋានកសិកម្មនៅមុនកាលបរិច្ឆេទផុតសុពលភាព។

រាជធានីភ្នំពេញ ថ្ងៃទី.................ខែ.............ឆ្នាំ២០........

អគ្គនាយក

1-C. **ទម្រង់(ក)៖ ផែនការផលិតកម្មគ្រាប់ពូជស្រូវប្រចាំរដូវ**

១. ឈ្មោះអ្នកស្នើសុំ៖...ភេទ៖................

២. ឈ្មោះស្ថាប័ន៖...តួនាទី៖.........................

៣. អាសយដ្ឋាន៖ ភូមិ............ឃុំ/សង្កាត់..................ស្រុក/ខណ្ឌ.................ខេត្ត/រាជធានី.................

៤. លេខទូរស័ព្ទ៖ (ទី១)..(ទី២)..

៥. អ៊ីម៉ែល៖...តេឡេក្រាម៖...

៦. លេខលិខិតអនុញ្ញាតធ្វើអាជីវកម្មពូជដំណាំ...................................ចុះថ្ងៃទី............/............./........

៧. រដូវដាំដុះ៖.................កាលបរិច្ឆេទចាប់ផ្តើមដាំដុះ៖....................កាលបរិច្ឆេទគ្រោងប្រមូលផល៖.....

៨. ព័ត៌មានស្តីពីផលិតកម្មគ្រាប់ពូជ៖

លរ.	**ឈ្មោះពូជ**	**ថ្នាក់គ្រាប់ពូជ**	**ផ្ទៃដី(ត.ហ)**	**ចំនួនស្រែ**	**ទីតាំងផលិតកម្ម**
១					
២					
៣					
៤					
៥					
	សរុប				

៩. ព័ត៌មានស្តីពីប្រភពគ្រាប់ពូជប្រើប្រាស់ក្នុងផលិតកម្មគ្រាប់ពូជ

លរ.	**ឈ្មោះពូជ**	**ថ្នាក់គ្រាប់ពូជ**	**បរិមាណ(គ្រ.គ)**	**ឡូតិ៍គ្រាប់ពូជ**
១				
២				
៣				
៤				
៥				
	សរុប			

❋កំណត់សម្គាល់៖ អ្នកផលិតគ្រាប់ពូជត្រូវរក្សាទុករាល់ស្លាកសំណៅដើម បាវវេចខ្ចប់ វិក្កយបត្រទិញគ្រាប់ពូជសម្រាប់ផ្ទៀងផ្ទាត់ដោយស្ថាប័នមានសមត្ថកិច្ច។

១០. ឯកសារជូនភ្ជាប់ (សូមមើលតារាងគំរូ)

ខ្ញុំសូមធានាអះអាងចំពោះអង្គភាពមានសមត្ថកិច្ចថា រាល់ព័ត៌មានខាងលើពិតជាត្រឹមត្រូវ។ ក្នុងករណីស្រែផលិតកម្មគ្រាប់ពូជខូចខាត ឬប្រែប្រួលដោយប្រការណាមួយ ខ្ញុំនឹងជូនដំណឹងទៅអង្គភាពមានសមត្ថកិច្ច។

ធ្វើនៅ.......................ថ្ងៃទី.........../........../...............

ហត្ថលេខានិងឈ្មោះអ្នកស្នើសុំ

....

គម្រូឯកសារជូនភ្ជាប់៖ បញ្ជីឈ្មោះសមាជិកក្រុមផលិតគ្រាប់ពូជស្រូវ

លរ.	ឈ្មោះ	ភេទ	កូដ អ្នកផលិត	ពូជ ផលិត	ថ្នាក់ គ្រាប់ពូជ	ផ្ទៃដីផលិត (ត.ហ)	ចំនួន ស្រែ	ផ្ទៃដីស្រែ នីមួយៗ	កូដស្រែ
១	អ៊ឹម សេរី	ប	G001	PRD	CS	1.2	2	0.7	G001F01
								0.5	G001F02
២	លឹម លាភ	ស	G002	SKO	CS	2.2	2	1.2	G002F01
								1.0	G002F02

ប្រើសម្រាប់តែកត់ត្រាប៉ុណ្ណោះ

1-D. ទម្រង់កំណត់ត្រាត្រួតពិនិត្យគុណភាពទីវាល

ឈ្មោះម្ចាស់ស្រែ៖ ________________ កាលបរិច្ឆេទ៖ ________________

លេខពាក្យស្នើសុំ៖ កូដស្រែ៖

ឈ្មោះពូជ	កាលបរិច្ឆេទ ដាំដុះ	កាលបរិច្ឆេទ ត្រួតពិនិត្យគុណភាព ទីវាលលើកទី១	កាលបរិច្ឆេទ រំពឹងទុកនៅ ដំណាក់កាលចេញផ្កា	កាលបរិច្ឆេទ ត្រួតពិនិត្យគុណភាព ទីវាលលើកទី២	កាលបរិច្ឆេទ រំពឹងទុកនៅ ដំណាក់កាលច្រូត

ចំនួនសំណាក	ពូជលាយ	ស្មៅហាម ឃាត់	ជំងឺហាមឃាត់		
			ប្លាស់	អុចត្នោត	រលាកស្រទបស្លឹក
សំណាកទី ១			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ២			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ៣			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ៤			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ៥			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ៦			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ៧			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ៨			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ៩			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សំណាកទី ១០			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣
សរុប			០ ១ ២ ៣	០ ១ ២ ៣	០ ១ ២ ៣

▼ ▼ ▼

១០ម^2			វិនិច្ឆ័យជំងឺជារួម		០ ១ ២ ៣

សម្គាល់៖ ០-ស្រូវគ្មានជំងឺ, ១-ស្រូវមានជំងឺតិចជាង២៥%, ២-ស្រូវមានជំងឺតិចជាង៥០%, និង៣-ស្រូវមានជំងឺលើស៥០% ។

1-E. **ទម្រង់របាយការណ៍ត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល**

លេខកូដស្រែ.. លេខរបាយការណ៍..

កាលបរិច្ឆេទត្រួតពិនិត្យ................../.........../.......... ពេលវេលាៈពីម៉ោង..............ដល់ម៉ោង..............

ឈ្មោះពូជស្រូវ... ថ្នាក់គ្រាប់ពូជ...

កាលបរិច្ឆេទដាំ/ស្ទូង................../.........../............ កាលបរិច្ឆេទគ្រោងប្រមូលផល........./......../.........

១.ឈ្មោះអ្នកផលិត... លេខកូដអ្នកផលិត...

២. អាសយដ្ឋានៈ ភូមិ.................ឃុំ/សង្កាត់...............ស្រុក/ខណ្ឌ............ខេត្ត/រាជធានី...................

៣. ទីតាំងស្រែ...

៤. ប្រភពគ្រាប់ពូជ..កាលបរិច្ឆេទទិញ...

៥. ផ្ទៃដីផលិតកម្មគ្រាប់ពូជសរុបនៃពូជស្រូវខាងលើ..ហិចតា

៦. ផ្ទៃដីស្រែត្រូវត្រួតពិនិត្យ...ហិចតា

៧. ប្រភេទដំណាំបានដាំពីមុននៅក្នុងស្រែ.....................................គម្លាតពីស្រែជុំវិញ.......................

៨. ដំណាក់កាលស្រូវពូជខាងលើនៅពេលត្រួតពិនិត្យ...

៩. លទ្ធផលតាមសំណាក (អនុវត្តតាមគោលការណែនាំ)

លេខរៀងសំណាក	**☐ ចំនួនដើម(លើកទី១) ☐ ចំនួនក្បួរ(លើកទី២)**		**ភាគរយ**
	ពូជលាយ	**ស្មៅហាមឃាត់**	**ជំងឺហាមឃាត់**
១.			
២.			
៣.			
៤.			
៥.			
៦.			
៧.			
៨.			
៩.			
១០.			
សរុប			

១០. (ក) ឈ្មោះជំងឺហាមឃាត់ៈ ☐ ប្លាស់ ☐ អុចត្នោត ☐ រលាកស្រទបស្លឹក

(ខ) ប្រភេទស្មៅហាមឃាត់...

១១. ស្ថានភាពលូតលាស់របស់ដំណាំស្រូវ...

១២. តើដំណាំស្រូវនេះអនុលោមទៅតាមស្តង់ដារទីវាលដែរទេ?...

១៣. គុណភាពនៃការងារផលិតកម្មគ្រាប់ពូជ...

១៤. តើនេះជារបាយការណ៍ចុងក្រោយមែនទេ?..

១៥. ទិន្នផលគ្រាប់ពូជស្រូវត្រូវបានប៉ាន់ប្រមាណ(តោន/ហិចតា)..

១៦. តើអ្នកផលិតឬតំណាងរបស់គាត់មានវត្តមានក្នុងពេលត្រួតពិនិត្យដែរឬទេ?....................................

១៧. អនុសាសន៍/សេចក្តីសន្និដ្ឋាន/កំណត់សំគាល់...

....

....

....

....

....

ហត្ថលេខាអ្នកផលិត	ហត្ថលេខាមន្ត្រីត្រួតពិនិត្យ
ឈ្មោះ	ឈ្មោះ

1-F. **ទម្រង់(ខ)៖ សំណើសុំត្រួតពិនិត្យគុណភាពគ្រាប់ពូជ**

១. ឈ្មោះអ្នកស្នើសុំ៖...............................ភេទ៖...............តួនាទី៖..

២. អាសយដ្ឋាន៖ ភូមិ..........ឃុំ/សង្កាត់..................ស្រុក/ខណ្ឌ.................ខេត្ត/រាជធានី.................

៣. លេខទូរស័ព្ទ៖ (ទី១)..(ទី២)...

៤. អ៊ីម៉ែល៖..តេឡេក្រាម៖...

៥. លេខលិខិតអនុញ្ញាតធ្វើអាជីវកម្មពូជដំណាំ................................ចុះថ្ងៃទី......../............/.............

៦. ជម្រើសនៃការត្រួតពិនិត្យគុណភាព (សូមគូសយកតែមួយប៉ុណ្ណោះ)៖

ក. ១០%នៃឡូត៍គ្រាប់ពូជសរុបនៃពូជនីមួយៗ ☐

ខ. គ្រប់ឡូត៍គ្រាប់ពូជទាំងអស់ ☐

លរ.	**ឡូត៍គ្រាប់ពូជ**	**បរិមាណ (គ្រ.គ)**	**ឈ្មោះពូជ**	**ថ្នាក់គ្រាប់ពូជ**	**ចំនួនបាវសម្រាប់ផ្តល់ស្លាកសញ្ញាបញ្ជាក់គុណភាព បព.គ.**
១					
២					
៣					
៤					
៥					
សរុប					

⁕<u>កំណត់សម្គាល់៖</u> ក្នុងករណីឡូត៍គ្រាប់ពូជមានចំនួនច្រើន សូមភ្ជាប់បន្ថែមតាមតារាងគំរូខាងលើ។

៧. គ្រាប់ពូជត្រូវបានដាក់ថ្នាំខ្ទូតនៅថ្ងៃទី.............ខែ...........ឆ្នាំ................ដោយប្រើថ្នាំឈ្មោះ...............
បានរយៈពេល.....................ម៉ោង ឬ................ថ្ងៃ។

ខ្ញុំសូមធានាអះអាងថា គ្រាប់ពូជនៃឡូត៍នីមួយៗត្រូវបានផលិតស្របតាមលក្ខខណ្ឌតម្រូវនៃប្រព័ន្ធធានាគុណភាពពូជដំណាំ (**ប.គ.ព**)។

ខ្ញុំសូមគោរពអញ្ជើញមន្ត្រីមានសមត្ថកិច្ចចុះមកត្រួតពិនិត្យគុណភាពគ្រាប់ពូជដោយក្តីអនុគ្រោះ។

ធ្វើនៅ..........................ថ្ងៃទី.........../............../...........

ហត្ថលេខានិងឈ្មោះអ្នកស្នើសុំ

....

ប្រើសម្រាប់តែកត់ត្រាប៉ុណ្ណោះ

1-G. ទម្រង់កត់ត្រាទិន្នផលដំណុះ

ឈ្មោះអ្នកផលិត៖ .... កូដអ្នកផលិត៖ ....

លេខសំណាក៖ ....

ថ្ងៃ	កាលបរិច្ឆេទ (ថ្ងៃ/ខែ/ឆ្នាំ)	គ្រាប់ដុះធម្មតា (A)	គ្រាប់ដុះខ្សោយ (B)	គ្រាប់រឹង (C)	គ្រាប់ខូច ឬងាប់ (D) *	សរុបដំណុះ (A)+(B)
ថ្ងៃទី១						
ថ្ងៃទី២						
ថ្ងៃទី៣						
ថ្ងៃទី៤						
ថ្ងៃទី៥						
ថ្ងៃទី៦						
ថ្ងៃទី៧						

* គ្រាប់ដែលដុះហើយខូច ឬងាប់មិនគួររាប់បញ្ចូលទៅក្នុងដំណុះសរុបនោះទេ។

អត្រាដំណុះនៅថ្ងៃទី៣

$$\frac{\text{គ្រាប់ដុះសរុប} \quad \boxed{}}{\text{គ្រាប់ធ្វើតេស្តសរុប} \quad \boxed{៤០០}} = \boxed{}\ \%$$

អត្រាដំណុះនៅថ្ងៃទី៧

$$\frac{\text{គ្រាប់ដុះសរុប} \quad \boxed{}}{\text{គ្រាប់ធ្វើតេស្តសរុប} \quad \boxed{៤០០}} = \boxed{}\ \%$$

1-H. ទម្រង់របាយការណ៍ត្រួតពិនិត្យគុណភាពគ្រាប់ពូជ

លេខរបាយការណ៍៖ ....

១. ព័ត៌មាននៃអ្នកស្នើសុំ

- ឈ្មោះអ្នកផលិត៖ .... កូដអ្នកផលិត៖ ....
- កាលបរិច្ឆេទនៃការបញ្ជូនសំណាក៖ ..../ ..../..

២. កាលបរិច្ឆេទ និងទីតាំងនៃការត្រួតពិនិត្យគុណភាព

- តេស្តភាពសុទ្ធ៖ ..../ ..../................... តេស្តសំណើម៖ ..../ ..../.....................
- តេស្តដំណុះ៖ ពីថ្ងៃទី ..../ ..../............. ដល់ថ្ងៃទី ..../ ..../............ (សរុប......ថ្ងៃ)
- ទីតាំងត្រួតពិនិត្យ៖ ....
- ឈ្មោះមន្ត្រីត្រួតពិនិត្យ៖ .... អង្គភាព៖ ....

៣. ព័ត៌មានសំណាកយកមកត្រួតពិនិត្យ

- ដំណាំ៖ .... ឈ្មោះពូជ៖ .... ថ្នាក់គ្រាប់ពូជ៖ RS / CS
- ឡូតិ៍គ្រាប់ពូជរបស់អ្នកផលិត៖ ....
- កាលបរិច្ឆេទប្រមូលផល៖ ..../ ..../................. បរិមាណសំណាក៖ .... ក្រាម

៤. លទ្ធផលត្រួតពិនិត្យគុណភាពគ្រាប់ពូជស្រូវ

កត្តា		តួលេខធ្វើតេស្ត	ស្តង់ដារ		លទ្ធផល ជាប់/ធ្លាក់
			RS	CS	
1. គ្រាប់ពូជសុទ្ធ (អប្បបរមា, %)			៩៨	៩៨	ជាប់/ធ្លាក់
2. កម្ទេចកម្ទី (អតិបរមា, %)			២	២	ជាប់/ធ្លាក់
គ្រាប់ពូជស្មៅ (អតិបរមា, ចំនួនគ្រាប់/៥០០ក្រាម)			៥	១០	ជាប់/ធ្លាក់
គ្រាប់ពូជដំណាំផ្សេង (អតិបរមា, ចំនួនគ្រាប់/៥០០ក្រាម)			៣	៥	ជាប់/ធ្លាក់
គ្រាប់ពូជស្រូវផ្សេង (អតិបរមា, ចំនួនគ្រាប់/៥០០ក្រាម)			៥	១៥	ជាប់/ធ្លាក់
ស្រូវក្រហម (អតិបរមា, ចំនួនគ្រាប់/៥០០ក្រាម)			២	៥	ជាប់/ធ្លាក់
3. អត្រាដំណុះ (អប្បបរមា, %)	៣ ថ្ងៃ		-	-	-
	៧ ថ្ងៃ		៨៥	៨០	ជាប់/ធ្លាក់
4. សំណើមគ្រាប់ពូជ (អតិបរមា, %)			១៣	១៤	ជាប់/ធ្លាក់

៥. កំណត់សំគាល់/សន្និដ្ឋាន៖

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ធ្វើនៅ......................., ថ្ងៃទី............./........../..............

ហត្ថលេខានិងឈ្មោះមន្ត្រីត្រួតពិនិត្យគុណភាព

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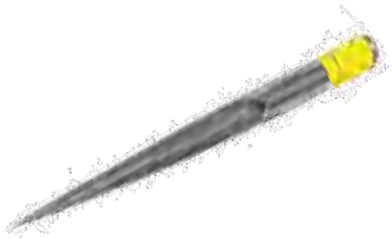
ឧបសម្ព័ន្ធទី២

ឧបករណ៍ និងសម្ភារសម្រាប់ត្រួតពិនិត្យគុណភាព

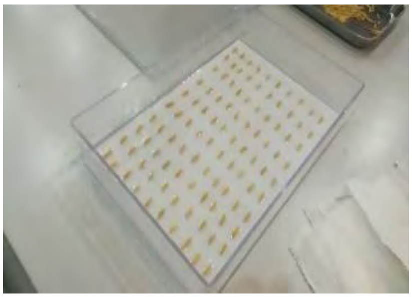
១. ឧបករណ៍សម្រាប់ត្រួតពិនិត្យគុណភាពទីវាល

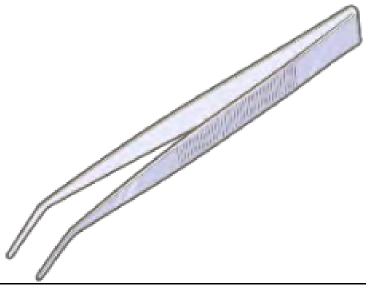
ម៉ែត្រវាស់ (ប្រវែងជាង ៣ម) ដើម្បីពិនិត្យមើលគម្លាតស្រែ ប្រើសម្រាប់វាស់និងពិនិត្យចម្ងាយរវាងស្រែផលិតកម្មនិងស្រែស្រូវផ្សេងទៀតឱ្យបានត្រឹមត្រូវ	
ស៊ុម១ម៉ែត្របួនជ្រុង (១ម x ១ម) ដើម្បីកំណត់កន្លែងយកសំណាកសម្រាប់ត្រួតពិនិត្យគុណភាព ត្រូវប្រើស៊ុម១ម៉ែត្របួនជ្រុង។ វាអាចធ្វើវាពីបំពង់ជ័រ PVC និងស៊កបញ្ចូលគ្នា ដែលអាចរកទិញបាននៅទីផ្សារ	
ក្តារទ្រនាប់កត់ត្រា វាមានប្រយោជន៍សម្រាប់កត់ត្រាលទ្ធផលត្រួតពិនិត្យគុណភាពផលិតកម្មទីវាល	
ឯកសណ្ឋានសមរម្យសម្រាប់ប្រតិបត្តិការការងារនៅទីវាល អ្នកផលិតគ្រាប់ពូជអាចទើបតែបាញ់ថ្នាំកសិកម្មក្នុងស្រែរបស់គាត់។ ដូច្នេះត្រូវពាក់ឯកសណ្ឋានសមស្របដើម្បីការងារខ្លួនរបស់អ្នក។	

២. ឧបករណ៍សម្រាប់យកសំណាក

ដែកឆាំគ្រាប់ពូជ ដើម្បីបញ្ចៀសការខូចបាវវេចខ្ចប់ ត្រូវប្រើដែកឆាំគ្រាប់ពូជ។ ស៊កដែកឆាំចូលទៅក្នុងបាវវេចខ្ចប់ រួចបង្វិលវាថ្នមៗដើម្បីទាញយកសំណាក	
ថង់ប្លាស្ទិច ដើម្បីបញ្ចៀសការលាយឡំសំណាក ត្រូវប្រើថង់ប្លាស្ទីកដើម្បីរក្សាទុកសំណាក។ សំណាកគួរតែស្ងួតល្អមុននឹងដាក់វាចូលទៅក្នុងថង់	
បិទស្លាកសំគាល់លើសំណាក បន្ទាប់ពីច្រកសំណាកចូលក្នុងថង់ប្លាស្ទិចរួច ត្រូវបិទស្លាកសំគាល់លើវាភ្លាមជាមួយនឹងព័ត៌មានចាំបាច់ ដើម្បីបញ្ចៀសការច្រឡំសំណាក។	

៣. ឧបករណ៍ និងសម្ភារសម្រាប់វិភាគគុណភាពនៅមន្ទីរពិសោធន៍

ជញ្ជីងអេឡិចត្រូនិច ភាគរយនៃភាពសុទ្ធត្រូវបានគណនាដោយផ្អែកលើទម្ងន់។ ដូច្នេះ ទម្ងន់នៃសំណាកគួរតែថ្លឹងឱ្យបានត្រឹមត្រូវ។ ជញ្ជីងអេឡិចត្រូនិចជាឧបករណ៍ទំនើប ហើយត្រូវបំផ្លាស់ទីដោយប្រុងប្រយ័ត្ន	
បន្ទះក្តារសម្រាប់ពិនិត្យភាពសុទ្ធគ្រាប់ពូជ ដើម្បីកំណត់ស្រូវក្រហម ប្រើបន្ទះក្តារសម្រាប់ពិនិត្យគ្រាប់ពូជមានបញ្ចាំងពន្លឺ ដោយប្រើចរន្តអគ្គីសនីសម្រាប់ដំណើការឧបករណ៍នេះ	
បន្ទះឈើ ដើម្បីបញ្ចៀសការឆ្លុតផ្ទៃមុខលើនៃបន្ទះក្តារវិភាគគ្រាប់ពូជ ត្រូវប្រើបន្ទះឈើសម្រាប់ត្រួតពិនិត្យសំណាកនៅលើបន្ទះក្តារវិភាគ	
ឧបករណ៍វាស់សំណើម ដើម្បីពិនិត្យសំណើមសំណាកត្រូវប្រើឧបករណ៍វាស់សំណើមអេឡិចត្រូនិច	
ប្រអប់បណ្តុះសាក ប្រអប់ប្លាស្ទិចណាក៏បានដែលគេអាចយកមកប្រើសម្រាប់វិភាគដំណុះ	
ក្រដាសសម្រាប់វិភាគដំណុះ	

ក្រដាសគួរតែដាក់ទ្រាប់បាតក្រោមនៃប្រអប់ដំណុះ ដើម្បីរក្សាគ្រាប់ឱ្យនៅសើមក្នុងពេលវិភាគដំណុះ។ ក្រដាសអនាម័យ ឬក្រដាសជូតមាត់អាចប្រើប្រាស់បាន	
ដង្កៀបចាប់ ប្រើដង្កៀបចាប់ដើម្បីតម្រៀបគ្រាប់ពូជជាជួរនៅក្នុងប្រអប់បណ្ដុះសាក ដូច្នេះយើងអាចសង្កេតនិងរាប់គ្រាប់ពូជងាយស្រួល	
ដបបាញ់ទឹក ដើម្បីរក្សាសំណើមគ្រាប់ពូជក្នុងការវិភាគដំណុះគ្រាប់ពូជ ត្រូវបាញ់ទឹកពីម្ដងទៅម្ដងដោយប្រើដបបាញ់ទឹក	

ឧបសម្ព័ន្ធទី៣

សន្ធានុក្រម

ប្រព័ន្ធធានាគុណភាពពូជដំណាំ (ប.គ.ព) (Quality Declared Seed-QDS System)

ប្រព័ន្ធធានាគុណភាពពូជដំណាំ ដែលសរសេរអក្សរកាត់ **ប.គ.ព** ជាប្រព័ន្ធធានាការបញ្ជាក់គុណភាពពូជដំណាំគ្រប់ប្រភេទដែលបានចុះបញ្ជីស្របច្បាប់នៅក្នុងព្រះរាជាណាចក្រកម្ពុជាសម្រាប់ផលិតកម្មពូជដំណាំ នៅក្នុងស្រុក ការធ្វើអាជីវកម្ម ឬការធ្វើចរាចរណ៍លើទីផ្សារនៅក្នុងប្រទេសឬការធ្វើពាណិជ្ជកម្មក្រៅប្រទេស។

អង្គភាពមានសមត្ថកិច្ច (Competency authority-CA)

អង្គភាពមានសមត្ថកិច្ច(CA) គឺសំដៅលើ**នាយកដ្ឋានពូជដំណាំ**នៃអគ្គនាយកដ្ឋានកសិកម្ម និង**មន្ទីរកសិកម្ម រុក្ខាប្រមាញ់និងនេសាទរាជធានី ខេត្ត**។

មន្ត្រីទទួលបន្ទុក

មន្ត្រីទទួលបន្ទុកគឺជាមន្ត្រីនៃ**នាយកដ្ឋានពូជដំណាំ** ដែលមានតួនាទីសំខាន់រៀបចំទុកដាក់ឯកសារពាក់ព័ន្ធទាំងអស់ដែលបានបញ្ជូនមក ព្រមទាំងកត់សម្គាល់ និងវាយតម្លៃអ្នកស្នើសុំជូន**អគ្គនាយកដ្ឋានកសិកម្ម** ដើម្បីធ្វើការសម្រេចចិត្តអនុញ្ញាត ផ្តល់អនុសាសន៍កែតម្រូវ ឬបដិសេធផ្តល់ជូនលិខិតអនុញ្ញាតធ្វើអាជីវកម្មពូជដំណាំ និងផ្តល់ស្លាកសញ្ញាបញ្ជាក់គុណភាព **ប.គ.ព** ជូនអ្នកស្នើសុំ។

ផលិតករគ្រាប់ពូជ

ផលិតករគ្រាប់ពូជ គឺសំដៅដល់ បុគ្គល ក្រុម ក្រុមហ៊ុន សហគមន៍កសិកម្ម ឬអង្គការក្រៅរដ្ឋាភិបាលដែលផលិតនិងធ្វើអាជីវកម្មគ្រាប់ពូជ។ ផលិតករគ្រាប់ពូជស្របច្បាប់នឹងត្រូវទទួលបានវិញ្ញាបនបត្រដែលបញ្ជាក់ថាពួកគាត់មានសិទ្ធិផលិតនិងធ្វើអាជីវកម្មគ្រាប់ពូជដែលអនុលោមទៅតាមស្តង់ដារ **ប.គ.ព**។

គ្រាប់ពូជគ្រឹះ (Foundation Seed - FS)

សំដៅដល់ពូជដំណាំជំនាន់ក្រោយនៃពូជជម្រើសវិទូតាមវិធីសាស្ត្រស្ទូងជាជួរ មួយដើមក្នុងមួយដំណោត និងឋិតក្រោមការគ្រប់គ្រងផ្ទាល់របស់រុក្ខជម្រើសវិទូ ឬអ្នកផលិតគ្រាប់ពូជស្របច្បាប់។ ថ្នាក់គ្រាប់ពូជគ្រឹះ ត្រូវបានផលិតក្រោមវិធានទទួលស្គាល់ដោយអង្គភាពបញ្ជាក់គុណភាពពូជដំណាំក្នុងគោលបំណងរក្សាភាពសុទ្ធពន្ធុ និងអត្តសញ្ញាណរបស់ប្រភេទពូជតាមស្តង់ដារគុណភាពគ្រាប់ពូជ។

គ្រាប់ពូជបញ្ជី (Registered Seed - RS)

សំដៅដល់ពូជដំណាំដែលបានផលិតចេញពីគ្រាប់ពូជគ្រឹះដោយវិស័យសាធារណៈ ឬវិស័យឯកជន តាមវិធីសាស្ត្រដាំជាជួរ ឬស្ទូងជាជួរ១-៣ដើមក្នុងមួយដំណោត និងឋិតនៅក្រោមវិធានដែលទទួលស្គាល់ដោយអង្គភាពបញ្ជាក់គុណភាពពូជដំណាំ ដើម្បីរក្សាភាពសុទ្ធពន្ធុនិងអត្តសញ្ញាណរបស់ប្រភេទពូជតាមស្តង់ដារគុណភាពគ្រាប់ពូជ។

គ្រាប់ពូជវិញ្ញាបនបត្រ (Certified Seed - CS)

សំដៅដល់ពូជដំណាំដែលបានផលិតពីគ្រាប់ពូជចុះបញ្ជីដោយអ្នកផលិតគ្រាប់ពូជ ឬស្ថានីយ៍អភិវឌ្ឍន៍កសិកម្មសាធារណៈតាមវិធីសាស្ត្រដាំជាជួរ ឬស្ទូងធម្មតា១-៣ដើមក្នុងមួយដំណោត និងឋិតនៅក្រោមវិធានទទួលស្គាល់ដោយអង្គភាពបញ្ជាក់គុណភាពពូជដំណាំ ដើម្បីរក្សាភាពសុទ្ធពន្ធុនិងអត្តសញ្ញាណរបស់ប្រភេទពូជតាមស្តង់ដារគ្រាប់ពូជ។

សមាគមវិភាគពូជដំណាំអន្តរជាតិ (International Seed Testing Association-ISTA) ឆ្នាំ2018

សហគមវិភាគពូជដំណាំអន្តរជាតិ (ISTA) មានវិធានគោលការណ៍បច្ចេកទេសដែលត្រូវបានប្រើប្រាស់សម្រាប់យកសំណាក និងវិភាគគុណភាពគ្រាប់ពូជដំណាំ។

Appendix 9

Quality Declared Seed System (QDS) for

Rice Seed Production and Business [English]

Quality Declared Seed System for Rice Seed Production and Business (QDS)

The General Directorate of Agriculture

August 2022

Cooperated and Co-funded by

JICA RSPP Quality Seed, Quality Rice Australian Aid CAVAC Innovation in Agriculture

PREFACE

The Royal Government of Cambodia (RGC) in Parliamentary Session VI still prioritizes an agricultural sector to support a national economic increase, food security, and promote rural economic development. In visualizing the vast potential of the agricultural sector, especially rice, in 2010, the RGC showed its intention on rice production by creating a policy to promote rice production and milled rice export. The annual increase in rice production and milled rice export is the core reason for accelerating qualified rice seed demand.

However, the RGC does not yet have a seed quality inspection and certification system with human and financial resources for all crop seeds. It causes farmers to lack qualified seeds for their good production.

In order to build trust amongst seed users and supply qualified seeds for use, the Quality Declared Seed System, hereby called the **QDS**, is prepared with valuable inputs and rectifications from the leaders of the Ministry of Agriculture, Forestry and Fisheries, experts from the departments under the General Directorate of Agriculture (GDA), experts from the Project for Rice Seed Production and Promotion of JICA (RSPP/JICA), the Cambodia-Australia Agricultural Value Chain Programme (CAVAC), IRRI-Cambodia, and Cambodia Climate-Resilient Rice Commercialization Sector Development Program (MAFF-NIO for Rice-SDP).

This QDS manual provides information relating to the implementation structure, procedure, criteria for quality inspection, and seed certification in the Kingdom of Cambodia.

The GDA gratefully thanks the Japan International Cooperation Agency (JICA) and the Department of Foreign Affairs and Trade (DFAT) of the Australian Government for supporting in compilation and print-out of this manual for the initial stage.

The GDA also welcomes all comments from readers on misleading points for improving this manual more effectively and brotherly for next step printing.

Date:

The General Directorate of Agriculture

QDS Technical Working Group

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ABBREVIATION

CA	Competent Authority
CAVAC	Cambodia-Australia Agricultural Value Chain Programme II
DCS	Department of Crop Seeds
DFAT	Department of Foreign Affairs and Trade
FAO	Food and Agriculture Organisation of the United Nations
GDA	General Directorate of Agriculture
IRRI	International Rice Research Institute
ISTA	International Seed Testing Association
JICA	Japan International Cooperation Agency
MAFF	Ministry of Agriculture, Forestry, and Fisheries
PDAFF	Provincial Department of Agriculture, Forestry, and Fisheries
QDS	Quality Declared Seed System
Rice-SDP	Cambodia Climate-Resilient Rice Commercialization Sector Development Program (MAFF-NIO for Rice-SDP)
RSPP	The Project for Rice Seed Production and Promotion

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INTRODUCTION

In 2006, the Food and Agriculture Organization of United Nations (FAO) published the guideline manual for the Quality Declared Seed System, hereby called the QDS. Since its introduction, the QDS has successfully been implemented in, among others, Zambia, Tanzania, Uganda, Bangladesh, Nepal, and India. The QDS is particularly helpful in countries where seed quality control systems do not exist, and human and financial resource constraints hamper the public sector from implementing a fully comprehensive system.

The Seed Policy for Cambodia (2016) states the primary purpose of a regulatory framework for the standards of seeds and varieties in the market is to protect farmers and other stakeholders against deliberate fraud. At this moment, administering the QDS is an initial stage toward creating a comprehensive regulatory framework in compliance with the existing seed law and the seed policy and improving the crop seed industry to increase farmers' productivity.

In the QDS operation for rice seed production and business, the Competent Authority (CA) is responsible for field inspections in a minimum of 10% of the seed production area by variety and seed class and laboratory inspection of a minimum of 10% of the final products offered for sale by variety and seed class. The seed producers and sellers are responsible for seed quality in compliance with the truly certified quality labels issued by the General Directorate of Agriculture.

CHAPTER I: MANAGEMENT STRUCTURE OF QDS FOR RICE SEED PRODUCTION AND BUSINESS.

1.1. QDS Implementing Stakeholders.

1.1.1. The Department of Crop Seeds

The **Department of Crop Seeds (DCS)** of the **General Directorate of Agriculture (GDA)** is the **Competent Authority (CA)** at the national level to promote the implementation of the QDS for rice seed production and business in the Kingdom of Cambodia.

1.1.2. The Department of Rice Crop

The **Departments of Rice Crop (DRC)** of the **GDA** is the technical entity at the national level to implement the QDS-related Rice Seed Training to the **Provincial Department of Agriculture, Forestry and Fisheries (PDAFF)**, private sector and other relevant stakeholders.

1.1.3. The Provincial Department of Agriculture, Forestry and Fisheries

The **PDAFFs** are the Competent Authorities at the subnational level to implement the QDS for Rice Seed Production and Business in their respective provinces.

1.1.4. The Seed Producer

The **Seed Producer** refers to an individual, group, company, agricultural cooperative (AC), association, or non-governmental organization (NGO) that pursues rice seed production and business in their respective locations.

1.2. Roles and Responsibilities of the QDS Implementing Stakeholders.

1.2.1. The Department of Crop Seeds

In the framework of the QDS operation for rice seed production and business, the **DCS** of the **GDA** has the following responsibilities:

- Educate and raise awareness of the stakeholders working in a seed sector on the QDS Implementing Structure and Procedures;
- Check all applications of the **Seed Producer**(s) and validate each applicant before the **GDA**'s approval on the issuance of the **QDS Rice Seed Production and Business Certificate**;
- Prepare technical guidelines and offer training on the QDS quality inspections to the staff of the **PDAFF**(s), the private sector, and other relevant stakeholders;
- Manage a roster of eligible **Seed Producer**(s) and rice varieties requested for seed production in the Kingdom of Cambodia;
- Cooperate with the **PDAFF**(s) in field inspections and getting samples for seed quality analysis in the laboratory and validate the result before the **GDA**'s approval on the issuance of the **QDS Labels** to the **Seed Producer**(s);
- Monitor and validate the **Seed Producers**' warehouses and rice seed market transactions in the Kingdom of Cambodia; and
- Keep all relevant documents and inspection reports in chronological order.

1.2.2. The Department of Rice Crop

In the framework of the QDS operation for rice seed production and business, the **DRC** of the **GDA** has the following responsibilities:

- Provide QDS-related training to the PDAFFs, private sector, and other relevant stakeholders.

1.2.3. The Provincial Department of Agriculture, Forestry and Fisheries

In the framework of QDS operation for rice seed production and business, the **PDAFFs** have the following responsibilities:

- Receive all applications from **Seed Producer**(s) and submit them to the **GDA** for proceeding with a validation procedure;
- Organize training on QDS quality seed inspection techniques for **Seed Producer**(s) in cooperation with the **DCS** of the **GDA**;
- Manage a roster of eligible **Seed Producer**(s) and rice varieties requested for seed production in their respective provinces;
- Cooperate with the **DCS** of the **GDA** in field inspections and getting samples for seed quality tests in the laboratory and validate the result before the GDA's approval on the issuance of the QDS Labels to the **Seed Producer**(s);
- Monitor and validate the **Seed Producers'** warehouses and rice seed market transactions in their respective provinces; and
- Keep all relevant documents and inspection reports in chronological order.

1.2.4. The Seed Producer

The **Seed Producer** is in charge of implementing the QDS for Rice Seed Production and Business. It has the following responsibilities:

- Possess the QDS Rice Seed Production and Business Certificate issued by the **GDA**;
- Complete and submit an application with required documents stated in the Application Form to the **GDA** directly or through the **PDAFF**(s);
- Guarantee and be responsible for the rice seed quality produced and marketed,
- Produce and market approved rice seeds free from three seed-borne diseases and contamination of other crops and other seed varieties;
- Cooperate with the competent officer from the **DCS** of the **GDA** and the **PDAFF**(s) in a field inspection and rice seed samplings for quality test in the laboratory;
- Pass the training course on the QDS quality test prepared and provided by the **DCS** of the **GDA**;
- Comply with rice seed production guidelines endorsed by the **GDA**; and
- Possess a record book on rice seed production and business in compliance with the template determined by the **DCS** of the **GDA**.

1.3. Permissible Rice Varieties for Seed Production.

The rice varieties permissible for seed production in the QDS are typical varieties registered in the national rice variety roster of the **GDA**. They are not in the harmful variety roster.

1.4. QDS Rice Seed Production and Business Certificate.

The **QDS Rice Seed Production and Business Certificate** (**Annex 2**) is an official letter issued by the **GDA** to the applicant if the application meets the requirement.

The certificate is valid for **3 (three) years** from the approval date, except for its suspension or withdrawal before the validation date.

A **Seed Producer** who wishes to continue seed production and business shall resubmit the application **3 (three) months** in advance before the expiration date of the existing certificate.

1.5. Field Inspection.

The QDS-based rice seed production fields shall be inspected at least twice, before flowering and at the dough stage of rice seed crops, in each growing season. The field inspection shall be randomly conducted in a minimum of **10%** of the total rice seed production area of each eligible **Seed Producer** by variety and seed class. In each inspection field, **10 sample** places (**1meter x 1meter**) shall be randomly selected and inspected. Soon after the inspection, the field inspection reports shall be prepared by the field inspector and sent to the **DCS** of the **GDA** for processing the QDS procedures.

1.6. Quality Test of Final Product of Seeds.

A seed inspector shall randomly take seed samples of a minimum of 10% of the total processed seed of the eligible **Seed Producer** by variety and seed class. The seed inspector shall submit the samples to the National Laboratory of Agriculture (NAL) or a laboratory accredited by the **GDA** for a quality test. The results of the seed quality test shall be submitted to the **DCS** for processing the QDS procedures.

1.7. Approval before QDS Label Issuance.

Based on the field inspection reports and the result of the seed quality test, the **GDA** shall either approve, recommend rectification, or decline to issue the **QDS Labels** for the **Seed Producer**. The **GDA** shall inform the **Seed Producer** of its decision within **5 (five) working days** after receiving the laboratory's quality test result.

1.8. QDS Label Issuance.

The **GDA** shall issue the **QDS Label**s to the **Seed Producer** based on the total volume of the rice seed claimed in the **Declaration (B): Request for Seed Quality Test** (**Annex 5**). The **QDS Labels** shall be affixed to the seed containers for sales, and their reuse is prohibited.

1.9. Service Charge.

Expenses for the application for the **QDS Rice Seed Production and Business Certificate** and seed quality test at the laboratory are determined by the Joint Prakas on Public Service of the **Ministry of Economy and Finance** and the **Ministry of Agriculture, Forestry and Fisheries**. Besides, the **GDA** decides on other expenses for training delivery on the QDS inspection techniques, field inspections, traveling for rice seed samples for quality testing, and the QDS Labels. All the expenses mentioned above are a burden on the **Seed Producer**.

CHAPTER II: QDS IMPLEMENTING PROCEDURES.

2.1. Application

2.1.1. An applicant for the QDS Rice Seed Production and Business shall hold a minimum area for a variety and seed class as follows:

Seed Class	Foundation Seed	Registered Seed	Certified Seed
Production Area by Variety	0.20ha	0.50ha	5.00ha

2.1.2. An applicant shall complete the **QDS Rice Seed Production and Business Application Form** described in **Annex 1** and submit it to the **DCS 3 (three) months** before starting rice seed production.

2.1.3. An applicant shall submit the **Application Form** to the **GDA** directly or through the **PDAFF**(s) in such a province where s/he will produce the seed. The original documents shall be dispatched to the **GDA**, and the copied documents shall be sent to the relevant **PDAFF**(s) within **5 (five) working days** after acceptance of the **Application Form**.

2.1.4. The **GDA** shall inform the applicant of its decision directly or through the **PDAFF**(s) within **20 (twenty) working days** after accepting the application. The **GDA** shall issue the **QDS Rice Seed Production and Business Certificate** with validity for **3 (three) years** from the approval date to the applicant who complied with the QDS required conditions, except for its suspense or withdrawal before the validity date in the case of a serious infringement committed by the **Seed Producer**. If the applicant does not fulfill the QDS requirement, the **GDA** shall request the applicant to resubmit the **Application Form** or end the process.

2.2. Reasons for Rejection.

The **GDA** may reject the application for the **QDS Rice Seed Production and Business Certificate** based on one or more grounds:

- Insufficient evidence of skills and experience in rice seed production (e.g. the applicant fails to submit the training certificates, previous or current rice seed production contracts, etc.),
- Incomplete or false information in the application.

2.3. Rights of Appeal.

The rejected applicant may appeal the decision of the **GDA** if they have sufficient proof that they complied with the requirements. The applicant must appeal to the **GDA** within **5 (five) working days after receiving an official rejection letter.**

2.4. Declaration for Seasonal Rice Seed Production Plan.

The qualified **Seed Producer** shall complete the **Declaration (A)**: **Seasonal Rice Seed Production Plan** (**Annex 3**) with his/her signature and submit it to the **GDA** directly or through the relevant **PDAFF**(s) **20 (twenty) days before the planting schedule**. The original documents shall be dispatched to the **GDA**, and the copied documents shall be sent to the relevant **PDAFF**(s) within **5 (five) working days after acceptance of the Declaration (A)**.

2.5. Determination of Seed Production Field for Inspection.

The inspector from the **DCS** or the **PDAFF**(s) shall randomly select a minimum of **10%** of the total confirmed seed production area for a variety and seed class produced by the **Seed Producer**.

2.6. Verification of Seed Source for Seed Production.

The inspector from the **DCS** or the **PDAFF**(s) shall, at the first field inspection, verify the origin of the FS or RS used in the production to ascertain whether the approved institution(s) or producer(s) produced them by confirming with the labels/tags, sales invoices, and packing sacks. Any doubt about the provenance of the FS or RS may constitute grounds for the rejection of the seed production.

2.7. Inspection of Seed Production Field.

2.7.1. The rice seed production fields notified in Declaration **(A)** shall be inspected at least twice during the growing season, particularly before flowering and at the dough stage of rice seed crops. The inspector(s) from the **DCS** or **PDAFF** shall inform the **Seed Producer** of the date and time of the inspection at least 24 hours before the inspection takes place.

2.7.2. The inspector(s) from the **DCS** or the **PDAFF** shall inspect the identified rice seed production area in accordance with the QDS field inspection guideline and complete the **Field Inspection Report** (**Annex 4**) by indicating the result of the inspection, notifications, conclusion, and recommendations, then inform the **Seed Producer** or his/her representative. The inspector(s) shall hand the **Field Inspection Report** with their signatures to the **Seed Producer** or his/her representative. And the inspector(s) shall send a copy to the **DCS** of the **GDA** and the relevant **PDAFF**.

2.7.3. If the result of the second field inspection meets the QDS field standard, the **Seed Producer** shall submit the **Declaration** (**B**): **Request for Seed Quality Test** (**Annex 5**) to the **DCS** of the **GDA** directly or through the relevant **PDAFF**.

2.7.4. Suppose the result of the second field inspection does not meet the QDS field standard, and the field condition cannot be rectified. In that case, the **GDA** shall issue an official rejection letter of all rice seed production fields to the **Seed Producer within 3 (three) working days after the field inspection**.

2.7.5. Suppose the field condition does not meet the QDS field standard but can be improved. In that case, the **inspector**(s) shall give a recommendation and make notes in the **Field Inspection Report** with the deadline for the additional field inspection (**third field inspection**) with the **Seed Producer**. Suppose the **Seed Producer** does not take the recommended actions for improvement as recommended in the second field inspection report by the deadline. In that case, the **GDA** shall issue the official rejection letter of all rice seed production fields to the **Seed Producer within 3 (three) working days after the day of the deadline** (**third field inspection**).

2.8. Inspection of Final Product of Seed.

2.8.1. The **GDA** shall entitle the **Seed Producer** to choose the seed quality test method by stating it in **Declaration** (**B**): **Request for Seed Quality Test** (**Annex 5**). The **Seed Producer** shall select **one of the 2 (two) options** as follows:

- The **Seed Producer** shall request the test of a minimum of **10%** of the total lots for each variety and seed class. In this case, randomly selected seed samples represent all seed lots of the variety and seed class.
- The **Seed Producer** shall request the test of all seed lots of the variety and seed class. In this case, the **GDA** will provide the **QDS Labels** only for the seed lots that pass the quality test (See **Chapter 5**).

2.8.2. After processing and packaging the seed, the **Seed Producer** shall complete and duly sign the **Declaration** (**B**) and submit it to the **DCS** of the **GDA** directly or through the **PDAFF**(s). An original document shall be dispatched to the **DCS** of the **GDA,** and a copied document shall be sent to the relevant **PDAFF**(s) **within five working days after the Declaration (B) is accepted**.

2.8.3. If the warehouse of the **Seed Producer** is located in Phnom Penh, the **Seed Producer** shall directly submit the **Declaration** (**B**) to the **DCS** of the **GDA**.

2.8.4. The **GDA** or the **PDAFF**(s) shall inform the **Seed Producer 24 hours before the sampling for the quality test** at the **NAL** or in a laboratory accredited by the **GDA**. The inspector shall verify the information claimed in **Declaration** (**B**) and randomly take a sample(s) from a minimum of **10%** of the total seed lot(s) by variety and class in accordance with the ISTA rules (see **Chapter 4**). If the amount of a single lot exceeds **10mertic tons**, the lot should be split into smaller lots. Each split lot shall not be more than 10metric tons.

2.9. Seed Quality Analysis.

The **inspector** shall divide the working sample in accordance with the ISTA rules to prepare the sample for the seed quality analysis and define the physical seed purity, number of weed seeds, number of other crop seeds, number of different variety seeds, number of red rice, moisture content, germination rate and the ratio of other inert matters. **Within 5 (five) working days after receiving the result** of the seed quality analysis, the inspector shall send the report to the **DCS** of the **GDA** in order to check and approve it.

2.10. Final Decision.

The **GDA** shall make the final decision in accordance with the conditions below:

2.10.1. The QDS Labels shall be issued to the **Seed Producer** within five working days of receiving the result of the seed quality analysis if the result meets the QDS seed quality standard.

2.10.2. The **QDS Labels** shall not be issued to the **Seed Producer** in case the result of the seed quality analysis by variety and seed class does not meet the QDS seed quality standard. However, a retest is available for the result of the ratio of inert matters, the number of weed seeds, moisture content, and germination rate (within two months after harvest, considering the seed dormancy). For the retest, the **Seed Producer** takes necessary remedial actions and resubmits the **Declaration** (**B**). The **GDA** shall not issue the **QDS Labels** if the retested result still does not conform to the QDS standard.

CHAPTER III: CRITERIA FOR FIELD INSPECTION.

3.1. Land Requirement for Rice Seed Production.

The land for rice seed production shall be free from ratoon or volunteer plants. The QDS-based rice seed production requires a field where only small grain crops or the same QDS rice variety crop have been previously planted for at least **one season**, which conforms with the QDS Rice Seed Production Manual.

3.2. Field Isolation.

The field for rice seed production shall be isolated from the fields of other rice varieties by a distance of **1 (one) meter** or by a physical barrier (ditch, hedge, fence, etc.) to avoid contamination by a mechanical movement and other factors.

3.3. Off-types.

The maximum permissible number of plants of other rice varieties in the rice seed production field shall be as follows:

Seed Production Class	Before flowering stage The number of tillers/10m^2	At dough stage The number of heads/10m^2
Registered Seed (RS)	1	1
Certified Seed (CS)	3	3

3.4. Noxious Weeds

Three kinds of weeds, *Echinochloa* spp., *Leptochloa Chinensis,* and *Cyperus iria* are defined as noxious weeds. The maximum permissible number of noxious weed plants in the rice seed production field shall be as follows:

Seed Production Class	Before flowering stage The number of tillers/10m^2	At dough stage The number of heads/10m^2
Registered Seed (RS)	5	5
Certified Seed (CS)	10	10

3.5. Seed Borne Diseases.

Three types of diseases, such as rice blast, brown spot, and sheath blight, are defined as seed-borne diseases. If more than **25%** of the leaves and stems of the plant are affected by the seed-borne disease(s), the plant shall be considered an infected plant. The number of infected plants in the seed production field shall not be more than **50%** at the ripening stage. If infected plants are detected exceeding the standard, the **Seed Producer** is not allowed to harvest the plants for seed. The Technical Guideline of Quality Inspection for Rice indicates the detailed evaluation guideline of seed-borne diseases.

3.6. Field Inspection Process.

3.6.1. Before entering the field, the inspector shall confirm the exact location, the variety, and the previous cropping history of the seed production field with the **Seed Producer**.

3.6.2. During the field inspection, the inspector shall examine the boundaries of the seed production field to verify the required isolation from other fields and confirm if the rice seed plants conform to the characteristics of the seed variety. Then, the **inspector**, following the technical procedure, shall examine ten randomly selected areas of 1-meter x 1-meter in each field for the inspection.

3.6.3. The **inspector** shall inspect and count the number of off-type plants, noxious weeds, and the plants infected by seed-borne diseases in the selected areas before the flowering stage and at the dough stage. If the result of the last field inspection does not conform to the QDS field standard, the inspector shall advise the **Seed Producer** or his/her representative to take remedial action for the re-inspection if there is a chance. Otherwise, the inspector rejects the seed production.

3.6.4. After the field inspection, the **inspector** shall complete the field inspection report, which includes the actual results and recommendations on the remedial actions, if there is a chance, to meet the QDS field standard (see **Point 2.7**). The **inspector** and the **Seed Producer** or his/her representative shall jointly sign the **Field Inspection Report**.

CHAPTER IV: SEED SAMPLING FOR QUALITY TEST.

Seed sampling of seed lots of each variety and seed class shall comply with the International Rules for Seed Testing (2018) developed by International Seed Testing Association (ISTA).

4.1. Seed Lot and Arrangement.

4.1.1. A maximum single seed lot size by a variety and class is 10,000 kg.

4.1.2. Seed lots shall be well arranged so that all parts of the seed lot are easily accessible for taking seed samples. The **Seed Producer** shall allocate the particular codes or defined numbers to all seed lots.

4.2. Sample Preparation for Quality Tests.

Seed sampling shall be conducted randomly and orderly as follows:

4.2.1. Primary Sample

Roughly equal sizes of primary samples shall be taken from the randomly selected containers. In case a primary sample is collected from 15 containers or less, it shall be taken from each container's top, middle, and bottom sections. If a primary sample is collected from more than 15 containers, it shall be taken from three (3) positions of a pile of the seed lot. The required number of primary samples depends on the total number of containers of the lot, as the table below shows:

Table: Minimum number of primary samples

Number of containers	Number of primary samples
1 – 4	Three primary samples from each container
5 – 8	Two primary samples from each container
9 – 15	One primary sample from each container
16 – 30	15 primary samples, one each from 15 different containers
31 -59	20 primary samples, one each from 20 different containers
>60	30 primary samples, one each from 30 different containers

4.2.2. Composite Sample

Primary samples shall be combined to compose a composite sample on the condition that the primary samples are sufficiently uniform.

4.2.3. Submitted Sample

A minimum of 700 g of the composite sample shall be submitted for testing. If the amount of the composite sample is large, it shall be divided to adjust the amount of the submitted sample using the hand halving method. If the amount of the composite sample is smaller but close to 700 g, all amounts of the composite sample may be submitted as the submitted sample.

Hand Halving Method

Pour the composite sample on a clean working surface and divide the mound into two halves using a spatula. Then divide each half again into two halves to obtain four portions.

At that point, combine alternate portions to receive two well-mixed equal mounds. Repeat the procedure, if necessary, to obtain the required size of 700 g for the submitted sample.

Packaging and Labelling the Submitted Sample

The submitted samples shall be packaged in clean containers with basic information such as the Seed Producer's assigned seed lot, variety name, seed class, and address.

4.2.4. Working Sample

In the testing place, the hand halving method shall be employed to obtain a minimum of 500 g of the working sample for determination of the purity, number of other crop seeds (other rice varieties, red rice, and non-rice crop seeds), the number of weed seeds, the moisture content, the weight of inert matter, and the germination rate. 200 g of the remaining sample shall be retained for a retest in case of need.

Chapter V: Minimum Quality Standard for Rice Seed

The QDS employs the national seed quality standard established by the **GDA** on July 5th, 2018, as the minimum quality standard for rice seed.

Factor		Rice seed standard by class		
		Foundation seed	**Registered seed**	**Certified seed**
1.	**Pure seed (Min, %)**	98	98	98
2.	**Inert matter (Max, %)**	2	2	2
-	Weed seeds (Max, number of grain/500g of sampled seed)	3	5	10
-	Other crop seeds (Max, number of grain/500g of sampled seed)	2	3	5
-	Other rice variety seeds (Max, number of grain/500g of sampled seed)	1	5	15
-	Red rice (Max, number of grain/500g of sampled seed)	0	2	5
3.	**Germination rate (Min, %)**	85	85	80
4.	**Moisture content (Max, %)**	12	13	14

Chapter VI: QDS Label

The **QDS Label** shall be officially issued to the **Seed Producer** by the **GDA** after the seed lot(s) has passed the inspection aligned with the QDS standard.

APPENDIXES

ANNEX 1: QDS Rice Seed Production and Business Application.

Applicant's Name: ……………………………………………… Gender: ……………………………

Institutions' Name: ……………………………………………... Position: ……………………………

Address: Village……. Commune/Sangkat…... District/Khan…… Province/Municipality……………

Telephone number: (1) ……………………………… (2) …………………………………………...

Email: ………………………………………………… Telegram: …………………………………

Name of responsible person for seed production: …………………………………………………….

Number of members involved in seed production: ………………………… (Female #…………………)

1. Training Obtaining

Did you receive rice seed production training? (tick only): ………………(Yes) ………………(No)

No.	Training Organizer	Year	Number of participating members
1			
2			
3			
4			
5			

2. Experience

Years of experience with rice seed production (attached reference): …………………………………...

Description of seed varieties produced by group members: ……………………………………………

3. Rice seed production history

Area and volume of produced seed in the last three years:

Variety	20………		20………		20………	
	HA	MT	HA	MT	HA	MT
1.						
2.						
3.						
4.						
5.						
Total:						

4. Equipment

Available/access to equipment for seed production:

Description of equipment	Own (yes/no)	Rent (yes/no)	Comments
4-wheel tractor			
2-wheel tractor			
Cattle Plow			
Rotavator			
Transplanter			
Direct seeder			

Spraying equipment			
Personal protection equipment			
Combine harvester			
Drier (specify type)			
Seed cleaner			
Winnower			
Scale			
Pallets			
Trolley			
Moisture meter			
Warehouse	……………m^2	……………m^2	Total: ……………m^2
Other (specify)			

5. Total Planned Seed Production Area for 3 years: …………………… (ha)

Seed Production Location	**20………**			**20………**			**20………**		
	EWS	**WS**	**DS**	**EWS**	**WS**	**DS**	**EWS**	**WS**	**DS**
1.									
2.									
3.									
4.									
5.									
Total:									

6. Attached reference

6.1. Training certificate on rice seed production ( )
6.2. Previous contract farming agreement, if any ( )
6.3. Organizational structure for rice seed business ( )

I officially declare that all information provided is true and promise to obey the QDS procedure for the applied rice seed production.

At ………………………………………………………… on …………………………………………...

Name and Signature of Applicant

…………………………………………………………

Kingdom of Cambodia

Nation Religion King

ANNEX 2: Business Certificate for Seed Production and Processing

Ministry of Agriculture, Forestry and Fisheries

General Directorate of Agriculture

Certificate No.: ……………………..អ.ន.ក

- Seen the Royal Decree No. នស/រកម/០៥០៨/០១៥ proclamation law dated May 13th, 2008, for crop seed management and breeder's rights.
- Seen the Prakas No. ៣៧៥ ប្រក/កសក dated July 6th, 2017, on application model and procedure for Quality Declared Seed System Certificate issuance.
- Seen application No. ………………. dated on day …………/month …………/year …………

Approved

Mr./Ms.: ………………………………………………………………….Occupation: …………………………………………………………………………...

Institution or Legislator: ………

Perform conditioned seed business: ……………………………………... with a capacity of producing and processing………………………………. per year.

Physical address of the institution: ……

Validation: This certificate is issued to the applicant for use in compliance with crop seed management and breeder's rights and shall be effectively valid for a period of **3 (three) years** from the date of issuance and expire on day …………/month …………/year …………, except being withdrawn by the General Directorate of Agriculture before the expiration of validity date in case of serious infringement.

Phnom Penh, Day ……. / Month ………. / Year …………….

Director of GDA

ANNEX 3: Declaration A: Seasonal Rice Seed Production Plan

1. Applicant's Name: ……………………………………….. Gender: …………………………....
2. Institutions' Name: ……………………………………… Position: ……………………………
3. Address: Village…… Commune/Sangkat…... District/Khan…… Province/Municipality…………
4. Telephone number: (1) ………………………….. (2) ………………………………………..
5. Email: ……………………………………………... Telegram: ………………………………...
6. Certificate number: ……………………………... Issued date: ……………………………….
7. Production season: ………… Starting date: …………………Intended date of harvest: …………
8. Seed production information:

No.	Variety Name	Seed Class	Planting Area (ha)	No. of Fields	Production Location
1					
2					
3					
4					
5					
	Total				

9. Information on seed sources for seed production:

No.	Variety Name	Seed Class	Volume (kg)	Lot No.
1				
2				
3				
4				
5				
	Total			

Note: Seed producer shall retain all original tags, packing sacks, and buying invoices for verification by the Competent Authority.

10. Additional information (see the attached example)

I officially declare that all information provided is true. In the event of the seed production fields being damaged or changed, on all occasions, I will inform the Competent Authority.

At ……………………………………………………… on …………………………………………...

Name and Signature of Applicant

…………………………………………………………

Attached Example: A Roster of Rice Seed Production Members

No.	Name	Gender	Grower ID	Product ID	Seed Class	Planting Area (ha)	Number of Field	Size of Field	Field Code
1	Im Sarey	M	G001	PRDU	CS	1.2	2	0.7	G001F01
								0.5	G001F02
2	Lim Leap	F	G002	SKOB	CS	2.2	2	1.2	G002F01
								1.0	G002F02

ANNEX 4: Field Inspection Report

Field code: …………………………………..… Report No.: …………………………………………

Date of inspection: ………..….……………… Time: From……………… To…………………….…

Rice variety: ………………………………… Certification class (RS/FS): …………………….…

Date of seeding: ………/………../……….. Intended date of harvest: ………/………/…………

1. Name of grower: ….……………………… Gender: ………. Grower code: ……………….……

2. Address: Village………….. Commune………….. District………….. Province………………

3. Field location: ……………………………………………………………………………

4. Seed provenance: ……………….………………………… Date of purchase: ……….………..

5. Total area under this seed crop production (ha): ………………………………………………….

6. Area of the inspected field (ha): ……………………………………………………………….

7. Previous crop in the field: ………………………… Isolation distance in the field: ………………

8. Stage of seed crop at this inspection: ……………………………………..…………………...

9. Result from counting (Take field counts as directed in the guidelines)

Sample No.	Number of tillers at first field inspection, Number of heads at second field inspection		Percentage
	Off-types	**Noxious weeds**	**Seed-borne disease plant**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total			

10. Name of

(a) Seed-borne diseases: Blast ( ), Brown Spot ( ), Sheet Blight ( )

(b) Noxious weed plants: ……………………………………………………………………....

11. Condition of seed crop: ……………………………………………………………………....

12. Does this seed crop conform to the field standard? ……………………………………………...

13. Quality of seed production work: ……………………………………………………………....

14. Is this the final report? ………………………………………………………………………

15. Estimated seed yield (mt/ha): …………………………………………………………………..

16. Is the grower or his/her representative present at inspection time? ……………………………..

17. Notification/Conclusion/Recommendation...………………………………………………………

…………………………………………………………………………………………………...

…………………………………………………………………………………………………...

Signature of Seed Producer

Signature of Field Inspector

Name: ……………………………………….

Name: ………………………………………

ANNEX 5: Declaration B: Request for Seed Quality Test

1. Applicant's Name: ………………………………………. Gender: ………….………………....
2. Institutions' Name: ……………………………………… Position: ……………………………
3. Address: Village…… Commune/Sangkat…... District/Khan…… Province/Municipality……….
4. Telephone number: (1) ………………………….. (2) …………………………………………..
5. Email: …………………………………………... Telegram: ……………………………….
6. Business Certificate number: ……………………... Issued date: ………/………/………………
7. Options for seed quality test (tick one only):

   (a). 10% of total seed lots of each variety ☐

   (b). All seed lots of each variety ☐

No.	Seed Lot	Volume (kg)	Variety Name	Seed Class	No. sacks for QDS Labels
1					
2					
3					
4					
5					
	Total				

Notice: In case more seed lots are to be inspected, insert an additional table as above.

8. The seeds were fumigated on day ……. /month ……. /year ……….. by using ………………… (name of fumigant) for the duration ………. hours or ………. days.

I declare that the seed of each lot has been produced in compliance with the requirements of the Quality Declared Seed System (QDS).

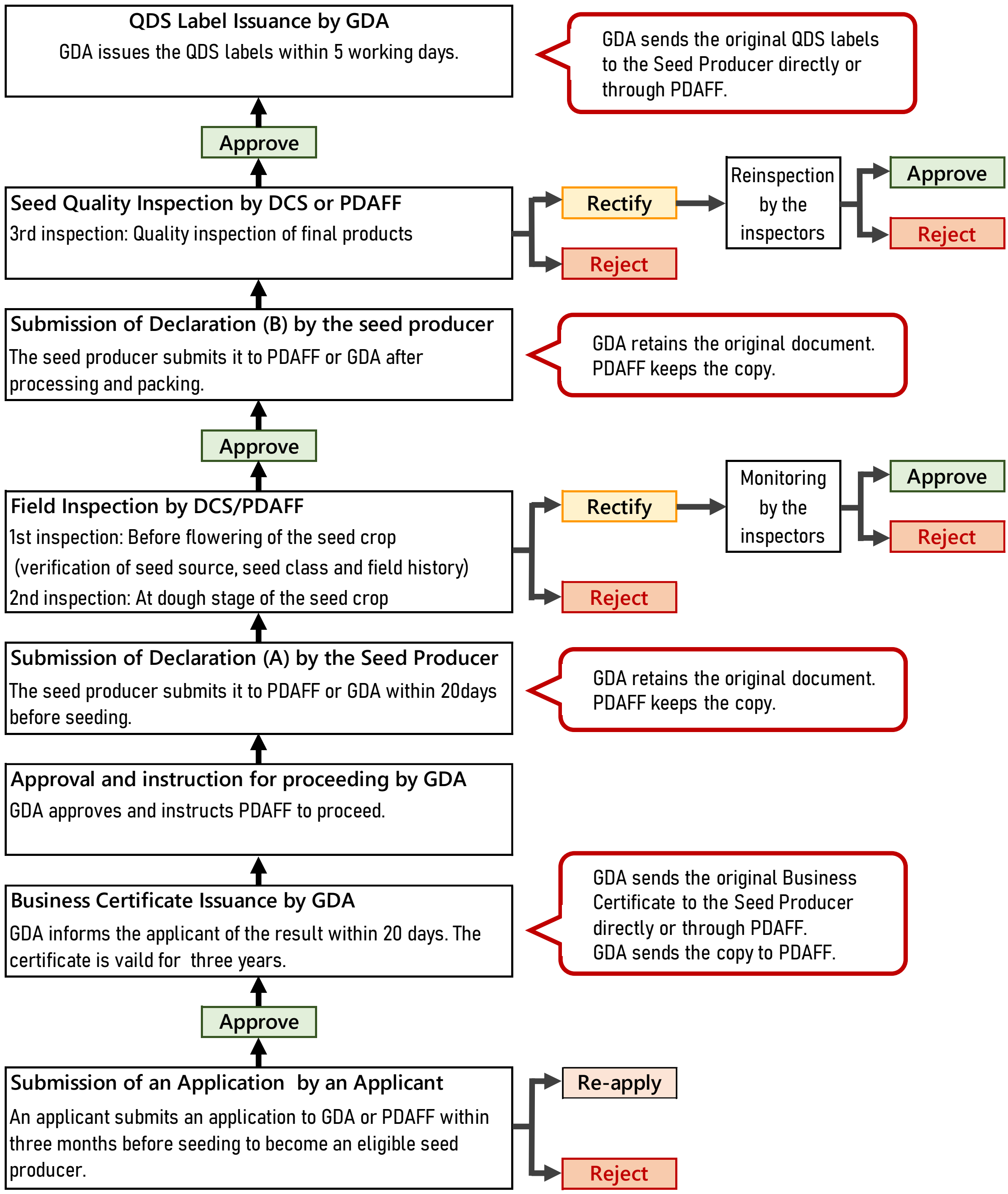
Hereby, I would like to request the competent officer to carry out an inspection of our seeds duly.

At …………………………………………………… on …………………………………………...

Name and Signature of Applicant

…………………………………………………………

PROCEDURE DIAGRAM FOR QUALITY DECLARED SEED SYSTEM (QDS)



GLOSSARY

Quality Declared Seed System (QDS)

The Quality Declared Seed System, abbreviated as QDS, is the system to declare the quality of all crop seeds, officially registered in Cambodia for domestic seed production, seed business, or seed marketing inside or outside the country.

Competent Authority (CA)

The competent authority (CA) refers to the Department of Crop Seeds (DSC) under the General Directorate of Agriculture (GDA) and Provincial Departments of Agriculture, Forestry and Fisheries (PDAFF).

Competent Officer

The competent officers from DCS are responsible for keeping all relevant submitted documents, notifying and validating the Seed Producer applicant for GDA approval on a Business Certificate issuance, and recommending rectification or rejecting an issuance of a Business Certificate and QDS labels to the Applicant.

Foundation seed (FS)

Foundation seed refers to the progeny of breeder seed through a row transplanting method with a single seedling per hill under the supervision of a plant breeder or an eligible Seed Producer. It shall be produced under the rule recognized by DCS to maintain its genetic purity and identity in compliance with the QDS standards.

Registered seed (RS)

Registered seed refers to the progeny of foundation seed produced by either the public or private sector (eligible Seed Producer) through a row transplanting method with 1–3 seedlings per hill. It shall be produced under the rule recognized by the DCS to maintain its genetic purity and identity in compliance with the QDS standard.

Certified seed (CS)

Certified seed refers to the progeny of registered seed produced by an eligible Seed Producer mainly for a commercial purpose or by the public agricultural development station through a row seeding method or a random transplanting method. It shall be produced under the rule recognized by the DCS to maintain its genetic purity and identity in compliance with the QDS standard.

ISTA (2018)

ISTA is an International Seed Testing Association regulating the technical rules for seed sampling and quality tests.