SMAP **Marketing** Technical Manual

for Market-oriented Agriculture

September 2019

Smallholder Market-oriented Agriculture Project in Rwanda (SMAP)

CONTRIBUTORS

1. Mr. Boniface Kagiraneza, Horticulture Program Leader/ RAB
2. Mr. Martin Busobozi, Research Assistant/ Horticulture Program – RAB
3. Ms. Bancy Waweru, Associate Research Fellow/ Horticulture Program – RAB
4. Mr. Gregoire Hagenima, Associate Research Fellow/ Horticulture program – RAB
5. Mr. Assinapol Ndereyimana, Assistant Research Fellow / Horticulture Program – RAB
6. Ms. Christine Umulisa, Assistant Research Fellow/ Horticulture Program –RAB
7. Mr. Jean Chrisostome Muhigirwa, Assistant Research Fellow/ Horticulture Program – RAB
8. Ms. Jeanne Priscille Ingabire, Crop Protection Specialist – RAB
9. Mr. Chrispin Hakizimana, Post-harvest Management Officer/ Post-Harvest and Biotechnology Division – RAB
10. Mr. Firmin Uwizerwa, Research Technician / Horticulture program – RAB
11. Mr. Aloys Musabyisoni, Research Technician / Horticulture Program – RAB
12. Ms. Esperance Nyirahategekimana, Research Technician/ Horticulture Program – RAB
13. Ms. Marie Aimée Ingabire, Research Technician/ Horticulture Program –RAB
14. Ms. Pacifique Mutanyagwa, Research Technician/ maize program – RAB
15. Ms. Sifa Alice Uwimana, Research and Transformation Technician/ Cassava Program – RAB
16. Mr. Ange Robert Akingeneye, Research Technician/ Tea Sub-Program
17. Ms. Christine Uzayisenga, Extensionist/ Horticulture Program-RAB
18. Ms. Peruth Murekeyimana, Traditional Cash Crop Production Specialist/ Horticulture Program –RAB
19. Mr. Aimable Gatete, Coordinator of Horticulture Center of Excellence (HCoE)/ RAB
20. Mr. Ndatinya Hakiza, Operation Manager/ Twigire Muhinzi – RAB
21. Ms. Clementine Nyirarukundo, Crop Technician/ Horticulture Program – RAB
22. Mr. Joseph Higiro, Crop Protection Technician
23. Ms. Marcelline Uwamahoro, Seed Production Technician/ Seed Program – RAB
24. Ms. Immaculée Mukangwije, Seed Production Technician/ Seed Program – RAB
25. Ms. Placidie Dusabimana, Seed Production Technician/ Seed Program – RAB
26. Ms. Cecile Kayitesi, Seed Production Technician/ Seed Program – RAB
27. Mr. Oswald Shyirambere, Senior Agronomist/ Irrigation Program – RAB
28. Mr. Jean Marie Vianney Uwihoreye, Agronomist / Banana Program – RAB
29. Mr. Gaspard Nshyimiyimana, Agronomist/ Wheat Program – RAB
30. Mr. Shaffy Niyoyita, Post-Harvest Handling Technician/ Post Harvest Program – RAB
31. Mr. Aimable Ndicunguye, Agronomist/ Coffee Sub - Program – RAB
32. Ms. Gertrude Mukampunga, Technician/ Banana Program – RAB
33. Mr. Michio Goto, Team Leader/ JICA-SMAP Project
34. Mr. Masaya Fukumoto, Co-Team Leader/ JICA-SMAP Project
35. Dr. Yoshinao Adachi, Horticulture Expert/ JICA-SMAP Project
36. Ms. Hiromi Takenaka, Gender & Cooperative Management Expert / JICA-SMAP Project Team
37. Ms. Nana Morita, Coordinator/ JICA-SMAP Project
38. Mr. Benoit Gatebuka, Horticulture Senior Agronomist/ JICA-SMAP Project
39. Mr. Didier Semanyenzi, Cooperative Management Expert / JICA-SMAP Project
40. Mr. Valens Ntezirembo, Project Operation Coordinator/ JICA-SMAP Project
41. Mr. Yahaya Muvunyi, Project Operation Coordinator/ JICA-SMAP Project Team
42. Ms. Gisele Karangwa Uwase, Secretary/ JICA-SMAP Project

Preface

I am very glad to present these technical guidelines entitled "Market-oriented Agriculture Extension Package" (MAEP) to all farmers and extension officers in our country. This is an output of the "Smallholder Market-oriented Agriculture Project in Rwanda" (SMAP), a project implemented by the Rwanda Agriculture and Animal Resources Development Board (RAB) under the technical and financial cooperation of the Japan International Cooperation Agency (JICA). SMAP has been implemented for 5 years, since October 2014, aiming at increase in smallholders' agricultural income as well as enhancing capacity in extension services on rice and vegetables.

MAEP is an important and comprehensive material for market-oriented agriculture. It addresses not only cultivation techniques, but also organization management, gender mainstreaming, and marketing. It is recommended for adaptation to farmers in consideration of the following three major reasons

Firstly, MAEP provides a series of practical cultivation techniques on rice and vegetables. They are useful and easy to apply, so that beneficiary farmers, on their own, can repeatedly put them into practice on their fields. Secondly, MAEP offers a unique marketing strategy for vegetable farmers to make their business profitable. It recommends farmers to conduct market surveys by themselves before selecting vegetables to cultivate, in order to understand market trends and demands. Based on such market information, farmers decide vegetables to maximize profit. Thirdly, MAEP enhances gender mainstreaming in agriculture by putting highest priority on it. The relationship of a husband and a wife in market-oriented agriculture should not be "an employer and an employee" but "business partners", if they want to have a successful result.

In conclusion, I would like to sincerely express my congratulations to RAB staffs and the SMAP Team for achieving the objective of the project which is in line with the Strategic Plan of Agricultural Transformation (PSTA 4) in areas of food security, nutritional health, and sustainable agricultural growth from a productive, green and market-led agriculture sector.

I also extend my cordial thanks to JICA for its cooperation with MINAGRI, RAB and all other stakeholders. The responsibility to disseminate MAEP is now on our shoulder, as SMAP is phasing out. All stakeholders should coordinate and collaborate to practice and deliver the knowledge and techniques, which MAEP offers, to our farmers throughout the country. I hope that as many stakeholders and farmers as possible have opportunities to touch and apply this precious MAEP.

Dr. Patric KARANGWA
Director General
Rwanda Agriculture and Animal
Resources Development Board (RAB)
September 2019

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Basic Knowledge of Marketing Activities

Step 1 Getting Started

1. SMAP Approach

SMAP marketing approach is to conduct commercial agriculture. Please remind your current farming activity. How do you decide type of crops to plant and time to start to cultivate? If you are not considering “market”, do you think you can earn enough profit from your marketing activity?

To conduct market-oriented agriculture, it is required to make decision based on reliable market information which is earned by yourself. To make decision, you have to “think” very well utilizing earned information. It can be said that “thinking” is “comparing something with something”. This SMAP training material will help you to conduct market-oriented agriculture which is also called as “Thinking Agriculture”.

2. Preparing Necessary Materials

Before starting activity of SMAP market-oriented agriculture, please make sure your cooperative to prepare following basic materials. Those materials are indispensable to practice all SMAP marketing activity effectively.

A. Notebooks and Pens

Notebooks and Pens are the most important material you must have in beginning. You have to record all Information regarding your agricultural activity, such as production cost, harvested volume, selling price, buyer contact address, and so on. You must remember that you cannot make any rational decision without that information. For example, if you do not record cost which you spent to produce Tomato, you will never know much is your profit from selling them. Moreover, you cannot even know you are earning money or losing money without such information.

B. Mobile Phone

Mobile phone is very powerful tool to communicate with outsiders of your cooperative. Even if your cooperative is located in remote area from the market, mobile phone helps you to communicate with buyers. Moreover, mobile phone makes you to access to Market Information System, so called “E-SOKO”, by which you can get recent market price information of major markets in Rwanda. That information will help you to increase your bargaining power when you are negotiating with buyers.

C. Weight Scale

Weight scale is very important to have to conduct commercial agriculture. For commercial activity, weight and measure are used to estimate the profit from the trade. If you decide the price by basket, you cannot know the price is appropriate or not because you do not have any standard to compare with it. Meanwhile, if you decide the price by the unit of “kg”, you can compare with the trend of market price, your past trade, or any other price information presented by “kg”. So, you can know the price is fair or not.

STEP 2 Getting Market Information

We now focus on how we can get market information. To conduct your business, market information is very important because it is one of the most important sources to make your decision. Always make sure you have a reliable source to get market information of your selling commodities. One of the reliable source you can get market information is "E-Soko" system which is a market information system provided by MINAGRI and RDB. You can access to "E-Soko" system anytime through SMS of your mobile phone.

Activity Getting market information from your mobile phone

Please try to access to "E-SOKO" system. Participants who have mobile phone are expected to be representative and demonstrate to show how to get information from the mobile phone to other participants who do not have mobile phone.

1. Send SMS to the number "7656" with following message.
   "Igiciro(space)market name(space)commodity name"
   For example, "igiciro kimironko inyanya"

For checking other market and commodity, please refer the pamphlet of market and commodity which is provided by MINAGRI and RDB.

Required material: Mobile phone

Use the following list of commodities and main markets that have been identified by MINAGRI in collaboration with RDB.

Commodity and Market List

Name of the commodity		Name of the market	
Amasaka	Ifu-ingano	Kicukiro	Nyagatare
Amashaza	Igitoki	Nyabugogo	Rwagitima
Amashu	Imineke	Kimironko	Rukomo
Amatunda	Imyumbati	Kayenzi	Mukarange
DAP	Ingano	Muhanga	Nyakarambi
Ditane	Inshyushyu	Butare	Kibungo
Ibigori	NPK	Nyanza	Ruhuha
Ibijumba	Soya	Ndago	Karenge
Ibirayi	Ubunyobwa	Musha	Mukamira
Ibishyimbo	Umuceri-Asia	Gikongoro	Kabaya
Ibitunguru- bitukura	Umuceri- RW	Base	Congo Nil
Ifu-ibigori	Umuceri- Tz	Byumba	Gisenyi
Ifu-imyumbati	Uree	Gaseke	Mahoko
		Rushashi	Kibirizi
		Rugarama	Kamembe
		Musanze	Bugarama

Note: Commodity List and Market List on "E-SOKO" is updating. Please check latest information with Sector Agronomists.

STEP 3 Selling Your Commodity by Weight

It is very important to sell your commodity by weight to know how much you earn from your products. Common language to describe amount of commodity in the world of business is unit of "kg". As you noticed in the Step 3 activity, the information provided by the "E-SOKO" system is applying the unit of "kg". That means that once you enter the world of business, you have to use "kg" in your every business activity, such as negotiation with middleman, checking market price, and also recording your past trade, and so on.

Activity Discussion of method to weigh your commodity

1. What kinds of material you need? Eg, Weight scale, Sacks, Rope, Basket.
2. How do you weigh if amount of commodity is big.
3. Is there different method between different commodities, etc.
4. Please write your commodity and method of weighing on a flipchart.
5. If you don't have a weight scale, please discuss how seriously you have a disadvantage to sell your products to buyers. Please make a plan to purchase it as a cooperative.

Required material: Flipchart, Pen

Step 4 Recording Your Business Activity

Recording your business activity is important to know how you conduct. Please record summary of your past trading with buyer on the notebook. This information is very important for your future activity. Please continue keeping record from now on.

Please refer the topic of "Record Keeping" in Cooperative Management/ Gender Training

STEP 5 Recording Your Production Costs

You cannot know how much is your profit from your farming activity if you know only selling record. You also need to know how much the cost for your production in order to know your earning money or losing money by your farming activity. Therefore, without selling record and production cost, you cannot judge your business is good or bad. Keeping production cost is very important.

Please refer the topic of "Record Keeping" in Cooperative Management/ Gender Training

Step 6 Selecting the Most Profitable Market

Farmer should calculate benefit of trade through selecting market to sell based on calculation of transportation cost, amount of commodity, and gap of selling price of each target market.

For example

Commodity: Tomato

Target Market	Selling Price (RWF/kg)	Transportation Cost (RWF/ trip)		Risk of Damaging
Local Market	230	0	On Head, Own Bicycle	Small
District Market	258	2,600	Mini Bus	Large
Kigali Market	320	80,000	Hiring Vehicle	Medium

Which is the most profitable market to sell if you want to sell 120 kg of Tomato?

For Local Market RWF 230/kg X 120kg =RWF 27,600
For District Market RWF 258/kg X 120kg - RWF 2,600/trip = RWF 28,360
For Kigali Market RWF 320 X 120kg - RWF 80,000/trip = RWF – 41,600

According to the calculation, to sell to district market is the most profitable.

Please try following exercises considering same condition of selling price and transportation cost above (for purpose of practice, damage kg of crop during transportation is ignored here).

Exercise 1: Which is the most profitable market to sell if you want to sell 50 kg of Tomato?

Exercise 2: Which is the most profitable market to sell if you want to sell 1,000kg of Tomato?

Exercise 3: If a middleman comes to your field and offers you to buy 1,500 kg of your Tomato at RWF 260/kg, do you sell to the middleman or to sell to Kigali market?

You must consider damage kg of crops according to transportation method when you adopt this idea in actual activity.

Participatory Market Survey

Step 1 Preparation of Participatory Marketing Survey

Objective of Market Survey

Conducting Market Survey is very important to make your planting plan which is orientated by marketing activity. To make a planting plan which is market orientated, you have to know about the situation of the market which you want to target to sell. So, it can be said that your marketing activities is started already before you start planting.

Procedure of market survey

-List target crops to be surveyed
-Determine the markets to be visited
-Prepare the survey questionnaire
-Pre-test the questionnaire
-Seek authority to carry out the survey
-Identify major dealers of the target crops
-Identify market survey team members
-Carry out the survey
-Analyze and make conclusion about the findings

As first step of market survey, let identify your target crops to be surveyed.

Activity Identifying the Crops to be Surveyed

Please discuss within your group to decide the crops to be surveyed by you. You consider the crops which you are currently cultivating, and also you are interested in starting to cultivate in near future. You can also identify the target buyers (retailer, middleman), and target market.

Example of Survey List

Crop Name	Target Buyer	Target Market
Tomato	Retailer	Kirehe
Tomato	Middleman	Kigali
Onion	Middleman	Kibungo
Cabbage	Retailers	Rwagamana
Sweet pepper	Retailers	Nyabugogo
Watermelon	Hotel	Kigali

Required material: Flipchart, Pen

Step 2 Preparation of the Market Survey Questionnaire

Next step is to identify what time of information to collect from the survey. Please refer the sample questionnaire on next page and discuss within the group to revise it.

Activity Preparation of Survey Questionnaire

1) Check sample questionnaire with your group members
2) Ask members the points to be revised or added to the sample of questionnaire. Please complete your own questionnaire.

Required material: Flipchart, Pen

Sample of Market Survey Questionnaire

Date: Name of Cooperative:

Name of Market:

Name & Contact of the Dealer	Crop & Variety	Product's Quality of Market Requirements	Months of Peak Demand	Quantity (kg) of Supply	Frequency of supply (daily/ weekly etc.)	Place of Production	Purchasing Unit Price (RWF/ kg)	Mode of Payment	Time for payment	Marketing Challenges	Dealer Willingness to Purchase production from the Group (*)
Mukamuhigirwa Aisha: 0788889817	Tomato Roma	Selected good tomato	11, 12, 4, 8	10kg per one time	Twice per week	-Karambi -Mwogo	1 small basket of 10 Kg/3000 RwF 1Kg/300	Cash	Immediately	-Taxes -Likely to get rotten -Non organized tomato trade	I am willing if the coop. offers good price
Butsure Faustin 0788948418	Carrot	Long and big carrot	11	100 Kg each market day	Two times	-Gisenyi -Ruhengeri	RwF 10,000/bag	Cash	Immediately	-Lack of customers.	Yes. Agreement with the Coop.
NGENANE 0788515295	Red Onion	Long white eggplants	6, 7, 8	150 Kg per 1 time	Twice per week	- Uganda - Tanzania - Mugina - Musenyi	400 RwF/ kg	Cash	Immediately	-Likely to get damaged -Price fluctuation	YES
TWIZEYIMANA Frédéric 0783502946	Sweet pepper	Big, clean and sprayed pesticide	7, 8, 9, 11, 12	5bags/week 1bag: 30kg	Weekly	Musenyi Nyamata	3000/bag	Cash	Immediately or after trading	-Customers are not familiar with them. -When they are not sprayed, they easily get rotten.	YES

*(If Yes, How Soon? If no, give reasons.)

Step 3 Conducting Market Survey

During conducting the market survey, Please pay your attention those points listed below to carry out the survey effectively.

1) Introduce interviewee about your group and purpose of your visit to obtain their cooperation.
2) Hold discussion when the interviewee is serving their customers.
3) Avoid repetitions to save a time. Remember the interviewee is very busy for their business during the survey.
4) Use friendly language and express your gratitude at the end of the interview.

Please note that the interviewees are your potential business partners in the future. The market survey also gives you a good opportunity to make a linkage with them.

Now you are ready to start survey!

Step 4 Crop Selection and Crop Ranking

The collected information from your market survey is very important to decide two major horticulture crops through crop ranking. Crops selected should be easy implement, low technical requirement and affordable.
Please share the information within your group and discuss two major horticulture crops of next cropping season.

Activity Crop Selection Sheet

Please discuss and prepare the crop selection sheet according to the results of market survey.
1) List down the crops covered during the market survey.
2) Discuss market survey findings for each produce with group members
3) Fill each column with accurate information for all candidate crops using: market survey results, crop production and income records and other available information
Considering the targets you discussed above, please complete "Crop Selection Sheet". You can use sample forms in the next page.

Required material: Flipchart, Marker

After completing the "Crop Selection Sheet", please select 2 priority crops by using "Crop Ranking Sheet" based on your decision by information in the Crop Selection Sheet. The target crop must by selected by profitability to aim to harvest in high demand season, however, you cannot ignore your major production challenge. For example, you cannot start cultivation when your field in marshland is submerged by water. In such a case, please discuss to try 2nd peak demand season in market to make your farming activity to be practical. The crops nominated here will be target crops of PiCROPP cultivation technology training.

Activity Crop Ranking Sheet

Please select target following the process below.
1) Prepare 2 crop ranking sheets, for 1st crop and 2nd crop.
2) On the 1st sheet, list the crops to be ranked.
3) Prepare voting papers and distribute them among group member.
4) Each group member writes down his/her 1st preferred crops on the voting paper
5) Collect the voting papers and count the votes, the crop chosen by more members becomes crop number 1
6) Write on the 1st sheet in front of that crop the number 1
7) Write down on the 2nd sheet the remaining crops excluding the 1st chosen crop.
8) Prepare the voting papers and each group member writes down his/her 2nd preferred crop.
9) Collect the voting papers and count the votes, the crop chosen by more members becomes crop number 2.
10) Write on the 2nd sheet in front of that crop the number 2

Required material: Flipchart, Marker

Notes:
-If the number of votes ties, let the group members to vote again for only those crops
-Voting result is transferred to the ranking column of the crop selection sheet.
-High ranked crops (crop no 1 & 2) are the target crops of the cooperative.
-However, group members can continue to grow other low ranked crops individually.

-This exercise should be conducted regularly after every market survey.

Activity Making Farming Schedule for Selected Crops

After selection of 2 preferred crops in the activity 2, please make farming schedule for those selected crops as a cooperative. Farming schedule should be designed to harvest your target period of high demand season, which you identify in the market survey and its analysis. Please make sure farming schedule is practical and try to avoid to ignorance of your condition of farming environment.

Required material: Flipchart, Marker

Sample of Crop Selection Sheet

Date
Name of Sector:

Name of Cooperative:
Name of District:

Crop Variety	Consumed by Local	Experience in cultivating the crop	Maturing period	Month of planting	Major production challenges	Average Marketable yield per are (10mx10m)	Average unit price (RWF/kg)	Total income per cropping season per are (RWF)	Cost of production per ha (RWF)	Estimated net income per ha (RWF)	Main market(s)	Marketing condition	Remarks	Ranking
Tomato, Roma variety	Yes	Yes	3 months	6,12	Late blight disease	300	200	120,000	20,000	100,000	Nyabugogo Kimisagara Nyamata	1500 kg 1000 kg 700 kg	Likely to get damaged	1
Water melon	Yes	Yes	3 months	10,2	Requires extreme care	300	300	180,000	60,000	120,000	Nyabugogo Kimisagara	3000 kg 3000 kg	A need to spray fungicide	2
Onion, Red Bombay variety	Yes	Yes	4 months	11,5	None	350	300	210,000	50,000	160,000	Nyabugogo Kimisagara	1000 kg 1000 kg		
Cabbage, Kopen Hargen market	Yes	Yes	3 months	6, 12	Pests difficult to get controlled	300	100	60,000	20,000	40,000	Nyamata Kicukiro Nyabugogo	500 1000 1000		
Eggplant, local variety	Yes	Yes	4 months	6, 12	None	250	100	50,000	20,000	30,000	Nyamata Nyabugogo	500 1000		

Sample of Crop Ranking Sheet

1st Crop

Name of Crops	No. of Members selected the Crop/ No. of total participants	Crop Ranking
Tomato	10/17	1
Watermelon	3/17	
Onion	2/17	
Eggplant	1/17	
Cabbage	1/17	

2nd Crop

Name of Crops	No. of Members selected the Crop/ No. of total participants	Crop Ranking
Watermelon	13/17	2
Onion	2/17	
Eggplant	1/17	
Cabbage	1/17	

Sample of Farming Schedule for 1st Crop

Name of Cooperative: Name of Crop: Tomato
Name of Sector: Name of District:

Month		May				June				July				August			
Week		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Purchase of Inputs	√															
2	Land Preparation	√	√														
3	Nursery Sowing			√													
4	Transplanting						√										
5	Top Dressing Fertilizer Application				√		√				√						
6	Pest Disease Control				√		√				√		√				
7	Weeding					√					√		√				
8	Harvesting																√
9	Marketing	√				√					√						√
10																	

Sample of Farming Schedule for 2nd Crop

Name of Cooperative: Name of Crop: Watermelon
Name of Sector: Name of District:

Month		September				October				November				December			
Week		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Purchase of Inputs	√															
2	Land Preparation	√	√														
3	Nursery Sowing			√													
4	Transplanting						√										
5	Top Dressing Fertilizer Application				√		√										
6	Pest Disease Control					√		√		√		√			√		
7	Weeding					√		√				√			√		
8	Harvesting																√
9	Marketing	√				√		√				√					√
10																	

Blank Forms for SMAP Marketing Activity

Market Survey Questionnaire

Date: Name of Cooperative:

Name of Market:

Name & Contact of the Dealer	Crop & Variety	Product's Quality of Market Requirements	Months of Peak Demand	Quantity (kg) of Supply	Frequency (daily/ weekly etc.)	Place of Production	Purchasing Unit Price (RWF/ kg)	Mode of Payment	Time for payment for payment	Marketing Challenges	Dealer Willingness to Purchase production from the Group (*)

*(If Yes, How Soon? If no, give reasons.)

Crop Selection Sheet

Date: Name of Cooperative:

Name of Sector: Name of District:

Crop Variety	Consumed by Local	Experience in cultivating the crop	Maturing period	Month of planting	Major production challenges	Average Marketable yield per are (10mx10m)	Average unit price (RWF/kg)	Total income per cropping season per are (RWF)	Cost of production per ha (RWF)	Estimated net income per ha (RWF)	Main market(s)	Marketing condition	Remarks	Rank ing

Crop Ranking Sheet

1st Crop

Name of Crops	No. of Members selected the Crop/ No. of total participants	Crop Ranking

2nd Crop

Name of Crops	No. of Members selected the Crop/ No. of total participants	Crop Ranking

Farming Schedule for 1st Preferred Crop

Name of Cooperative: Name of Crop:
Name of Sector: Name of District:

Month																
Week		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Purchase of Inputs																
2	Land Preparation																
3	Nursery Sowing																
4	Transplanting																
5	Top Dressing Fertilizer Application																
6	Pest Disease Control																
7	Weeding																
8	Harvesting																
9	Marketing																
10																	

Farming Schedule for 2nd Preferred Crop

Name of Cooperative: Name of Crop:

Name of Sector: Name of District:

Month																
Week		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Purchase of Inputs																
2	Land Preparation																
3	Nursery Sowing																
4	Transplanting																
5	Top Dressing Fertilizer Application																
6	Pest Disease Control																
7	Weeding																
8	Harvesting																
9	Marketing																
10																	

No._____.

Crop Production and Profit Monitoring Sheet

Survey Date: _____. Sector Agronomist' Name:_____. .

Coop. Name: _____ Sector: _____ District: _____ Province:_____.

Total Area of the Field: ____M by ____M or ____ Ha Num. Of Members: _____(M: F:).

	(1) Crop Name and Variety/	(2) Cultivation Period (Month/ Year to Month /Year)	(3) Area under the Crop (M x M or Ha)		(4) Total Production (kg)	(5) Total Production per Ha (kg/ha)	(6) Sold Amount (kg)	(7) Average Price per Kg (RWF/kg)	(8) Total Income (RWF)	(9) Total Production Cost (RWF)	(10) Net Income (RWF)	(11) Net Income per Ha (RWF/ Ha)
			M X M (M^2)	Ha		(4) ÷(3)	(6) ÷(3)		(6) X (8)		(9) - (10)	
1	1st Crop:											
2	2nd Crop:											
3	Other Crop:											
4	Other Crop:											
5	Other Crop:											
6	Other Crop:											
7	Other Crop:											
8	Other Crop:											
9	Other Crop:											
10	Other Crop:											
11	Other Crop:											
12	Other Crop:											

ADDITIONAL INFORMATION:

NOTES:

Please answer all questions under the un-shaded columns. The shaded columns are calculated by project.

1. Crop Name and Variety: indicate name of the crop and the variety. Target crop is limited to vegetable which are taret of SMAP cultivation training.

2 Cultivation Period: indicate start month/year of cultivation and end month/year of harvesting

3 Area under the Crop (M x M or Ha): where it is difficult to estimate the area in acres, it can be given in paces for both length and width of the farm in square meters.

4 Total Production (kg): farmers should indicate total production in kg for the area which has been put under the crop. Total production should include both marketable (net produce) and the unmarketable produce

5 Total Production per Ha (kg/ha): all production including marketable and unmarketable produce per ha (this will be calculated by the project from column 2 & 3)

6 Sold Amount (kg): this is marketable produce and is obtained by subtracting unmarketable produce from total production

7 Sold Amount per Acre (kg/ha): total produce minus unmarketable produce per ha (this will be calculated by the project from column 3 & 6)

8 Average Price per Kg (RWF./kg): where marketing is done using units other than weighing balances, the units need to be converted into kg

9 Total Income (RWF): average price per kg multiplied by net produce in kilos (this will be calculated by the project from column 6 & 8)

10 Total Cost of Production (RWF): should include the following where applicable:
- Cost of seed/planting material, fertilizers and manures, pesticides, posts/stakes,
- Labour costs such as nursery establishment/maintenance, ploughing, manures/fertilizer application, weeding, staking/training, spraying, harvesting
- Irrigation costs, and Transportation costs

11 Net Income (RWF): total income minus total cost of production (this will be calculated by the project from column 9 & 10)

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for Market-oriented Agriculture




September 2019

Smallholder Market-oriented Agriculture Project in Rwanda (SMAP)

CONTRIBUTORS

1. Mr. Boniface Kagiraneza, Horticulture Program Leader/ RAB
2. Mr. Martin Busobozi, Research Assistant/ Horticulture Program – RAB
3. Ms. Bancy Waweru, Associate Research Fellow/ Horticulture Program – RAB
4. Mr. Gregoire Hagenima, Associate Research Fellow/ Horticulture program – RAB
5. Mr. Assinapol Ndereyimana, Assistant Research Fellow / Horticulture Program – RAB
6. Ms. Christine Umulisa, Assistant Research Fellow/ Horticulture Program –RAB
7. Mr. Jean Chrisostome Muhigirwa, Assistant Research Fellow/ Horticulture Program – RAB
8. Ms. Jeanne Priscille Ingabire, Crop Protection Specialist – RAB
9. Mr. Chrispin Hakizimana, Post-harvest Management Officer/ Post-Harvest and Biotechnology Division – RAB
10. Mr. Firmin Uwizerwa, Research Technician / Horticulture program – RAB
11. Mr. Aloys Musabyisoni, Research Technician / Horticulture Program – RAB
12. Ms. Esperance Nyirahategekimana, Research Technician/ Horticulture Program – RAB
13. Ms. Marie Aimée Ingabire, Research Technician/ Horticulture Program –RAB
14. Ms. Pacifique Mutanyagwa, Research Technician/ maize program – RAB
15. Ms. Sifa Alice Uwimana, Research and Transformation Technician/ Cassava Program – RAB
16. Mr. Ange Robert Akingeneye, Research Technician/ Tea Sub-Program
17. Ms. Christine Uzayisenga, Extensionist/ Horticulture Program-RAB
18. Ms. Peruth Murekeyimana, Traditional Cash Crop Production Specialist/ Horticulture Program –RAB
19. Mr. Aimable Gatete, Coordinator of Horticulture Center of Excellence (HCoE)/ RAB
20. Mr. Ndatinya Hakiza, Operation Manager/ Twigire Muhinzi – RAB
21. Ms. Clementine Nyirarukundo, Crop Technician/ Horticulture Program – RAB
22. Mr. Joseph Higiro, Crop Protection Technician
23. Ms. Marcelline Uwamahoro, Seed Production Technician/ Seed Program – RAB
24. Ms. Immaculée Mukangwije, Seed Production Technician/ Seed Program – RAB
25. Ms. Placidie Dusabimana, Seed Production Technician/ Seed Program – RAB
26. Ms. Cecile Kayitesi, Seed Production Technician/ Seed Program – RAB
27. Mr. Oswald Shyirambere, Senior Agronomist/ Irrigation Program – RAB
28. Mr. Jean Marie Vianney Uwihoreye, Agronomist / Banana Program – RAB
29. Mr. Gaspard Nshyimiyimana, Agronomist/ Wheat Program – RAB
30. Mr. Shaffy Niyoyita, Post-Harvest Handling Technician/ Post Harvest Program – RAB
31. Mr. Aimable Ndicunguye, Agronomist/ Coffee Sub - Program – RAB
32. Ms. Gertrude Mukampunga, Technician/ Banana Program – RAB
33. Mr. Michio Goto, Team Leader/ JICA-SMAP Project
34. Mr. Masaya Fukumoto, Co-Team Leader/ JICA-SMAP Project
35. Dr. Yoshinao Adachi, Horticulture Expert/ JICA-SMAP Project
36. Ms. Hiromi Takenaka, Gender & Cooperative Management Expert / JICA-SMAP Project Team
37. Ms. Nana Morita, Coordinator/ JICA-SMAP Project
38. Mr. Benoit Gatebuka, Horticulture Senior Agronomist/ JICA-SMAP Project
39. Mr. Didier Semanyenzi, Cooperative Management Expert / JICA-SMAP Project
40. Mr. Valens Ntezirembo, Project Operation Coordinator/ JICA-SMAP Project
41. Mr. Yahaya Muvunyi, Project Operation Coordinator/ JICA-SMAP Project Team
42. Ms. Gisele Karangwa Uwase, Secretary/ JICA-SMAP Project

Preface

I am very glad to present these technical guidelines entitled "Market-oriented Agriculture Extension Package" (MAEP) to all farmers and extension officers in our country. This is an output of the "Smallholder Market-oriented Agriculture Project in Rwanda" (SMAP), a project implemented by the Rwanda Agriculture and Animal Resources Development Board (RAB) under the technical and financial cooperation of the Japan International Cooperation Agency (JICA). SMAP has been implemented for 5 years, since October 2014, aiming at increase in smallholders' agricultural income as well as enhancing capacity in extension services on rice and vegetables.

MAEP is an important and comprehensive material for market-oriented agriculture. It addresses not only cultivation techniques, but also organization management, gender mainstreaming, and marketing. It is recommended for adaptation to farmers in consideration of the following three major reasons

Firstly, MAEP provides a series of practical cultivation techniques on rice and vegetables. They are useful and easy to apply, so that beneficiary farmers, on their own, can repeatedly put them into practice on their fields. Secondly, MAEP offers a unique marketing strategy for vegetable farmers to make their business profitable. It recommends farmers to conduct market surveys by themselves before selecting vegetables to cultivate, in order to understand market trends and demands. Based on such market information, farmers decide vegetables to maximize profit. Thirdly, MAEP enhances gender mainstreaming in agriculture by putting highest priority on it. The relationship of a husband and a wife in market-oriented agriculture should not be "an employer and an employee" but "business partners", if they want to have a successful result.

In conclusion, I would like to sincerely express my congratulations to RAB staffs and the SMAP Team for achieving the objective of the project which is in line with the Strategic Plan of Agricultural Transformation (PSTA 4) in areas of food security, nutritional health, and sustainable agricultural growth from a productive, green and market-led agriculture sector.

I also extend my cordial thanks to JICA for its cooperation with MINAGRI, RAB and all other stakeholders. The responsibility to disseminate MAEP is now on our shoulder, as SMAP is phasing out. All stakeholders should coordinate and collaborate to practice and deliver the knowledge and techniques, which MAEP offers, to our farmers throughout the country. I hope that as many stakeholders and farmers as possible have opportunities to touch and apply this precious MAEP.

Dr. Patric KARANGWA
Director General
Rwanda Agriculture and Animal
Resources Development Board (RAB)
September 2019

Table of Contents

AGENDA and INSTRUCTIONS
SMAP Training on "Cooperative Management and Gender"

1. Schedule

	Time	Content
Day 1	08:00 -	Registration
	09:00	Opening, Introduction to SMAP
	09:30	Introduction to Coop Management/ Gender Training
	09:45	GENDER Session
	12:30	Lunch Break
	13:30	Recap + FAMILY BUDGETING Session
	15:30	Recap + COOPERATIVE Session
Day 2	08:00	Recap + LEADERSHIP Session
	10:00	Recap + RECORD MANAGEMENT session
	12:30	Lunch
	13:30	Recap + BOOK KEEPING + Recap
	15:00	・ Brief Explanation of GEL ・ Recap of Coop Management/ Gender ・ How to disseminate your learning to other members?
	16:00	Closing

2. How to Disseminate Your Learning to Other Members?

Q1: What topic should be start with?

A1: Start with "**Gender/ Family Budgeting**". For these sessions, member to bring their spouse!

Q2: Each session might take long time to cover. It sounds very difficult for us to manage.

A2: Conduct the training per each **SUB-TOPIC**.

<Sample>

	Sub-Topic 1	Sub-Topic 2	Sub-Topic 3
Cooperative	What is Coop and Why Coop?	Principles, Organs, Membership	1) Obligation and Right of Members 2) Successful Cooperative
Leadership	1) What is Leadership 2) Why Leadership?	1) Character of Good Leader 2) What can be done?	
Record Management	1) Why Record Management? 2) 2 Sets of Information	Basic Group Information	Production Data
Book Keeping	1) Why Book-Keeping? 2) Income and Expenditure	Cash Book	1) Year-End reconciliation 2) Calculation of Profit and Loss

Q3: WHEN is Good Timing to Conduct Training to the Members?

A3: Utilize the chance when many members gather together e.g., **cooperative activity day**. After the cooperative activities, ask the members to spare the time for **30 minutes** for the training. Thus, the training should not take long time as members are tired and has other activities as well.

TIPS!

- ✓ Try to cover all the topics within **before the next season harvest**, e.g., **May-June**
- ✓ SMAP activities require many cooperative works with the members e.g., how to organize group work, how to disseminate the crop production techniques, etc, and these topics would provide members foundation to work as cooperative member.
- ✓ SMAP is market-oriented– thus, we would ask you about the profit in the beginning and in the end of the cycle. At the end of the cycle, the cooperative would understand their profit and which crops were profitable based on the analysis, which requires good book keeping and good record management.

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Gender

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Topic of This Session

0. Before Starting: Introductory Exercise
1. Objective of the Training
2. Concept on Gender
3. Definition of Gender
4. Why GENDER?
5. Gender Analysis Tools
   - Roles & Responsibilities
   - Access and Control of Resources
   - Daily Activity Calendar
6. Plenary Session
7. Wrap Up
8. Consideration

0. Before Starting

Exercise 1

5 min

Read the statement and indicate by tick (√) whether it describes sex or gender

	Statement	Sex	Gender
1	Men inherit land		
2	Women do cooking		
3	Women breastfeed babies		
4	Men are bread winners		
5	Men are good in sciences while women are good in arts		
6	Women give delivery		
7	Women should not speak loud in public		

1. Objective of the Training

GENDER AWARENESS TRAINING

- To know and become aware on the **DIFERRENCE** between **GENDER** and **SEX**.
- To understand better on the **IMPLICATION** of **GENDER ON HOUSEHOLD ECONOMY**.
- To **IDENTIFY GENDER DISPARITIES** and lay intervention strategies.

2. Concept on Gender

Exercise

Please fill the blank:

- In my culture, I must be _____ because I am a women.
- In my culture. I must be _____ because I am a man.

2. Concept on Gender

SEX

- **Biological**
- **Universal**
- **Unchanging**
- **In Born**

GENDER

- **Constructed by Society**
- **Social & Cultural Regional Differences**
- **Changes over time**
- **Acquired**

2. Concept on Gender

Re-Exercise 1

Read the statement and indicate by tick (√) whether it describes sex or gender

	Statement	Sex	Gender
1	Men inherit land		
2	Women do cooking		
3	Women breastfeed babies		
4	Men are bread winners		
5	Men are good in sciences while women are good in arts		
6	Women give birth		
7	Women should not speak loud in public		

3. Definition of Gender

Definition of Gender

- COMPLEMENTARITIES and COLLABORATION of male and female.
- SAME RIGHT and OPPORTUNITIES to EVERYONE, in all aspects of life without favoring any sex (men or female) and age (boy or girl, elder man or elder female).
- DOES NOT REFER to FEMALE SEX as some people wrongly think.

4. Why GENDER?

GENDER matters as…

1. It is **NOT ONLY for WOMEN**.
2. It is for **BOTH MEN and WOMEN** to improve their livelihood.
3. **Better understanding and communication** between MEN and WOMEN can result in **MORE COLLABORATION** within their households, farming activities and cooperatives, and,
4. **EQUAL DEVELOPMENT** would be more **SUSTAINABLE**.

5. Gender Analysis Tools

Gender Analysis Tools

1. **Roles** and **Responsibilities**
   Productive Roles
   Reproductive Roles
2. **ACCESS** to and **CONTROL** of RESOURCES
3. **Daily Activity Calendar**

5. Gender Analysis Tools

WHY do we use Gender Analysis Tools?

- **BOTH Men and Women** are engaged in Farming.
- It is to **UNDERSTAND** and **KNOW** the situation of the others.
- We think that **WE KNOW** what the others are doing, but let's hear from their **OWN MOUTH** to rethink.

5-1. Roles & Responsibilities (1)

Roles and Responsibilities

Roles and Responsibilities of men and women in the household.

Productive Role

Any farm & off-farm production activities which lead farmers to financial benefits.

e.g., Farming, Construction

Re-Productive Role

Any household activities which do not lead farmers to financial benefits. Not paid work.

e.g., Cooking, Washing Clothes, Cleaning Houses

5-1. Roles & Responsibilities (2)

Exercise 2: Productive Roles

30 Minutes

- Discuss and agree on the most important horticultural crop in your area.
- Fill name of crop in the space provided on the PRODUCTION ROLES working sheet.
- Discuss, agree and fill in the spaces provided with major activities of the identified crop.
- The last activities for each crop would be "selling" and "income control".

5-1. Roles & Responsibilities (3)

Example: Productive

Activities	Men	Women
Land Preparation		
Leveling		
Sowing		
Weeding		
Watering		
Input Procurement		
Fertilizer/ Chemical Application		
Harvesting		
Winnowing		
Selling Crops/ Marketing		
Control of Benefit from Crop Selling (Income Control)		

5-1. Roles & Responsibilities (4)

Exercise 3: Reproductive Role

30 minutes

- Confirm if the listed household activities are the most common in your area.
- Create space and add any other important household activity.

5-1. Roles & Responsibilities (5)

Example: Reproductive

Activities	Men	Women
Cooking		
Washing Dishes/ Clothes		
Fetching Firewood		
Fetching Water		
Cleaning Houses		
Taking Care of Babies/ Children		
Taking Care of Elders/ Sick		
Grinding		
House Repair		
Security		

5-1. Roles & Responsibilities (6)

Before Starting the Exercise

- Form 1 Man Group and 1 Women group
- Be informed that 1 member of the group would Present the Result of the Exercise Result.
- Exercise to be completed in 15 – 30 minutes.

How to Fill the Sheet

- Identify who either men or women does the listed activities.
- Use "O" to mark. You have 4 O (OO OO) for each row.
  - OOOO (4 circle), if it is solely done by one or the other.
  - OO (2 circle), if both men & women do equally.
  - OOO (3 circle) if one does more than the other.

5-1. Roles and Responsibilities (7) - Plenary

Roles and Responsibilities

What can we understand from Exercise 2 & 3?

- Women are involved in the productive activities, but have limitation in income control.
- Women's limitation in income control negatively affects their active engagement in farming activity.
- Women are overburdened with both productive and reproductive role

5-2. Access & Control of Resources (1)

Access and Control

Who in the household has ACCESS to and CONTROL of a particular resource.

Resource

Anything that can be **OWNED and USED**.

e.g., Land, Tools, Crops, Cattles to obtain a benefit from it.

Access

Opportunity to **MAKE USE OF** the resource

Control

POWER to decide how the resource to be used.

5-2. Access & Control of Resources (2)

Access and Control

Example 1

- **Carrying out ACTIVITIES** on the LAND, such as grazing, cultivation, could be done because you are having the **ACCESS**.
- However, to **DECIDE on HOW TO USE THE LAND** is done by who has **CONTROL**.
- One can **MILK and UTILIZE THE MILK** in the household if he/she has an **ACCESS TO the animal**. But one **CANNOT SELL** the animal if he/she **DOES NOT HAVE CONTROL** of the animal.

5-2. Access & Control of Resources (3)

Exercise 4: Access to Resources

- List up resources which could be used to generate income in the household.
- One of the resources should be the crop which you have selected for Productive Roles Exercise (exercise 2).
- Identify who either men or women has access to each resource listed.

5-2. Access & Control of Resources (4)

Before Starting the Exercise

- Form 1 Man Group and 1 Women group
- Be informed that 1 member of the group would Present the Result of the Exercise Result.
- Exercise to be completed in 15 – 30 minutes.

How to Fill the Sheet

- Identify who either men or women does the listed activities.
- Use "O" to mark.
  - You have 4 O (OOOO) for each row.
  - OOOO (4 circle), if it is solely done by one or the other.
  - OO (2 circle), if both men & women do equally.
  - OOO (3 circle) if one does more than the other.

5-2. Access & Control of Resources (6)

Example of Access Sheet

No.	Resources	Men	Women
1	Land		
2	Farming Tools		
3	Farming Machines		
4	Fertilizers/ Chemicals		
5	Daily Cow		
6	Poultry		
7	House		
8	Cash		
9	Bicycle/ Motorbike		
10	Training		
11	Marketing		
12	Income Control		

5-2. Access & Control of Resources (6)

Exercise 5: Control of Resources

- Copy the resources which you listed for ACCESS (exercise 4), expect for training, to the control of resources sheet.
- Identify who either men or women has control of each resource listed.

5-2. Access and Control of Resources(7) - Plenary

Access and Control

What can we understand from the exercise 4 & 5?

- Women have access to some resources but little control over them.
- Men control almost all the resources.
- Lack of control of resources excludes women from decision making at the household.
- No one can make any decision on the issues related to the resources of which he/ she does not control.

5-3. Daily Activity Calendar (1)

Exercise 6: Daily Activity Calendar

- What kind of activities does man and women do within 1 day?
- What role does man and women take within 1 day?
- Let's Appreciate the different workloads of different gender groups in the household.
- Write down for each hours, what YOU (the group, either men or women) do as a typical day.

Time	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Activity																	

5-3. Daily Activity Calendar (2) - Plenary

Daily Activity Calendar

What can we understand from the exercise 6?

- Women work throughout the day but men have some time for leisure activities and rest.
- Women do not have time for training neither can they create more time for farming.
- Better time management is required to spend more time in the farm so as to increase productivity.

6. Plenary Session

Plenary Session

6.1. Plenary session

6.2. Plenary: Three Different Types of Analysis

6.3. Plenary: Consideration

6-1. Plenary Session

Recall what was the findings from each exercise.
<15 minutes>

WHAT CAN WE UNDERSTAND from the exercise result?

List the FINDINGS (ISSUES and PROBLEMS) on the flipchart.

6-2. Plenary: 3 Different Types of Analysis

3 Different Types of Analysis

What can we understand from exercise 2 to 6?

- Women are overburdened by both productive and reproductive roles.
- Women have limited time for farming activities due to the heavy workload.
- Men could better utilize time for more productive activities.

6-3. Plenary: Consideration

Consideration

- Household economy and the livelihood are negatively affected by the above problems.
- Something needs to be done to improve the household economy.
- Your suggestion are welcome to be on the action plan for effective implementation.

7. Wrap Up (1)

- Women play a **BIG ROLE** in farming.
- **SHARING of WORKLOAD** between men and women will improve their relationship and lead to more unity among the household members.
- **SHARING of RESOURCES** between men and women will improve household economy.
- Because both men and women are engaged in farming, let **BOTH OF THEM GET CHANCE to UPDATE** their skills and knowledge.

7. Wrap Up (2)

- **GENDER EQUALITY** is important for the livelihood improvement for BOTH MEN and WOMEN.
- Enhancement of understanding and more communication between men and women can result in **MORE COLLABORATION** within their households and community.
- This leads to **IMPROVED PRODUCTIVITY** in farming and livelihood.
- **EQUAL** development is **SUSTAINABLE** for both men and female.

8. Consideration

Create GENDER AWARENESS to the member of your cooperative and communities.

Your LITTLE EFFORT will bring about GREAT CHANGES and RESULTS!

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Family Budgeting

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Topic of This Session

1. Objective of the Training
2. What is FAMILY BUDGETING?
3. Before Starting Exercise
4. Exercise Procedure – Step 1 to Step 6
5. Plenary Session
6. Result
7. Consideration

1. Objective of the Training

FAMILY BUDGETING TRAINING

- To know and become aware on **WHAT and HOW much money are being spent** by men and women to fulfill their household roles and responsibilities.
- To explore **BETTER MANAGEMENT** of family income and its impact on farming activities even on the family welfare.
- To realize the **IMPORTANCE of INCREASING INCOME** for livelihood improvement.

2. What is FAMILY BUDGETING?

FAMILY BUDGETING is ….

Financial plan which provide prioritized information on

HOW FAMILY INCOME is SPENT
among family members.

3. Before Starting Exercise

Imagine an **AVERAGE HOUSEHOLD** in your community …

- HOUSEHOLD ECONOMY to be dependent solely on **FARMING**.
- Family members: Husband, Wife, Children

  Note: No. of children and Level of schools they are attending to be decided.
- **LAND SIZE** and **ENTERPRISE** (Crop) to be decided.

4. Exercise Procedure – Step 1

Divide the group into

1 Men Group & 1 Women Group

4. Exercise Procedure – Step 2

Each group to list

INCOME & EXPENDITURE

INCOME

List **THREE (3) MAJOR INCOME SOURCES** of his/ her in the household.

EXPENDITURE

List **TEN (10) MAJOR ITEMS** on which he/ she would spend his/ her own money

4. Exercise Procedure – Step 3-1

INCOME

- List **THREE (3) MAJOR SOURCES** of income.
- **ESTIMATE** how much you earn from each 3 sources.
- Calculate **ANNAUL INCOME** from each 3 sources.
- ADD 3 sources to figure out **TOTAL ANNUAL INCOME**.

Note !

- *This is not to bring out actual accurate amount of income which either men or women earn.*
- *DO NOT spend too much time to calculate annual income.*
- *This exercise if to understand the importance to balance income and expenditure.*

4. Exercise Procedure – Step 3-2

Income Sheet

	3 Major Income	Unit Cost	Total/ Year (RWF)
1			
2			
3			
Total			

4. Exercise Procedure – Step 3-3

- Once you list the INCOME, please Submit the List in the front.
- Each group would present the list after we finish all exercises so decide who to present the result.

4. Exercise Procedure – Step 4-1

Expenditure

- **RANK** the listed **TEN (10) ITEMS** in order of **IMPORTANCE**.
- Copy the **RANKED LIST** on worksheet.
- Discuss **HOW MUCH YOU WOULD SPEND** for each items **EACH MONTH**. Write down on the worksheet.
- Find out for **ALL TEN (10) ITEMS**.
- **ADD ALL 10 ITEMS** to understand how much expenditure is needed for **EACH MONTH**.

4. Exercise Procedure – Step 4-2

Expenditure Sheet

	10 Major Expenditure	Unit Cost	Total/ Year (RWF)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total			

4. Exercise Procedure – Step 4-3

Expenditure

- **TICK THE ITEM** on which you think that you should spend more than the amount indicated on worksheet.
- Indicate **HOW MUCH MORE** you would need.
- **CIRCLE the ITEMS** on which you believe that you would DECRESE the EXPENDITURE and how much.
- Indicate **HOW MUCH** you would decrease.

4. Exercise Procedure – Step 4-4

- Once you finish with Expenditure Exercise, please Submit the List in the front.
- Each group would present the list after we finish all exercises so decide who to present the result.

4. Exercise Procedure – Step 5-1

THINK of OTHER GROUP

- List **FIVE (5) MAJOR ITEMS** on the difference worksheet which you think the other group (opposite sex) spends for in each month.

4. Exercise Procedure – Step 5-2

- Once you listed FIVE (5) MAJOR ITEMS on the difference worksheet, please submit the List in the front.
- Each group would present the list after we finish all exercises so decide who to present the result.

5. Plenary Session

Each group present their group exercise result.
<15 minutes>

WHAT CAN WE UNDERSTAND from the exercise result?

List the FINDINGS (ISSUES and PROBLEMS) on the flipchart.

6. Result (1)

- **Both husbands and wives contribute** to household welfare.
- HOWEVER, there is usually **misunderstanding on the expenditure due to lack of communication** between each others.
- Men and women are **not aware on WHAT and HOW the other spend**.

6. Result (2)

- Both keep their income and expenditure SECRET.
- Lack of transparency between each other create SUSPICION and MISTRUST.
- Men and women spend on the SAME ITEMS.
- HOWEVER, LACK OF TRANSPARENCY results in **INEFFICIENT UTILIZATION OF RESOURCES** such as purchasing more than the household requirement.

7. Consideration (1)

- Lack of transparency between husband and wife is likely to affect the household economy negatively.
- It could be possible to pool the resources to budget for the items which both husband and wife spend on currently.
- Sharing of resources will assist the household to optimize the use of the income available in the household.

7. Consideration (2)

- Household to consider about having a common income source to improve on transparency among family members.
- Household should strive to increase income from a common source.
- Household to TAKE TIME for EVALUATION. Evaluation is very useful as we can understand HOW the planned budget has been implemented, WHETHER the objectives are achieved or not, and WHY was it achieved and why was it difficult to achieve.

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Cooperative

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Topic of This Session

0. Before Starting the Training
1. Objective of the Training
2. What is Cooperative?
3. Why Cooperative?
4. Principles of Cooperative
5. Organs of Cooperative
6. Membership
7. Obligation of Members
8. Rights of Members
9. Successful Cooperative
10. Problems which Coop Face
11. Discussion

0. Before Starting the Training (1)

Before Starting the Training 10 min

WHY did you Join the Cooperative?

※Participants to share the reason what made them join the cooperative.

0. Before Starting the Training (2)

Before Starting the Training 10 min

Do you know the **Roles and Responsibilities** as being the Coop member?

※Participants to share their opinion on what they think as Roles and Responsibilities as being the coop member.

1. Objective of the Training

Cooperative Management Training

- To know and understand what Cooperative is.
- To know and understand Roles and Responsibilities as being Coop members.
- Members play an important role in cooperative development. Thus, it is essential for the members to know their responsibilities, rights and access to information on cooperative activities and management.

2. What is Cooperative?

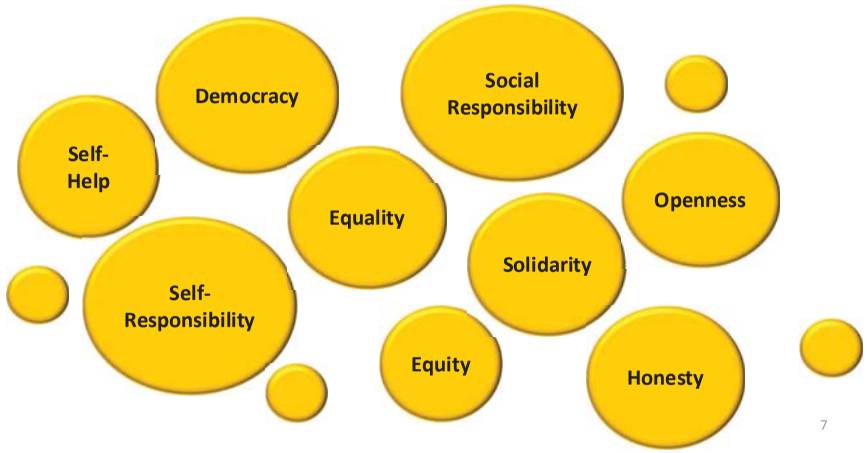
Cooperative is…

- Autonomous and Voluntary
- Group of individuals working together to achieve common needs; e.g., produce and sell vegetables/ rice.
- A Group with Legal Entity.

Note: A Cooperative is NOT an ASSOCIATION.
A Cooperative is NOT a COMPANY.
A Cooperative is NOT a TONTINE (SAVING GROUP).

3. Why Cooperative? (1)

COMMON VALUES of Cooperative



3. Why Cooperative? (2)

Benefits of Cooperative are…

- ✓ **Value Addition** to your life and product
- ✓ **Stimulate Savings** by working together
- ✓ **Contribute to Community Development**
- ✓ **Enterprise Succession**
- ✓ **Group Cohesion**
- ✓ **Access to Training**
- ✓ **Access to Micro Credit and Loans**

4. Principles of Cooperative

7 PRINCIPLES of Cooperative

1. Voluntary and Openness Membership
2. Democratic Member Control
3. Member Economic Participation
4. Autonomy and Independence
5. Education, Training and Information
6. Co-operation among Co-operatives
7. Concern for Community Development

5. Organs of Cooperative (1)

Organs of Cooperative

1

General Assembly

- **SUPREME** Organ of the Cooperative.
- Have **FULL POWER to examine and take decisions**.
- **Every member shall have the right to attend or to be represented in its meetings.**

2

Board of Directors

- **MANAGEMENT** organ of a cooperative.
- Implement thee DECISIONS and DIRECTIVES made by the General Assembly.
- This is in accordance with the by-laws governing the Cooperative Organization and the cooperative law in Rwanda.

5. Organs of Cooperative (2)

Organs of Cooperative

3

Supervisory Committee

- **SUPERVISE the MANAGEMENT** of the cooperative **EVERY THREE MONTH** and at any time it is considered necessary.
- **SUBMIT its REPORT** to the members and the members of the Board of Directors.
- **COUNTER-CHECK** the respect and effectiveness and ensure the appropriateness of guidelines set up by the General Assembly.
- **VERIFY** whether the Board of Directors and other Organs of a Cooperative implement all the decisions made in order to protect the general interests of the members of the Cooperative Organization.

5. Organs of Cooperative (3)

Organs of Cooperative

4

Specialized Committee

- Where possible, every Cooperative shall establish Specialized Committees.
- Example; Marketing, Education and Training, Credit and Finance, Personnel committee.
- Define each committees functions and duties in accordance with the By-laws.

5

Manager & Support Staff

- The Board of Directors shall subject to the approval of the General Assembly and in compliance with the Labor Law, **APPOINT a REMUNERATED MANAGER and OTHER SUPPORT STAFF** of a Cooperative.

6. Membership

Condition to become Coop Member

- ✓ At least **SIXTEEN (16) YEARS OLD** or be an **EMANCIPATED CHILD**.
- ✓ Not participate directly or indirectly in any activity competing with the coop which he or she is a member.
- ✓ Have **SUBSCRIPTED and PAID UP HIS/ HER SHARES** in accordance with the by-laws in order to constitute the share capital.
- ✓ **EXPRESSION OF INTEREST** in the coop activities.
- ✓ **RESIDE/ WORK NEAR** coop localization.
- ✓ **APPLY** for it and **ADMITTED** by the General Assembly.

7. Obligation of Members

Obligation of Cooperative Members

- ✓ **ATTEND General Assembly meeting** – vote and take decision.
- ✓ **CONTRIBUTE** and **PARTICIPATE** in any economics, socials activities, appointed responsibility of the Coop.
- ✓ **IMPLEMNET the DECISIONS** taken by the Board Director.
- ✓ **COMPLY with Coop by-laws** and the decisions taken by the relevant organs of the Coop.
- ✓ **INFORM** the Cooperative each activity that is against the interest of the Coop whenever he/ she finds.
- ✓ **CONTIBUTE to PAY the debts** of the Coop to the capital share value

8. Rights of Members

Rights of Cooperative Members

- ✓ **ATTEND** General Assembly – vote and take decision.
- ✓ **ELECT** and be **ELECTED**
- ✓ **PROVIDE IDEAS** and **ADVISE** to the cooperative member.
- ✓ **ENTER** and **WITHDRAW** the COOP
- ✓ **BENEFIT** from all activities performed by the coop.
- ✓ Be INFORMED of the ECONOMIC and FINANCIAL situation of the Coop.
- ✓ **RECEIVE** annual profit of his or her share capita.

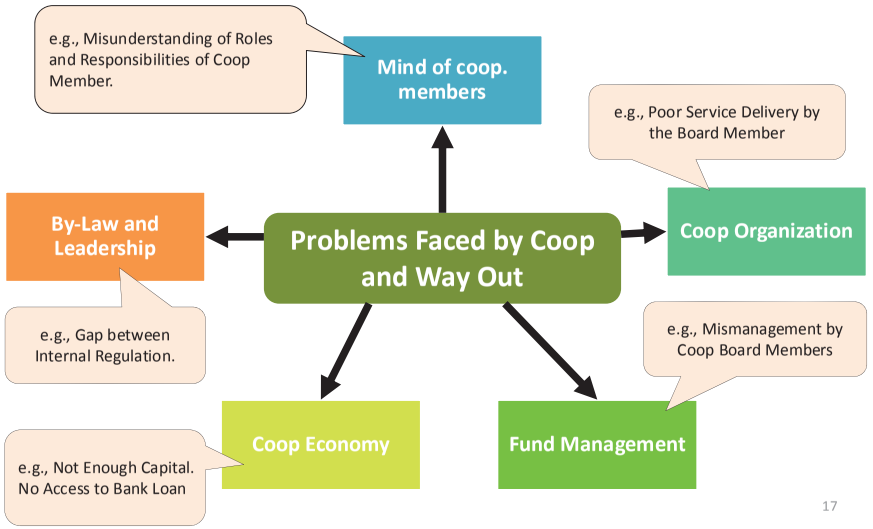
9. Successful Cooperative

TIPS for SUCCESSFUL Cooperative

- ✓ **PARTICIPATION of MEMBERS** are KEY to the Success.
- ✓ Records and Book Keeping is Imperative
- ✓ Plan – Do – Check – Adjust. Planning is important and reviewing/ adjusting to improve the action is more important.
- ✓ Divide roles and tasks for working together

Note: Never form a cooperative for the sole purpose of accessing funds only!

10. Problems which Coop Face



11. Discussion

Group Discussion on Issues your Coop Face 30 min

- **Divide the participants** in group based on Cooperative/ Zones/ Associations.
- **Discuss on each topics**; member's mind, organization, fund management, coop economy, by-law, and leadership
- After group discussion, each group to **present the discussion and hold plenary discussion**.
- After the clarification of problems & challenges which coop. face, the cooperatives' members try to spell out how they can be resolved or how they can prevent them in their respective cooperative/ associations/ Zones.

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Leadership

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Topic of This Session

1. Objective of the Training
2. What is Leadership?
3. Why Leadership and Management?
4. Effective Group Management/ Leadership
5. Characteristics of Good Leader
6. What to be Incorporated?
7. Exercise
8. Consideration

1. Objective of the Training

Leadership

- To understand WHAT leadership is and WHY it is important in Cooperative management and organization.

10 min

<Exercise>

- Discuss in group (cooperative based) about WHAT THEY think as "Leadership" and "Good Leader/ Leadership".
- Each group to share their opinion and list them up.

2. What is Leadership?

LEADERSHIP is ….

Organizing a group of people to achieve a common goal

- Organize Cooperative to INCREASE PRODUCTION per crop.
- Organize Cooperative to INCREASE INCOME (example, vegetables, rice) to make profit.

3. Why Leadership and Management?

Strong and Effective Management

Supervise and Coordinate Group Activities

Ensure Equal Distribution of the Work Load Among its Members

Type of Leadership Determines the Status of the Group.

- Good Leadership = Maintain More Cohesive Group.
- Bad/ Poor Leadership = Lead to Cliques an Coups within the Group

Tendency of Men = Chair person

Women = Treasures.

- Denies Women Opportunities to Participate in the Decision Making
- Women Participation in Group Activities.

4. Effective Group Management/ Leadership

Effective Group Management & Leadership leads to …

- **SUSTAINABLE GROUP** as it would be more cohesive and mutual trust among members.
- **GOOD COOPERATION** among members. No discriminatory behaviors of men against women, hence active participation of women.
- **EXCHANGE of IDEAS** between men and women and women enriches group management/ leadership.
- **CONFLITS and WHISPERING PREVENTION** through transparency and a good communication between leaders and members.

5. Characteristics of Good Leader (1)

Characteristics of Good Leader

- **COLLABORATE** with Cooperative member in order to achieve their target;
- **COORDINATE** the Cooperative/Zone/ Association activities and members;
- **PROMOTE** the Cooperative and the Cooperative members;
- Accept and understanding the reason to **DELEGATE POWER**;
- Being exemplary in his/her conduct and in day activities;

5. Characteristics of Good Leader (2)

Characteristics of Good Leader

- **Being the ability to** work on behalf of the cooperative;
- Fight against **FAVOURITISM** in the cooperative management;
- Effort to be trained and develop on his intellectual level;
- Being a collaborative mind with cooperative's members;
- Capacity to **RESOLVE** without favouritism the internal conflicts between cooperative's members

6. What to be Incorporated? (1)

- **MIXED GROUP** is more **stable** and more **constructive in ideas**.
- **Gender balance** in leadership improves leadership.

Encourage all group members to participate.

Encourage Spouses to attend in cases where gender is excessively skewed.

6. What to be Incorporated? (2)

- **MIXED GROUP** is easier to get the opinions of both men and women.
- **MIXED GROUP is more CONSTRUCTIVE in ideas as everyone has diversified know-how.**
- Involving men and women in the management will encourage **ALL MEMBERS to be ACTIVE in the GROUPS.**

Invite all members and their spouses to the first meeting to inform them of the training and the leadership approach.

If spouses are aware of the content of the training, they are likely to support each other to participate.

6. What to be Incorporated? (3)

SHARING EVERY INFORMATION with Each Member

- Cooperative members finds **TRUST** and **CONFIDENCE** to the Board members and as being cooperative member
- Increase the spirit of **COLLABORATION** and **COMPLEMENTARILY** among cooperative members;
- **FULL PARTICIPATION** by the Cooperative members;
- **DISPELL any CONFLICT** between Cooperative members;
- Speed up Cooperative **PROMOTION** and **DEVELOPMENT**.

6. What to be Incorporated? (4)

Collaboration with Local Leaders, Government Officers, Union and **Other Stakeholders**

- Motivate the cooperative
- Establish rapport for the cooperative
- Win their good-will which is necessary for the cooperative's future

Share Information with **Local** Leaders on the Training on its Objectives and Approaches.

7. Exercise

Exercise

20 min

- Participants to be divided in group based on each cooperative.
- Discuss within your members about; the situation within your cooperative, any issues which you think could be changed for benefit for the members, and WHAT kind of action could be taken to change the situation.

Share with the other groups what you have discussed.

Look for others opinions and others experience which you might want to bring back to your cooperative.

8. Consideration

For Effective Participation

- **All MEMBERS** to attend the training.
- All men and women members are **PARTICIPATING ACTIVELY** in the training.
- All men and women are sitting/ standing in a way they can **EXCHANG VIEWS and OPINIONS FREELY.**
- All men and women **UNDERSTAND what you are EXPLAINING**.
- Always **USE SIMPLE LANGUAGE** that every participants understand

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Record Management

Horticulture Cooperative

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Topic of This Session

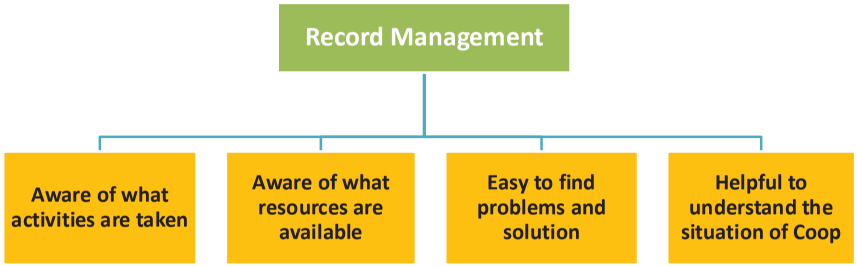
1. Objective of Training
2. Why Record Management?
3. Two (2) Sets of Basic Information
4. Ten (10) Record Management Sheets
5. Cooperative Profile
6. Membership List
7. Attendance Sheet
8. Minutes of Meeting
9. Tools and Equipment
10. Farming Schedule
11. Season Wise Crop Cultivation Record
12. Input Purchasing
13. Harvesting Record
14. Sales of Product

1. Objective of Training

Record Management

- To understand **WHY** it is good to keep record.
- To understand **BASIC** and **ESSENTIAL information** which are needed while running Cooperative.
- To acquire basic knowledge on **RECORD MANAGEMENT SHEETS**, especially on basic group information and production data.

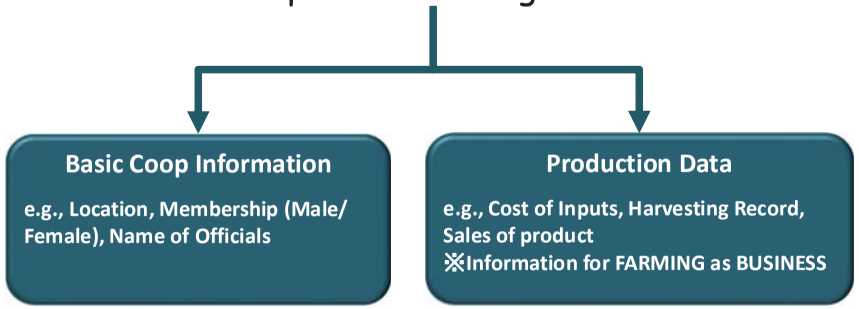
2. Why Record Management?



Proper record keeping will be helpful for **EFFECTIVE MANAGEMENT** as it could be checked and shared easily.

3. Two (2) Sets of Basic Information

2 Sets of Basic Information in Cooperative Management



4. Nine (9) Record Management Sheets

Nine (9) Record Management Sheets

Basic Group Information

1. Cooperative Profile
2. Membership List
3. Attendance Sheet
4. Minutes of Meeting
5. Tools and Equipment
6. Cropping Calendar (per crops)
7. Season Wise Crop Cultivation Record

Production Data

8. Input Purchasing
9. Harvesting Record
10. Sales of Product

4. Nine (9) Record Management Sheets

Note: These sheets are EXAMPLE.

Information could be recorded in different ways, so it does not have to follow THE FORMAT.

The most important points to keep in mind are;

- Have I written down **ALL the NECESSARY INFORMATION** related to the certain content?
- Could the record be **UNDERSTOOD by the OTEHERS** easily?

5. Cooperative Profile

Cooperative Profile

1. Cooperative Name/ Specific Business
2. District/ Sector
3. Date of Establishment
4. Membership; Number of Members (Total, Male, Female)
5. Organs of Cooperative and Composition of Committee Members
6. Leadership
7. Date of Last Election of the Officials
8. Day of the Group Meetings
9. Date of Official Registration

6. Membership List (1)

Membership List

1. Cooperative Name
2. District/ Sector
3. Name
4. Male or Female
5. ID Number
6. Telephone Number
7. Date when joined
8. Agreed on By-law
9. Membership Fee Paid
10. Nominee
11. Signature

Renew the Membership List Annually!

6. Membership List (2)

Membership List (Year _____) **Date:**

Coop Name: _____

District/Sector: _____/_____

No.	Name	M/F	ID Number	Tel Number	Date when Joined	Agreed on By-Law (signature)	Membership Fee Paid		Nominee	Signature
							Date	Amount		
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

7. Attendance Sheet (1)

Attendance Sheet

1. Date
2. Name of Activity
3. Cooperative Name
4. District/ Sector
5. Name
6. Male or Female
7. Position
8. Zone
9. Association
10. Signature

If the cooperative has associations or zones, we can add a column of members' association or zone after the point 7 of position

7. Attendance Sheet (2)

Attendance Sheet

No.	Name of Farmer	M/F	Position	Zone	Association	Activity	Activity	*Example: Community Work*
						Date	Date	*Date: 14 June 2017*
						✔	✔	✓
1								
2								
3								
4								
5								
6								
7								
8								
9								
10	*Example: Mukakalisa Jane*	*F*	*Member*	*Zone 1*	*Gashanga Association*			✓

8. Minutes of Meeting (1)

Minutes of Meeting

1. Date
2. Cooperative Name
3. District/ Sector
4. Attendance: Total No., Male No., Female No.
5. Agenda
6. Decision made
7. Action to be taken
8. Responsible Person/ Committee in charge of Action to be taken
9. Deadline of the Action
10. Remarks

8. Minutes of Meeting (2)

Date:
Coop Name:_____ _____
District/Sector:_____/_____
Attendance: Total No. _____ Male _____ Female _____

Agenda	
Decision made	
Action to be taken	
Responsible Person/Committee in Charge of Action to be Taken:	
Deadline of the Action	
Remarks	

9. Tools and Equipment (1)

Tools and Equipment

1. Cooperative Name
2. District/ Sector
3. Date of Purchase/ Received
4. Name of the Tools/ Equipment
5. Number of Each Tools/ Equipment
6. Total Number of Each Tools/ Equipment
7. Remarks

9. Tools and Equipment (2)

Coop Name:_____ _____
District/Sector:_____/_____

No.	Date of Purchase/ Received	Name of Tools/ Equipment	No. of Tools/ Equipment	Total No. of Tools/ Equipment	Remarks
1					
2					
3					
4					
5					

【Example】
1) Donated or Purchased, 2) Unit Cost of the Tools/ Equipment
3) Condition of the Tools/ Equipment

10. Cropping Calendar (1)

Farming Schedule

1. Date
2. Cooperative Name
3. District/ Sector
4. Crop Planting Calendar
5. Purchase of Input (seeds, fertilizers, agro-chemicals, etc.)
6. Land Preparation
7. Nursery Sowing
9. Transplanting
10. Top-dressing/ Fertilizer Application
11. Pest Disease Control
12. Weeding
13. Marketing
14. Harvesting
15. Cost & Income Analysis

★Check with Marketing Training

10. Cropping Calendar (2)

Coop Name: _____ **Date:**
District/Sector: _____/_____
Name of the Crop: _____

Month																							
Week		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Market Survey																								
2	Crop Planting Calendar																								
3	Purchase of Input																								
4	Land Preparation																								
5	Nursery Sowing																								
6	Transplanting																								
7	Top-dressing/ Fertilizer Application																								
8	Pest Disease Control																								
9	Weeding																								
10	Marketing																								
11	Harvesting																								
12	Cost & Income Analysis																								

★**Right down actions needed to achieve smooth implementation:**
Example – Purchase fertilizer and pesticide timely with no delay. Check tools for watering.

11. Season Wise Crop Cultivation Record (1)

Season Wise Crop Cultivation Record

1. Name of cooperative
2. District/ Sector
3. Season
4. Crop
5. Cultivated area

11. Season Wise Crop Cultivation Record (2)

Name of Cooperative: _____
District/ Sector:_____/_____

No.	Season:		Season:		Season:	
	Name of Crop	Cultivated area (HA/ARE/M)	Name of Crop	Cultivated area (HA/ARE/M)	Name of Crop	Cultivated area (HA/ARE/M)
1						
2						
3						
4						
	Cabbage	*0.05HA m 25 x m 20*	*Tomatoes*	*0.15HA m 30xm 50*	*Eggplants*	*0.45HA m 15 x m 30*

12. Input Purchasing (1)

Input Purchasing

1. Cooperative Name
2. District/ Sector
3. Name of Product
4. Variety
5. Date of Purchase
6. Unit Price (RWF)
7. Quantity Purchased
8. Total Cost of Purchase (RWF)

12. Input Purchasing (2)

Input Purchasing: Cooperative

Name of cooperative: _____
District / Sector:_____/_____

No.	Name of Product	Variety	Date of Purchase	Unit Price (RWF)	Quantity Purchased	Total Cost of Purchase (RWF)
1						
2						
3						
4						
5						

13. Harvesting Record (1)

Harvesting Record

1. Cooperative Name
2. District/ Sector
3. Name of Product/ Variety
4. Date of Harvest
5. Quantity (KG)
6. Responsible of Selling
7. Remarks

13. Harvesting Record (2)

Harvesting Record: Cooperative Farmland

Name of cooperative: _____
District / Sector:_____/_____

No.	Date	Name of Product/ Variety	Quantity (kg)	Responsible of selling	Remarks
1					
2					
3					
4					
5					

14. Sales of Product (1)

Sales of Product: Cooperative Farmland

1. Cooperative Name
2. District/ Sector
3. Name of Crop
4. Sales:
   - Date of Sales
   - Name of Product
   - Unit Price (RWF/KG)
   - Quantity sold (kg)
   - Total Amount (RWF)
   - Name of Buyer
   - Buyer's Phone Number
   - Remarks

14. Sales of Product (2)

Sales of Product: Cooperative Farmland

Coop Name: _____
District/Sector:_____/_____

1. Name of Crop / Variety:
2. Sales

Date	Name of Product	Unit Price/ Kg (RWF)	Quantity Sold	Total Amount (RWF)	Name of Buyer	Buyer's Phone Number	Remarks

14. Sales of Product (3)

Sales of Product: Members Farmland

1. Cooperative Name
2. District/ Sector
3. Name of Crop
4. Date
5. Name of Farmer
6. Quantity of Product Delivered (KG)
8. Quantity of Product Rejected (KG)
9. Quantity of Product Sold (KG)
10. Sales (RWF)
11. Signature
12. Remarks

14. Sales of Product (4)

Sales of Product: Members Farmland

Coop Name: _____
District/Sector:_____/_____

Name of Crop / Variety:

No	Date	Name of Farmer	Quantity of Product Delivered (Kg)	Quantity of Product Rejected (Kg)	Quantity of Product Sold (Kg)	Sales (RWF)	Signature	Remark
1								
2								
3								
4								
5								
6								

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Record Management

Rice Cooperative

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Topic of This Session

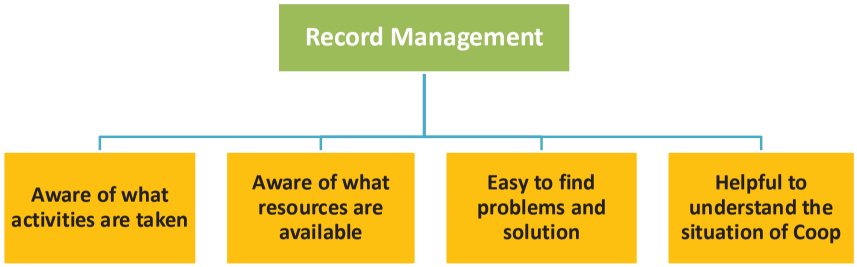
1. Objective of Training
2. Why Record Management?
3. Two (2) Sets of Basic Information
4. Ten (10) Record Management Sheets
5. Cooperative Profile
6. Membership List
7. Attendance Sheet
8. Minutes of Meeting
9. Tools and Equipment
10. Cropping Calendar
11. Input Purchasing
12. Input Distribution to Members
13. Harvesting Record
14. Sales of Product (Coop, members)

1. Objective of Training

Record Management

- To understand **WHY** it is good to keep record.
- To understand **BASIC** and **ESSENTIAL information** which are needed while running Cooperative.
- To acquire basic knowledge on **RECORD MANAGEMENT SHEETS**, especially on basic group information and production data.

2. Why Record Management?



Proper record keeping will be helpful for **EFFECTIVE MANAGEMENT** as it could be checked and shared easily.

3. Two (2) Sets of Basic Information

2 Sets of Basic Information in Cooperative Management

Basic Coop Information

e.g., Location, Membership (Male/ Female), Name of Officials

Production Data

e.g., Cost of Inputs, Harvesting Record, Sales of product

※Information for FARMING as BUSINESS

4. Ten (10) Record Management Sheets

Ten (10) Record Management Sheets

Basic Group Information

1. Cooperative Profile
2. Membership List
3. Attendance Sheet
4. Minutes of Meeting
5. Tools and Equipment
6. Cropping Calendar

Production Data

7. Input Purchasing
8. Input Distribution to Members
9. Harvesting Record
10. Sales of Product

4. Ten (10) Record Management Sheets

Note: These sheets are EXAMPLE.

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The most important points to keep in mind are;

- Have I written down **ALL the NECESSARY INFORMATION** related to the certain content?
- Could the record be **UNDERSTOOD by the OTEHERS** easily?

5. Cooperative Profile

Cooperative Profile

1. Cooperative Name/ Specific Business
2. District/ Sector/ Location
3. Date of Establishment
4. Membership; Number of Members (Total, Male, Female)
5. Organs of Cooperative and Composition of Committee Members
6. Leadership
7. Date of Last Election of the Officials
8. Day of the Group Meetings
9. Date of Official Registration

6. Membership List (1)

Membership List

1. Cooperative Name
2. District/ Sector
3. Name
4. Male or Female
5. ID Number
6. Telephone Number
7. Date when joined
8. Agreed on By-law
9. Membership Fee Paid
10. Nominee
11. Signature

Renew the Membership List Annually!

6. Membership List (2)

Membership List (Year _____) **Date:**
Coop Name: _____
District/Sector: _____/_____

No.	Name	M/F	ID Number	Tel Number	Date when Joined	Agreed on By-Law (signature)	Membership Fee Paid		Nominee	Signature
							Date	Amount		
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

7. Attendance Sheet (1)

Attendance Sheet

1. Date
2. Name of Activity
3. Cooperative Name
4. District/ Sector
5. Name
6. Male or Female
7. Position
8. Zone
9. Association
10. Signature

If the cooperative has associations or zones, we can add a column of members' association or zone after the point 7 of position

7. Attendance Sheet (2)

Attendance Sheet

No.	Name of Farmer	M/F	Position	Zone	Association	Activity					
						Date	✔	Date	✓	Date	✓
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

8. Minutes of Meeting (1)

Minutes of Meeting

1. Date
2. Cooperative Name
3. District/ Sector/ Location
4. Attendance: Total No., Male No., Female No.
5. Agenda
6. Decision made
7. Action to be taken
8. Responsible Person/ Committee in charge of Action to be taken
9. Deadline of the Action
10. Remarks

8. Minutes of Meeting (2)

Date:
Coop Name:_____ _____
District/Sector:_____/_____
Attendance: Total No. _____ Male _____ Female _____

Agenda	
Decision made	
Action to be taken	
Responsible Person/Committee in Charge of Action to be Taken:	
Deadline of the Action	
Remarks	

9. Tools and Equipment (1)

Tools and Equipment

1. Cooperative Name
2. District/ Sector/ Location
3. Date of Purchase/ Received
4. Name of the Tools/ Equipment
5. Number of Each Tools/ Equipment
6. Total Number of Each Tools/ Equipment
7. Remarks

9. Tools and Equipment (2)

Coop Name:_____ _____
District/Sector:_____/_____

No.	Date of Purchase/ Received	Name of Tools/ Equipment	No. of Tools/ Equipment	Total No. of Tools/ Equipment	Remarks
1					
2					
3					
4					
5					

【Example】
1) Donated or Purchased, 2) Unit Cost of the Tools/ Equipment
3) Condition of the Tools/ Equipment

10. Cropping Calendar (1)

Cropping Calendar

1. Date
2. Cooperative Name
3. District/ Sector/ Location
4. Crop Planting Calendar
5. Purchase of Input (seeds, fertilizers, agro-chemicals, etc.)
6. Land Preparation
7. Nursery Sowing
9. Transplanting
10. Top-dressing/ Fertilizer Application
11. Pest Disease Control
12. Weeding
13. Harvesting
14. Marketing
15. Cost & Income Analysis

10. Cropping Calendar (2)

Coop Name: _____ **Date:**
District/Sector: _____/_____
Name of the Crop: _____

Month																							
Week		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Market Survey																								
2	Crop Planting Calendar																								
3	Purchase of Input																								
4	Land Preparation																								
5	Nursery Sowing																								
6	Transplanting																								
7	Top-dressing/ Fertilizer Application																								
8	Pest Disease Control																								
9	Weeding																								
10	Marketing																								
11	Harvesting																								
12	Cost & Income Analysis																								

★Right down actions needed to achieve smooth implementation:
Example – Purchase fertilizer and pesticide timely with no delay. Check tools for watering.

12. Input Purchasing (1)

Input Purchasing

1. Cooperative Name
2. District/ Sector/ Location
3. Name of Product
4. Date of Purchase
5. Unit Price (RWF)
6. Quantity Purchased
7. Total Cost of Purchase (RWF)

12. Input Purchasing (2)

Input Purchasing: Cooperative

Name of Cooperative: _____
District / Sector:_____/_____

No.	Name of Product	Variety	Date of Purchase	Unit Price (RWF)	Quantity Purchased	Total Cost of Purchase (RWF)
1						
2						
3						
4						
5						

13. Input Distribution to Members (1)

Input Distribution to Members

1. Cooperative Name
2. Zone/ Association
3. Name of Farmers
4. Male/ Female
5. Date of Receiving Input
6. Quantity Received
7. Contribution to Pay (RWF)
8. Signature

13. Input Distribution to Members (2)

Input Distribution to Members

Name of Cooperative: _____

Zone / Association:_____/_____

No	Name of Farmers	M/F	Date of Receiving Input	Name of Input (Product)	Variety	Quantity Received	Contribution to pay (RWF)	Signature
1								
2								
3								
4								
5								

13. Harvesting Record (1)

Harvesting Record

For Cooperative

1. Cooperative Name
2. District/ Sector
3. Date of Harvest
4. Name of Zone/ Association
5. Cultivated Area
6. Quantity (KG)
7. Remarks

For Zone/ Association

1. Cooperative Name
2. Zone/ Association
3. Name of Farmer
4. Cultivated Area
5. Quantity (KG) Harvested
6. Signature
7. Remarks

13. Harvesting Record (2)

Harvesting Record: Cooperative

Name of cooperative: _____

District / Sector:_____/_____

No.	Date	Name of Zone/ Association	Cultivated Area	Quantity (kg)	Remarks
1					
2					
3					

Harvesting Record: Zone/ Association

Name of cooperative: _____

District / Sector:_____/_____

Zone/ Association:_____/_____

No.	Date	Name of Farmer	Cultivated Area	Quantity (kg)	Signature	Remarks
1						
2						
3						

14. Sales of Product (1)

Sales of Product: Cooperative Farmland

1. Cooperative Name
2. District/ Sector/ Location
3. Information of Miller:
   - Name
   - Telephone No.
4. Sales/ Delivery:
   - Date of Delivery to Miller
   - Unit Price (RWF/KG)
   - Quantity Delivered
   - Total Amount (RWF)
   - Remarks

14. Sales of Product (2)

Sales of Product: Cooperative Farmland

Coop Name: _____

District/Sector/Location:_____/_____

1. Name of Crop / Variety:
2. Information of Miller: Name: _____ Telephone No.:_____

3. Sales/ Delivery to Miller:

Date of Delivery	Unit Price (RWF)	Quantity Delivered	Total Amount (RWF)	Remarks

14. Sales of Product (3)

Sales of Product: Members Farmland

1. Cooperative Name
2. District/ Sector
3. Zone/ Association
4. Name of Farmer
5. Male/ Female
6. Quantity Delivered (KG)
7. Unit Cost/ Kg
8. Total Sales Amount (RWF)
9. Cooperative Margin (RWF)
10. Input Expenditure to be paid back to Coop
11. Any Other Fines
12. Sales Amount back to Farmer
13. Signature
14. Remarks

14. Sales of Product (4)

Sales of Product: Members Farmland

Coop Name:_____

District/Sector:_____/_____

Zone/ Association: _____/_____

No	Name of Farmer	M/F	Quantity Delivered (Kg)	Unit Cost /Kg	Total Sales Amount (RWF)	Coop Margin (RWF)	Input Expenditure for Coop (RWF)	Any Other Fines (RWF)	Sales Amount back to Farmer (RWF)	Signature	Remark
1											
2											
3											
4											
5											
6											

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Book Keeping

Horticulture Cooperative

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Topic of This Session

1. Objective of the Training
2. Why Book Keeping?
3. Book Keeping
4. Income and Expenditure
5. Two Types of Book
6. Cash Book
7. Credit Book
8. Year-end Reconciliation
9. Calculation of Profit and Loss
10. Calculation of Profit per Crop
11. How to Utilize Profit
12. What can We do in case of LOSS?

1. Objective of the Training

Book Keeping

- To understand **BASIC UNDERSTANDING** on book keeping.
- To understand WHY we keep the record.

2. Why Book-Keeping?

Book-Keeping is…..

RECORDING INCOME (Money Coming IN) and EXPENDITURE (Money Going OUT) of Cooperative.

- Know profit and loss of financial transaction in Coop.
- Prepare action/budget plan based on the previous year
- Be Financially transparent and accountable

To make decision for FURTHER IMPROVEMNET of Coop activities

3. Book Keeping (1)

Book Keeping

Book Keeping is Important

As you **CANNOT REMEMBER EVERYTHING**

- It Helps you in **TRACKING PERFORMANCE**
  = Am I making Profit or am I loosing?
- It Helps you in **PLANNING**
- It Helps you in **DECISION MAKING**
- It Helps you in **REDUCING** the Probability of **EARLY FAILURE**

3. Book Keeping (2)

Book Keeping

- **EASY** to Understand and **SIMPLE** to use
- Must be **ACCURATE**
- Needs to be **UP TO DATE**
- Needs **SUPPORTING DOCUMENTS** (e.g., receipt, Invoice/ Bill, Order Form) so that the other can check and confirm.

3. Book Keeping (3)

Book Keeping

BOOK KEEPING is about writing down

- ALL the Money that **COMES INTO (RECEIVED),** and,
- ALL the Money that **GOES OUT (SPENT)**
- By adding Information on **HOW you SPENT**.

Making PROFIT? Or LOSS?

Better Decision on WHAT TO BUY and WHAT TO SELL

4. Income and Expenditure

Income and Expenditure

INCOME

Money that **COME INTO** your Business

Example

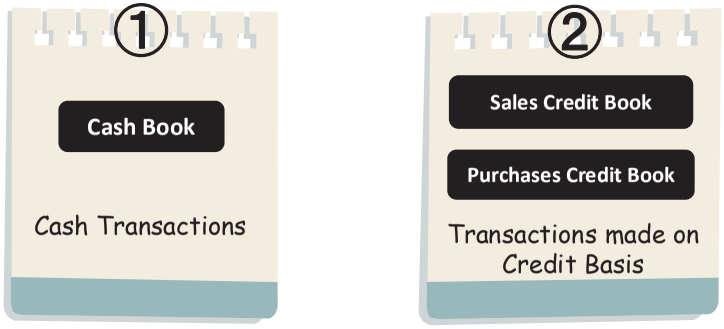
1. Producing and selling production
2. Membership fee
3. Getting loan

EXPENDITURE

Money that **GOES OUT** of your Business

1. **Materials/ Inputs**: e.g., Seeds, fertilizers, agro-chemicals
2. **Service**: e.g., Transport, Market toll, electricity, rent
3. **Wages/ Salary**: for those helping your business
4. **Savings**: For replacement and replacement of equipment

5. Two Types of Book



Book-keeping requires two types of notebooks.

6. Cash Book (1)

Example: Cash Book for June 2015

Date	Particulars	Unit Cost	Quantity	Incoming	Expenditure	Balance
1 June 2015	***Balance from May 2015***			***16,150***		***16,150***
12 June 2015	Seed (Tomato, RWF 500/can)	500	5		2,500	13,650
18 June 2015	Seeds (Cabbage, RWS400/can)	400	8		3,200	10,450
18 June 2015	Fertilizer (RWF 250/kg)	250	10		2,500	7,950
19 June 2015	Office Rental				4,000	3,950
20 June 2015	Transportation Cost to Market	1,000	1 time (return)		1,000	2,950
30 June 2015	Membership Fee (15 members)	1,000	15	15,000		17,950
30 June 2015	***Total***			***31,150***	***13,200***	***17,950***

6. Cash Book (2)

Exercise

15 min

Let's Try Writing Down Cash Book

- On 26th February 2015, XYZ Cooperative received membership fee for 20,000 RWF.
- On the same day, the cooperative paid 800RWF as sector taxes.
- On the next day, 27th February 2015, the cooperative received RWF 4,000 as house rental.
- On the same day, the cooperative purchased 10kg of fertilizer. The fertilizer was RWF250 per kg.
- On the same day, the cooperative purchased bags for RWF1,050.

※Group Work based on Cooperative

7. Credit Books (1) Sales Credit Book

There are **TWO TYPES** for **Credit Books**.

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- Record **whatever you sold some products** (e.g., Carrot, tomato) **in CREDIT.**
- Thus, you would need to **keep on checking** whether there are any **BALANCE OWING** for each item.
- **Once being repaid, please record the amount in CASH BOOK as you received incoming money in CASH.**

7. Credit Books (1) Sales Credit Book

Example: SALES Credit Book

Month: January 2015

Date	Particulars	Sold To	Unit Cost	Quantity	Amount Owing	Paid Amount	Paid Date	Balance Owing
7	Tomato	AAA buyer	300	20	6,000	2,500	20-Jan	3,500
17	Carrots	XYZ	1000	20	2,000			

When repaid, record the transaction in cash book !

7. Credit Books (2) Purchases Credit Book

There are **TWO TYPES** for **Credit Books**.

<Type 2: Purchase Credit Book>

- Record **whatever you purchased** (e.g., seeds, fertilizer) **in CREDIT.**
- Thus, you would need to **keep on checking** whether there are any **BALANCE**.
- **Once being paid, please record the amount in CASH BOOK as this is OUTGOING money which took place in in CASH.**

7. Credit Books (2) Purchases Credit Book

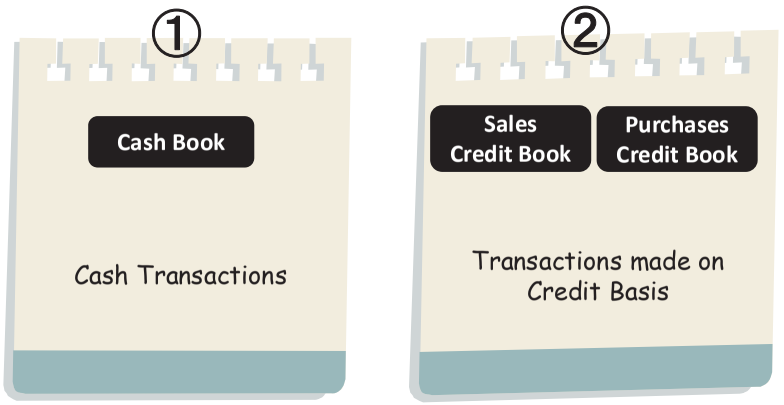
Example: PURCHASE Credit Book

Month: January 2015

Date	Particulars	Purchased From	Unit Cost	Quantity	Amount	Paid Amount	Paid Date	Balance to be Paid
2	Seeds	Shop A	500	3	1,500	1,500	10 Jan	0
17	Fertilizer	Shop XX	300	5	1,500	1,000	22 Jan	500

When you paid, record the transaction in cash book !

8. Year-end Reconciliation



CLEAR and ACCOUNTABLE

8. Year-end Reconciliation

- In addition to checking balance every month, we need to **CHECK** the following at the **END OF THE FISCAL YEAR**.
- For **CASH BOOK**,
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- For **CREDIT BOOKS**,
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  - If not, do you need to **record as loss** or are you going to **carry it over to next year?**
  - **Were all transactions on purchases credit book settled?**
- In this way, the finance of Coop will be **CLEAR and ACCOUNTABLE** to all stakeholders.

9. Calculation of Profit and Loss

To Calculate whether we have profit or loss,,,

- List up ALL the expense and input which took place to produce a certain crop produced by the cooperative.
- For example, for tomato; tomato seeds, items to produce manure, casual labor cost (not including family labor), transportation cost to the market.
- If you purchased fertilizer and applied the same fertilizer to different crops, divide the total amount based on how much you spent per crops.
- Check the INCOME from the crops and check the TOTAL EXPENDITURE which took place.

9. Calculation of Profit and Loss

Profit and Loss

PROFIT

Bigger in Amount

INCOME (Money In) EXPENDITURE (Money Out)

= You have something left with you.

LOSS

Bigger in Amount

INCOME (Money In) EXPENDITURE (Money Out)

= You have Nothing left with you or You owe money

10. Calculation of Profit per Crop (1)

STEP 1: Basic Information of Crop

	1	2	3		4	
	Crop Name & Variety	Market Survey (Y/N)	Cultivation Period		Area of Cultivation	
			From	To	MxM	Are/Ha
1	Tomato	Yes	March 2016	July 2016	OR	25 are
2						
3						
4						
5						

10. Calculation of Profit per Crop (2)

STEP 2: Sales Income Information

		5	6	7	8	9	10
	Crop Name & Variety	Total Production (kg)	Sold Amount (kg)	Production not Sold (kg)	Unit Cost (RWF./kg)	Type of Market *Local *District *Province *Kigali, etc.	Total Income (RWF) 【6x8】
1	Tomato	3,012.5kg	2,980kg	32.5kg	RWF.365/kg	District	RWf.1,087,700
2							
3							
4							
5							

10. Calculation of Profit per Crop (3)

STEP 3: Input/ Production Information

		11	12	13	14	15
	Crop Name & Variety	Cost of Inputs (RWF)	Cost of Labor (RWF)	Cost of Transportation (RWF)	Others e.g., Mulching	Total Production cost (RWF) 【11+12+13+14】
1	Tomato	RWF.104,000	RWF. 150,000	RWF. 50,000	RWF. 50,000	RWF.354,000
2						
3						
4						
5						

Example: Seed, Fertilizer, Pesticide, Product for Manure

10. Calculation of Profit per Crop (4)

STEP 4: Profit Calculation

		10		15		16
	Crop Name & Variety	Total Income (RWF) 【6x8】		Total Production cost (RWF) 【11+12+13+14】		Total Net Income (RWF) 【10-15】
1	Tomato	RWF.1,087,700	-	RWF. 354,000	=	RWF. 733,700
2			-		=	
3			-		=	
4			-		=	
5			-		=	

STEP 2 STEP 3

Profit per Crop & Variety

11. How to Utilize Profit of Cooperative

Profit of the Cooperative could be used as…

- 20% of the Legal Reserve Fund of the Cooperative Organization.
- Interest on members' deposits
- Divide the benefits among members based on the proportion of business done by the members.
- Special reserve funds, if any.
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(Cooperative Law: Article 86)

11. How to Utilize Profit of Cooperative

Exercise 1

15 min

- XYZ Cooperative has 45 members.
- They found out that the net profit of year 2014 was RWF 1,320,000.
- The cooperative is facing the trouble with their irrigation scheme, and needs to buy water pump, which costs RWF 600,000.
- As cooperative, they have to pay health insurance for all members at RWF 3,000 for each member.
- The remaining are planned to be shared among the members.

Question: How much money would a member receive as benefit surplus?

※Group Work based on Cooperative

11. How to Utilize Profit of Cooperative

Exercise 2

15 min

- List down the NEEDS which you think that your cooperative is lacking (e.g., renovation cost for canal).
- If there are any item which you know how much it would cost, mention the amount.
- Think about the other stakeholders who might support with those items you listed. Are you sure that you have deal with it only by your coop?
- Put priorities on the list and check how much it could be supported from the profit which coop made. Keep the NEEDS list and check overtime by revising accordingly.

※Group Work based on Cooperative

12. What can We do in case of LOSS?

If you found ANY LOSS in the Cooperative…

- Check and Analyze why we record loss.
- Share information with members
- Develop strategies for loss prevention.

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Book Keeping

Rice Cooperative

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

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1. Objective of the Training
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Income and Expenditure

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Money that **COME INTO** your Business

Example

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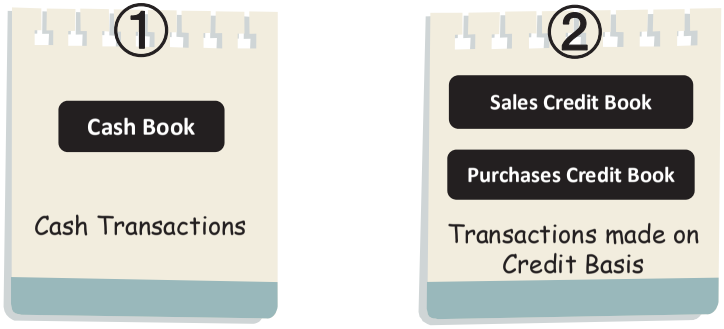

Book-keeping requires two types of notebooks.

6. Cash Book (1)

Example: Cash Book for June 2015

Date	Particulars	Unit Cost	Quantity	Incoming	Expenditure	Balance
1 June 2015	***Balance from May 2015***			***16,150***		***16,150***
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6. Cash Book (2)

Exercise

15 min

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When repaid, record the transaction in cash book !

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2	Seeds	Shop A	500	3	1,500	1,500	10 Jan	0
17	Fertilizer	Shop XX	300	5	1,500	1,000	12 Jan	500

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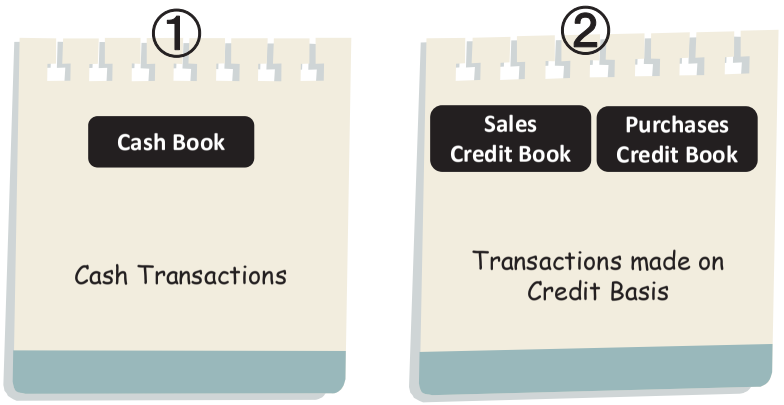

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Bigger in Amount

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= You have something left with you.

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= You have Nothing left with you or You owe money

10. Calculation of Profit per Variety (1)

STEP 1: Basic Information of Crop

1	2		3	4
Crop Name & Variety	Cultivation Period Season		Area of Cultivation	Estimated Production
	From	To		
			Are	
Rice/ Yun Yeng	Jan 2016	June 2016	5 Are	200-350 Kg

STEP 2: Sales Income Information

1	5	6	7	8	9
Crop Name & Variety	Total Production (kg)	Sold Amount (kg)	Production not Sold (kg)	Unit Price (RWF...../kg)	Total Income【6x8】(RWF)
Rice/ Yun Yeng	250 Kg	210 Kg	40 Kg	RWF. 265/kg	RWF. 55,650

10. Calculation of Profit per Variety (2-1)

STEP 3: Input/ Production Information / Expenses

1	10				11				12		13
Crop Name & Variety	Cost of Inputs (RWF)				Cost of Labor (RWF)				Others		Total cost (RWF) 【10+11+12】
	Items	Qtty	Unit Cost (RWF)	Total Cost (RWF)	Items	Qtty	Unit Cost (RWF)	Total Cost (RWF)	Items	Cost (RWF)	
	Seed				Nursery prep.				District Taxes		
	Fertilizer NPK				1st Plowing				Contribution/coop		
	Fertilizer Urea				2nd Plowing				Water fees		
	Manure				Puddling				Transportation		
	Pesticide				Leveling				Weighing		
					Trans-planting				Bags		
					1st Weeding						
					2nd Weeding						
					3rd Weeding						
					Soil band cleaning						
					Pesticides application						
					Bird scaring						
					Harvesting						
					Drying paddy						
					Winnowing						
	Total (10) =				Total (11) =				Total (12) =		

10. Calculation of Profit per Variety (2-2)

STEP 3: Input/ Production Information / Expenses

1	10				11				12		13
Crop Name & Variety	Cost of Inputs (RWF)				Cost of Labor (RWF)				Others		Total cost (RWF) 【10+11+12】
	Items	Qtty	Unit Cost (RWF)	Total Cost (RWF)	Items	Qtty	Unit Cost (RWF)	Total Cost (RWF)	Items	Cost (RWF)	
Rice/ Yun Yeng	Seed	1.5 kg	350	525	Nursery prep.	1	1,000	1,000	District Taxes	300	**RWF. 35,650**
	Fertilizer NPK	10kg	520	5,200	1st Plowing	3	1,000	3,000	Contribution/coop	1,000	
	Fertilizer Urea	5kg	355	1,775	2nd Plowing	2	1,000	2,000	Water fees	1,000	
	Manure	-	-	-	Puddling	1	1,000	1,000	Transportation	-	
	Pesticide A	-	-	600	Leveling	1	1,000	1,000	Weighing	300	
	Pesticide B			300	Trans-planting	2	1,000	2,000	Bags	750	
					1st Weeding	1.5	1,000	1,500			
					2nd Weeding	2	1,000	2,000			
					3rd Weeding	3	1,000	3,000			
					Soil band cleaning	-	-	600			
					Pesticides application	-	-	900			
					Bird scaring	-	1,200	1,200			
					Harvesting	2	1,000	2,000			
					Drying paddy	-	-	1,500			
					Winnowing	-	-	1,200			
	Total (10) =			8,400	Total (11) =			23,900	Total (12) =	3,350	

10. Calculation of Profit per Variety (3)

STEP 4: Profit Calculation

	9		13		14
Crop Name & Variety	Total Income (RWF) 【6x8】	-	Total Production cost (RWF) 【10+11+12】	=	Total Net Income (RWF) 【9-13】
Rice/ Yun Yeng	RWF.55,650		RWF. 35,650		RWF. 20,000
	STEP 2		STEP 3		Profit per Variety

Note:

- Each farmer to purchase a notebook where he/she records the expenses regularly.
- **To Increase Profit** = **Increase Production** + **Reduce Production Cost**

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Profit of the Cooperative could be used as…

- 20% of the Legal Reserve Fund of the Cooperative Organization.
- Interest on members' deposits
- Divide the benefits among members based on the proportion of business done by the members.
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11. How to Utilize Profit of Cooperative

Exercise 2

15 min

- List down the NEEDS which you think that your cooperative is lacking (e.g., renovation cost for canal).
- If there are any item which you know how much it would cost, mention the amount.
- Think about the other stakeholders who might support with those items you listed. Are you sure that you have deal with it only by your coop?
- Put priorities on the list and check how much it could be supported from the profit which coop made. Keep the NEEDS list and check overtime by revising accordingly.

※Group Work based on Cooperative

12. What can We do in case of LOSS?

If you found ANY LOSS in the Cooperative…

- Check and Analyze why we record loss.
- Share information with members
- Develop strategies for loss prevention.

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda

Group Empowerment Level

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Topic of This Session

1. What is Group Empowerment Level?
2. Contents of GEL
3. How to Decide the Level
4. Taking Actions with GEL: Check Progress, Monitor, and Evaluation

1. What is Group Empowerment Level? (1)

Group Empowerment Level

Group Empowerment Level (GEL) is a TOOL…

- To understand the **GROUP COHESION** in terms of; Cooperation, Leadership, Record Keeping, and Gender relation.
- To understand the **GROUP PROGRESS**; where we were before, and what changes are taken in place.
- Used during Baseline Survey & will be used during the periodical Monitoring and Evaluation to **UNDERSTAND the CHANGE**.

1. What is Group Empowerment Level? (2)

Group Empowerment Level

Group Empowerment Level (GEL) = 5 LEVEL

Each level presents "Specific Description"
which explains HOW the group could be defined.

1. What is Group Empowerment Level? (3)

Group Empowerment Level

GEL Level	Description
GEI Level 5	• Coop is able to work together to address various problems. • Coop could build and maintain a network with other coops, groups and organizations.
GEI Level 4	• Strong ties have been established among coop members. • Members are interested in the capacity enhancement of the coop as well as the community as a whole.
GEI Level 3	• Coop members became confident in each other.
GEI Level 2	• Coop members are getting aware of the benefits of grouping.
GEI Level 1	• Coop is formed as recommended by outsiders. • Not all members are fully convinced of its benefit.

2. Contents of GEL: Cooperation

Cooperation

GEL 5	• Cooperative interacts with other organizations to solve problems. • The external shocks, such as loss of buyers, unfavorable weather, poor prices do not jeopardize the coop cohesion and integrity. • Coop members are engaged in the skills/ knowledge dissemination to other farmers.
GEL 4	• Members acquire enough bargaining power against buyers. • Conflict management is done properly. The group has an effective conflict resolution mechanism in place. • More than 70% of members are aware of and are satisfied with how the membership fee is spent and how the profit from the collective marketing are shared among the members. • Skills/ knowledge imparted by the training are implemented by more than 80% of members in their fields.
GEL 3	• Collective input purchase and production sale are done. • Members participate actively in coop activities. • More than 80% of members contribute regularly. • Skills/ knowledge imparted by the training are implemented more than 50% of the members in their fields.
GEL 2	• Coop members understands their rights and responsibilities. • Less than 50% of members contribute regularly. • Group members organize the farming activities together with an aim to upgrade their skills/knowledge. Acquired skills and knowledge are being shared (50%).
GEL 1	• Coop members do not understand their rights and responsibilities. • Little cooperation exists among members. • Limited number of group members implement coop activities.

2. Contents of GEL: Leadership

Leadership

GEL 5	• Change in leaders does not give negative impact for cooperative management.
GEL 4	• Leader consider interest of all members. • Members have confidence in leaders and assist them for the smooth group operation.
GEL 3	• Leaders provide necessary information to all members. • The decisions and plans of the group activities are discussed in the regular management.
GEL 2	• Leaders are selected by the members. • Leaders understand their rights and responsibilities. • The meeting is to convey messages from the leaders/ officials to the members, not for discussion. E.g., group members are not given the opportunity either to make changes or approve the agenda.
GEL 1	• There has been no election for officials. • Leaders do not know their rights and responsibilities. • Only group officials are exclusively involved in the decision-making.

2. Contents of GEL: Record/ Book Keeping

Record Keeping/ Book Keeping

GEL 5	• Cooperative holds meeting to decide how to utilize profit.
GEL 4	• Financial status is disclosed at general assembly.
GEL 3	• Profit of cooperative is calculated and recorded properly. • Non-financial records are kept and recorded properly.
GEL 2	• Income and expenditure are recorded properly. • Record on members' contribution is available.
GEL 1	• Record keeping and book keeping is not done/ not updated regularly. • Coop members do not have accounting skill.

2. Contents of GEL: Gender

Gender

GEL 5	• Members spontaneously promote gender awareness for those who do not belong to cooperative.
GEL 4	• Women can express their opinions and ideas in coop meetings. • Women are well motivated in coop activities. • Women members participate in the community meetings actively.
GEL 3	• There is at least one female board member. • All farming activities are shouldered by both men and women. • Both men and women are comfortable in expressing themselves freely in the meeting. • Both men and women are actively involved in the group management.
GEL 2	• Coop members understand importance of gender issues. • Women participate in the group activities along with men. • Women passively participate in the meeting. • More than 70% of women members participate in the group activities regularly. • Less than 30% of group officials are women.
GEL 1	• Coop members are not aware of importance of gender issues. • There are some works which are shouldered by men or women. • Women feel they are inferior to men.

3. How to decide the Level (1)

How to Decide the Level

- We start from "Cooperation". Read what is described as "Cooperation" in each level.
- Each member decide WHICH LEVEL presents the current situation of the coop and write down on piece of paper.
- Every member VOTE without mentioning their names and put the paper in the envelope.
- Continue with other 3 dimensions; Leadership, Record Keeping/ Book Keeping, and Gender. The pieces of papers are collected in separate envelopes.
- Open the four envelopes and count. The majority of the level is the current situation of the cooperative perceived by the members.

3. How to decide the Level (2)

Example

- Cooperative AAA has 25 members.
- 25 members voted for GEL.
- For COOPERATION,
  5 members voted for Level 1
  10 members voted for Level 2
  7 members voted for Level 3
  3 members voted for Level 4
  0 members voted for Level 5
- The COOPERATION level for Cooperative AAA is Level 2.

4. Taking Action with GEL

Way Forward

- GEL Level decided, which is the majority of the vote, reflects the current situation of the cooperative.
- Re-read each level and think about **HOW TO IMPROVE THE LEVEL**. What kind of action could be taken?
- Include those activity to improve GEL (cooperation, leadership, record & book keeping, and gender) in Action Plana and review those actions taken at the time of Action Plan Review.
- Take time for monitoring and evaluation – recommended to continue voting GEL on annual base e.g., Every March General Assembly.

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda
SMAP

Appropriate use of profit in Horticulture cooperative

Horticulture cooperatives

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Contents

1. Introduction

- WHY we form Cooperative and WHAT IS "PROFIT" in Cooperative?
  - Cooperative as "**Income/ Profit Generating Institution**"
  - **GENERATING PROFIT** as one of key motivation of coop. members
- HOW TO GENERATE PROFIT in Cooperative
  - Plan
  - Implement Coop. Activities (= Farming Activities) to Generate INCOME
  - **CALCULATE PROFIT** = Check **INCOME** and **EXPENDITURE**
  - Control and Verify
  - Prepare & Submit Financial Report in General Assembly
  - **Decide on HOW TO USE the Profit**
- Expected Learning from this Session
  - Acquire basic knowledge on **HOW TO UTILIZE cooperative profit**
  - Understand **PITFALLS** which cooperative might face due to inappropriate use of coop profit.

2. Profit and Loss in cooperative

- **NECESSARY INFORMATION** to Calculate Coop Profit
  - Records of Cooperative's **EXPENDITURES**
  - Records of cooperative's **INCOMES**
  - Brief review of profit calculation format in horticulture cooperatives.
- **MAJOR CHALLENGES** which Coop faces at the time of Calculating Profit
  - **LACK of DATA** or insufficient recording system = **Weak in Recording**
  - **LACK OF KNOWLEDGE** on HOW to CALCULATE PROFIT
  - **CALCULTION MISTAKES** which took during profit calculation
  - Lack of verification system/ structure
  - Missed the **RIGHT TIMING** for calculating profit
  - **MISMANAGEMENT** and/or **EMBEZZLEMENT** within cooperative, etc.

3. Factors which affect increase/ decrease of profit

- **FACTORS** which affect **INCREASE/ DECREASE of Profit**
  - Cost of **INPUTS**, **LABOUR** and basic **TOOLS**
  - **YIELD** and **QUANTITY** of production sold
  - **SELLING PRICES**
  - Administrative costs and other expenses
  - Unexpected/ Uncontrollable Factors e.g., diseases, floods, natural disasters, etc.

MINIMIZE EXPENDITURE to appropriate level

INCREASE PRODUCTION which could be sold at good price

E.g., 1: Increase Coop Farmland Production = Increase Coop Income = Profit Increase
E.g., 2: Member's active participation to activity = Decrease Hired Labor Cost
E.g., 3: Receive Support from Others = Decrease Expenditure of Coop

4. Use of profit in cooperative

- **Decide HOW TO USE the Profit**
  - Collect suggestions/ opinions from leaders and members
  - Decide at General Assembly
- Reference: Rwandan Cooperative Law (Article 86)
  - 20% of the Legal Reserve Fund of the Cooperative Organization.
  - Interest on members' deposits
  - Divide the benefits among members based on the proportion of business done by the members.
  - Special reserve funds, if any.
  - Incentives to the Board of Directors and employees.
  - Any other matter not specified above in furtherance to the objective of the cooperative organization.
- **Examples** of Utilization of Profit
  - Purchase tools/ equipment, Coop Farmland to increase production
  - Divide the benefit among members after each season
  - Set up support fund for members (secure members' welfare)

5. Causes & consequences of conflicts on the use of profit

- **CAUSES** of Conflicts
  - **DIFFERENCES in EXPECTATION/ MOTIVATIONS** within cooperative members
  - Weak **DECISION MAKING PROCESS**
  - Weakness in **PLANNING** for medium and long term
  - Weak internal regulation (no updated)
  - **LACK OF SUFFICIENT TRANSPARANCY** - difference information among members
  - **LACK OF TRUST** to Board due to the inactive supervisory committee, etc.
- **CONSEQUENCES**
  - **LOW MOTIVATION** within members
  - DECREASE in PRODUCTION due to lack of management of coop farmland
  - **INACTIVE** cooperative, etc.

6. Strategies to prevent conflicts

- **Decision Making by ALL MEMBERS**, including both leaders and members, especially on HOW TO USE THE PROFIT
- Decision making based on **SUFFICIENT AMOUNT OF INFORMATION** within the members
- SHARING of cooperative's plan within members = Members understand and agree on cooperative's plan
- **TRANSPARANCY** on the use of profit
- **DO NOT KEEP UNUSED MONEY** which has no objective
- ....

7. Conclusion

- COOP PROFIT = Contribute to **GENERATE INCOME**
- COOP PROFIT = To be used to **ENHANCE COOP ACTIVITIE**
- **PLAN** how the cooperative would like to be and **SHARE the PLAN to all members** so that everyone has same vision.
- **THOROUGH DISCUSSION** among members on the use of profit = Increase in **TRANSPARRENCY**.
- **GOOD MANAGEMENT** of cooperative's resources.

Murakoze!

Questions & Answers & Discussions

Republic of Rwanda
Smallholder Market –Oriented Agriculture Project in Rwanda
SMAP

Promotion to Reduce Malnutrition utilizing profit created by RAB-SMAP activities

Horticulture cooperatives

Ministry of Agriculture and Animal Resources
Rwanda Agriculture and Animal Resources Development Board
Japan International Cooperation Agency

Contents

1. Introduction

- **How farmers utilize the profit from RAB-SMAP to improve their nutrition.**
- **Current Situation of Nutrition in Rwanda**
  - Food security status
  - Forms of malnutrition
  - Stunting prevalence
- **How to Improve Malnutrition with RAB-SMAP's Profit**
  - Relationship between RAB-SMAP and Nutrition
  - Fortified/bio-fortified crops
  - Diversified/balanced diet

2. Example of Utilization of Profit

- **How much farmers gained the profit from vegetable cultivation by SMAP techniques, for example;**
  - **3.7 times** increase even after 5 years of SMAP training in Rwamagana District (17,242Rwf/member ⇒ 62,995Rwf/member from cooperative farmland)
  - **2.4 times** increase after 3 years of SMAP training in Rulindo District (5,121Rwf/member⇒12,237Rwf/member from cooperative farmland)
- **Farmers/Cooperatives utilize SMAP profit for**
  - Improvement of livelihood
  - Income generation activities
  - Strengthening of organization

2. Example of Utilization of Profit

- **Improvement of livelihood**
  1. Improve in Nutrition, ex: Kitchen garden
  2. Insurance
  3. Saving
  4. Loan within cooperatives
  5. School fee

Others: Clothing, Electricity, Repairing of house, etc…

Kitchen Garden

Installation of Tap Water

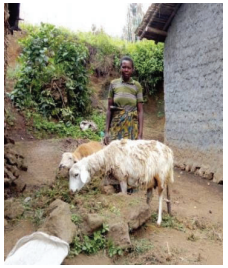
Purchase of Motorcycle

Certification of Insurance document

2. Example of Utilization of Profit

- **Income generation activities**
  1. Livestock rearing
  2. Agri equipment machine
  3. Contract farming, etc.

- **Strengthening of organization**
  1. Ripple effect to neighbors
  2. Group purchasing of agriculture input
  3. Purchasing of cooperative farmland, etc…

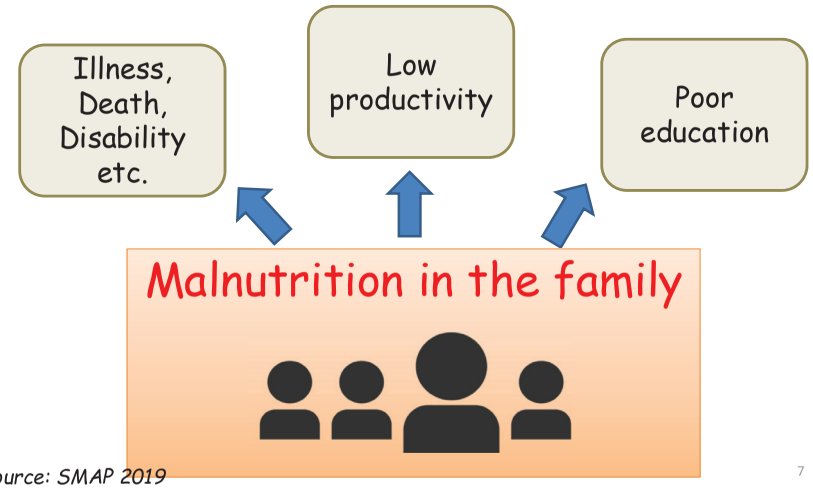


Goat Rearing

Contract Farming of French Been & Broccoli

3. Current Situation of Nutrition in Rwanda

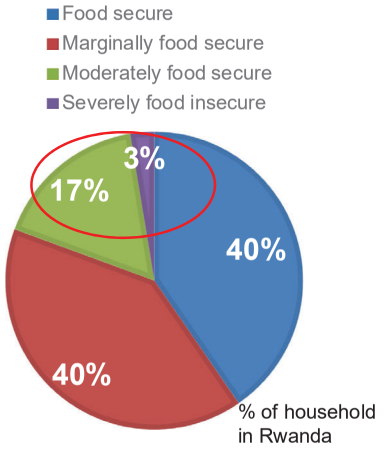
- **What is impact of "Malnutrition"?**



Source: SMAP 2019

3. Current Situation of Nutrition in Rwanda

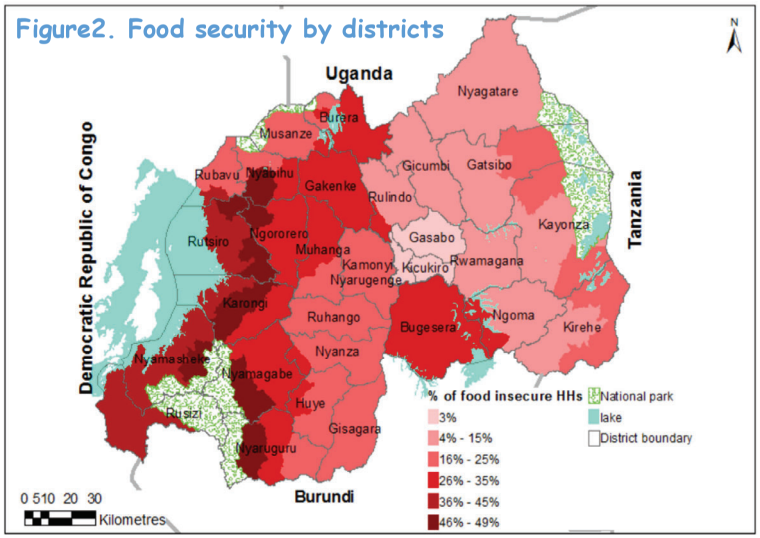
Figure 1. Food security status by province



Source: Rwanda CFSVA 2015

3. Current Situation of Nutrition in Rwanda

Figure2. Food security by districts



Source: Rwanda CFSVA 2015

3. Current Situation of Nutrition in Rwanda

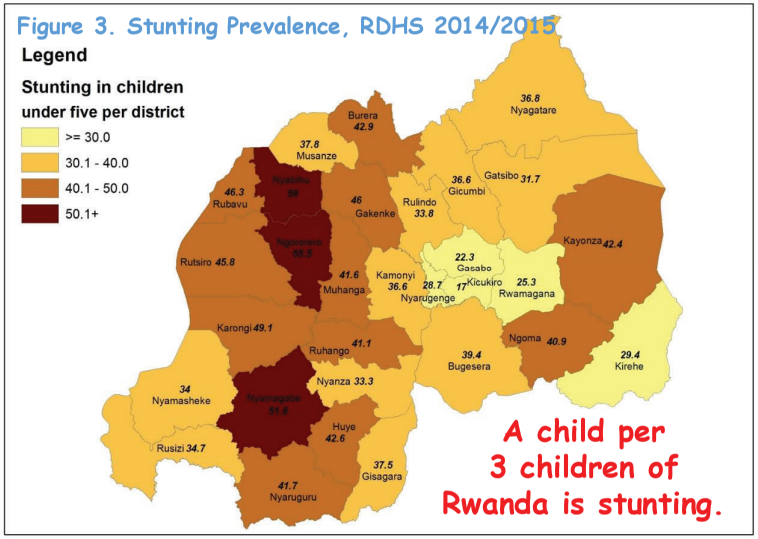
Forms of Malnutrition

Form of Malnutrition	Description
Wasting (acute malnutrition)	Weight too low for height
Stunting (chronic undernutrition)	**Height too low for age**
Underweight	Weight too low for age
Micronutrient deficiency	Not enough essential vitamins and minerals present in the body

Source: Essential Nutrition Concepts for Nutrition-Sensitive Agriculture, Feed the Future/ USAID, 2018

3. Current Situation of Nutrition in Rwanda

Figure 3. Stunting Prevalence, RDHS 2014/2015



Source: Rwanda CFSVA 2015

4. How to Improve Malnutrition with RAB-SMAP's Profit

How to improve "Malnutrition"?

Improve sanitary situation, kitchen, toilet and washing etc.

Better HH investments in health care and education

Increased HH income for food security

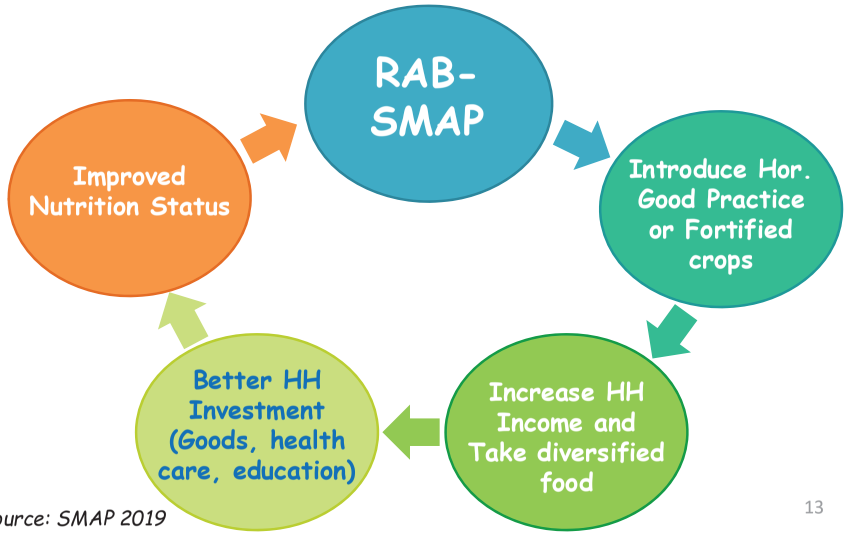
Take diversified food; cereals, vegetables, fruits, and meat etc.

Related to Agriculture

Source: SMAP 2019

4. How to Improve Malnutrition with RAB-SMAP's Profit

Relationship between RAB-SMAP and Nutrition



Source: SMAP 2019

4. How to Improve Malnutrition with RAB-SMAP's Profit

Fortified/bio-fortified crops

Fortified crops

- Vegetables,
- Soybean and beans,
- Irish potato
- Fruits, etc.

Bio-fortified crops

- Orange Fresh Sweet Potato,
- High Iron Bean,
- Yellow Cassava, etc.




Source: SMAP 2019

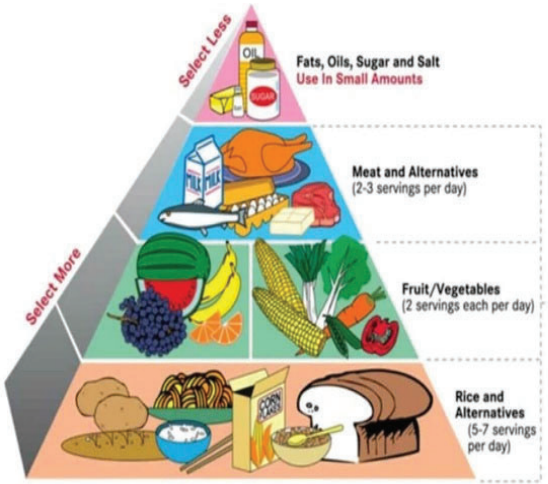
4. How to Improve Malnutrition with RAB-SMAP's Profit

Kitchen garden?

Source: SMAP 2019

4. How to Improve Malnutrition with RAB-SMAP's Profit

Diversified/balanced diet



With profit obtained by selling the vegetables produced with the RAB-SMAP techniques, farmers are encouraged to purchase diversified/ balanced food such as cereals, fruit, other vegetables, meat, oil or sugar etc.

7. Conclusion

- PROFIT by selling the vegetables = Can be used to IMPROVE **MALNUTRITION**
  1. Introduce to cultivate fortified/bio-fortified food
  2. Purchase and take diversified/balanced food.

Murakoze!

Questions & Answers & Discussions

SMAP **Horticulture** Technical Manual

for Market-Oriented Farming

September 2019

Smallholder Market-oriented Agriculture Project in Rwanda (SMAP)

CONTRIBUTORS

1. Mr. Boniface Kagiraneza, Horticulture Program Leader/ RAB
2. Mr. Martin Busobozi, Research Assistant/ Horticulture Program – RAB
3. Ms. Bancy Waweru, Associate Research Fellow/ Horticulture Program – RAB
4. Mr. Gregoire Hagenima, Associate Research Fellow/ Horticulture program – RAB
5. Mr. Assinapol Ndereyimana, Assistant Research Fellow / Horticulture Program – RAB
6. Ms. Christine Umulisa, Assistant Research Fellow/ Horticulture Program –RAB
7. Mr. Jean Chrisostome Muhigirwa, Assistant Research Fellow/ Horticulture Program – RAB
8. Ms. Jeanne Priscille Ingabire, Crop Protection Specialist – RAB
9. Mr. Chrispin Hakizimana, Post-harvest Management Officer/ Post-Harvest and Biotechnology Division – RAB
10. Mr. Firmin Uwizerwa, Research Technician / Horticulture program – RAB
11. Mr. Aloys Musabyisoni, Research Technician / Horticulture Program – RAB
12. Ms. Esperance Nyirahategekimana, Research Technician/ Horticulture Program – RAB
13. Ms. Marie Aimée Ingabire, Research Technician/ Horticulture Program –RAB
14. Ms. Pacifique Mutanyagwa, Research Technician/ maize program – RAB
15. Ms. Sifa Alice Uwimana, Research and Transformation Technician/ Cassava Program – RAB
16. Mr. Ange Robert Akingeneye, Research Technician/ Tea Sub-Program
17. Ms. Christine Uzayisenga, Extensionist/ Horticulture Program-RAB
18. Ms. Peruth Murekeyimana, Traditional Cash Crop Production Specialist/ Horticulture Program –RAB
19. Mr. Aimable Gatete, Coordinator of Horticulture Center of Excellence (HCoE)/ RAB
20. Mr. Ndatinya Hakiza, Operation Manager/ Twigire Muhinzi – RAB
21. Ms. Clementine Nyirarukundo, Crop Technician/ Horticulture Program – RAB
22. Mr. Joseph Higiro, Crop Protection Technician
23. Ms. Marcelline Uwamahoro, Seed Production Technician/ Seed Program – RAB
24. Ms. Immaculée Mukangwije, Seed Production Technician/ Seed Program – RAB
25. Ms. Placidie Dusabimana, Seed Production Technician/ Seed Program – RAB
26. Ms. Cecile Kayitesi, Seed Production Technician/ Seed Program – RAB
27. Mr. Oswald Shyirambere, Senior Agronomist/ Irrigation Program – RAB
28. Mr. Jean Marie Vianney Uwihoreye, Agronomist / Banana Program – RAB
29. Mr. Gaspard Nshyimiyimana, Agronomist/ Wheat Program – RAB
30. Mr. Shaffy Niyoyita, Post-Harvest Handling Technician/ Post Harvest Program – RAB
31. Mr. Aimable Ndicunguye, Agronomist/ Coffee Sub - Program – RAB
32. Ms. Gertrude Mukampunga, Technician/ Banana Program – RAB
33. Mr. Michio Goto, Team Leader/ JICA-SMAP Project
34. Mr. Masaya Fukumoto, Co-Team Leader/ JICA-SMAP Project
35. Dr. Yoshinao Adachi, Horticulture Expert/ JICA-SMAP Project
36. Ms. Hiromi Takenaka, Gender & Cooperative Management Expert / JICA-SMAP Project Team
37. Ms. Nana Morita, Coordinator/ JICA-SMAP Project
38. Mr. Benoit Gatebuka, Horticulture Senior Agronomist/ JICA-SMAP Project
39. Mr. Didier Semanyenzi, Cooperative Management Expert / JICA-SMAP Project
40. Mr. Valens Ntezirembo, Project Operation Coordinator/ JICA-SMAP Project
41. Mr. Yahaya Muvunyi, Project Operation Coordinator/ JICA-SMAP Project Team
42. Ms. Gisele Karangwa Uwase, Secretary/ JICA-SMAP Project

Preface

I am very glad to present these technical guidelines entitled "Market-oriented Agriculture Extension Package" (MAEP) to all farmers and extension officers in our country. This is an output of the "Smallholder Market-oriented Agriculture Project in Rwanda" (SMAP), a project implemented by the Rwanda Agriculture and Animal Resources Development Board (RAB) under the technical and financial cooperation of the Japan International Cooperation Agency (JICA). SMAP has been implemented for 5 years, since October 2014, aiming at increase in smallholders' agricultural income as well as enhancing capacity in extension services on rice and vegetables.

MAEP is an important and comprehensive material for market-oriented agriculture. It addresses not only cultivation techniques, but also organization management, gender mainstreaming, and marketing. It is recommended for adaptation to farmers in consideration of the following three major reasons

Firstly, MAEP provides a series of practical cultivation techniques on rice and vegetables. They are useful and easy to apply, so that beneficiary farmers, on their own, can repeatedly put them into practice on their fields. Secondly, MAEP offers a unique marketing strategy for vegetable farmers to make their business profitable. It recommends farmers to conduct market surveys by themselves before selecting vegetables to cultivate, in order to understand market trends and demands. Based on such market information, farmers decide vegetables to maximize profit. Thirdly, MAEP enhances gender mainstreaming in agriculture by putting highest priority on it. The relationship of a husband and a wife in market-oriented agriculture should not be "an employer and an employee" but "business partners", if they want to have a successful result.

In conclusion, I would like to sincerely express my congratulations to RAB staffs and the SMAP Team for achieving the objective of the project which is in line with the Strategic Plan of Agricultural Transformation (PSTA 4) in areas of food security, nutritional health, and sustainable agricultural growth from a productive, green and market-led agriculture sector.

I also extend my cordial thanks to JICA for its cooperation with MINAGRI, RAB and all other stakeholders. The responsibility to disseminate MAEP is now on our shoulder, as SMAP is phasing out. All stakeholders should coordinate and collaborate to practice and deliver the knowledge and techniques, which MAEP offers, to our farmers throughout the country. I hope that as many stakeholders and farmers as possible have opportunities to touch and apply this precious MAEP.

Dr. Patric KARANGWA
Director General
Rwanda Agriculture and Animal
Resources Development Board (RAB)
September 2019

Table of Contents

General
Making Cropping Plan

Manual Number: SMAP-H-G-01

Step-1: Considerations of Market Requirement and Field Environment

(1) In making a cropping plan, it is essential to consider the results of the **market survey, problem analysis, and action plan** before vegetable cultivation.

(2) In general, **market prices in small local markets depend on the supply of crops at a specific time**. If many farmers sell the crop at the same time, the market price will go down. Conversely, if few farmers sell the crop at the same time, the market price will go up.

(3) A **profitable and realistic** planting plan for the field of each target crop at a certain season is essential. In planning, the **trends of market prices and quality and cultivation environment** such as rainfall, irrigation water availability, pest, diseases, and flood should be considered.

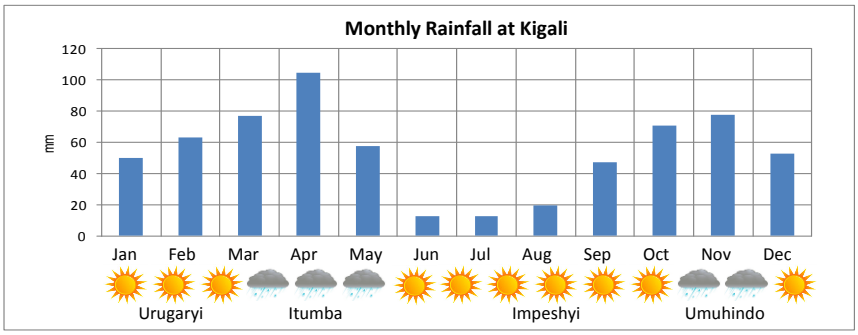
Figure: Simplified General Market Mechanism in Rwanda

Exercise and Practice

(1) Let's review the results of the market survey and mark the period of high market price in the table below.

(2) Let's discuss the relation of the market price and rainfall trend using the figure presented on the right by each crop.

(3) Let's discuss the reasons behind the increase of market price and the decrease of market price



Why are the market prices in those months high?

	Name of Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark the Period of High Market Price for each Crop	Example: Tomato			✔	✔	✔						✔	✔

(4) Let's select a cropping schedule which is profitable and realistic for concerned cooperatives per season for each target crop, taking into consideration the market requirement and field environment using the form below. Comparison of each cropping period with considerations to the commercial, technical, and financial viabilities should be performed. The average duration from sowing to harvesting for each major crop in Rwanda as shown in the right table could be used for comparison.

Table: Average Duration from Sowing to Harvesting in Rwanda

Crops	Average Duration
Tomato	4.0-4.5 months
Sweet Pepper	4.0-4.5 months
Eggplant	4.5-5.0 months
Cabbage	3.0-3.5 months
Onion	5.0-6.0 months
Watermelon	3.5-4.0 months
Carrot	3.5-4.0 months
French Bean	1.5-2.0 months

Table: Form in the Selection of Cropping Schedule with Consideration of the Commercial, Technical and Financial Feasibility

Crop	Peak Demands based on the Result of the Market Survey (Month)	Cropping Period	Conceivable Problems in the Field	Countermeasures	Is it Technically and Financially Feasible?	**Selection Result**
					Yes/No	Yes/No
					Yes/No	Yes/No
					Yes/No	Yes/No
					Yes/No	Yes/No

Figure: Selection Flow of Target Cropping Period which is Commercially, Technically, and Financially Feasible

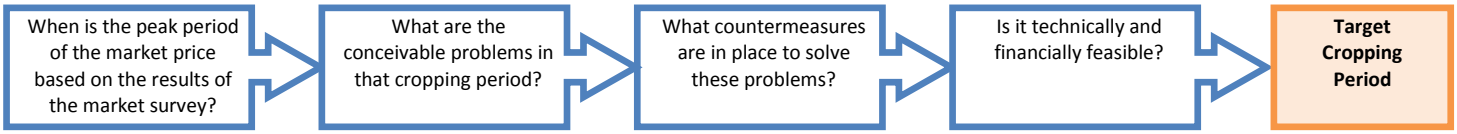
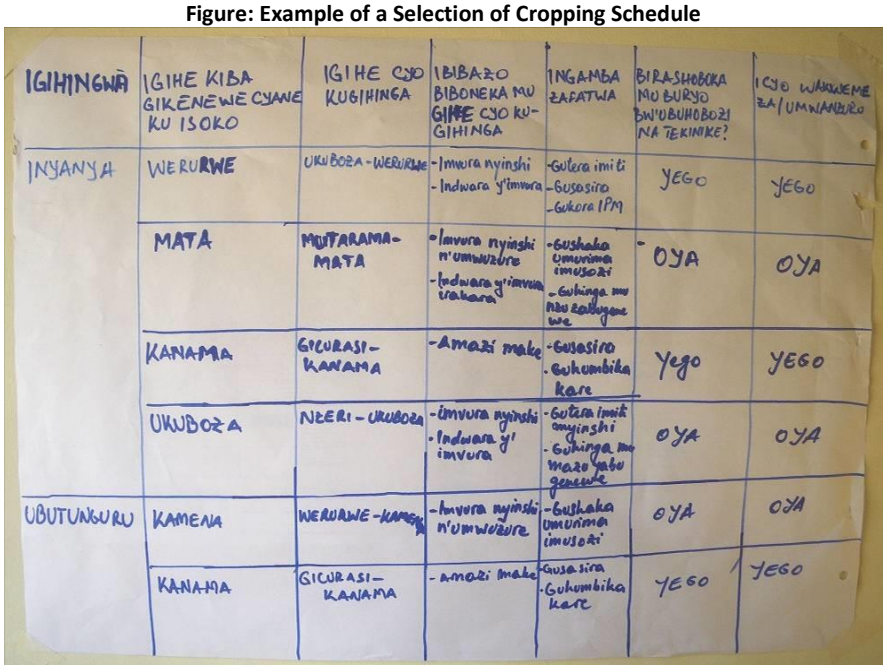


Figure: Example of a Selection of Cropping Schedule



Step-2: Crop Rotation

(1) It is essential to set up a crop rotation schedule. The schedule shall compose of different kinds of crops to avoid successive cultivation of crop belonging to the same family which causes replanting failure. This is attributed to soil-borne diseases and soil nutritional imbalance.

(2) To establish crop rotation in the field, the plant's crop family and required duration are presented in the right table to avoid successive planting of crop belonging to the same family.

(3) If the field is submerged with flood during the rainy season, replanting failure can be mitigated using crop rotation.

Table: Required Duration to Avoid Successive Planting of Crop belonging to the Same Family

Crop Family	Crops	Required Duration
Solanacerous	Tomato, Eggplant, Sweet Pepper, Chili Pepper	3-4 seasons
	Irish Potato	2-3 seasons
Cucurbits	Pumpkin	1 season
	Cucumber, Squash, Gourd, Zucchini	2-3 seasons
	Watermelon	5 seasons
Cruciferous	Cabbage, Cauliflower	2 seasons
Liliacerous	Onion, Leek, Garlic	1-2 seasons
Leguminous	French Bean, Kidney Bean, Cowpea	3-4 seasons
Umbelliferous	Carrot, Celery	1 season
Convolvulacerous	Sweet Potato	1-2 seasons

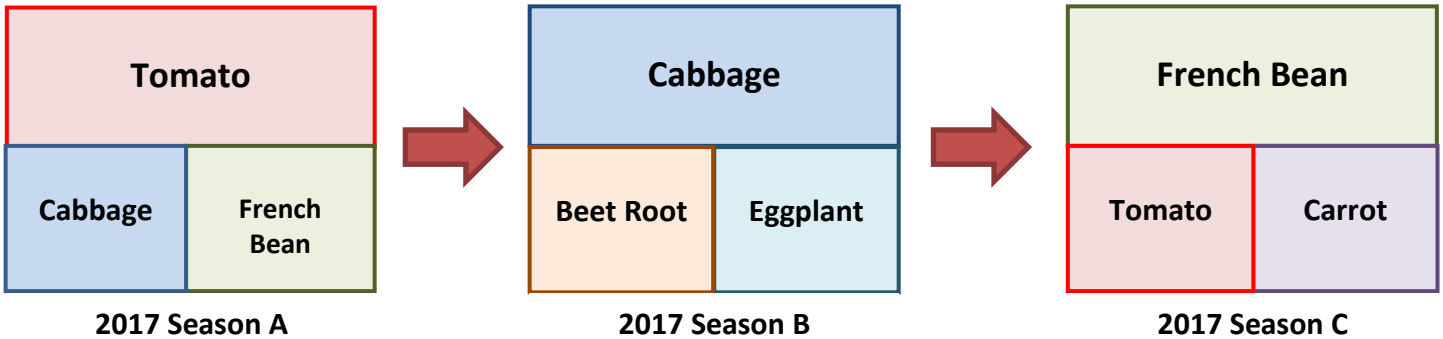
Exercise and Practice

(1) Let's make a map of your farm and put a number in each plot.

(2) Let's think of the historical land use for each plot.

(3) Let's make a cropping plan for each plot for the next season.

Figure: Example of the Map showing a Historical Land Use and Cropping Plan for the Next Season



General
Raising Vegetable Seedlings

Manual Number: SMAP-H-G-02

Step-1: Seed Preparation

(1) Vegetable seeds are prepared before sowing. It is recommended to buy seeds at reliable agro-shops. Doing such guarantees good taste, good fruit size, and disease resistance.

(2) Before buying, check the product's expiration date or packed date. It is normally printed on the package. "EXP DATE" means expiration date of seed germination and "PKD" or "Packed Date" means the date of seed packing at a company. Effective period of vegetable seed germination is shown in the right table.

(3) For the effective use of the seed, the required amount of seed for 1a sized field should be considered.

Life of Vegetable Seed under Dried Condition

Crop	Period
Tomato	4 years
Sweet Pepper	2 years
Eggplant	4 years
Cabbage	4 years
Onion	1 year
Watermelon	4 years
Carrot	3 years

One Cup of Seeds in a Water Bottle Cap

Crop	Required Amount of Seed for 1a Sized Field	Number of Water Bottle Cap
Tomato	5 g	1 and half caps
Sweet Pepper	5 g	1 and half caps
Eggplant	8 g	1 and half caps
Cabbage	7 g	1 and half caps
Onion	60 g	15 caps
Carrot	60 g	15 caps
Watermelon	10 g	2 and half caps

Planting Method

i. Direct sowing: Seeds are directly sown in the field.
ii. Raising seedlings and Transplanting: Seeds are sown, and seedlings are raised in the nursery, then they are transplanted in the field.

How is Good Nursery Bed?

The following are good conditions of a nursery bed to raise quality seedlings:
(1) Good aeration, moisture, and drainage;
(2) Sufficient fertilizer nutrient;
(3) Adequate soil pH for the plant; and
(4) No contamination from diseases and pests.

It is important to keep the above conditions of the nursery bed.

Benefits of Raising Seedlings

(1) Small and young seedlings can be raised in large quantities.
(2) Damages from insects, diseases, heavy rains, drought, and high or low temperature are avoided.
(3) Labor saving for thinning, weed and pest control, and watering.
(4) Field utilization can be maximized.
(5) Amount of seeds can be reduced and cost of seeds can be saved.
(6) Uniform growth can be obtained.
(7) Good quality and uniform seedlings can be obtained.

Step-2: Sowing and Raising Seedlings

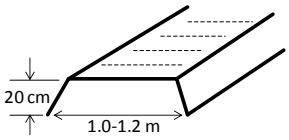
Practice-1: Raising Seedlings in a Nursery Bed

(1) The site for nursery beds should preferably be under the sun and should not have been be planted with crops of the same family.

(2) The site should be ploughed to a depth of 20 cm to 30 cm. Weeds and debris should be removed as much as possible.

(3) The soil should contain enough soil aggregates or apply rice husk charcoal (5-6 handfuls/m^2) to ensure good root development. It is recommended to incorporate well-rotted weed compost (2-4 handfuls/m^2) or cow dung (1-2 handfuls/m^2) and fertilizer such as NPK 17-17-17 (20 g/m^2) which should be applied one week before sowing. A 20 g of NPK 17-17-17 is equivalent to two cups of water bottle cap.

(4) A 1.0 m to 1.2 m wide bed should be prepared. This size is convenient for management. A 20 cm bed height is good for drainage. The required area size for the nursery bed depends on the crops. The average is about 5% (1/20) of the total planting field.



Preparing the Nursery Bed

Compost and Fertilizer Application

Leveling using a Wooden Pole

(5) It is recommended to apply fungicide and insecticide 2 to 3 days before sowing to prevent occurrence of disease and insects.

(6) At the day of sowing, the surface of the bed is leveled, and sowing ditches of 5 mm depth are made using a straight wooden stick.

(7) Seeds are placed in the ditch. The seeds are then covered with soil. Thickness of soil covering is about 1 cm. Sowing with high density should be avoided.

Making Sowing Ditches using a Wooden Pole

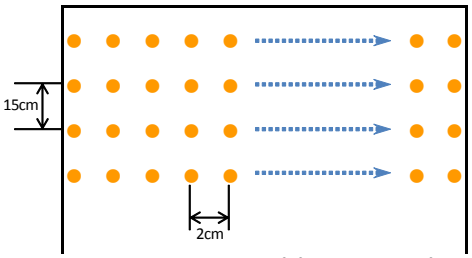
Sowing keeping Proper Space

(8) Surface of nursery bed is covered with dried weeds to keep the moisture of the soil. When germination occurs, the mulch material should be removed quickly, otherwise, seedlings become elongated and weak.

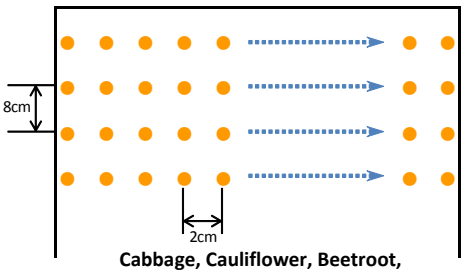
(9) Seedlings should be protected from direct sunlight by using plant materials like weeds and leaves as coverings. However, sunlight should be allowed to pass through these materials without totally blocking the sun. It is better to remove the coverings during cloudy and light rains.

Covering with Dried Grass

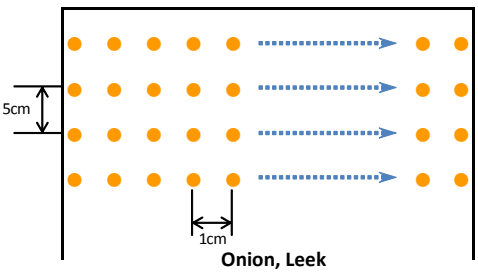
Sunlight Protection



Tomato, Sweet Pepper, Chili Peeper, Eggplant



Cabbage, Cauliflower, Beetroot, Amaranthus, Lettuce



Onion, Leek

(10) Water the seedlings early in the morning and afternoon. Apply less water during rainy and cloudy days, otherwise, seedlings become weak and elongated.

(11) To harden the seedlings, the frequency of watering is reduced, and the seedlings are gradually exposed to direct sunlight 1 to 2 weeks before transplanting.

Practice-2: Raising Seedling in a Nursery Pot made by Local Materials

(1) Old banana bark/stem is prepared as a material of nursery pots.

(2) Nursery pots are made by the following procedures shown in the right pictures.

(3) Soil and weed compost are mixed together with a ratio of about 2:1. Then the mixture is placed into the pots.

(4) Three (3) seeds are placed per pot and are covered with soil. The thickness of soil covering is about 1 cm. A pinch of NPK-17-17-17 per pot is then applied.

(5) If available and required, fungicide and insecticide are applied to prevent diseases and pests. The pots are then covered with dry weeds to keep the moisture of the soil.

(6) Seedlings are protected from direct sunlight by using plant materials like dried grass or leaves as coverings, allowing sunlight to pass through these materials. Do not block the sunlight completely. It is better to remove the coverings during cloudy days and light rains.

(7) Seedlings are watered in the morning and afternoon. Apply less water during rainy and cloudy days.

Put a part of banana stem fiber on a banana stem fixed on the ground.

Put one more part of banana stem fiber

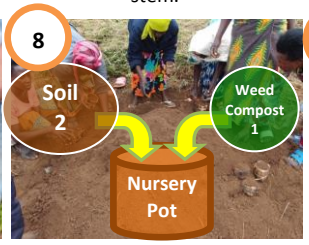
Fixed it using a rope made of banana fiber

Turn it up and fixed again

Cut the excess part of the stem.

Cut the bottom to make a drainage hole.

Finished



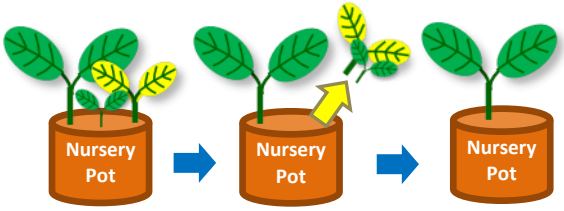
Mixing of Soil and Compost well, then put it into the pot.

Sowing in the Nursery Pots

(8) When germination occurs, the mulch material should be removed quickly otherwise, the seedlings become elongated and weak.

(9) When the seed germinates and has 2 to 3 leaves, two of the three seedlings are removed and only the best seedling is left.

(10) To harden the seedlings, the frequency of watering is reduced, and the seedlings are gradually exposed to direct sunlight 1 to 2 weeks before transplanting.



General
Measurement Method on the Field

Manual Number: SMAP-H-G-03

Measurement Method on the Field

(1) It is essential to know the exact length or area in order to conduct the appropriate cultivation method on horticulture. However, it is difficult to measure the length or area by scale on the farmer's farmland.

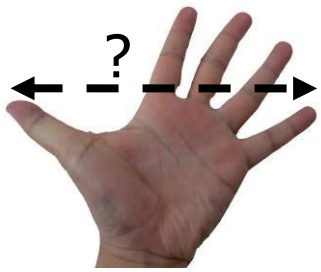
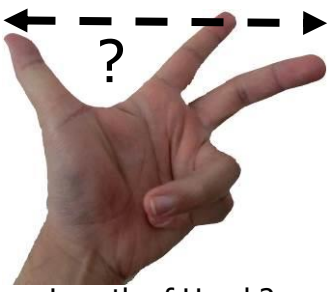
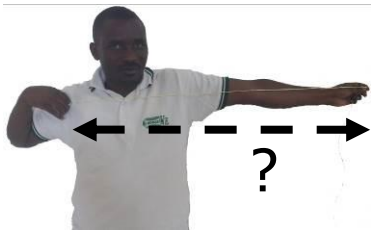
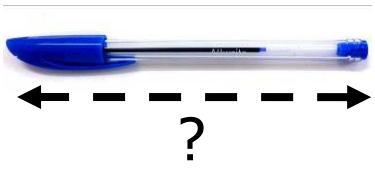
(2) Body lengths such as length of footstep, foot, hand and arm can be used for measurement instead of scale.

(3) Daily items e.g. water bottle and pen also can be used for scale on the farmland.

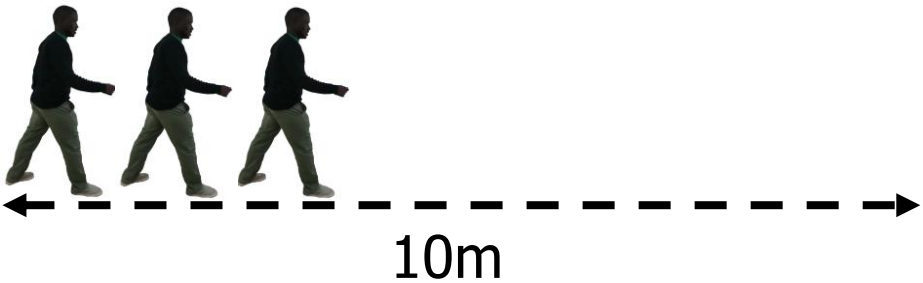
(4) To use these lengths instead of the scale, the farmers should know the length of body parts or items before go to the farmland.

Exercise and Practice

(1) Let's measure the length of your body parts and daily items.

 Length of Hand 1	 Length of Hand 2	 Length of Forearm
(1) **cm**	**(2)** **cm**	**(3)** **cm**
 Length of Reach	 Length of Half Reach	 Length of Foot
(4) **cm**	**(5)** **cm**	**(6)** **cm**
 Length of Water Bottle	 Length of Pen	
(7) **cm**	**(8)** **cm**	

(2) Let's count the number of step in 10m and cultrate the length of a step.



No. of Steps =
One Step = cm

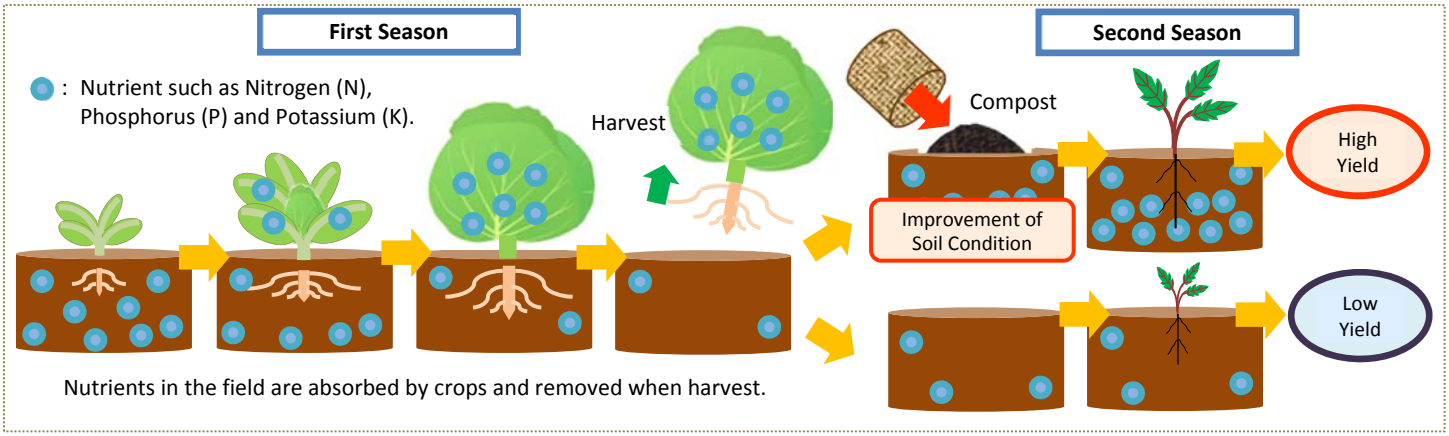
General
Making Compost

Manual Number: SMAP-H-G-04

Effect of Compost and Soil Nutrient

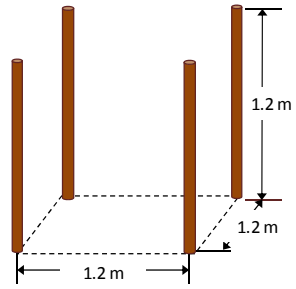
- To improve soil fertility, application of compost is the best way in Rwanda. The compost has the following effects.
- Soil nutrients are absorbed by crops for growing and removed from the field with crops at harvest. Therefore, the compost must be applied continuously to keep soil nutrition for better crop yield in the next season.

Effect of Compost:
- Improvement of physical property of soil:
  - water holding capacity
  - air permeability
  - water permeability
- Increasing soil nutrient and slow release nutrient supply
- Increasing helpful microorganisms
- Holding of nutrients
- Buffer action against pH, dryness, wetness, hotness



Procedure of Compost Making

1



Put wooden sticks of about 1.2m length on the ground at the corners of about 1.2 m x 1.2 m sized square.

2

Pile grasses, crop residue or rice straws to about 30 cm thick and chop it. (As long as the crop residue is decomposed well, it can be used as material of compost for the following seasons.)

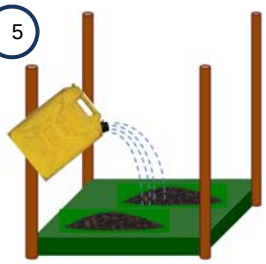
3

Trample on the piled grasses.

4

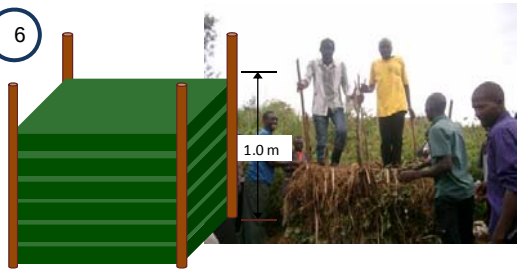
Put manure on the piled grasses.

5



Apply water until water drips from between fingers when materials are squeezed by hand.

6



Continue those processes up to 1 m height.

7

Put banana leaves on the heap to keep moisture moderate for the acceleration of decomposition.

8

If the grasses are not well decomposed, turn over the heap sometimes. In general, the compost will be matured after about three (3) months in Rwanda and become soft and deep brown or black in color.

General
Making Rice Husk Charcoal

Manual Number: SMAP-H-G-05

Effect of Rice Husk Charcoal

- Application of rice husk charcoal can improve soil physical quality and it can be made by local materials. The rice husk charcoal also has many good effects for vegetable cultivation as shown in the right box.

Effect of Rice Husk Charcoal:
- Improvement of physical property of soil:
  - ✧ water holding capacity
  - ✧ air permeability
  - ✧ water permeability
- Enhance root development
- Increasing helpful microorganisms
- Holding of nutrients
- Increasing soil pH
- Repellent effect of insects, etc.

- Rice husk charcoal is good for nursery bed of vegetables because of free from bacteria, and it has not only good water holding capacity, but also good water permeability. It can be mixed with 20 – 30 % of nursery bed soil.

How to make Rice Husk Charcoal

1

Take rice husk from rice millers

2

Prepare the flat and clean place for rice husk charcoal making

3

Fill firewood in to the pot

4

Ignite the firewood in the material

5

Put the rice husk around the making material

6

Few hours later, some part of rice husk mount become black color

7

Mix the rice husk several times until the mount color become black

8

After all husks become black color, spread it and apply water it in order to stop the extra burning

9

After cooling down, rice husk charcoal can be kept in a sack

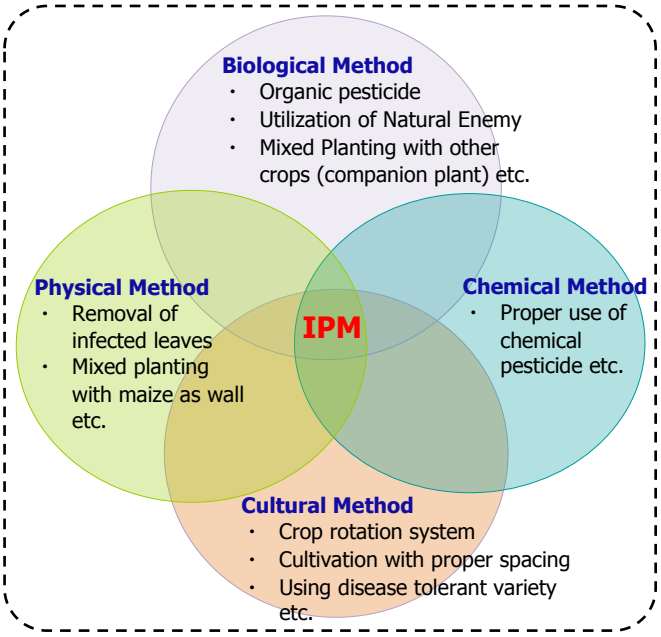
General
Plant Protection (1)

Manual Number: SMAP-H-G-06

What is IPM?

IPM (Integrated Pest and Disease Management) is an effective and environment-friendly approach to pest and disease management that relies on a combination of cultural, chemical, physical and biological approaches. Benefits of IPM are as follows.

- Reduction of farm input cost by the reduction of chemical pesticide and insecticide
- Reduction of health risk for farmer by the reduction of chemical pesticide and pesticide
- Avoidance of development of chemical-resistant insects
- Mitigation of environment stress and establishment of environment-friendly farming system
- Safe agriculture products



Method-1: Organic Pesticide of Chili Pepper (Biological Method)

An extract (capsaicin) of chili pepper is effective to prevent aphid and other harmful insects in the field. Method to make the organic pesticide of chili pepper is as follows.

(1) Two handfuls of chili pepper (about 200g) are prepared.

(2) 4 liters of water is poured into a cooking pan, and it is boiled for 20 minutes.

(3) And then, it is kept for three days.

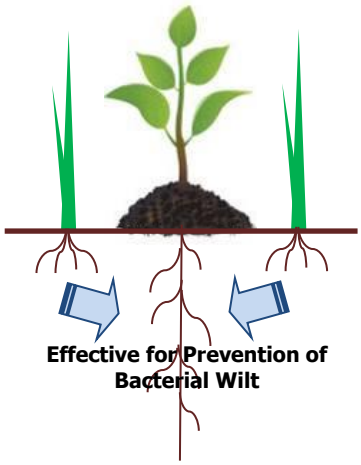
(4) After three days, it is filtered using cloth and water is added up to 10 liters. One pinch of soap is dissolved into it.

(5) Then, it is sprayed on the 1a sized field.

(6) Continuous splaying at least once in five days is effective. In general, for the application of an organic pesticide, the frequent application is very effective for prevention of insect attack.

Method-2: Mixed Planting with Leek/Onion (Biological Method)

For solanaceous crops (tomato, sweet pepper, eggplant, chili pepper, Irish potato, and tobacco), mixed planting with leek and/or onion is effective to prevent bacterial wilt. Extract from leek and/or onion's roots prevent the spread of bacterial wilt in the soil.



(1) When transplanting of solanaceous crops, leeks and/or onions are planted beside the target cultivated crops.

(2) Extract from the roots of leek and/or onion prevents germination and spread of bacterial wilt in the soil.

Method-3: Organic Fungicide of Ikibonobono (Biological Method)

An extract of Ikibonobono (Ricinus communis) is effective to prevent germination of fungus such as late blight, early bright and any kind of fungus diseases.

Leaves of Ikibonobono

Seeds of Ikibonobono

(1) One basket of fresh ikibonobono is prepared.

(2) Then, it is cut and put into water. The volume of water is same as the volume of ikibonobono.

(3) After 24 hours, it can be used as organic fungicide. 10 liter of the extract of ikibonobono is effective for splaying for the 1a sized field.

(4) It is not sure how it is harmful to human body

scientifically. Therefore, it is recommended not to apply for fruit or any parts to be eaten by human but to apply for soil surface and leaves. Application for soil surface is also effective because late blight and early blight are mainly transmitted from the soil.

Method-4: Organic Fungicide/Pesticide of Inyabarasanya (Biological Method)

An extract of Inyabarasanya (Guizotia scabra) is effective to prevent germination of fungus such as late blight, early bright and any kind of fungus diseases. It is also effective to prevent many kinds of insects.

Leaves of Inyabarasanya

(1) One basket of fresh inyabarasanya is prepared.

(2) Then, it is cut and put into water. Volume of water is same as the volume of Inyabarasanya.

(3) It is boiled for 10 minutes or kept in water for 24 hours.

(4) And then, it can be used as organic fungicide/pesticide. 10 liter of the extract of Inyabarasanya is effective for splaying for 1a sized field.

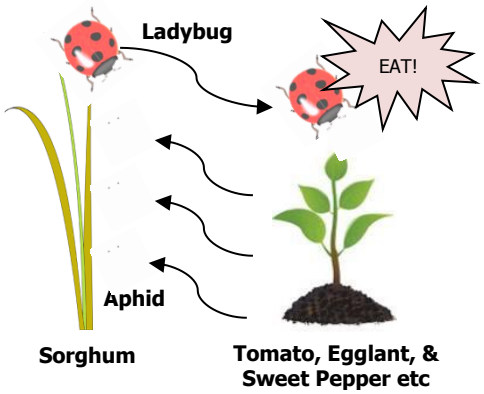
Method-5: Mixed Planting with Sorghum (Biological Method)

Naturally, aphids prefer sorghum because it contains much sugar in the plant body. By planting sorghum in a farm field, aphids are attracted to sorghum and moved from other cultivated crops.

If many aphids come together on sorghum, the ladybug is also attracted to sorghum to prey on an aphid. And then, ladybug goes to prey on aphid on other cultivated crops occasionally.

(1) Some sorghum seeds are sowed in the field together with other crops.

(2) It is recommended to sow sorghum seeds before sowing or transplanting of target cultivated crops in the field.



Method-6: Mixed Planting with Maize/Sorghum (Physical Method)

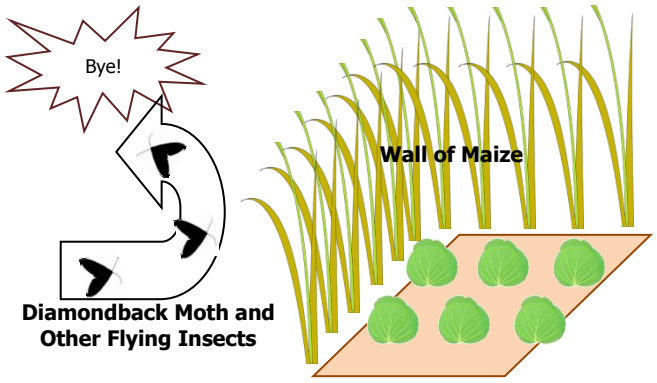
Naturally, butterfly, moth, and some flying insects cannot go beyond tall grasses such as maize and sorghum.

If tall grasses are planted around field densely, those insects cannot exceed it and lay eggs on cultivated crops.

In Bugesera and Ngoma district, diamondback moth is major harmful insect especially for cabbage. Normally, it flies within 1.5 m heights. This method is effective to protect crops from diamondback moth.

(1) Maize or sorghum seeds are sown around field densely before sowing or transplanting of target cultivated crops.

(2) Maize and sorghum physically protect cultivated crops from butterfly, moth, and some other flying insects.

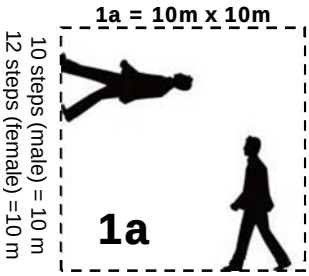


General
Plant Protection (2)

Manual Number: SMAP-H-G-07

Using of Agro-Chemicals

- Using of agro-chemicals is one of the strong control methods of pest and disease.
- Agro-chemicals are harmful for human body, so farmers must understand the usage of it and be careful about using.
- DO NOT ingest agro-chemicals and avoid contact of skin and eyes with the concentrate or spraying mixture.
- Avoid breathing dust and spray mist.



Storage

- Store in original tightly closed containers and away from sun and damp.
- Out of reach of children, animals and unauthorized people.
- DO NOT store together with foods, drinks and feeds.
- Avoid storage in the high temperature condition.

Pre-Harvest Interval

- As agricultural chemicals are harmful not only to the environment but human being, farmers must follow the instruction of pre-harvest interval.
- Pre-Harvest interval of agro-chemicals depends on the type of chemical and target crops. Usually, stopping the application 1 to 2 weeks before harvesting.

Large Spoon for Measuring Fungicide

Dosage of Chemical Fungicide Application

SAFARI-ZEB 80WP

Classification: Agricultural Fungicide
Ingredient: Mancozeb 80%

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)	
(m^2)	(are)				
50	0.5	5	12.5	=	2.5
100	1	10	25.0	=	5
150	1.5	15	37.5	=	7.5
200	2	20	50.0	=	10

VICTORY 72WP

Classification: Agricultural Fungicide
Ingredient: Mancozeb 64% + Metalaxyl 8%

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)	
(m^2)	(are)				
50	0.5	5	12.5	=	2.5
100	1	10	25.0	=	5
150	1.5	15	37.5	=	7.5
200	2	20	50.0	=	10

MANCOZEB 80WP
Classification: Agricultural Fungicide
Ingredient: Mancozeb 80%

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)
(m^2)	(are)			
50	0.5	5	12.5	= 2.5
100	1	10	25.0	= 5
150	1.5	15	37.5	= 7.5
200	2	20	50.0	= 10

INDOFIL M-45
Classification: Agricultural Fungicide
Ingredient: Mancozeb 80%

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)
(m^2)	(are)			
50	0.5	5	12.5	= 2.5
100	1	10	25.0	= 5
150	1.5	15	37.5	= 7.5
200	2	20	50.0	= 10

Ridomil Gold MZ WG
Classification: Agricultural Fungicide
Ingredient: Metalaxyl-M 4% + Mancozeb 64%

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)
(m^2)	(are)			
50	0.5	5	12.5	= 2.5
100	1	10	25.0	= 5
150	1.5	15	37.5	= 7.5
200	2	20	50.0	= 10

Copper Oxychloride 50% WP
Classification: Agricultural Fungicide
Ingredient: Copper 50%

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)
(m^2)	(are)			
50	0.5	5	12.5	= 2.5
100	1	10	25.0	= 5
150	1.5	15	37.5	= 7.5
200	2	20	50.0	= 10

Thiovit Jet 80WG
Classification: Agricultural Fungicide
Ingredient: Sulfer 80%

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)
(m^2)	(are)			
50	0.5	5	10-12.5	= 2-2.5
100	1	10	20-25	= 4-5
150	1.5	15	30-37.5	= 6-7.5
200	2	20	40-50	= 8-10

BENOBEST 50WS
Classification: Agricultural Fungicide
Ingredient: Carbendazim 50%

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)
(m^2)	(are)			
50	0.5	5	3-5	= 0.5-1
100	1	10	6-9	= 1-2
150	1.5	15	8-11	= 1.5-2.5
200	2	20	12-18	= 2.5-3.5

EUREKA 72WP
Classification: Agricultural Fungicide
Ingredient: Mancozeb 64% + Metalaxyl 8%

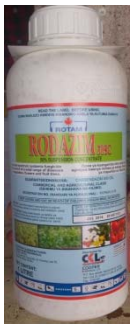
Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)
(m^2)	(are)			
50	0.5	5	12.5	= 2.5
100	1	10	25.0	= 5
150	1.5	15	37.5	= 7.5
200	2	20	50.0	= 10

ASCOPPER 50 WP
Classification: Agricultural Fungicide
Ingredient: Copper Oxychloride 50% WP

Area		Water (liter)	Fungicide (g)	Number of Spoonful (Large)
(m^2)	(are)			
50	0.5	5	12.5	= 2.5
100	1	10	25.0	= 5
150	1.5	15	37.5	= 7.5
200	2	20	50.0	= 10

RODAZIM 50SC

Classification: Agricultural Fungicide
Ingredient: Carbendazim 500 g/l
Manufacturer: Rotam Crop Science Ltd., Hong Kong



Area		Water (liter)	Fungicide (ml)	Number of Water Bottle Cap
(m^2)	(are)			
50	0.5	5	5	=
100	1	10	10	=
150	1.5	15	15	=
200	2	20	20	=

Dosage of Insecticide Application

IMAXI 200SC

Classification: Agricultural Insecticide Target Pests: Aphids, Whiteflies, Thrips, Leafminers,
Ingredient: Imidacloprid 200 g/l

Area		Water (liter)	Insecticide (ml)	Number of Water Bottle Cap
(m^2)	(are)			
50	0.5	5	3	=
100	1	10	7.5	=
150	1.5	15	10	=
200	2	20	12.5	=

ROKET 44 EC

Classification: Agricultural Insecticide Target Pest: Bollworm
Ingredient: Profenofos 40% + Cypermethrin 4% EC

Area		Water (liter)	Insecticide (ml)	Number of Water Bottle Cap
(m^2)	(are)			
50	0.5	5	5	=
100	1	10	10	=
150	1.5	15	15	=
200	2	20	20	=

CYPRO 44 EC

Classification: Agricultural Insecticide Target Pest: Bollworm
Ingredient: Profenofos 40% + Cypermethrin 4% EC

Area		Water (liter)	Insecticide (ml)	Number of Water Bottle Cap
(m^2)	(are)			
50	0.5	5	5	=
100	1	10	10	=
150	1.5	15	15	=
200	2	20	20	=

CYPERSCOPE 5 EC

Classification: Agricultural Insecticide Target Pest: Bollworm

Ingredient: Cypermethrin 5% EC

Area (m^2)	Area (are)	Water (liter)	Insecticide (ml)	Number of Water Bottle Cap
50	0.5	5	5	=
100	1	10	10	=
150	1.5	15	15	=
200	2	20	20	=

Use a mask to prevent inhale of fungicide. If a mask is not available, roll a towel around face to cover nose and mouth.

For your safety, put on a hat or cap and worn a cloth or towel to cover nose and mouth!!

Applying agro-chemicals by hand-made brush without any protection items

Improved !!

Applying agro-chemicals by sprayer with protection items

General
Harvesting & Transportation

Manual Number: SMAP-H-G-08

Harvesting Time

- Farmers should harvest the crops with mature and appropriate size.
- Agricultural chemical's application must be stopped at latest one week before harvesting to prevent the toxic effect for consumers.
- Freshness is the one of the important points to sell vegetables at a high price in a market.
- To sell the fresh vegetable, farmers should harvest in the early morning of the selling day.
- Regarding after-ripening, farmers should not apply any chemicals. It is not only costly but also harmful to consumers.

		
Harvest matured and appropriate size of vegetables.	Do NOT harvest immature fruit.	Do NOT harvest small size of fruit.

Harvesting Method

- To achieve high yield, it is important do not damage the plant by harvesting.
- In order to prevent the damage to the plant at harvesting, farmers should use a hand tools such as scissors and knife.

		
Scissors for harvesting fruit crops	Cut the peduncle of the matured fruit.	Cut the peduncle of the matured fruit.

Sorting and Transportation

- To sell the crops at a high price and prevent an early putridity, Sorting must be done before bringing the crop to a market.
- In order to prevent the damage of commodities by transportation, plastic containers are recommended to use.

		
Damaged fruit must be removed from the good fruit.	Transport with a plastic bag will damage the commodities.	The plastic container is an appropriate tool for transportation.

Tomato

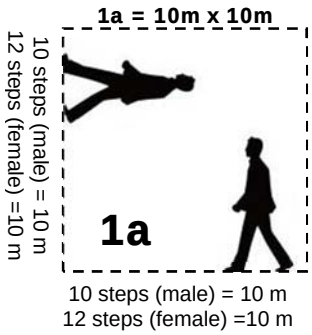
Transplanting and Field Management

Manual Number: SMAP-H-To-01

Field Preparation

- In selecting the proper site for transplanting, farmers have to choose a field that has not been planted with eggplant, tomato, sweet pepper, chili pepper and tobacco for the last four (4) seasons or a field where Irish potato have not been planted for the last three (3) seasons.
- Before transplanting, the field should be ploughed at a depth of about 15 cm to 20 cm. Debris in the field should also be removed. Then the field is leveled.

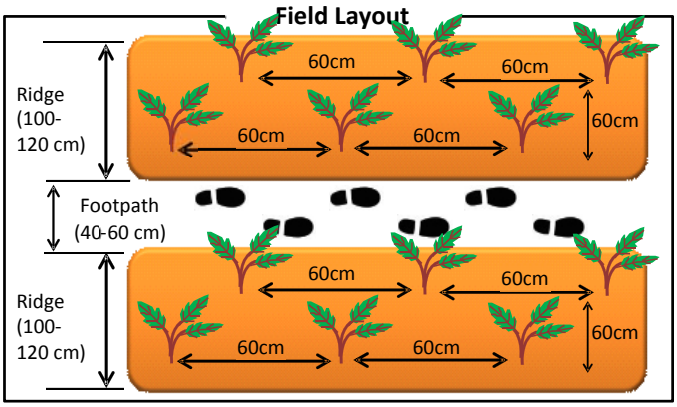
Ploughing the Field



10 steps (male) = 10 m
12 steps (female) =10 m

Field Layout

- It is recommended to plant seedlings by the following figure shown in the right side. In this case, about 160 to 170 seedlings are required for a 1a sized field.

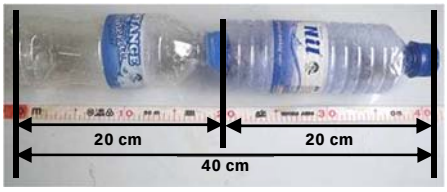


Time of Transplanting

- The time of transplanting is after 4 to 5 weeks from the sowing of seedlings. Seedlings with 3 or 4 large true leaves are suitable for transplanting.

Transplanting

- It is recommended that transplanting should be done in early morning or late afternoon to avoid withering caused by direct sunlight.
- Field is measured using a measuring tape or any measuring equipment based on the field layout shown in the figure above. Another device used in measuring is a 500 ml water bottle as shown in the right side. The height of one water bottle is equivalent to 20 cm, therefore, two bottles is equal to 40 cm and five bottles is 100 cm. This can be useful as an alternative measuring device.



- Ditches with 30cm depth are made. Compost made from grass is applied and mixed with soil well. It is recommended that one small basket of compost (5kg) be applied per $1m^2$ (1 step x 1 step). Then, ridges with 20 cm height and 120 cm width are made.
- Holes with 15 cm to 20 cm depth are made at each planting point based on the planting layout. Recommended space between plants is 60 cm. Compost made from grass or well decomposed manure is applied to planting holes. One (1) handful of manure per planting hole is applied.

With 3-4 large true leaves

No pests and diseases

Thick stem

Well developed roots (**Do not cut the roots when taking from the nursery.**)

Healthy Seedling

Making Ditch of 30cm Depth

Application of Grass Compost and Mixing with Soil

Making Ridge

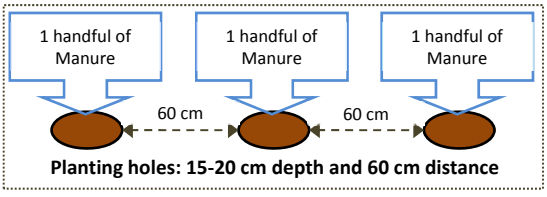
Measuring Planting Space

Manure Application

Mulching Application

Transplanting

Well decomposed manure should be applied rather than fresh manure to prevent damaging the plant's roots. Soil and applied manure are mixed well. Then, planting holes are made. Depth of planting hole depends on the size of the seedling.



Planting holes: 15-20 cm depth and 60 cm distance

- Before taking the seedlings from the nursery, water is applied to the nursery in advance to take the seedlings out easily.
- Dried grasses are applied on the ridges which serve as mulching material.
- Healthy seedlings with thick stems and large leaves without any diseases should be selected. Selected seedlings are carefully taken from nursery to avoid damage on the roots. Do not remove the soil from the seedling when transplanting. Seedlings of poor quality should be avoided. These seedlings can be transplanted in home gardens for self-consumption.

Watering

Shading by Banana Stem

- After transplanting, water is applied immediately. If seedlings are transplanted during daytime, a shade made of banana stem placed above the planted seedlings is an effective means to avoid direct sunlight for a few days.

NAE-HANSAKU (One of Japanese Old Proverb:苗半作)

"If you have succeeded in raising good vegetable seedlings, it means that you have almost accomplished 50% of the whole cultivation practice which promises a high yield."

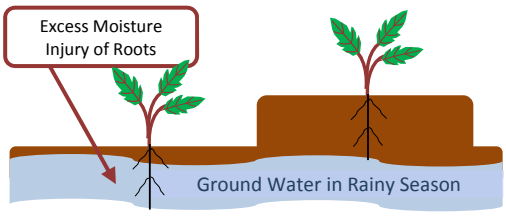
It is very important to raise good seedlings in nursery stage for high yield and good quality of products.

Advantages of Mulching and Ridging

- For vegetable cultivation, the importance of mulching is well known, and it is widely practiced using locally available dried grasses.
- Thick mulching is effective for keeping the moisture of the soil longer, preventing grass from growing and the contagion of soil borne-diseases.
- Excess moisture in soil causes damage to the roots and emergence of fungal disease in rainy season.
- High ridging to avoid excess moisture around the roots is effective to prevent excess moisture injury of the roots and incidence of fungal disease during rainy season.


Field with Mulching

Field without Mulching

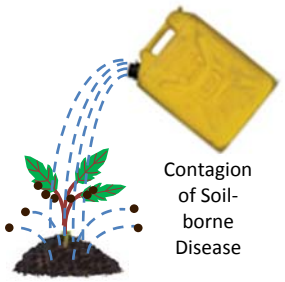


Field without Ridging　　Field with Ridging

Watering

- Regular watering is required especially in dry season. However, watering should be reduced gradually as the crop grows. Watering should be done in the early morning or evening time.
- It is recommended to water the bottom part of the plants gently to avoid the contagion of soil-borne diseases.

Gentle watering can prevent attack of soil-borne diseases

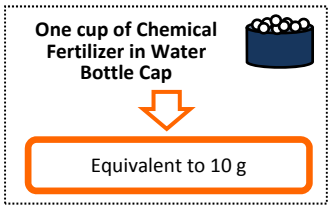


Weeding

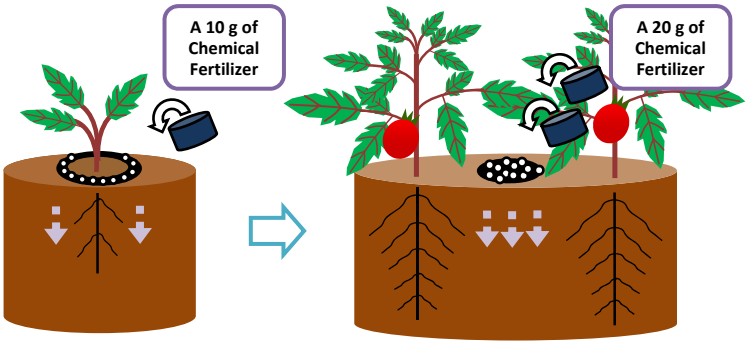
- The frequency of weeding depends on weed infestation; generally keeping the field weed free as much as possible to avoid competition of nutrients, sunlight, and water.

Top Dressing

- To get better yields, proper fertilization is necessary. Top dressing of chemical fertilizer such as NPK 17-17-17 should be applied in two (2) splits to avoid nutrients loss. Application at the top of the roots is effective.



- First top dressing: One cup of chemical fertilizer (10g) is applied in between plants and then, covered with soil after three (3) weeks from transplanting. 10g of chemical fertilizer is equivalent to one water bottle cap.
- Second top dressing: Two cups of chemical fertilizer (20g) is applied in between plants, and then covered with soil after six (6) weeks from transplanting. 20g of chemical fertilizer is equivalent to two water bottle caps.



After 3 weeks from transplanting　　After 6 weeks from transplanting

First top dressing is effective for increasing the number of leaves.

Second top dressing is effective for the formation and enlargement of fruits.

Tomato
Disease and Pest Control

Manual Number: SMAP-H-To-02

Major Disease and Pest in Rwanda

Name & Characteristic	Control Method
Late Blight ■ Leaves, stems, fruits, and roots are affected by the disease. ■ This disease occurs especially under cool and high humidity conditions in rainy season. ■ The disease spread rapidly and destroys the plants in a few days after initial occurrence. ■ Lesions on leaves initially appear as small water-soaked irregular spots with a grayish green color later becoming dark gray as they expand.  	■ Crop rotation ■ Rice straw or weed mulching and protection from rain by covering the top of tomato plants with a plastic film ■ Removal of infected parts as soon as it is found ■ Application of fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb and ASCOPPER® including copper oxychloride (oxychlorire de quivre) as soon as the disease occurs in the rainy season
Leaf Curl (Tomato Yellow Leaf Curl Virus) ■ Symptom consists of dwarfism and curling in newly developed leaves, and curling, twisting and interveinal yellowing in lower leaves. ■ The plants infected at the young stage are markedly damaged. They are stunted and apical leaves proliferate. Consequently, they bear a small number of flowering buds. ■ This virus disease is mainly transmitted by tobacco white fly. 	■ Crop rotation ■ Application of insecticide to prevent tobacco white fly ■ Removal of infected parts as soon as it is found ■ Application of fungicide is not effective because this is not a fungus disease but a virus disease.
Mosaic (Tomato mosaic virus, Tobacco mosaic virus, Cucumber mosaic virus)  ■ Symptom consists of mosaic on the leaves, narrowing of leaves, necrosis on the stem and leaves. ■ This virus disease is transmitted by seeds, by soil through the debris of infected plants, aphids and mechanically from the infected plants by farming practice, namely transplanting, disbudding, training, harvesting, etc.	■ Prevention of continuous cropping ■ Application of insecticide to prevent aphids ■ Removal of infected plant as soon as it is found ■ Application of fungicide is not effective because this is not a fungus disease but a virus disease.
Bacterial Wilt ■ Symptoms are wilt on leaves of the shoot apex during daytime and wilt is no longer present in the morning and evening of under cloudy weather. ■ A few days later, all the leaves of the plant wilt without appreciable change in color and turn brown as they dry up. ■ Browning appears on the vascular strands of the basal part of stem in the wilted plant and grayish white bacterial exudate oozes out from the cut surface of the infected stem.  	■ Crop rotation ■ Use of resistant variety or grafted nursery plants on resistant root stock ■ Removal of infected plant as soon as it is found ■ Mix planting with liliaceae crops such as leek and onion for prevention and mitigation of the disease

Name & Characteristic	Control Method
Blossom-end Rot ■ Blossom-end rot is caused by a calcium deficiency and is induced by deficiency of water in the soil. ■ Hot, dry periods followed by large applications of water results in the plant not be able to absorb calcium quickly. ■ Rapid plant growth, low potassium and calcium, excess magnesium and nitrogen, high salinity, root damage, and high relative humidity all predispose plants to Blossom-end Rot. 	■ Careful irrigation in hot and dry season especially at fruit development stage ■ Balanced fertilization ■ Applications of lime to the soil ■ Rice straw or weed mulching to keep soil moisture content
Early Blight ■ Initially small dark spots form on older foliage near the ground. ■ Leaf spots are round, brown and can grow up to half inch in diameter. ■ Leaf spots are round, brown and can grow up to half inch in diameter. ■ It develops moderate tempareture (15 – 27℃) and high humidity condition (90% or greater) 	■ Crop rotation ■ Use pathogen-free seed ■ Removal of infected plant as soon as it is found ■ Application of fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs in the rainy season
Aphid (Pea Aphid, Foxglove Aphid, Turnip Aphid, Green Peach Aphid) ■ 1-2 mm long aphids feeds gregariously on plants. Body color varies from dark green to yellow green. The aphids parasitize young leaves of stems and flowers as well as lower leaves. ■ This insect is a vector of a kind of mosaic virus and other viruses. ■ However, the aphids may become resistant to insecticides due to the large reproduction potential and short germination cycle. Continuous application of the same insecticides must be avoided. 	■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Mix planting with sorghum which has high sugar content to attract aphids from tomato ■ Many kinds of natural enemies of the aphids such as ladybug should be preserved and utilized for controlling the aphids.  Ladybug as natural enemy
Sweetpotato Whitefly  ■ The families of vegetables i.e. Leguminosae, Cucurbitaceae and Solanaceae are attacked by the insect which feeds directly on plants and causes sooty mold disease due to excreta that affects the plant metabolism. ■ The whitefly is a vector of plant viruses such as (Tomato mosaic virus, Tobacco mosaic virus, Cucumber mosaic virus)	■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Dense planting of maize or sorghum around the field like a fence as a physical protection method
Nematode (Southern Root-knot Nematode, Reniform Nematode, Steiner's Spiral Nematode) ■ Growth of infected plants is retarded, leaves are small and yellow as if affected by fertilizer deficiency. ■ Roots have numerous knots, leaves are wilting and dying. 	■ Utilization of animal dung, green manure and compost in soil ■ Crop rotation with ground nut, maize, sorghum and guinea grass to prevent nematode damage ■ Mix planting or crop rotation with marigold  African marigold

Reference: Diseases of Tropical Vegetable Crops, JAICAF, Japan

University of Minnesota Extension: https://www.extension.umn.edu/

Sweet Pepper
Transplanting and Field Management

Manual Number: SMAP-H-Sw-01

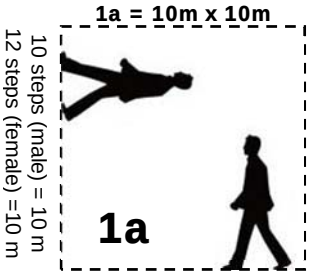
Field Preparation

- In selecting the proper site for transplanting, farmers have to choose a field that has not been planted with eggplant, tomato, sweet pepper, chili pepper and tobacco for the last four (4) seasons or a field where Irish potato have not been planted for the last three (3) seasons.

Solanaceous Crops

Tomato
Sweet Pepper
Egg Plant
Chili Pepper
Irish Potato
Tobacco

Ploughing the Field

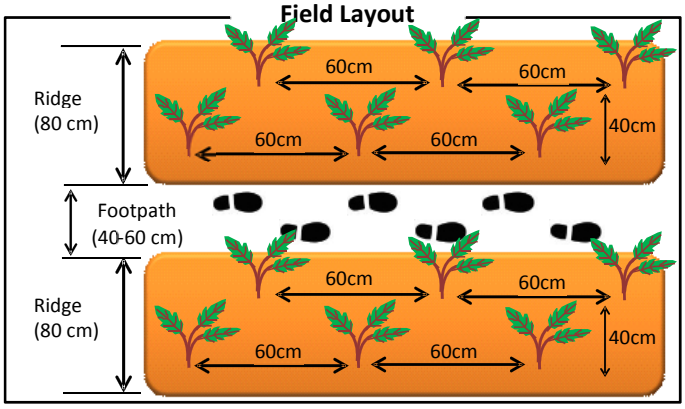


10 steps (male) = 10 m
12 steps (female) =10 m

- Before transplanting, the field should be ploughed at a depth of about 15 cm to 20 cm. Debris in the field should also be removed. Then the field is leveled.

Field Layout

- It is recommended to plant seedlings by the following figure shown in the right side. In this case, about 230 to 240 seedlings are required for a 1a sized field.

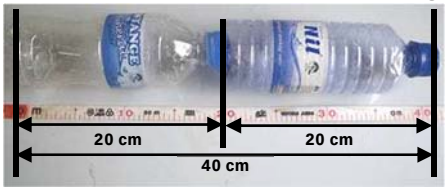


Time of Transplanting

- The time of transplanting is after 6 to 7 weeks from the sowing of seedlings. Seedlings with 3 or 4 large true leaves are suitable for transplanting.

Transplanting

- It is recommended that transplanting should be done in early morning or late afternoon to avoid withering caused by direct sunlight.
- Field is measured using a measuring tape or any measuring equipment based on the field layout shown in the figure above. Another device used in measuring is a 500 ml water bottle as shown in the right side. The height of one water bottle is equivalent to 20 cm, therefore, two bottles is equal to 40 cm and fore bottles is 80 cm. This can be useful as an alternative measuring device.



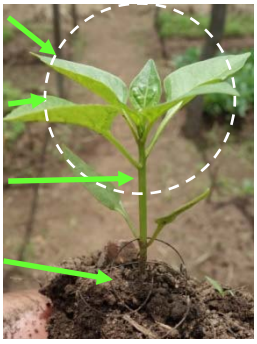
- Ditches with 30cm depth are made. Compost made from grass is applied and mixed with soil well. It is recommended that small basket of compost (5kg) be applied per $1m^2$ (1 step x 1 step). Then, ridges with 20 cm height and 80 cm width are made.
- Holes with 15 cm to 20 cm depth are made at each planting point based on the planting layout. Recommended space between plants is 60 cm. Compost made from grass or well decomposed manure is applied to planting holes. One (1) handful of manure per planting hole is applied. Well decomposed manure should be applied

With 3-4 large true leaves

No pests and diseases

Thick stem

Well developed roots (**Do not cut the roots when taking from the nursery.**)



Healthy Seedling

Making Ditch of 30cm Depth

Application of Grass Compost and Mixing with Soil

Making Ridge

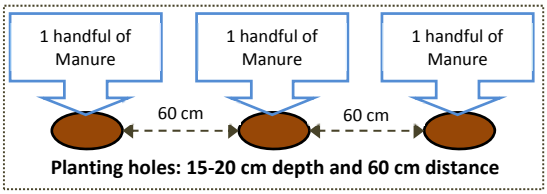
Measuring Planting Space

Manure Application

Mulching Application

Transplanting

rather than fresh manure to prevent damaging the plant's roots. Soil and applied manure are mixed well. Then, planting holes are made. Depth of planting hole depends on the size of the seedling.



- Before taking the seedlings from the nursery, water is applied to the nursery in advance to take the seedlings out easily.
- Dried grasses are applied on the ridges which serve as mulching material.
- Healthy seedlings with thick stems and large leaves without any diseases should be selected. Selected seedlings are carefully taken from nursery to avoid damage on the roots. Do not remove the soil from the seedling when transplanting. Seedlings of poor quality should be avoided. These seedlings can be transplanted in home gardens for self-consumption.
- After transplanting, water is applied immediately. If seedlings are transplanted during daytime, a shade made of banana stem placed above the planted seedlings is an effective means to avoid direct sunlight for a few days.

Watering

Shading by Banana Stem

Watering

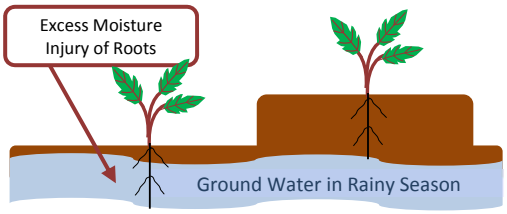
- Regular watering is required especially in dry season. However, watering should be reduced gradually as the crop grows. Watering should be done in the early morning or evening time.
- It is recommended to water the bottom part of the plants gently to avoid the contagion of soil-borne diseases.

Advantages of Mulching and Ridging

- For vegetable cultivation, the importance of mulching is well known and it is widely practiced using locally available dried grasses.
- Thick mulching is effective for keeping the moisture of the soil longer, preventing grass from growing and the contagion of soil borne-diseases.
- Excess moisture in soil causes damage to the roots and emergence of fungal disease in rainy season.
- High ridging to avoid excess moisture around the roots is effective to prevent excess moisture injury of the roots and incidence of fungal disease during rainy season.


Field with Mulching

Field without Mulching



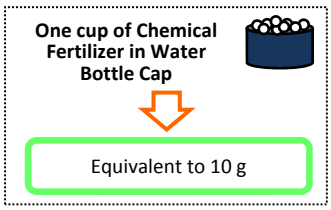
Field without Ridging
Field with Ridging

Weeding

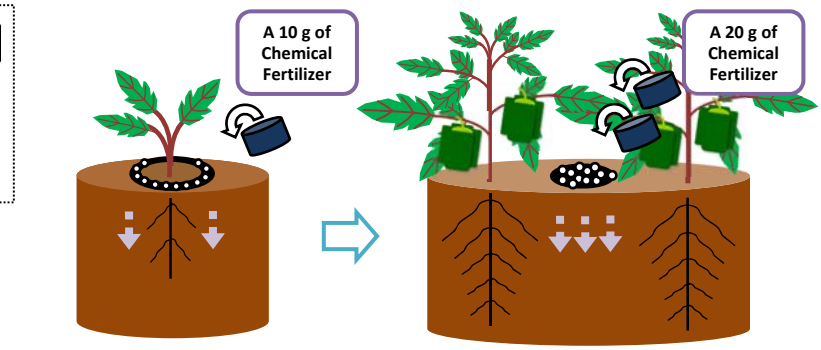
- The frequency of weeding depends on weed infestation; generally keeping the field weed free as much as possible to avoid competition of nutrients, sunlight, and water.

Top Dressing

- To get better yields, proper fertilization is necessary. Top dressing of chemical fertilizer such as NPK 17-17-17 should be applied in two (2) splits to avoid nutrients loss. Application at the top of the roots is effective.



- First top dressing: A pinch of chemical fertilizer (10 g) is applied in between plants and then, covered with soil after three (3) weeks from transplanting. A 10 g chemical fertilizer is equivalent to one water bottle cap.
- Second top dressing: Two pinches of chemical fertilizer (20 g) is applied in between plants and then covered with soil after six (6) weeks from transplanting. A 20 g chemical fertilizer is equivalent to two water bottle caps.



After 3 weeks from transplanting
After 6 weeks from transplanting

First top dressing is effective for increasing the number of leaves.

Second top dressing is effective for the formation and enlargement of fruits.

Sweet Pepper
Disease and Pest Control

Manual Number: SMAP-H-Sw-02

Major Disease and Pest in Rwanda

Name & Characteristic	Control Method
Bacterial Spot ■ Symptoms appear on leaves, stems, and fruits. Initial symptoms on leaves consist of small dark brown circular spots and yellowing of leaf margin. ■ Later, lesions slightly sink and become brown to blackish brown and in some cases coalesce to large spots.  	■ Removal of infected parts as soon as it is found ■ Application of copper compound such as FUGURAN® including copper oxychloride (oxychlorire de quivre) when disease occurs severely
Leaf Curl (Pepper Veinal Mottle Virus)  ■ Symptom consists of dwarfism and curling in newly developed leaves, and curling, twisting and interveinal yellowing in lower leaves. ■ The plants infected at the young stage are markedly damaged. They are stunted and apical leaves proliferate. Consequently, they bear a small number of flowering buds. ■ This virus disease is mainly transmitted by tobacco white fly.	■ Crop rotation ■ Application of insecticide to prevent tobacco white fly ■ Application of fungicide is not effective because this is not a fungus disease but a virus disease.
Bacterial Wilt ■ Symptoms are wilt on leaves of the shoot apex during daytime and wilt is no longer present in the morning and evening of under cloudy weather. ■ A few days later, all the leaves of the plant wilt without appreciable change in color and turn brown as they dry up. ■ Browning appears on the vascular strands of the basal part of stem in the wilted plant and grayish white bacterial exudate oozes out from the cut surface of the infected stem.  	■ Crop rotation ■ Use of resistant variety or grafted nursery plants on resistant root stock ■ Mix planting with liliaceae crops such as leek and onion for prevention and mitigation of the disease ■ Removal of infected plant as soon as it is found
Nematode (Southern Root-knot Nematode, Reniform Nematode, Steiner's Spiral Nematode) ■ Growth of infected plants is retarded, leaves are small and yellow as if affected by fertilizer deficiency. ■ Roots have numerous knots, leaves are wilting and dying. 	■ Utilization of animal dung, green manure and compost in soil ■ Crop rotation with ground nut, maize, sorghum and guinea grass to prevent nematode damage ■ Mix planting or crop rotation with marigold  African marigold

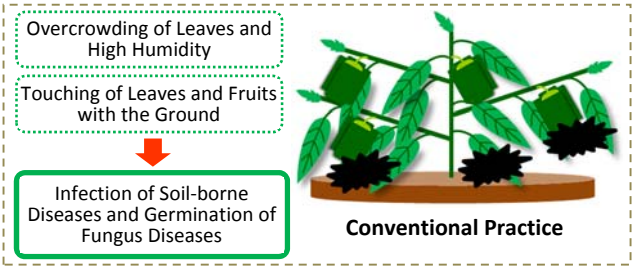
Name & Characteristic	Control Method
Aphid (Pea Aphid, Foxglove Aphid, Turnip Aphid, Green Peach Aphid)  ■ 1-2 mm long aphids feeds gregariously on plants. Body color varies from dark green to yellow green. The aphids parasitize young leaves of stems and flowers as well as lower leaves. ■ This insect is a vector of a kind of mosaic virus and other viruses.	■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Mix planting with sorghum which has high sugar content to attract aphids from tomato ■ However, the aphids may become resistant to insecticides due to the large reproduction potential and short germination cycle. Continuous application of the same insecticides must be avoided. ■ Many kinds of natural enemies of the aphids such as ladybug should be preserved and utilized for controlling the aphids. 
Sweetpotato Whitefly  ■ The families of vegetables i.e. Leguminosae, Cucurbitaceae and Solanaceae are attacked by the insect which feeds directly on plants and causes sooty mold disease due to excreta that affects the plant metabolism. ■ The whitefly is a vector of plant viruses such as (Tomato mosaic virus, Tobacco mosaic virus, Cucumber mosaic virus)	■ Dense planting of maize or sorghum around the field like a fence as a physical protection method ■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®.

Reference: Diseases of Tropical Vegetable Crops, JAICAF, Japan

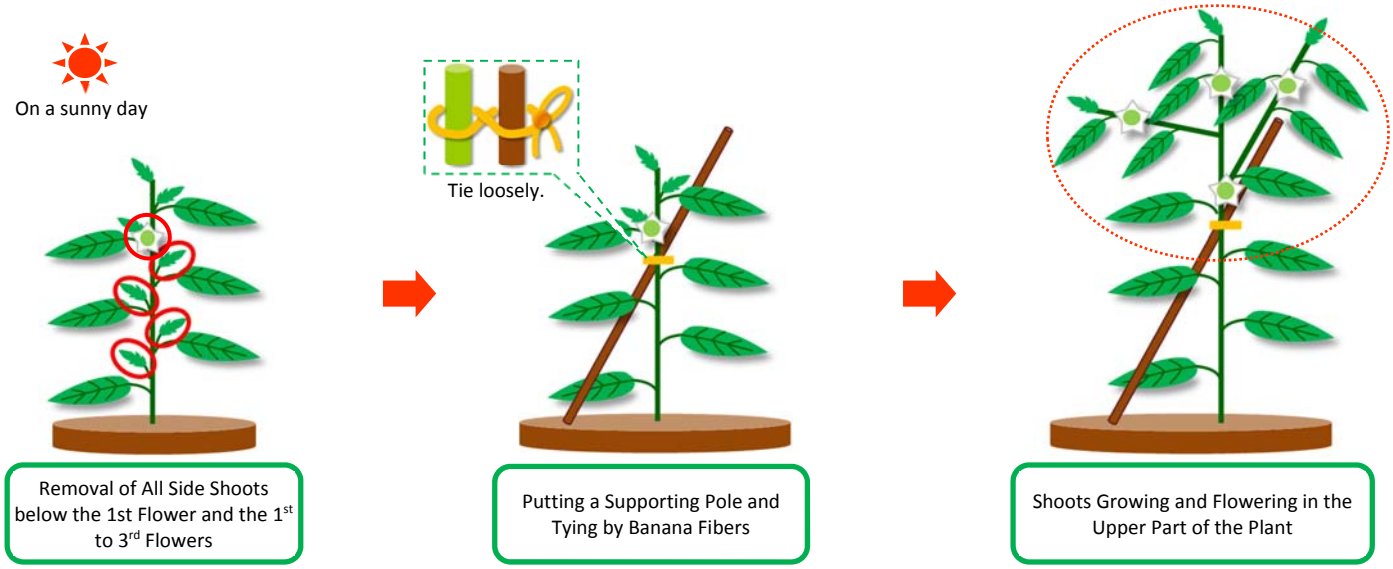
Sweet Pepper
Branch Training

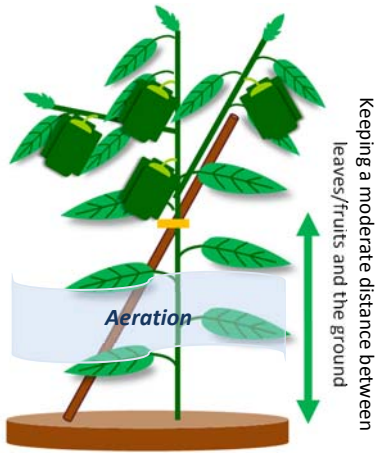
Manual Number: SMAP-H-Sw-03

Branch Training



- To increase yield and improve the quality, the branch training to modify the plant shape is important. All side shoots below the first flower and the first to third flower should be removed as the plant grow to improve the shape of plant which can keep a moderate distance between leaves, fruits and ground to prevent infection of soil-borne disease. The flowers (usually 1st to 3rd flowers) also should be removed in the growing stage of the plant in order to make the plant become large size. The pinching treatment must be done in sunny day to prevent infection of diseases. In addition, improving plant shape can prevents overcrowding of leaves and keep moderate aeration to prevent fungus disease and insect germination by the modification of humidity.
- Plant should be staked using wooden poles to keeps the fruits and leaves from touching the ground, which reduces soil-borne diseases and improves fruit quality. Staking also makes harvesting fruits easier. Plant can be staked with a 50 cm





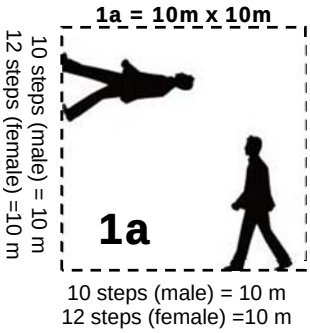
Eggplant
Transplanting and Field Management

Manual Number: SMAP-H-Eg-01

Field Preparation

- In selecting the proper site for transplanting, farmers have to choose a field that has not been planted with eggplant, tomato, sweet pepper, chili pepper and tobacco for the last four (4) seasons or a field where Irish potato have not been planted for the last three (3) seasons.
- Before transplanting, the field should be ploughed at a depth of about 15 cm to 20 cm. Debris in the field should also be removed. Then the field is leveled.

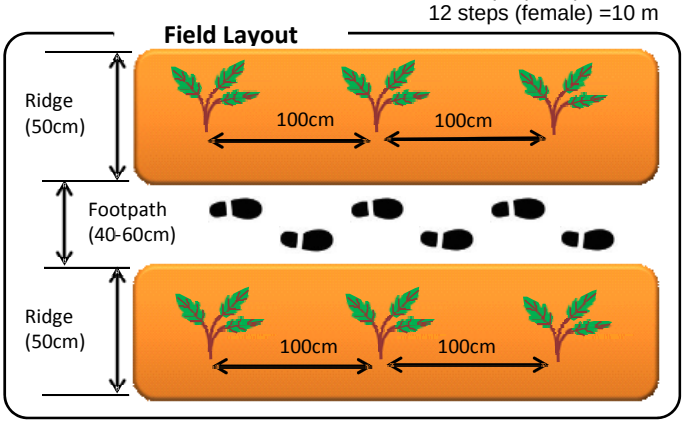
Ploughing the Field



10 steps (male) = 10 m
12 steps (female) =10 m

Field Layout

- It is recommended to plant seedlings by the following figure shown in the right side. In this case, about 70 to 80 seedlings are required for a 1a sized field.



Time of Transplanting

- The time of transplanting is after 7 to 8 weeks from the sowing of seedlings. Seedlings with 3 or 4 large true leaves are suitable for transplanting.

Transplanting

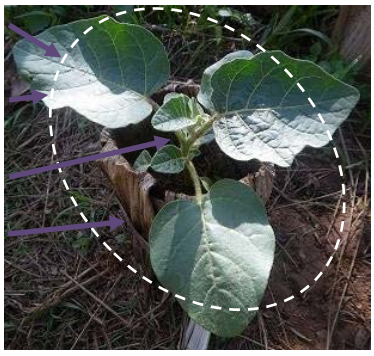
- It is recommended that transplanting should be done in early morning or late afternoon to avoid withering caused by direct sunlight.
- Field is measured using a measuring tape or any measuring equipment based on the field layout shown in the figure above. Another device used in measuring is a 500 ml water bottle as shown in the right side. The height of one water bottle is equivalent to 20 cm, therefore, two bottles is equal to 40 cm and five bottles is 100 cm. This can be useful as an alternative measuring device.
- Ditches with 30cm depth are made. Compost made from grass is applied and mixed with soil well. It is recommended that one small basket of compost (5kg) be applied per $1m^2$ (1 step x 1 step). Then, ridges with 20 cm height and 50 cm width are made.
- Holes with 15 cm to 20 cm depth are made at each planting point based on the planting layout. Recommended space between plants is 100 cm. Compost made from grass or well decomposed manure is applied to planting holes. One (1) handful of manure per planting hole is applied. Well decomposed manure should be applied rather than fresh manure to prevent damaging the plant's roots. Soil and applied manure are mixed well. Then, planting holes are made. Depth of planting hole depends on the size of the seedling.
- Before taking the seedlings from the nursery, water is applied to the nursery in advance to take the seedlings out easily.
- Dried grasses are applied on the ridges which serve as mulching material.

With 3-4 large true leaves

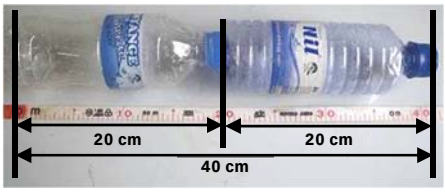
No pests and diseases

Thick stem

Well developed roots (**Do not cut the roots when taking from the nursery.**)



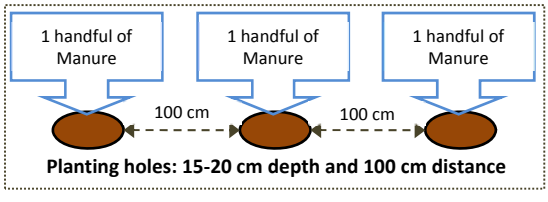
Healthy Seedling for Transplanting



Making Ditch of 30cm Depth

Application of Grass Compost and Mixing with Soil

Making Ridge



Planting holes: 15-20 cm depth and 100 cm distance

Measuring Planting Space

Manure Application

- Healthy seedlings with thick stems and large leaves without any diseases should be selected. Selected seedlings are carefully taken from nursery to avoid damage on the roots. Do not remove the soil from the seedling when transplanting. Seedlings of poor quality should be avoided. These seedlings can be transplanted in home gardens for self-consumption.


Mulching Application


Transplanting


Watering


Shading by Banana Stem

- After transplanting, water is applied immediately. If seedlings are transplanted during daytime, a shade made of banana stem placed above the planted seedlings is an effective means to avoid direct sunlight for a few days.

NAE-HANSAKU (One of Japanese Old Proverb:苗半作)

"If you have succeeded in raising good vegetable seedlings, it means that you have almost accomplished 50% of the whole cultivation practice which promises a high yield."

It is very important to raise good seedlings at nursery stage for high yield and good quality of products.

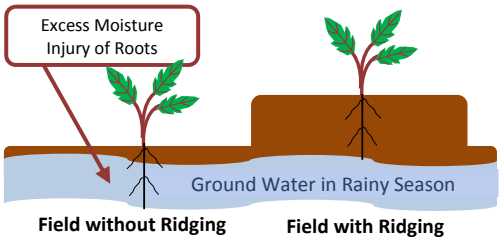
Advantages of Mulching and Ridging

- For vegetable cultivation, the importance of mulching is well known and it is widely practiced using locally available dried grasses.
- Thick mulching is effective for keeping the moisture of the soil longer, preventing grass from growing and the contagion of soil borne-diseases.


Field with Mulching

Field without Mulching

- Excess moisture in soil causes damage to the roots and emergence of fungal disease in rainy season.
- High ridging to avoid excess moisture around the roots is effective to prevent excess moisture injury of the roots and incidence of fungal disease during rainy season.

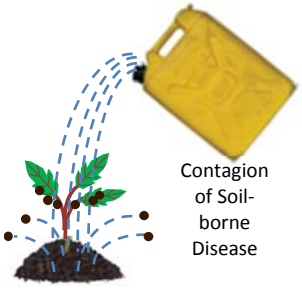


Field without Ridging　　Field with Ridging

Watering

- Regular watering is required especially in dry season. However, watering should be reduced gradually as the crop grows. Watering should be done in the early morning or evening time.
- It is recommended to water the bottom part of the plants gently to avoid the contagion of soil-borne diseases.

Gentle watering can prevent attack of soil-borne diseases

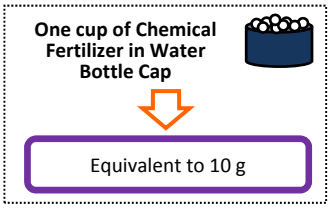


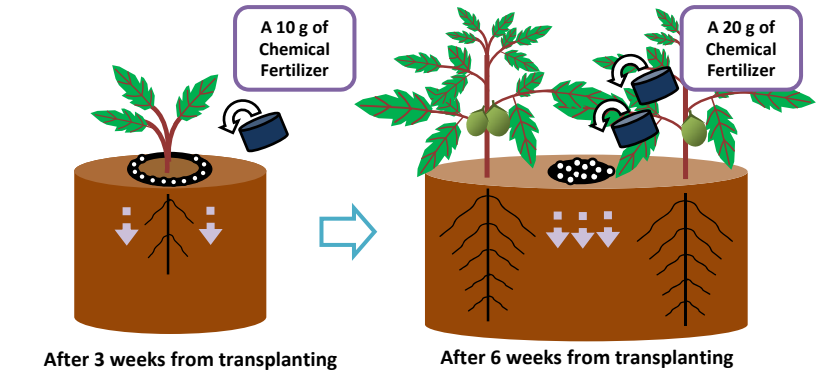
Weeding

- The frequency of weeding depends on weed infestation; generally keeping the field weed free as much as possible to avoid competition of nutrients, sunlight, and water.

Top Dressing

- To get better yields, proper fertilization is necessary. Top dressing of chemical fertilizer such as NPK 17-17-17 should be applied in two (2) splits to avoid nutrients loss. Application at the top of the roots is effective for root development.





After 3 weeks from transplanting　　After 6 weeks from transplanting

First top dressing is effective for increasing the number of leaves.

Second top dressing is effective for the formation and enlargement of fruits.

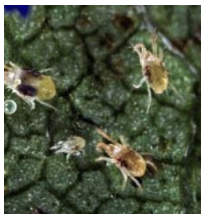
- First top dressing: A pinch of chemical fertilizer (10 g) is applied in between plants and then, covered with soil after three (3) weeks from transplanting. A 10 g chemical fertilizer is equivalent to one water bottle cap.
- Second top dressing: Two pinches of chemical fertilizer (20 g) is applied in between plants and then covered with soil after six (6) weeks from transplanting. A 20 g chemical fertilizer is equivalent to two water bottle caps.

Eggplant
Disease and Pest Control

Manual Number: SMAP-H-Eg-02

Major Disease and Pest in Rwanda

Name & Characteristic	Control Method
Mosaic (Tomato mosaic virus, Tobacco mosaic virus, Cucumber mosaic virus) ■ Symptom consists of mosaic on the leaves, narrowing of leaves, necrosis on the stem and leaves. ■ This virus disease is transmitted by seeds, by soil through the debris of infected plants, aphids and mechanically from the infected plants by farming practice, namely transplanting, disbudding, training, harvesting, etc. 	■ Avoid the continuous cropping ■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Removal of infected plant as soon as it is found ■ Application of fungicide is not effective because this is not a fungus disease but a virus disease.
Leaf Spot (*Alternaria spp., Septoria melongenae, Cercospora spp.*) ■ First visible symptoms of foliar infection are expanding necrotic spots with yellow to dark-brown margins. ■ Infection usually starts on lower leaves and moves up the plant as the disease progresses. ■ Disease development is generally dependent on high relative humidity. ■ Splashing irrigation water to the foliage facilitates spread of the disease.  	■ Use field sanitation techniques such as crop rotation, weed control and removal of debris from previous crops. ■ Use good quality seeds. ■ Use mulching. ■ Application of fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® as soon as the disease occurs in the rainy season.
Aphid (Pea Aphid, Foxglove Aphid, Turnip Aphid, Green Peach Aphid)  ■ 1-2 mm long aphids feeds gregariously on plants. Body color varies from dark green to yellow green. The aphids parasitize young leaves of stems and flowers as well as lower leaves. ■ This insect is a vector of a kind of mosaic virus and other viruses.	■ Mix planting with sorghum which has high sugar content to attract aphids from Eggplant ■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ However, the aphids may become resistant to insecticides due to the large reproduction potential and short germination cycle. Continuous application of the same insecticides must be avoided. ■ Many kinds of natural enemies of the aphids such as ladybug should be preserved and utilized for controlling the aphids. 
Sweetpotato Whitefly ■ The families of vegetables i.e. Leguminosae, Cucurbitaceae and Solanaceae are attacked by the insect which feeds directly on plants and causes sooty mold disease due to excreta that affects the plant metabolism. ■ The whitefly is a vector of plant viruses such as (Tomato mosaic virus, Tobacco mosaic virus, Cucumber mosaic virus) 	■ Dense planting of maize or sorghum around the field like a fence as a physical protection method ■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®

Name & Characteristic	Control Method
Spider Mite ■ Leaves stippled with yellow and may appear bronzed. ■ Mites may be visible as tiny moving dots on the webs or underside of leaves, best viewed using a hand lens. ■ Usually not spotted until there are visible symptoms on the plant; leaves turn yellow and may drop from plant ■ Fine webbing is visible on and under eggplant leaves in mite-infested fields.  	■ Apply watering, regularly ■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER® ■ Apply insecticide carefully not only upper side of leaf but lower side
Nematode (Southern Root-knot Nematode, Reniform Nematode, Steiner's Spiral Nematode) ■ Growth of infected plants is retarded, leaves are small and yellow as if affected by fertilizer deficiency. ■ Roots have numerous knots, leaves are wilting and dying. 	■ Utilization of animal dung, green manure and compost in soil ■ Crop rotation with ground nut, maize, sorghum and guinea grass to prevent nematode damage ■ Mix planting or crop rotation with marigold  African marigold

Reference: Diseases of Tropical Vegetable Crops, JAICAF, Japan

University of Minnesota Extension: https://www.extension.umn.edu/

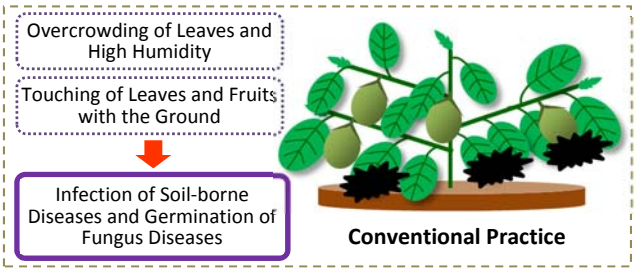
Pepper & Eggplant Disease Guide, Seminis Grow forward, USA

Eggplant
Branch Training

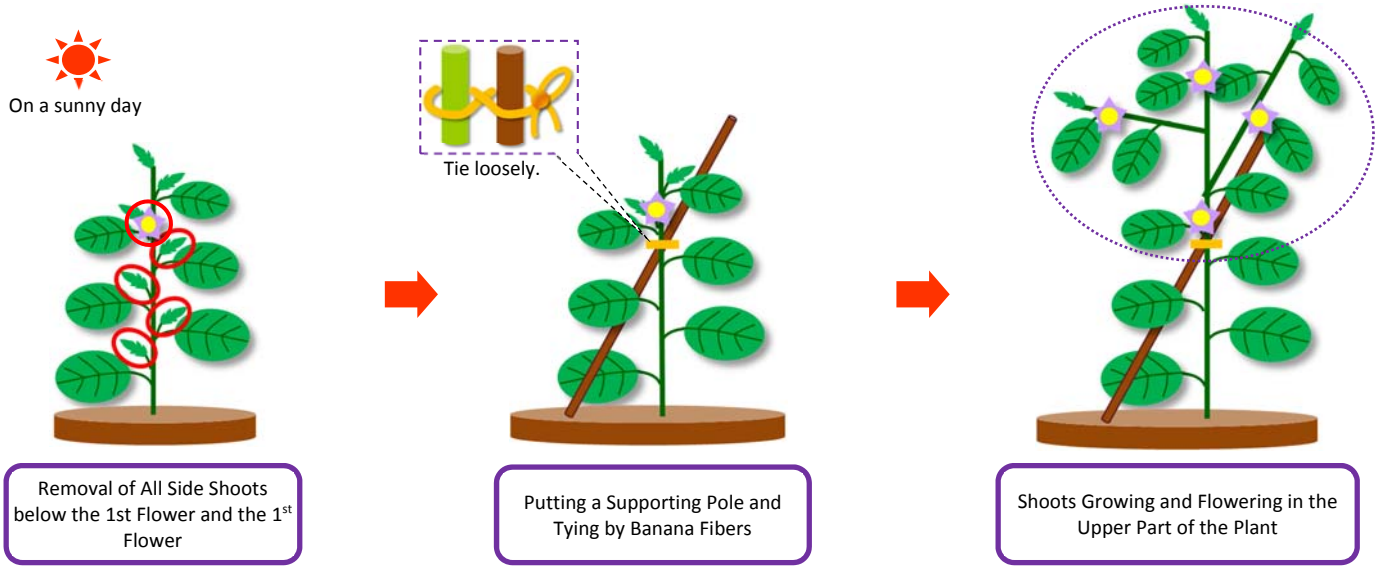
Manual Number: SMAP-H-Eg-03

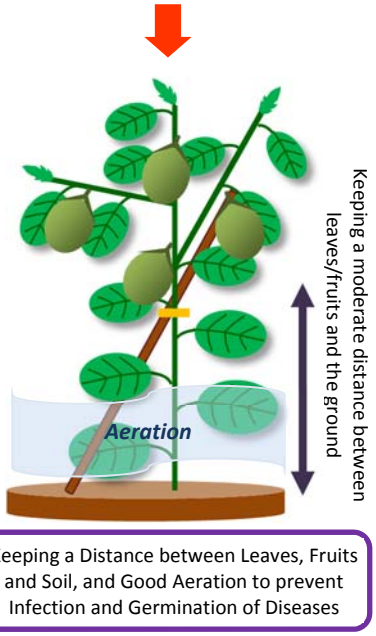
Branch Training

- To increase yield and improve the quality, the branch training to modify the plant shape is important. All side shoot below the first flower should be removed as the plant grow to improve the shape of plant which can keep a moderate distance between leaves, fruits and ground to prevent infection of soil-borne disease. The 1st flower also should be removed in the growing stage of the plant in order to make the plant become large size. The pinching treatment must be done in sunny day to prevent infection of diseases. In addition, improving plant shape can prevents overcrowding of leaves and keep moderate aeration to prevent fungus disease and insect germination by the modification of humidity.



- Plant should be staked using wooden poles to keeps the fruits and leaves from touching the ground, which reduces soil-borne diseases and improves fruit quality. Staking also makes harvesting fruits easier. Plant can be staked with a 50 cm length wooden pole like *pennisetum* placed at every plant. Plants are tied to the pole by banana fibers.





Cabbage
Transplanting and Field Management

Manual Number: SMAP-H-C-01

Field Preparation

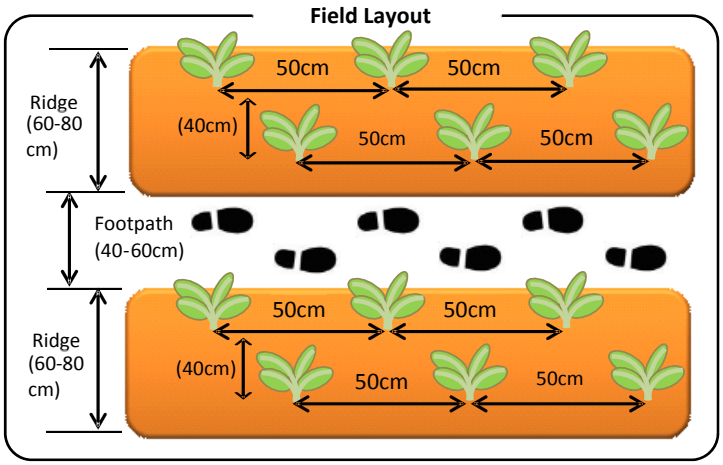
- The site of field which cabbage has not been planted for the last 2 seasons should be selected.
- At about one week before transplanting, the field should be ploughed at a depth of about 15-20 cm and debris and clods are eliminated. And then the field is leveled.
- It is recommended that the compost made from grasses is broadcasted in the field (10-20 baskets per 1a sized field depending on soil fertility) and then mixed into soil preferably using hoe.

Ploughing the Field

Compost Application to the Field

Field Layout

- It is recommended to plant seedlings as shown in the right figure. In this case, about 360 to 380 seedlings are required for 1a sized field. In case of F1 variety, the distance between plants is 10 cm wider than that.

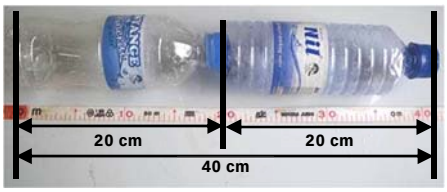


Timing of Transplanting

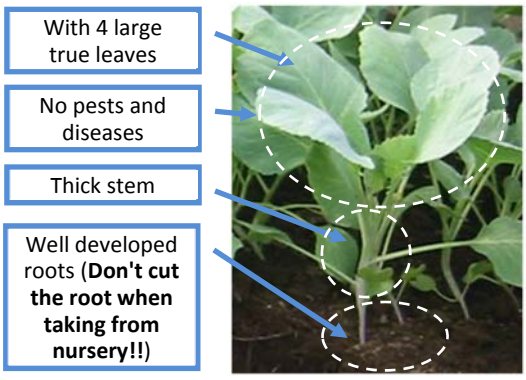
- Timing of transplanting is after 3-4 weeks after sowing. Seedlings with 3 or 4 large true leaves are suitable for transplanting.

Transplanting

- It is recommended that transplanting should be done in early morning or late afternoon to avoid strong sun shine.
- Field is measured by measuring tape or any measuring equipment based on the field layout. Ridges with 20 cm height and 60 cm width are made. For measuring, a 500 ml water bottle is available. The height of one water bottle is equivalent to 20 cm, two bottles are 40 cm and three bottles are 60 cm. It is very useful for measuring.



- Holes with 15-20 cm depth are made at each planting point in the planting layout. Recommended space between rows is 40 cm and between plants is 50 cm.
- Compost made from grass or maturing cow dung is applied to planting holes. 1 handful of compost per planting hole is applied. Mature cow dung should be applied, otherwise immature cow dung may damage plant's roots. Soil and applied compost are mixed well. Then, planting holes are made. Depth of planting hole depends on the size of seedling.



Healthy Seedling for Transplanting

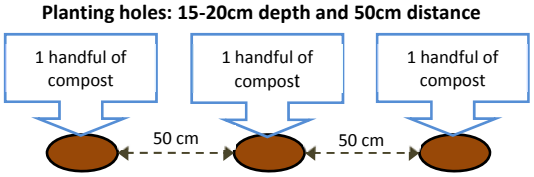
- Before taking seedlings from nursery, water is applied to the nursery in advance to take seedling easily.
- Dried grasses are applied on the ridge for mulching material.

Making Ridge

Measuring Planting Space

Making Planting Hole and Compost Application

- Healthy seedlings which have a thick stem and large leaves without any diseases should be selected. Selected seedlings are carefully taken from nursery to avoid damage on the roots. Don't remove soil from seedling when transplanting. Poor seedling should be avoided. Poor seedling should be transplanted in home garden for self-consumption.



- After transplanting, water is applied immediately. If seedlings are transplanted in daytime, a shade made of banana stem put above the planted seedlings is effective to avoid direct sunlight for a few days.


Mulching Application


Transplanting


Watering


Planted Field

NAE-HANSAKU (One of Japanese Old Proverb:苗半作)

"If you have succeeded in raising good vegetable seedlings, it means that you have almost accomplished 50% of the whole cultivation practice which promises a high yield."

It is very important to raise good seedlings in nursery stage for high yield and good quality of products.

Advantages of Mulching and Ridging

- For cabbage cultivation, importance of mulching is well known and it is widely practiced using locally available dried weeds and grasses.
- Thick mulching is effective for keeping soil moisture longer and preventing grass growing and contagion of soil borne-diseases.
- Excess moisture in soil causes a damage of root and prevailing of fungal disease in rainy season.
- High ridging to avoid excess moisture around roots is effective to prevent damage on root and fungal disease in rainy season.

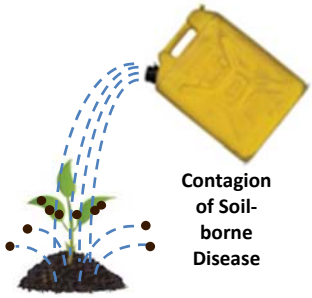

Field with Mulching


Field without Mulching

Watering

- Regular watering ensures uniform head formation and increases the size of the head. However, watering should be gradually reduced as crop matures. Watering should be done in the early morning or evening time.
- It is recommended to water gently at the bottom of plants to avoid contagion of soil-borne disease.

Gentle watering can prevent attack of soil-borne diseases



Weeding

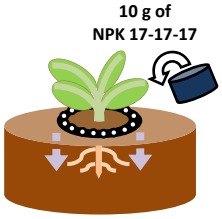
- Cabbage has a shallow root system. Care should therefore be taken to avoid brushing the roots during weeding.
- The frequency of weeding depend on weed infestation; generally keep the field weed free as much as possible to avoid competition for nutrients, sunlight and moisture.

Top Dressing

- Cabbage is a heavy feeder, so to get better yields, proper fertilization is necessary.
- Top dressing of fertilizer such as NPK 17-17-17 should be applied in 2 splits to avoid nutrients loss. Application at the top of the roots is effective for root development.

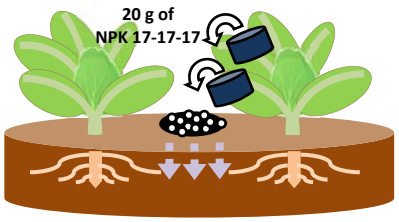
1 cup of NPK 17-17-17 in Water Bottle Cap

Equivalent to 10 g



After 3 Weeks from Transplanting

1st top dressing is effective for increasing the number of leaves.



After 6 Weeks from Transplanting

2nd top dressing is effective for the formation and enlargement of head.

- 1st top dressing: One pinch of NPK 17-17-17 (10g) is applied around the bottom of the plant and covered with soil at 3 weeks after transplanting. 10g of NPK 17-17-17 is equivalent to one cup of water bottle cap.
- 2nd top dressing: Two pinches of NPK 17-17-17 (20g) is applied at the midpoint between plants along the planting rows and then covered with soil at 6 weeks after transplanting.

Cabbage
Disease and Pest Control

Manual Number: SMAP-H-C-02

Major Disease and Pest in Rwanda

Name & Characteristic	Control Method
Black Rot ■ This disease tolerates dry conditions and survives in seeds and in dried infected plant tissues for one year. Debris of infected plants in soil may be the major source of infection. The pathogen is mainly carried by rain splash.  	■ For the control of the disease, avoidance of continuous cropping of cruciferous vegetables and spray of fungicide including copper oxychloride (oxychlorire de quivre) such as FUGURAN® before wide spread of the disease are effective. Immediate removal of infected crops is also effective to prevent the infection to other crops.
Cabbage Mosaic Virus  ■ The disease is mainly transmitted by aphids. This disease is not transmitted by seeds. The source of the disease is other infected cabbage, other cabbage family crop or weed in and around the field. To prevent the disease, immediate removal of infected plants in and around the field or control of aphids.	■ To control aphids, Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Mix-planting with sorghum is also effective to attract aphid and ladybug. The lady bug is a helpful insect. It predates aphids in the field. When the disease is found, infected crops must be removed from the field.
Bacterial Soft Rot ■ The bacterium lives in various kinds of crops such as Solanaceae (tomato, eggplant sweet pepper), Cucurbitaceous (pumpkin, watermelon, cucumber), Apiaceous (celery, carrot) and Liliaceous (onion, leek) crops all the year round in the tropical area. But the bacterial is not transmitted through seeds and cannot survive under dry conditions. It is mainly disseminated by rain splash on lower leaves and enters through wounds or insect bites. 	■ Crop rotation with Graminaceous crops (maize and sorghum) and legume crops (French bean) is effective for the control. Spray of fungicide including copper oxychloride (oxychlorire de quivre) such as FUGURAN® at the early stage of head formation and after heavy rain is also recommended.
Yellows ■ This disease transmitted from infected plant debris. 	■ It is effective to remove infected plant as soon as possible, to remove all plant debris from the field after harvesting and to implement crop rotation to avoid continuous cropping of cabbage and cabbage family crops.
Cabbage White  	■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER® is effective. Immediate killing in the field when farmer find crops with bite damage by it. It can be easily find out. ■ Catching of adult flying white butterfly also effective. For physical protection method, dense planting of maize or sorghum around the field like a fence may also be effective because the insect cannot fly high and over the maize and sorghum.

Name & Characteristic	Control Method
Diamondback Moth  	■ Cypermethrin such as DUDU-CYPER® and ROKET®, may be effective. But insecticide application is less effective for egg, mature larvae and pupae. ■ For physical protection method, dense planting of maize or sorghum around the field like a fence may also be effective because the insect cannot fly high and over the maize and sorghum.
Grasshopper   Habitat in Napier grasses	■ Application of insecticide is not effective because it get away easily. ■ For physical protection method, continuous and daily catching by farmer using insect catching net may be effective. ■ In daytime, the insect normally hides in habitat under the shade of leaves or crop residue in and around the field. Removal of their habitat such as grasses or crop residue in and around the field and tilling the soil to expose its eggs to sunshine may also be effective.
Aphids  	■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER® ■ Spraying insecticide carefully not only surface leaves but in lying position leaves

Reference: Diseases of Tropical Vegetable Crops, JAICAF, Japan

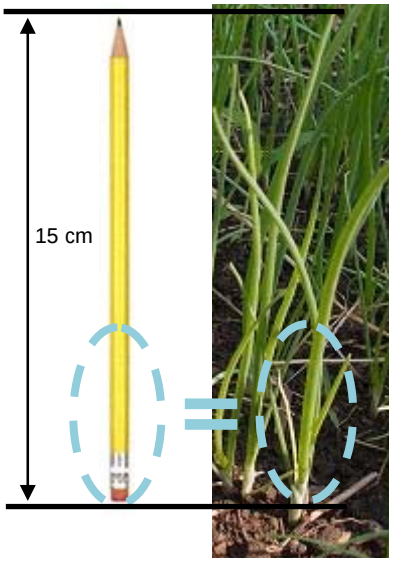
Onion

Transplanting

Manual Number: SMAP-H-O-01

Field Preparation

- The site of field which onion and leek have not been planted for the last 3 seasons should be selected.
- At about one week before transplanting, the field should be ploughed at a depth of about 15-20 cm and debris and clods are eliminated. And then the field is leveled.
- If enough compost is available, it is recommended that compost is broadcasted in the field (10-20 baskets per 1a sized field, depending on soil fertility) and then mixed into soil preferably using hoe.



Seedling for Transplanting

Timing of Transplanting

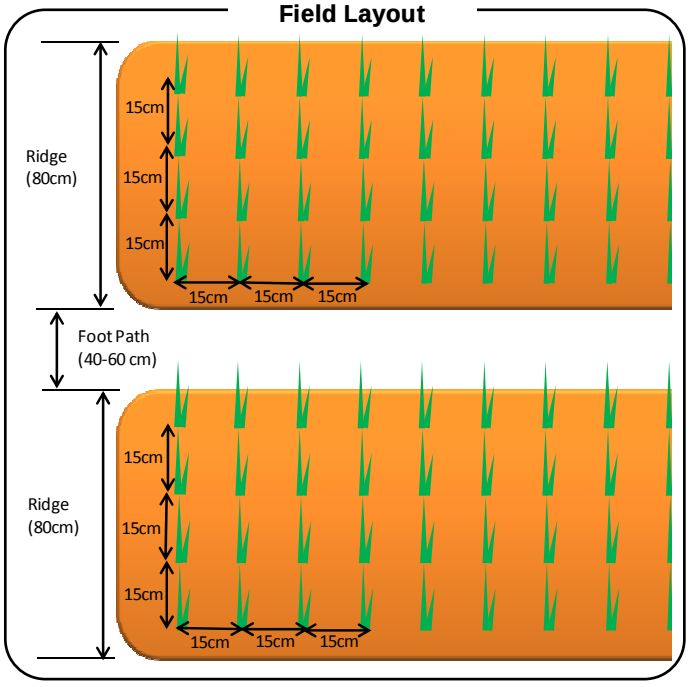
- Seedling for transplanting should be 7-8 weeks old and which base of stem is pencil thick and 15 cm tall.

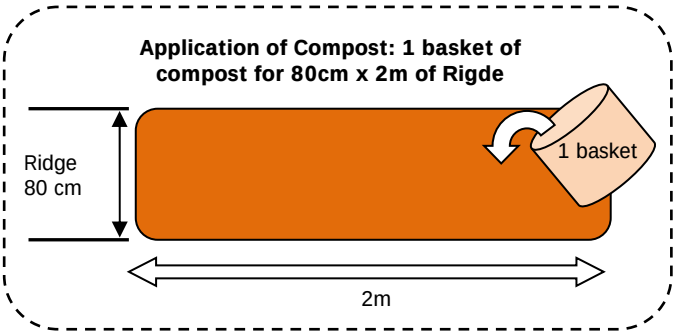
Field Layout

- It is recommended to plant seedlings as shown in the right figure. In this case, about 2,000–2,500 seedlings are transplanted in 1a sized field (10 m x 10 m).

Transplanting

- It is recommended that transplanting should be done in late afternoon to avoid strong sunshine.
- Field is measured by measuring tape or any measuring equipment based on the layout. Ridges with 10-15 cm height and 80cm width are made. For measuring, a pen is available. The length of pen is equivalent to 15 cm, two pens are 30 cm.
- Compost made from grass or maturing cow dung is applied. Amount of compost is one basket per 80cm x 2m on ridge.
- Before taking seedlings from nursery, water is applied to the nursery in advance to take seedling easily.
- Dried grasses are applied on the ridge for mulching material.





- Healthy seedlings which have a thick stem and large leaves without any diseases should be selected. Selected seedlings are carefully taken from nursery to avoid damage on the roots. Don't remove soil from seedling when transplanting. Poor seedling should be avoided. Poor seedling should be transplanted in home garden for self consumption.

Mulching Application

Transplanting

Watering

- After transplanting, water is applied immediately.

Onion
Disease and Pest Control

Manual Number: SMAP-H-O-02

Major Disease and Pest

Name & Characteristic	Control Method
Purple Blotch ■ The disease affects leaves and flower stalks. ■ Lesion are ellipsoidal or spindle shaped, 1-3 cm in size, slightly sunken with a pale brown margin. ■ The disease spreads at the late stage of growth when plants become weak or in case of nutrient deficiency. ■ High temperature and abundant precipitation on conductive to the disease occurence. 	■ Application of fungicides such as DITHANE® including mancozeb and FUGURAN® including copper oxychloride (oxychlorire de quivre) as soon as the disease occurs ■ Crop rotation ■ Use of resistant variety ■ High ridging
Downy Mildew ■ The fungus disease affects leaves and flower stalks. ■ Yellow and large ellipsoidal or spindle shaped lesions appear on old leaves and flower stalks. ■ This disease mainly occurs if the precipitation is abundant. 	■ Application of fungicides such as DITHANE® including mancozeb and FUGURAN® including copper oxychloride (oxychlorire de quivre) as soon as the disease occurs ■ Crop rotation ■ High ridging
Rust ■ Orange-yellow and slightly raised pustules appear on leaves and later orange-yellow uredospores disease from burst pustules. ■ If the temperature is low and the precipitation is abundant in hot season, rust may occur in later. 	■ Application of fungicides such as SAFARI-ZEB® or VICTORY including mancozeb, and ASCOPPER® including copper oxychloride (oxychlorire de quivre) as soon as the disease occurs ■ Crop rotation ■ Application of sufficient amount of fertilizer to maintain the plant vigor at the early stage of disease development ■ High ridging
Onion Fly  ■ The onion fly has an ash-grey body and resembles a housefly. ■ It lays its eggs near the base of the plant onion, on the leaves and in the soil nearby. ■ It is particularly troublesome in the larval stage, when the maggots tunnel into the plant tissue.	■ Use well decomposed manure ■ Crop rotation ■ Removal of crop residues immediately after harvest
Onion Thrip ■ When the insect feeds on the surface of young leaves, white dots appear. If the damage is severe, plants wither. ■ Considerable damage cen be observed at the early growth stage of plants. ■ The insidence of the insect tend to increase at high temperature and in the case of light rain. ■ It was also shown that the insect populations increased when the content of soil nitrigen was high and the contents of soil phosphate and potassium were low. 	■ Weeding to remove their habitat ■ Supplemental irrigation ■ Stopping the fertilizer which contains high nitrogen ■ Application of insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®

Reference: Diseases of Tropical Vegetable Crops, JAICAF, Japan

Watermelon
Transplanting and Field Management

Manual Number: SMAP-H-Wa-01

Field Preparation

- In selecting the proper site for transplanting, one has to choose a field that has not been planted with watermelon for the last five (5) seasons or a field where cucumber, squash and gourd have not been planted for the last three (3) seasons.
- One week before transplanting, the field should be ploughed at a depth of about 15 cm to 20 cm. Debris in the field should also be removed. Then the field is leveled.

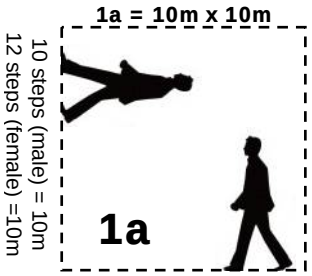
Ploughing the Field

Compost Application to the Field

- It is recommended that the compost made from grasses be widely spread out in the field (10-20 baskets per 1a sized field depending on soil fertility) and then mixed into the soil preferably using a hoe.

Field Layout

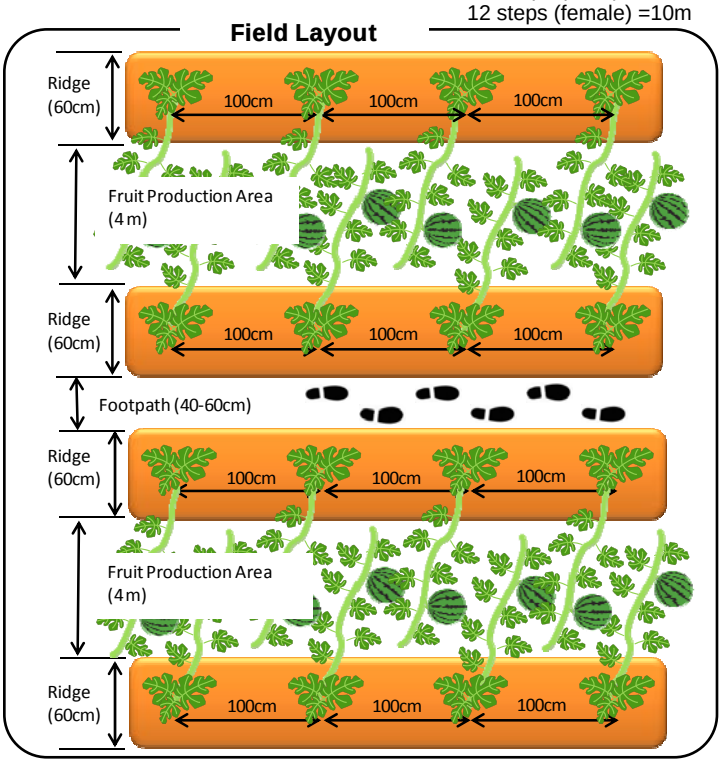
- It is recommended to plant seedlings by the following figure shown in the right side. In this case, about 40 seedlings are required for a 1a sized field.



10 steps (male) = 10m
12 steps (female) =10m

Time of Transplanting

- The time of transplanting is after 4 to 5 weeks after the sowing. Seedlings with 3 or 4 large true leaves are suitable for transplanting.

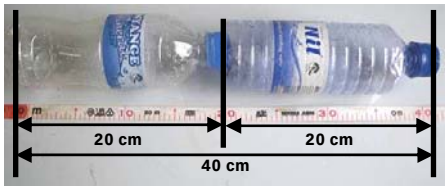


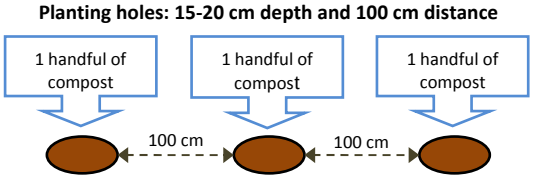
Transplanting

- It is recommended that transplanting should be done in early morning or late afternoon to avoid direct sunlight.
- Field is measured using a measuring tape or any measuring equipment based on the field layout. Ridges with 20 cm height and 60 cm width are made. Another device used in measuring is a 500 ml water bottle as shown below. The height of one water bottle is equivalent to 20 cm, therefore, two bottles is equal to 40 cm and three bottles is 60 cm. This can be very useful as an alternative measuring device.
- Holes with 15 cm to 20 cm depth are made at each planting point in the planting layout. Recommended space between plants is 100 cm.
- Compost made from grass or well decomposed cow dung is applied to planting holes. One (1) handful of compost per planting hole is applied. Well rotted cow dung should be applied rather than fresh cow dung to prevent damaging the plant's roots. Soil and applied compost are mixed well. Then, planting holes are made. Depth of planting hole depends on the size of the seedling.
- Before taking the seedlings from the nursery, water is applied to the nursery in advance to pluck the seedlings out easily.
- Dried grasses are applied on the ridges which serve as mulching material.
- Healthy seedlings with thick stems and large leaves without any diseases should be selected. Selected seedlings are carefully taken from nursery pots to avoid damage on the roots. Do not remove

Making Ridge

Measuring Planting Space





the soil from the seedling when transplanting. Seedlings of poor quality should be avoided. These seedlings can be transplanted in home gardens for self-consumption.

- After transplanting, water is applied immediately. If seedlings are transplanted during daytime, a shade made of banana stem placed above the planted seedlings is an effective means to avoid direct sunlight for a few days.

Compost Application

With 3-4 large true leaves

No pests and diseases

Thick stem

Well developed roots (**Do not cut the roots when taking out from the nursery pot.**)

Healthy Seedling for Transplanting

Mulching Application

Transplanting

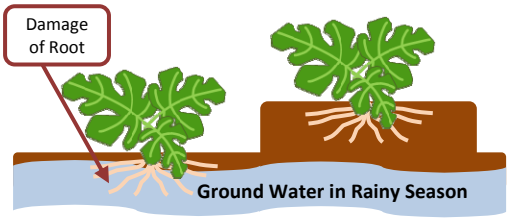
Watering

Shading by Banana Stem

Advantages of Mulching and Ridging

- For watermelon cultivation, the importance of mulching is well known and it is widely practiced using locally available dried weeds and grasses.
- Thick mulching is effective for keeping the moisture of the soil longer, prevent grass from growing and prevent the contagion of soil borne-diseases.
- Excess moisture in soil causes damage to the roots and emergence of fungal disease in rainy season.
- High ridging to avoid excess moisture around the roots is effective to prevent damage to the roots and incidence of fungal disease during rainy season.

Survived Watermelon in Flooded Field



NAE-HANSAKU (One of Japanese Old Proverb:苗半作)

"If you have succeeded in raising good vegetable seedlings, it means that you have almost accomplished 50% of the whole cultivation practice which promises a high yield."

It is very important to raise good seedlings at nursery stage for high yield and good quality of products.

Watering

- Regular watering is required especially in dry season. However, watering can be reduced gradually as the crop grows. It should be done early morning or evening time.

1 cup of NPK 17-17-17 in Water Bottle Cap

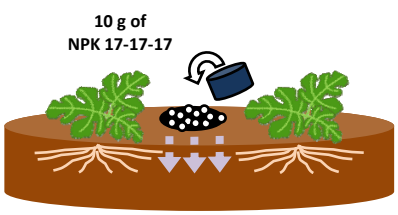
Equivalent to 10 g

Weeding

- The frequency of weeding depends on weed infestation; generally keeping the field weed free as much as possible to avoid competition of nutrients, sunlight, and moisture.

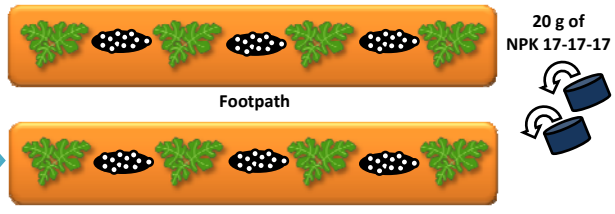
Top Dressing

- To get better yields, proper fertilization is necessary. Top dressing of fertilizer such as NPK 17-17-17 should be applied in two (2) splits to avoid nutrients loss. Application at the top of the roots is effective for root development.



After 3 weeks from Transplanting

First top dressing is effective for increasing the number of leaves.



After 6 weeks from Transplanting

Second top dressing is effective for the formation and enlargement of fruits.

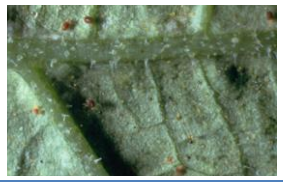
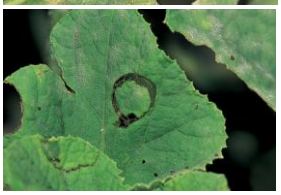
- First top dressing: A pinch of NPK 17-17-17 (10g) is applied in between plants and then, covered with soil after three (3) weeks from transplanting. A 10 g NPK-17-17-17 is equivalent to one water bottle cap.
- Second top dressing: Two pinches of 17-17-17 (20 g) is applied in between plants then covered with soil after six (6) weeks from transplanting.

Watermelon
Disease and Pest Control

Manual Number: SMAP-H-Wa-02

Major Disease and Pest in Rwanda

Name & Characteristic	Control Method
Powdery mildew Cause: Fungus ■ Powdery mildew is first evident as pale yellow leaf spots. White powdery spots can form on both upper and lower leaf surfaces, and quickly expand into large blotches which ultimately can cover entire leaf, petiole, and stem surfaces. ■ When the majority of the foliage is infected, the plant is weakened and the fruit ripens prematurely.  	■ Apply fungicide, copper oxychloride, for prevention purpose. ■ Apply fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs particularly in the rainy season. ■ Apply fungicide every 10 days from the beginning of infection. ■ Not use the self-multiplied seed. ■ Balanced fertilization. Avoid over applying nitrogen. ■ Cultivate with a proper spacing to air can circulate and dry off the wet foliage.
Anthracnose Cause: Fungus ■ Angular dark brown or black lesions appear on leaves with a yellow border. ■ The most striking diagnostic symptoms are produced on the fruit, where circular, black, sunken cankers appear. ■ Water soaked lesions are seen on the leaf which later become yellowish irregular spots.  	■ Apply fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs particularly in the rainy season. ■ Use crop rotation. ■ Balanced fertilization. ■ Remove the infected plant as soon as it is found, and bury it in the ground.
Downy Mildew Cause: Fungus ■ It is caused by a parasitic organism that is related to algae. ■ Firstly, yellow mottling appears on leaves, and it will be changed to dark brown lesions, and then leaves curling inwards. ■ The spots turn necrotic with age. The diseased leaves become yellow and fall down. Diseased plants get stunted and die. Fruits produced may not mature and have a poor taste.  	■ Apply fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs particularly in the rainy season. ■ Apply fungicide not only upside of the leaf but also back side of it. ■ Remove the infected plant as soon as it is found, and bury it in the ground.
Mosaic Virus Cause: Virus ■ Symptoms of mosaic appear on the youngest leaves when infection occurs at 6 – 8 leaves stage. ■ Symptoms vary widely depending on species, cultivar, virus strain and environmental conditions. Symptoms on leaves may include green mosaic patternation, green vein-banding, chlorotic rings and disfigured leaves. ■ Mosaic virus is aphid-borne and shows up sporadically. Watermelon mosaic shows up on outdoor cucumbers, zucchini and other members of the cucurbit family. ■ Virus-infected leaves often have a mottling or mosaic pattern in shades of green and yellow. Leaves are often distorted or deformed. Young leaves often show the most severe symptom s and are frequently abnormally small.  	■ Application of fungicide is not effective because this is not a fungus disease but a virus disease. ■ Purchase clean seed from a reputable supplier. Not use the self-multiplied seed. ■ Weeding properly. ■ Manage Aphids and Cucumber Beetles. ■ Balanced fertilization ■ Remove the infected plant as soon as it is found, and bury it in the ground.

Name & Characteristic	Control Method
Aphid (Aphis Gossypii, Myzus persicae) Cause: Insect ■ 1-2 mm long aphids feed gregariously on plants. Body color varies from dark green to yellow-green. The aphids parasitize young leaves of stems and flowers as well as lower leaves. ■ This insect is a vector of a kind of mosaic virus and other viruses. ■ However, the aphids may become resistant to insecticides due to the large reproduction potential and short germination cycle. Continuous application of the same insecticides must be avoided.  	■ Apply insecticides such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Many kinds of natural enemies of the aphids such as ladybug should be preserved and utilized for controlling the aphids.  Ladybug as natural enemy
Spider Mite Cause: Arachnid ■ Spider Mites exist everywhere, so it is impossible to control the damage perfectly. ■ Firstly, small spots with pale leaf color appear on the leaves. Then, it expands to all leaf and it becomes brown color and dies. ■ The damaged leaves enlarge from lower leaves to upper. ■ Adult spider mites are very small and are yellow to dark crimson, with dark spots.  	■ Apply insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER® at least 2 times within 5 to 7 days.
Cucumber Beetles Cause: Insect ■ Cucumber beetles are a major concern to zucchini because they spread some disease such as bacterial wilt and cucumber mosaic virus. ■ Adult insect feeds on cucurbit leaves by a round or half-round shape. ■ Larvae of the beetles feed on cucurbit roots and stems which can stunt and kill young plants, but this damage is minimal compared to the potential losses due to bacterial wilt.    	■ Apply insecticides such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER® every 5 to 7 days.
Thrips (Western flower thrips, Onion thrips, etc.) Couse: Incect ■ Feeding of thrips injures developing and mature tissues of many plant parts including buds, leaves, flowers, and fruit, and then capable of spreading plant diseases such as tomato spotted wilt. ■ They start the feeding by rasping the leaf surface with their mouth parts to release the liquids from the plant cells and suck the plant juice. ■ The plant loses more water than normal through the damaged tissues and plant pathogens penetrate the injured plant cells easily. ■ If the population is high, leaves may be distorted. ■ Adult thrips are pale yellow to light brown and the nymphs are smaller and lighter in color.  	■ Apply insecticides such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Avoid cultivation next to Onion, Garlic, or Cereals where very large numbers of thrips can build up. ■ Use IPM.

Reference: Color Book for Diagnose Diseases and Pest of Vegetable Crops, 1991, Nobunkyo, Tokyo

Plant village: https://plantvillage.org/

University of Minnesota Extension: https://www.extension.umn.edu/

Watermelon
Vine Training

Manual Number: SMAP-H-Wa-03

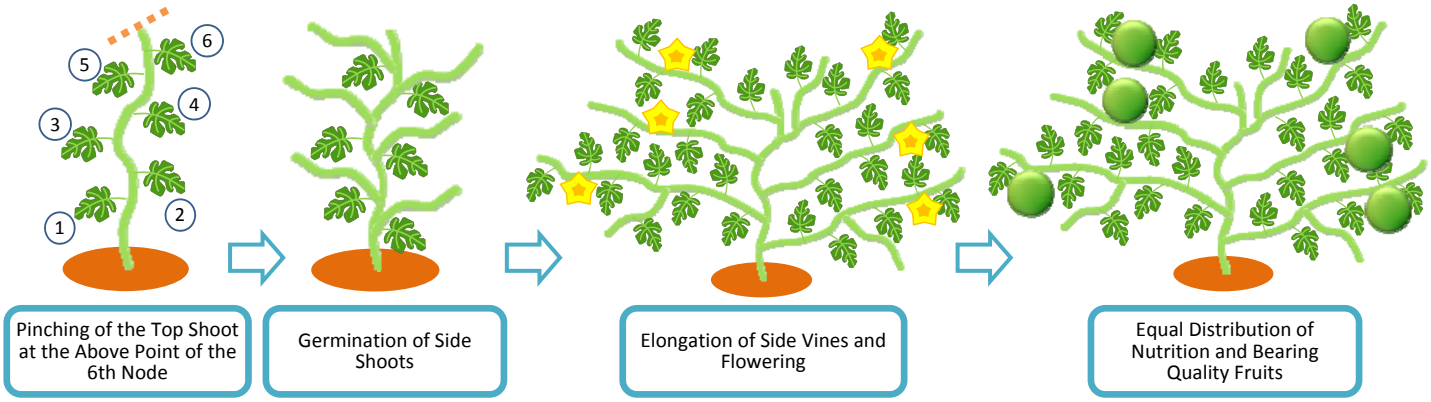
Vine Training

- Pinching of main stem: Pinch off the main shoot at the 6th node. Allow 6 major vines to develop.
- Remove all side shoots that appear before the first fruit to be maintained, to avoid overcrowding, and to control vegetative growth. Allow succeeding side shoots to grow. They will help nourish the developing fruits.

Water Melon before the Pinching

Removal of the Top Shoot by Hands at the Above Point of the 6th Node

Watermelon after the Pinching



Carrot

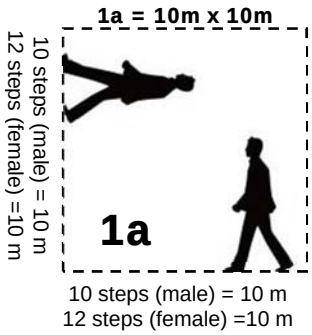
Sowing and Field Management

Manual Number: SMAP-H-Ca-01

Field Preparation

- Carrot can be cultivated the same place repeatedly at the maximum 4 years because it is hard to injure by continuous cropping.
- Before sowing, the field should be ploughed at a depth of about 15 cm to 20 cm. As a basal fertilizer, compost made from grass or manure is applied and mixed with soil well. It is recommended that half basket of compost (3kg) or quarter basket of manure (1.5kg) be applied per 1m^2 (1 step x 1 step). Debris or stones in the field should also be removed. Then the field is leveled.

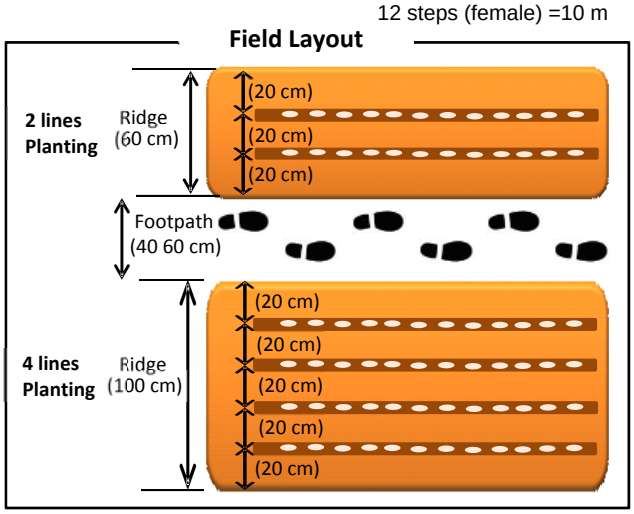
Ploughing the Field



10 steps (male) = 10 m
12 steps (female) =10 m

Field Layout

- It is recommended to sow seed by the following figure shown on the right side. Prepare the planting ridge with 20 cm to 30 cm height. To manage the field easily, carrot can be sown in 2 lines or 4 lines with 15 cm to 20 cm distance between lines. In this case, about 60 gm to 80 gm seeds are required for a 1a sized field.
- Field is measured using a measuring tape or any measuring equipment based on the field layout shown in the right figure. Another device used in measuring is a 500 ml water bottle. The height of one water bottle is equivalent to 20 cm, therefore, two bottles is equal to 40 cm and five bottles is 100 cm. This can be useful as an alternative measuring device.



Sowing

- The seed is sown in line. Because of the small size of the seed, it should be covered with soil about 5 mm depth. If the seed is sown deeply, the germination rate becomes low.
- After sowing, apply mulching materials to keep soil moisture and prevent any damage by heavy rain or watering. To avoid the low germination rate due to drying of seeds, frequent watering is required specifically in the germination stage.

Preparing field

Compost and Fertilizer Application

Leveling using a Wooden

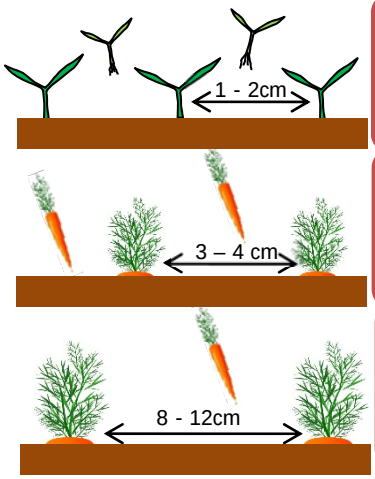
Making Sowing Ditches using a Wooden Stick

Row Sowing with Proper Space

Covering with Dried Grass

Thinning

- Thinning is necessary for carrot cultivation. Excessive amounts of seed are sowed and some of them are taken off in each growth stage to make more space.
- Carrot thinning must be performed at least three times. The first thinning is performed when the carrot seedling has 2 or 3 true leaves, and it makes spaces 1 cm to 2 cm distance between plants. The second thinning is carried out when the seedling has 3 or 4 leaves, it is approximately 4 weeks after sowing, and it makes spaces 3 cm to 4 cm between plants. The third thinning is performed when the seedling has 5 or 6 leaves, it is about 6 weeks after sowing, and it makes space 8 cm to 12cm between plants.



First thinning:
After 2 weeks from sowing. The distance between plants is 1 - 2 cm.

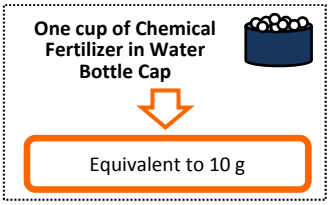
Second thinning:
After 4 weeks from sowing. The distance between plants is 3 - 4 cm.

Third thinning:
After 6 weeks from sowing. Distance of each plant is 8 - 12 cm.

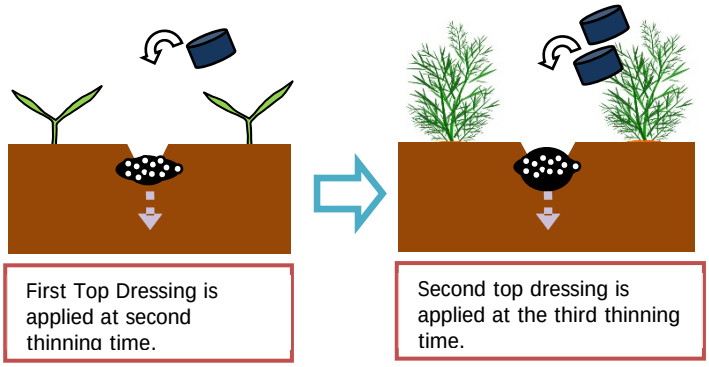
Timing of Thinning

Top Dressing

- In order to achieve high yield, top dressing of chemical fertilizer such as NPK 17-17-17 must be applied at least two times. Ditches with 5 cm depth between planting rows are made for applying chemical fertilizer.



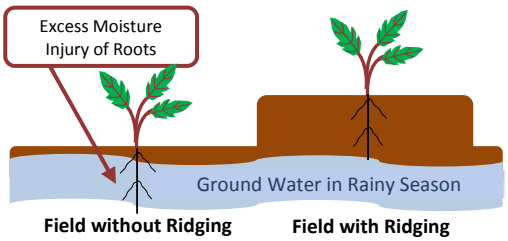
- First top dressing: One pinches of chemical fertilizer (10 g) is applied in the ditch in 30 cm between the planting lines and then, covered with soil after fourth (4) weeks from sowing. A 10 g chemical fertilizer is equivalent to one water bottle cap.
- Second top dressing: Two pinches of chemical fertilizer (20 g) is applied in the ditch in 30 cm between the planting lines and then covered with soil after six (6) weeks from sowing. A 20 g chemical fertilizer is equivalent to two water bottle caps.



Timing of Top Dressing

Advantages of Ridging

- Excess moisture in the soil causes damage to the roots and emergence of fungal disease in the rainy season. High ridging to avoid excess moisture around the roots is effective to prevent excess moisture injury of the roots and incidence of fungal disease during the rainy season.



Watering

- Regular watering is required especially during the germination period and the dry season. As the seed and seedling of carrot are small, frequent watering is necessary. However, watering should be reduced gradually as the crop grows.
- Watering should be done early morning or evening time. During hot temperature season, applied water becomes high temperature and damages the seed or plants. It is better to avoid applying water during the daytime.
- It is recommended for watering the bottom part of the plants gently to avoid the damage from the water pressure and contagion of soil-borne diseases.

Watering Method

Weeding

- The frequency of weeding depends on the weed infestation. Keeping the field weed free as much as possible by frequent weeding is recommended to avoid competition of nutrients, sunlight, and water.

Harvesting

- Appropriate harvesting time is after 3.5 to 4 month from the sowing.

Carrot
Disease and Pest Control

Manual Number: SMAP-H-Ca-02

Major Disease and Pest in Rwanda

Name & Characteristic	Control Method
Bacterial leaf blight Cause: Fungus ■ Firstly, appear along leaflet margins as greenish-brown, water-soaked lesions which enlarge, turn brown to black, and often develop a yellow halo. ■ Older leaves are more susceptible to infection. When about 40% of the leaf is infected, the leaf yellows, collapses, and dies. ■ This disease occurs especially under around 28℃ and high humidity condition in the rainy season. 	■ Apply fungicide, copper oxychloride, for prevention purpose. ■ Apply fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs particularly in the rainy season. ■ Not use the self-multiplied seed. ■ Apply fungicide every 10 days from the beginning of infection. ■ Balanced fertilization.
Cercospora leaf blight Cause: Fungus ■ Firstly, small and round spots develop with brown-purplish brown color on leaves and petioles. ■ Areas around the spots become yellowed and leaflets curl. ■ Infected leaves and petioles turn dark brown and finally die. ■ Symptom resembles with Bacterial leaf blight. ■ This disease occurs especially under around 28℃ and high humidity condition in the rainy season.   	■ Apply fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs particularly in the rainy season. ■ Apply fungicide every 10 days from the beginning of infection. ■ Apply fungicide not only upside of the leaf but also back side of it. ■ Not use the self-multiplied seed. ■ Balanced fertilization
Powdery mildew Cause: Fungus ■ Powdery growth on leaves, petioles flowers stalks, and bracts. ■ Firstly, Fungus appears as a spot of white powder on old leaves and then spreads to cover all leaf surfaces. ■ Infected foliage becomes brittle and distorted, and the petioles turn brown and die. ■ This disease occurs especially under around 20℃ and high humidity condition in the rainy season. 	■ Apply fungicide such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb at the beginning of symptom appearance. ■ Apply fungicide every 7 to 10 days from the beginning of infection. ■ Apply fungicide not only upside of the leaf but also back side of it. ■ Conduct thinning at the appropriate time. ■ Incinerate the infected plant. ■ Manage weeding properly.
Carrot Scab Cause: Fungus ■ Firstly, small spots in 1 – 2mm with yellow-brown color appear on petiole and small leaves. Then it enlarges to the young leaves and it makes yellow-green color and carling. ■ It appears and expands quickly under around 20℃ and high humidity condition in the rainy season. Especially, frequent rain causes widely expanding of the disease. 	■ Apply fungicide such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the symptom appearance. ■ Not use the self-multiplied seed. ■ Balanced fertilization ■ Incinerate the infected plant.
Carrot Red Leaf Virus Cause: Virus ■ In the early of growth stage, the infected leaves become dwarfing. ■ Infected old leaves become yellow color. ■ Aphid is a vector of the disease and it increases the number of high temperatures and lower humidity condition. Therefore, this disease also expands the same condition.  	■ Application of fungicide is not effective because this is not a fungus disease but a virus disease. ■ Aphid is one of the vectors of the disease, so controlling of the vector is important. ■ Remove the infected plant as soon as it is found, and bury it in the ground.

Name & Characteristic	Control Method
Aphid (Willow - Carrot Aphid, Green Peach Aphid) Cause: Insect ■ 1-2 mm long aphids feed gregariously on plants. Body color varies from dark green to yellow-green. The aphids parasitize young leaves of stems and flowers as well as lower leaves. ■ This insect is a vector of a kind of mosaic virus and other viruses. ■ However, the aphids may become resistant to insecticides due to the large reproduction potential and short germination cycle. Continuous application of the same insecticides must be avoided.  	■ Apply insecticides such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Many kinds of natural enemies of the aphids such as ladybug should be preserved and utilized for controlling the aphids.  Ladybug as natural enemy
Carrot Rust Fly Cause: Insect ■ Surface scarring of taproot caused by tunnels; tunnels are filled with a rust colored mush. ■ Adult insect is a small, dark-colored fly. Larvae are white maggots approximately 1 cm long. ■ Carrot rust fly also attacks parsnip, celery and other Umbelliferous crops which will also need to be protected if carrot rust fly is a problem.  	■ Apply insecticides such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®.
Carrot Weevil Cause: Insect ■ Irregular dark grooves in zig-zag pattern on roots, leaves of plant may yellow. ■ Adult insect is a dark-colored beetle. Larvae are white to pinkish white C-shaped grubs with a yellow-brown head.  	■ Apply insecticides such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®.
Nematode (Southern root-knot Nematode, Stubby-Root Nematode, Noodle Nematode) Couse: Nematodes ■ In severely infected plants, carrot tops may be stunted, yellow, and wilt during the day. ■ Tap root is stunted, deformed, or forked. ■ Many fibrous roots may be present. ■ Many small rounds to irregular lumps and swellings can be found on both the tap root and fibrous roots. 	■ Crop rotation. ■ Mix planting or crop rotation with Marigold. ■ Cultivate Marigold more than three months can reduce Nematodes.  African marigold

Reference: Color Book for Diagnose Diseases and Pest of Vegetable Crops, 1991, Nobunkyo, Tokyo

UMass Amherst: http://www.umass.edu/

University of Minnesota Extension: https://www.extension.umn.edu/

Plant Village: https://plantvillage.org/

Beetroot

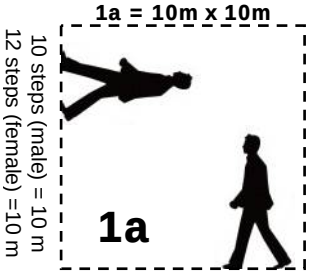
Transplanting and Field Management

Manual Number: SMAP-H-Be-01

Field Preparation

- The site of field which beetroot has not been planted for the last 4 seasons should be selected to avoid injury by continues cropping.
- As beetroot prefer higher p.H. (5.8 – 7.0) soil condition, it is recommended to apply 10 kg of lime for 1a size field (10 m x 10 m) before two (2) weeks from transplanting.
- At about one week before transplanting, the field should be ploughed at a depth of about 15-20 cm and debris and clods are eliminated. And then the field is leveled.
- If enough compost is available, it is recommended that compost is broadcasted in the field (10-20 baskets per 1a sized field, depending on soil fertility) and then mixed into soil preferably using hoe.

Ploughing the Field



10 steps (male) = 10 m
12 steps (female) =10 m

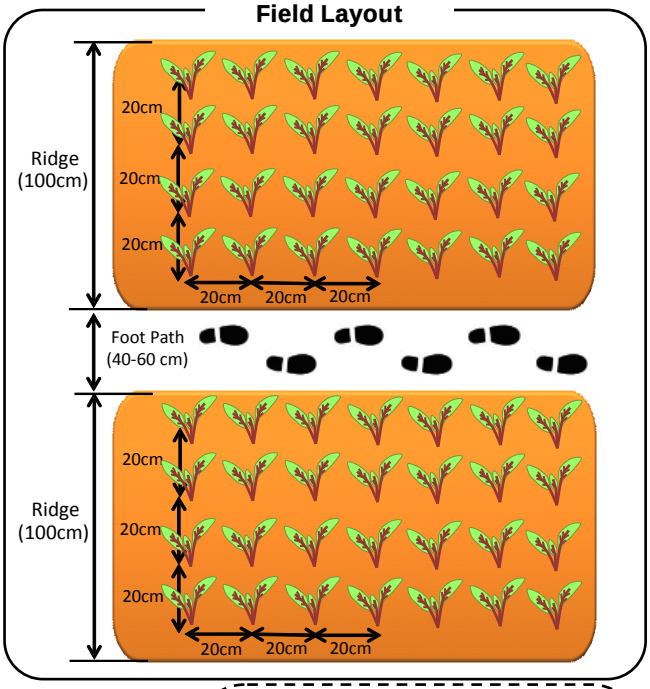
Appropriate Seedling Size for Transportation

Timing of Transplanting

- Seedling for transplanting should be 3-4 weeks old which has 4-5 leaves (see right side photo).

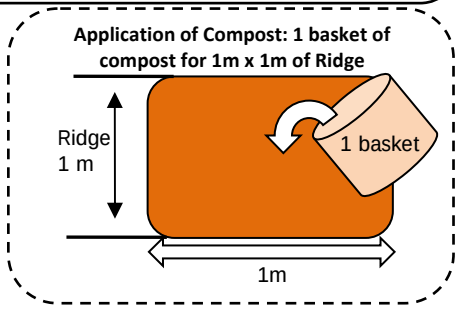
Field Layout

- It is recommended to plant seedlings as shown in the right figure. In this case, about 1,000 – 1,200 seedlings are transplanted in 1a sized field (10 m x 10 m).



Transplanting

- It is recommended that transplanting should be done in early morning or late afternoon to avoid strong sun shine.
- Field is measured by measuring tape or any measuring equipment based on the layout. Ridges with 15 cm to 20 cm height and 100cm width are made. For measuring, a 500 ml water bottle is an appropriate tool. The length of the water bottle is equivalent to 20 cm, and two bottles are 40 cm.
- Compost made from grass or well-decomposed manure is applied for the planting ridge. The one basket of compost or half basket of manure is applied for 1m x 1m ridge.
- Before taking seedlings from nursery, water is applied to the nursery bed in advance to take seedling easily.
- Small sticks are put on the planting places as shown the right side figure to make clear the planting point after applying mulching materials.



- Dried grasses are applied on the ridge for mulching material before transplanting.
- Healthy seedlings which have 5 to 6 large leaves without any diseases should be selected. Selected seedlings are carefully taken from nursery to avoid any damages on the roots. Don't remove soil from seedling when uprooting and transplanting. Poor seedling should be avoided. Poor seedling can be transplanted in home garden for self consumption.
- After transplanting, water is applied immediately.

Mulching Application

Transplanting

Watering

Beetroot
Disease and Pest Control

Manual Number: SMAP-H-Be-02

Major Disease and Pest in Rwanda

Name & Characteristic	Control Method
Bacterial leaf blight Cause: Bacteria   ■ The symptom appears on leaves with circular brown to gray spots with distinct reddish-purple. ■ As the spots enlarge, the center turns gray, cracks, and eventually falls out, although the purple halo remains around the lesion. ■ Lower leaves are infected first and often most severely affected. ■ In humid weather, produce silver or steel-gray spores which give the leaf spot a fuzzy appearance. ■ Plants may be stunted.	■ Apply fungicide, copper oxychloride, for prevention purpose. ■ Apply fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs particularly in the rainy season. ■ Not use the self-multiplied seed. ■ Balanced fertilization. ■ Proper weeding. ■ Use crop rotation.
Root Rot Cause: Fungus   ■ Leaves may appear first red colored, then yellow and wilted. ■ Beet root may be soft and rotten. ■ Beet roots may develop dark sunken lesions on surface of root. ■ Fluffy, white to grayish brown fungal growth may be present on rotted areas of the root.	■ Deep plowing. ■ Use Crop rotation. ■ Cultivate at free of disease field. ■ Balanced fertilization. ■ Proper weeding.
Spinach Leaf miner Cause: Insect    ■ As the larvae feed and develop, they create winding trails (mines) of dead tissue where they have fed. ■ These mines eventually expand into irregular blotches. ■ Leaf miner activity has little impact on plant growth but can be quite destructive to vegetables grown for edible greens.	■ Apply insecticides such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®as soon as you find the insect. ■ Remove and destroy infected leaves when mines are small. ■ Balanced fertilization ■ Proper weeding.
Flea Beetles Cause: Insect   ■ Adult flea beetles cause the most damage by feeding on foliage, cotyledons, and stems. ■ As flea beetles feed, they create shallow pits and small rounded, irregular, holes in the leaves, resulting in a shot hole appearance. ■ A heavy flea beetle attack can result in wilted or stunted plants. ■ Transplants can generally withstand more damage than plants started from seed, although both can be severely injured if flea beetle numbers are high.	■ Apply insecticides such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®as soon as you find the insect. ■ Frequent monitoring the crop. ■ Proper weeding around the crop.

Reference: Color Book for Diagnose Diseases and Pest of Vegetable Crops, 1991, Nobunkyo, Tokyo

University of Minnesota Extension: https://www.extension.umn.edu/

French Bean

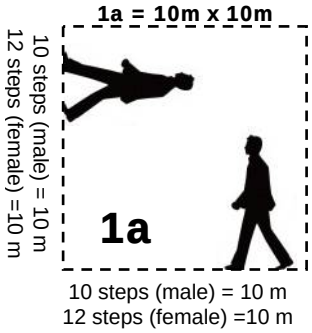
Sowing and Field Management

Manual Number: SMAP-H-Fr-01

Field Preparation

- In selecting the proper site for planting, farmers have to choose a field that has not been planted with beans such as French bean, Soya bean, and Peas for the last four (4) seasons in order to avoid the injury by continuous cropping.
- Before sowing, the field should be plowed at a depth of about 15 cm to 20 cm. As a basal fertilizer, compost made from grass or well-decomposed manure is applied and mixed with soil well. It is recommended that one small basket of compost (5kg) or half small basket of manure (2.5kg) be applied per $1m^2$ (1 step x 1 step). Debris or stones in the field should also be removed. Then the field is leveled.

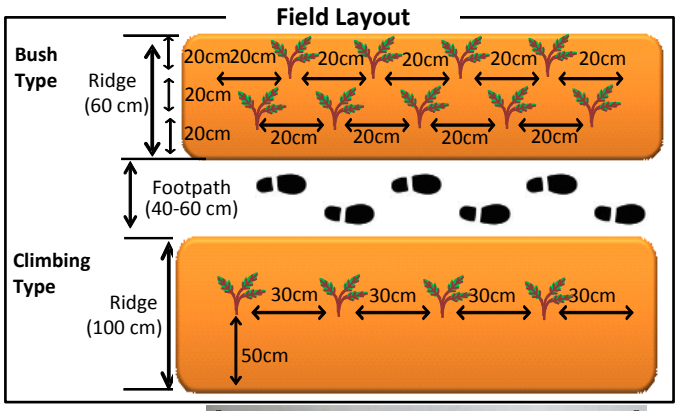
Ploughing the Field

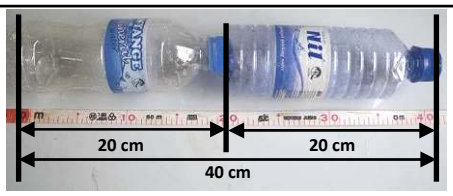


10 steps (male) = 10 m
12 steps (female) =10 m

Field Layout

- It is recommended to sow seed by the following figure shown on the right side. French beans are classified by growth habit into two major groups, “Bush type” and “Climbing type”. Prepare the planting ridge with 15 cm to 20 cm height. “Bush type” is sown 20 cm distance between lines and plants, and it needs 2,000 to 2,400 of seed for a 1a sized field. Meanwhile, “Climbing type” is cultivated on a 1m length of the ridge with 30 cm distance between plants, and it needs 1,200 to 1,300 of seed for a 1a sized field.
- The field is measured using a measuring tape or any measuring materials based on the field layout shown in the right side figure. Another device used in measuring is a 500 ml of water bottle. The height of one water bottle is equivalent to 20 cm, therefore, two bottles are equal to 40 cm, and five bottles is 100 cm. This way can be useful as an alternative measuring device.





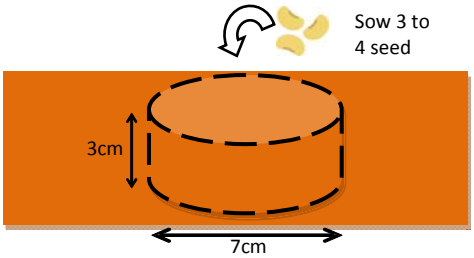
Sowing

- French bean is sown by hill sowing on the planting ridge. Planting ridge with 60 cm width for “Bush type” and 100 cm width for “Climbing type” with 15 cm to 20 cm height are made.
- Holes with 15 cm to 20 cm depth are made at each planting point based on the planting layout. Recommended space between plants is 20 cm for “Bush type” and 30 cm for “Climbing type”.

Planting Ridge

Manure Application

- Compost made from grass or well-decomposed manure is applied to planting holes (see right side photo). One (1) handful of manure per planting hole is applied as a basal fertilizer. Well decomposed manure should be applied rather than fresh manure to prevent damaging the plant's roots. Soil and applied manure are mixed well.
- Planting holes with 7 cm of diameter and 3 cm of depth are made. 3 to 4 seeds are sown in the hole (see right side fig.).
- Dried grasses are applied on the ridges which serve as mulching material.
- After sowing, water is applied immediately.



Planting Hole

Thinning

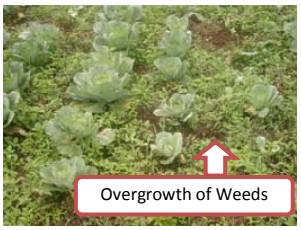
- After two weeks form the sowing, when the plant has first true leaves, thinning is conducted. Remove the seedlings up to two seedlings for "Bush type" variety, and one seedling for "Climbing type" variety in one planting place.

Mulching Application

Watering

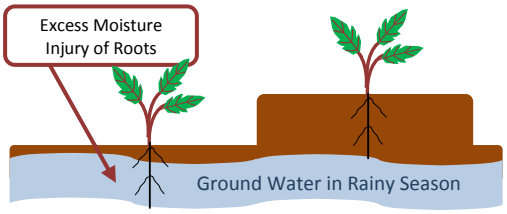
Advantages of Mulching and Ridging

Field with Mulching



Field without Mulching

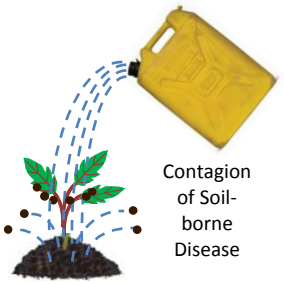
- For vegetable cultivation, the importance of mulching is well known, and it is widely practiced using locally available dried grasses.
- Thick mulching is effective for keeping the moisture of the soil longer, preventing grass from growing and the contagion of soil-borne diseases.
- Excess moisture in the soil causes damage to the roots and emergence of fungal disease in the rainy season.
- High ridging to avoid excess moisture around the roots is effective to prevent excess moisture injury to the roots and incidence of fungal disease during the rainy season.



Field without Ridging Field with Ridging

Watering

- Regular watering is required especially in dry season. However, watering should be reduced gradually as the crop grows.
- It is recommended to water the bottom part of the plants gently to avoid the contagion of soil-borne diseases.

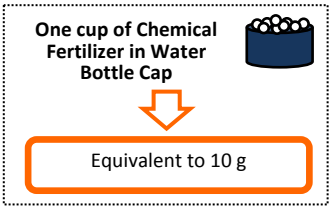


Weeding

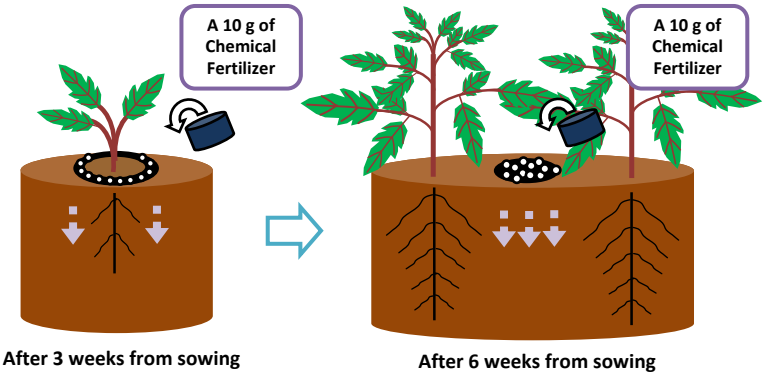
- The frequency of weeding depends on weed infestation; generally keeping the field weed free as much as possible to avoid competition of nutrients, sunlight, and water.

Top Dressing

- To get better yields, proper fertilization is necessary. Top dressing of chemical fertilizer such as NPK 17-17-17 should be applied in two (2) splits to avoid nutrients loss. Application at the top of the roots is effective.



- First top dressing: One pinch of chemical fertilizer (10g) is applied around plants and then, covered with soil after three (3) weeks from sowing and thinning. 10g of chemical fertilizer is equivalent to the amount of one water bottle cap. The first top dressing increases the number of stems, leaves, flowers, and pods, so it affects the yield, strongly. It is better not to delay the timing of application.



- Second top dressing: One pinch of chemical fertilizer (10g) are applied in between plants, and then mixed and covered with soil. It is after six (6) weeks from sowing and beginning of harvesting period. 10g of chemical fertilizer is equivalent to the amount of one water bottle caps.

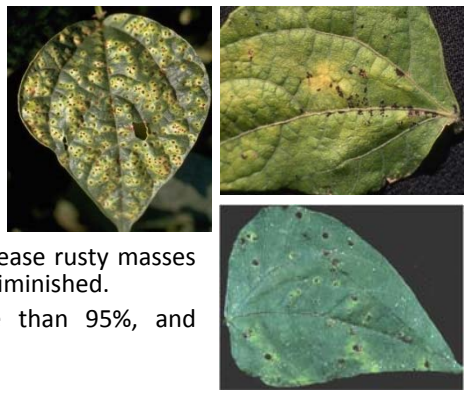
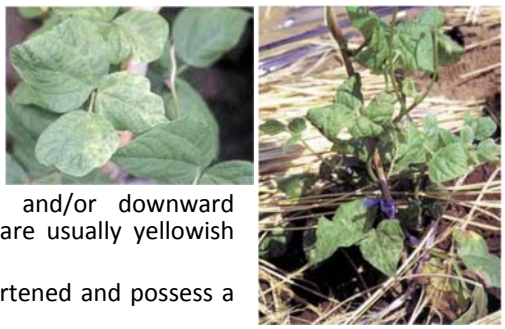
Harvesting

- Harvesting can be started approximately six (6) weeks later from sowing for “Bush type” and seven (7) to eight (8) weeks for “Climbing type.” It can be harvested about three (3) to four (4) weeks.
- The pod after 10 to 15 days from flowering is the appropriate harvesting period. Late harvesting makes the pod harder, and it is not suitable for vegetable use.
- The pod should be harvested using scissors to prevent any damage to the plant body.

French Bean
Disease and Pest Control

Manual Number: SMAP-H-Fr-02

Major Disease and Pest in Rwanda

Name & Characteristic	Control Method
Rust Cause: Fungus ■ Rust affects leaves and stems, petioles and pods. ■ Firstly, symptoms appear on the undersurface of leaves as tiny, white, raised spots. These spots gradually enlarge and form reddish-brown pustules, which eventually erupt to release rusty masses of spores. Plant vigor may be severely diminished. ■ Rust occurs of high humidity, more than 95%, and moderate temperature, 17 to 27℃. 	■ Use crop rotation. ■ Removal of infected parts as soon as it is found and incinerates it. ■ Apply fungicide, copper oxychloride, for prevention purpose. ■ Apply fungicides such as Beam® or product which include Carbendazim as soon as the disease occurs, particularly in the rainy season.
Halo Blight Cause: Bacteria ■ Firstly, small, mahogany color, water-soaked spots appear on the lower leaf surface. As these spots increase in size a characteristic halo of yellow tissue develops around each water-soaked spot.  ■ As enlarging the area of disease, all leaf surface change brown color and the plant die. ■ Both leaf and pod lesions often coalesce. The upper foliage of diseased plants develops a characteristic yellow color infected seed may be smaller than normal, have a wrinkled seed coat and be discolored. ■ Halo disease development is favored by humid, cloudy conditions. Halo expression is favored by cool temperatures of 16 to 20℃.	■ Apply fungicide, copper oxychloride, for prevention purpose. ■ Apply fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs particularly in the rainy season. ■ Not use the self-multiplied seed. ■ Remove the infected plant as soon as it is found and incinerate it. ■ Use Crop rotation.
Anthracnose Cause: Fungus ■ Symptoms on above-ground parts of the plant appear as black-red to dark brown lesions. ■ On stem, leaf petioles and veins on the undersurface of leaves, lesions are usually sunken and elongate. On pods, lesions are sunken and circular.  ■ Infected seeds are usually discolored and may have sunken lesions. During periods of moist weather, gelatinous masses of pinkish spores may develop in infected areas. Severely diseased plants are greatly reduced in vigor and yield. ■ This disease is favored by cool temperatures around 16℃ and wet condition.	■ Use Crop Rotation. ■ Not use the self-multiplied seed. ■ Remove the infected plant as soon as it is found, and bury it in the ground. ■ Apply fungicides such as Beam® or product which include Carbendazim as soon as the disease occurs, particularly in the rainy season.
Mosaic Couse: Virus ■ Mottled dark and light green patterns on leaves. Growth of plant may be reduced. ■ Leaves may have considerable puckering, stunting, malformation and/or downward curling. Early infected bean plants are usually yellowish and dwarfed. ■ Infected pods may be chlorotic, shortened and possess a glossy sheen.  ■ Mosiac symptoms are best expressed at moderate temperaturs of 20 to 25℃.	■ Application of fungicide is not effective because this is not a fungus disease but a virus disease. ■ Aphid is one of the vectors of the disease, so controlling of the vector is important. ■ Remove the infected plant as soon as it is found, and bury it in the ground.

Name & Characteristic	Control Method
White Mold Cause: Fungus ■ The initial symptom of infection is a water-soaked area of indefinite size and shape on any aerial plant part. ■ After flowering 3 to 4 days, flowers cover with white cottony fungal growth and it enlarges to pods, stems, petioles and leaves, and makes water-soaked lesions. Cottony white growth may be visible on lesions during periods of high humidity. ■ Blossom-end rot is caused by a calcium deficiency and is induced by deficiency of water in the soil. ■ Fungus can survive in soil for in excess of 5 years and the disease can be spread by wind, contaminated irrigation water and by infected seeds. ■ Severe outbreaks of white mold are favored by temperatures averaging 21℃ or less in combination with high moisture or humidity.  	■ Apply fungicides such as DITHANE®, SAFARI-ZEB® and RIDOMIL® including mancozeb as soon as the disease occurs particularly in the rainy season. ■ Not use the self-multiplied seed. ■ Use Crop Rotation. ■ Cultivate in the appropriate distance. ■ Remove the infected plant as soon as it is found and incinerate it.
Aphid (Pea Aphid, Cowpea Aphid, etc.) Cause: Insect ■ 1-2 mm long aphids feeds gregariously on plants. Body color varies from dark green to yellow green. The aphids parasitize young leaves of stems and flowers as well as lower leaves. ■ This insect is a vector of a kind of mosaic virus and other viruses. ■ However, the aphids may become resistant to insecticides due to the large reproduction potential and short germination cycle. Continuous application of the same insecticides must be avoided. 	■ Apply insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ Many kinds of natural enemies of the aphids such as ladybug should be preserved and utilized for controlling the aphids.  Ladybug as natural enemy
Leaf miners Cause: Insect ■ Firstly, white spots on leaves appear and it becomes white winding trails. Heavy mining can result in white blotches on leaves and leaves dropping from the plant prematurely. Early infestation can cause fruit yield to be reduced. ■ Adult leaf miner is a small black and yellow fly which lays its eggs in the leaf and larvae hatch and feed on leaf interior.   	■ Apply insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER®. ■ In order to avoid the insecticide resistance, do not apply same insecticides, continually.
Spider Mite Cause: Arachnid ■ Spider Mites exist everywhere, so it is impossible to control the damage perfectly. ■ Firstly, small spots with pale leaf color appear on the leaves. Then, it expands to all leaf and it becomes brown color and dies. ■ The damaged leaves enlarge from lower leaves to upper.    	■ Apply insecticide such as ROKET®, IMAXi 200SC®, CYPRO®, CYPERSCOPE® and DUDU-CYPER® at least 2 times within 5 to 7 days.

Reference: Color Book for Diagnose Diseases and Pest of Vegetable Crops, 1991, Nobunkyo, Tokyo
Hand Book of Beas Diseases, 1986, University of Wisconsin-Extension, Madison
UMass Amherst: http://www.umass.edu/
University of Minnesota Extension: https://www.extension.umn.edu/
Plant Village: https://plantvillage.org/

SMAP **Rice Cultivation** Technical Manual

for Improvement of Quality and Productivity

September 2019

Smallholder Market-oriented Agriculture Project in Rwanda (SMAP)

CONTRIBUTORS

1. Dr. Innocent Ndikumana,
   Rice Sub-program Leader and Senior Research (Breeder)/RAB
2. Dr. Elie René Gasore,
   Rice Advisor and Senior Researcher (Agronomist) / RAB
3. Mr. Edouard Cyubahiro, Crop Production Technician / Rice Sub-program – RAB
4. Mr, Jean Baptiste Maniraguha, Crop Production Technician / Rice Sub-program - RAB
5. Mr. Azarias Twagirayezu, Reasearcher Technician / Rice Sub-program – RAB
6. Mrs. Jeanne Priscille Ingabire, Crop Protection Specialist – RAB
7. Mr. Emmanuel Musabyimana, IWUAs Specialist / LIM-RAB
8. Mr. Théogène Uwitonze, Senior Rural Engineer, LIM-RAB

1. Mr. Zetsugaku Kurita,
   Rice Cultivation, Training Post-Harvesting/ Marketing Expert
   JICA-SMAP Project

2. Mr. Harunobu Yoshino,
   Rice Cultivation, Post-Harvesting/ Marketing specialist
   JICA-SMAP Project

3. Mr. Koura Takuma, Water Management Expert, JICA-SMAP Project

4. Mr. Isaie Gashongore, Senior Agronomist of Rice Cultivation,
   JICA-SMAP Project

Preface

I am very glad to present these technical guidelines entitled "Market-oriented Agriculture Extension Package" (MAEP) to all farmers and extension officers in our country. This is an output of the "Smallholder Market-oriented Agriculture Project in Rwanda" (SMAP), a project implemented by the Rwanda Agriculture and Animal Resources Development Board (RAB) under the technical and financial cooperation of the Japan International Cooperation Agency (JICA). SMAP has been implemented for 5 years, since October 2014, aiming at increase in smallholders' agricultural income as well as enhancing capacity in extension services on rice and vegetables.

MAEP is an important and comprehensive material for market-oriented agriculture. It addresses not only cultivation techniques, but also organization management, gender mainstreaming, and marketing. It is recommended for adaptation to farmers in consideration of the following three major reasons

Firstly, MAEP provides a series of practical cultivation techniques on rice and vegetables. They are useful and easy to apply, so that beneficiary farmers, on their own, can repeatedly put them into practice on their fields. Secondly, MAEP offers a unique marketing strategy for vegetable farmers to make their business profitable. It recommends farmers to conduct market surveys by themselves before selecting vegetables to cultivate, in order to understand market trends and demands. Based on such market information, farmers decide vegetables to maximize profit. Thirdly, MAEP enhances gender mainstreaming in agriculture by putting highest priority on it. The relationship of a husband and a wife in market-oriented agriculture should not be "an employer and an employee" but "business partners", if they want to have a successful result.

In conclusion, I would like to sincerely express my congratulations to RAB staffs and the SMAP Team for achieving the objective of the project which is in line with the Strategic Plan of Agricultural Transformation (PSTA 4) in areas of food security, nutritional health, and sustainable agricultural growth from a productive, green and market-led agriculture sector.

I also extend my cordial thanks to JICA for its cooperation with MINAGRI, RAB and all other stakeholders. The responsibility to disseminate MAEP is now on our shoulder, as SMAP is phasing out. All stakeholders should coordinate and collaborate to practice and deliver the knowledge and techniques, which MAEP offers, to our farmers throughout the country. I hope that as many stakeholders and farmers as possible have opportunities to touch and apply this precious MAEP.

Dr. Patric KARANGWA
Director General
Rwanda Agriculture and Animal
Resources Development Board (RAB)
September 2019

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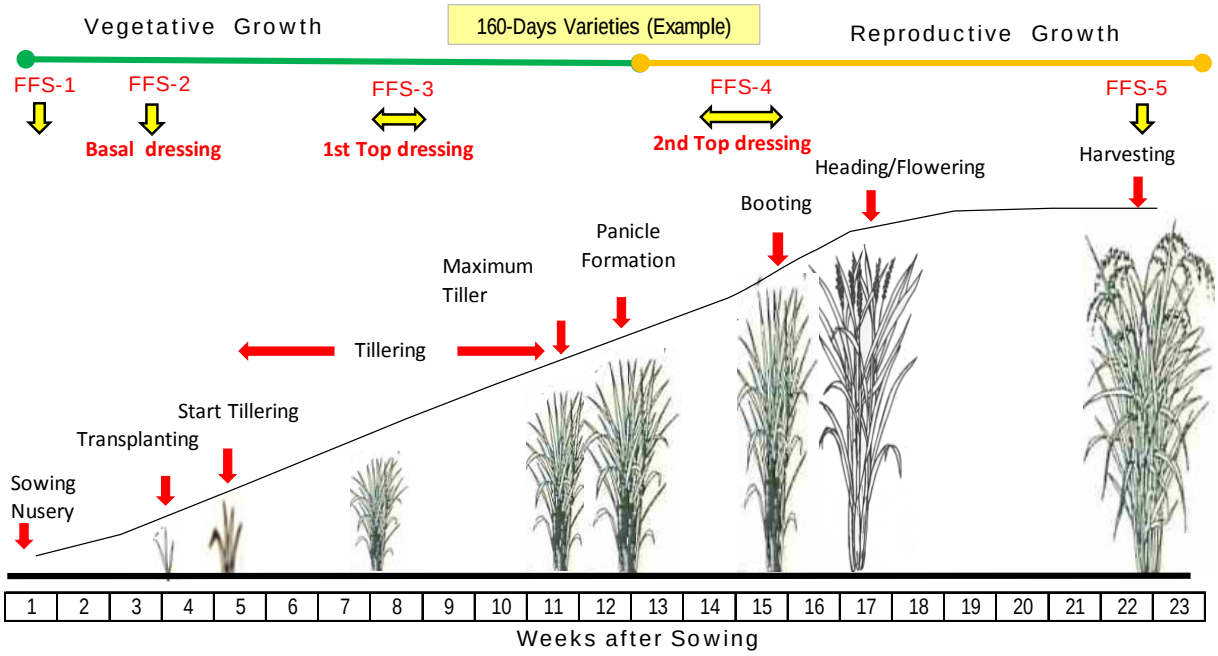
FFS-1: Field Training on Nursery Sowing Practice and Soil Improvement

I. FFS-1: Field Training on Nursery Sowing Practice and Soil Improvement

I.0 Point of Lecture and Practice in FFS1

- Life cycle of rice plant, FFS schedule and crop calendar
- Irrigation management
- Seed source, sorting by water, disinfection and pre-germination
- Seed bed preparation
- Seed rate and sowing density
- Management of nursery bed after seeding
- Land preparation and land leveling

I.1 Life Cycle of Rice Plant, FFS Schedule and Crop Calendar



<Crop Calendar>

Seson	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
A season												
B season												

Nursery Main plot

I.2 Irrigation Management

1) Cooperation between WUA (Water Users Association) and rice cooperative

- Major missions of WOA are operation, maintenance and management of water resources and hydraulic infrastructure in irrigation schemes
- For fullfllment of the missions, communication between Coop and WUA is very important

Rice Coop
To make and implement a seasonal work plan of rice cropping

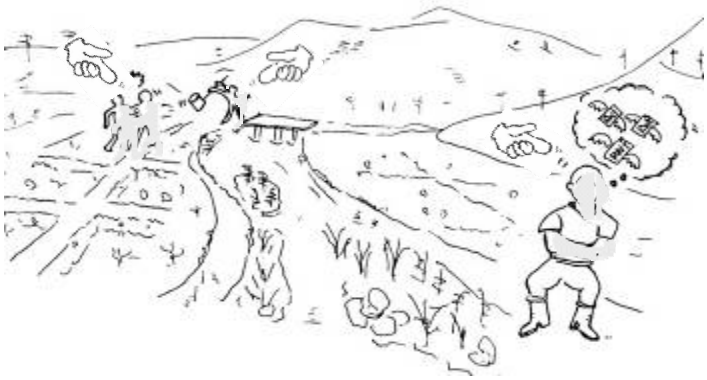
⇒
⇐
Mutual communication

WUA
- To make a seasonal plan of water management
- To manage irrigation water
- To operate and maintain irrigation infrastructure

- Coop and WUA share necessary information frequently to understand what is need each other. Rice production can't be implemented without water management. Water management can't be planned without coop's needs. Based on their needs, each action plan is made, and the both can consolidate the base of high production.

2) Advantage of irrigation water management

- Problem which happens in case farmers use irrigation water in wrong way
  - ✧ Water shortage
  - ✧ Conflict between water users due to unequal water distribution
  - ✧ Destruction of irrigation infrastructures due to less discipline
  - ✧ Poor yield



- Advantage of water use in right way
  - ✧ Farmers can receive irrigation water equally
  - ✧ Reduced conflict about the water use problems
  - ✧ Receiving irrigation water according to the rotation schedule (mitigation of water shortage)
  - ✧ Puddling on time
  - ✧ Production increase

Note: Refer to Annex about details of irrigation management

I.3 Seed Source, Sorting by Water, Disinfection and Pre-germination

- Use certified seeds from registered seeds-producers
- Procure the seeds through cooperatives
- Soak seeds in water and remove floating grains **(Photo-1 & -2)**
- Only sunken seeds should be disinfected with Beam, Benlate or all other recommended fungicides solution for 24 hours as below (**Photo-3**)
  - ✧ Water 1 litter + 5 gms of Beam (or Benlate) = 5 caps of Fanta bottle
- After disinfection, seed should be air-dried till the surface of the seeds dries (dry seeds before soaking: **Photo-4**)
- Soaking seeds for about 48 hours by replacing fresh water every day (**Photo-5**)
- Incubate the soaked seeds for about 24 hours under wet & warm condition so as to prepare well

pre-germinated seeds (**Photo-6 & -7**).

Photo-1

Photo-2

Photo-3

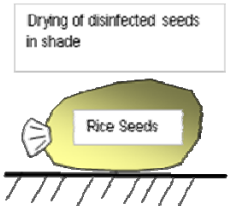


Photo-4

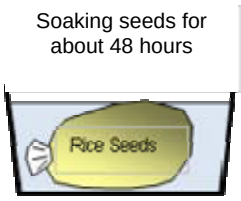


Photo-5

Photo-6

Photo-7

Note:

- ✧ Seed disinfection plays a role to control occurrence of seed-born disease such as bakanae disease, blast disease, brown spot, and grain rot.
- ✧ Recommendation to conduct seed germination test for coop. agronomists;
  Count 100 grains and put them in line on wet cloth and keep it for 4 - 5 days under wet & warm condition. Count numbers of germinated seeds, and relace the seeds to others or increase seeds amount if the germination rate is less than 80 % germination rate.

I.4 Seedbed Preparation for 500 m² main plot

- Seed bed size for 500 m^2 main plot = 15 m^2 = 3 beds with 1 m width and 5 m length **(Fig. 1)**
- Space between beds = 40-50 cm for management of seed beds (**Photo-8**)
- Leveling bed surface evenly by using stick or wood board (**photo-9**)
- Apply NPK fertilizer 2 caps of 500 ml pet bottle (**Photo-10**), equivarent to about 12 g per each 1 m^2 and mix it with soil by hand (**Photo-11**), and/or apply well decomposed manure before sowing

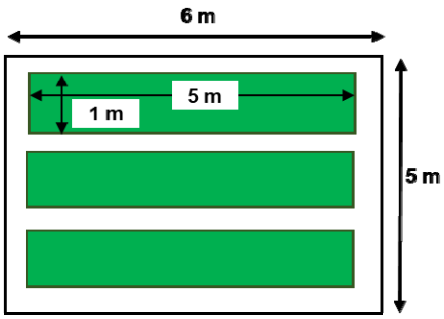


Fig.1 Nursery Bed

Photo-8

Photo-9

Photo-10

Photo-11

I.5 Seed Rate and Sowing Density

- Seed rate =20 - 30 kg/ha or 1.0 - 1.5 kg/500 m^2 plot
- Proper sowing density to rear healthy seedlings = 100 gm/m^2 or 1.5kg/15m^2
  Volume of a tea cup (ordinary size) is almost the same volume of 100 gm of paddy seeds (**Photo-12**)
- Sow seeds evenly on the seed bed (**Photo-13**).
- Press seeds gently on the bed by hand to be attached firmly to soil (**Photo-14)**

Photo-12


Photo-13


Photo-14

I.6 Management of Nursery Bed after Sowing on Bed

- Covering of nursery bed by banana leaves or dry grass to avoid dryness of bed surface and bird damage, and do not use rice straw to avoid seed contamination and disease infection (**Photo-15**)
- Remove mulching materials after 4-5 days of sowing when seedlings were emerged (**Photo-16)**.
- Keep water level same as nursery bed to control weed infestation (**Photo-16**).
- Transplanting schedule: 21 - 25 days after seeding


Photo-15

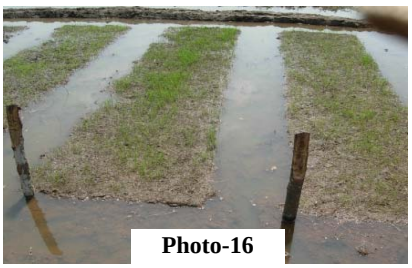


Photo-16

I.7 Land Preparation (1st & 2nd plowing) and Leveling

1) 1st plowing

- 1st plowing shall be done immedilately after harvesting of the previous season
- Before the 1st plowing, compost or rice straw is spreaded eavenly on the field
- Plow-in the spreaded compost or rice straw while the1st plowing **(Photo-17**)
- Plow the soil deeply (**Photo-18)**


Photo-17


Photo-18

2) 2nd plowing

2nd plowing shall be done for crushing soil lump into fine soil and for leveling off the land before puddling. An additional plowing is sometimes done according to the soil condition after the 2nd plowing

3) Land leveling & terracing

- A well leveled paddy field promotes the higher yield with the following positive impacts;
  - ✧ Uniform growth of paddy due to eaven distribution of fertilizers and water
  - ✧ Efficient water management (irrigation and drainage)
- If a paddy field is too large to level land properly, usually more than 10 a (1000 m^2), terracing after demarcation of the land is a good solution **(Fig.2)**

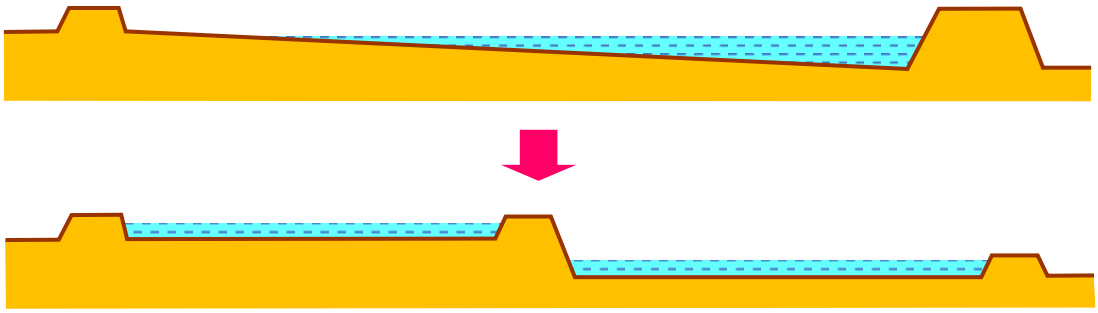


Fig 2. Terracing after Demarcation of Paddy Field

- Identify location of soil bands for land demarcation by using wooden sticks and rope **(Fig.3)**
- Width of soil band = 40 – 50 cm

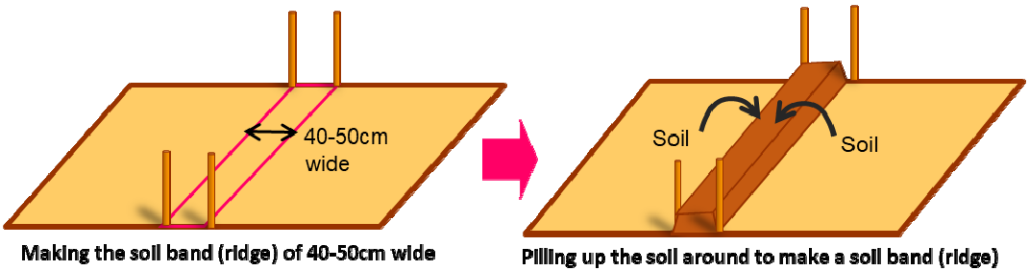


Fig 3. Making Soil Band (Ridge) for Land Demarcation

- Pull up soil around into a shape of soil bands by using hoes **(Photo-19)**

Photo-19

4) Mitigation of horizontal water percolation (leakage) from paddy field

- Objectives to mitigate horizontal percolation (leakage) from paddy field **(Photo-20, -21 & -22)**:
  - ✧ Reducing of water requirement
  - ✧ Mitigation of leaching out of soil nutrient elements

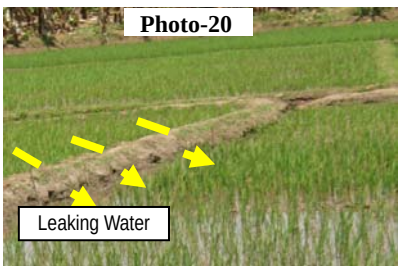


Photo-20

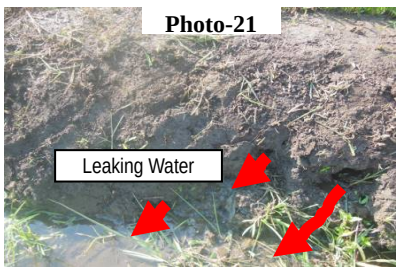


Photo-21

Photo-22

- Method
  - ✧ Coating (plastering) soil paste on the both sides of soil band to mitigate leaking water **(Fig.4)**
  - ✧ Plowing organic matter into paddy field to improve water holding capacity of soil, as well as to increase soil fertility

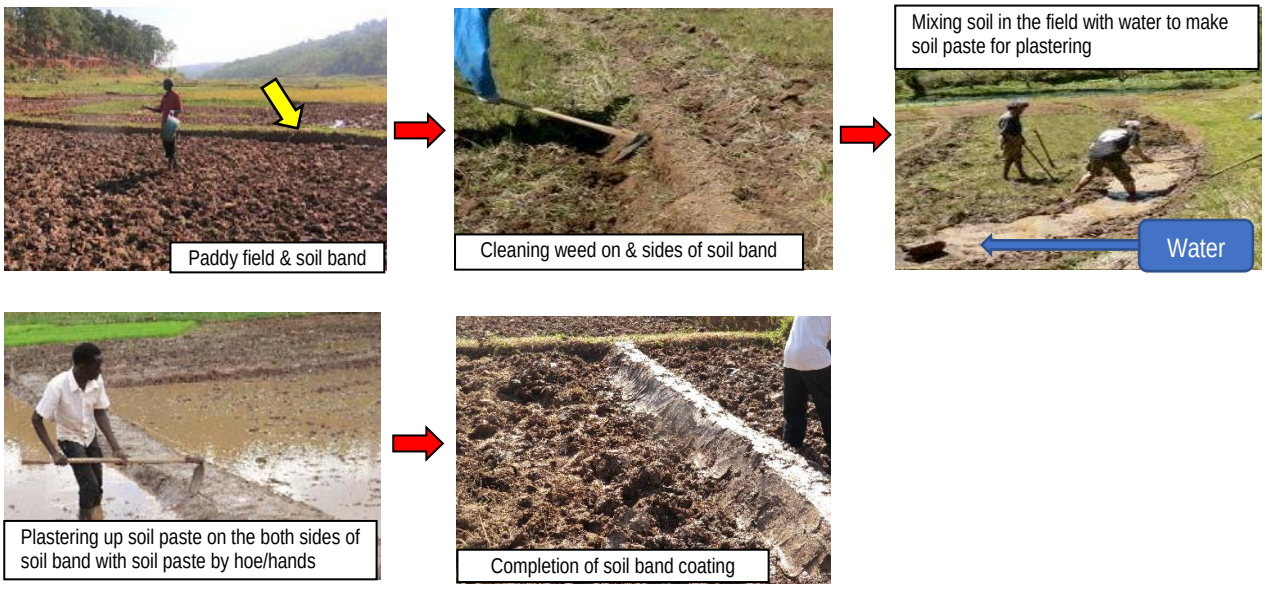


Fig.4 Process of Soil Band Coating with Soil Paste

FFS-2: Field Training on Transplanting Practice

II. FFS-2: Field Training on Transplanting Practice

II.0 Point of Lecture and Practice in the FFS2

- Proper seedling age of transplanting
- Proper transplanting density
- Proper numbers of seedlings per hill
- Proper transplanting depth
- Preparation of transplanting guide rope
- Application of basal dressing
- Puddling and leveling
- Transplanting (TP)
- Water management

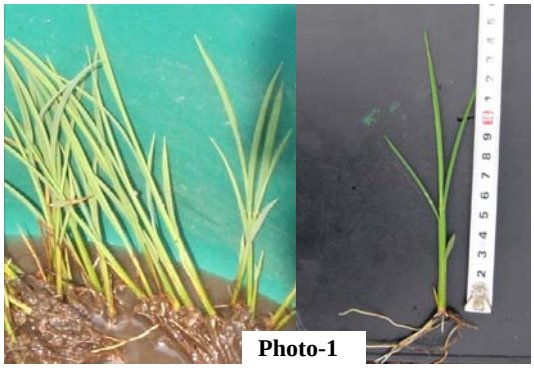


Photo-1

II.1 Proper Seedling Age of Transplanting

Use 20 days to 25 days seedling with 4-5 leaf age because of vigor rooting ability (**Photo-1**).

II.2 Proper Transplanting Density

There are two ways to decide transplanting density based on soil fertility and variety. Farmers shall decide their appropriate spacing based on the following conditions and in accordance with RAB's recommendation

- Wide spacing for fertile soil or high tillering varieties
- Dense spacing for low fertile soil or low tillering varieties

Note:

Standard spacing in Rwanda is 25 hills/m^2: 20 cm between rows and 20 cm between hills **(Photo-2)**. High dense planting may cause lodging and low % of full grains in some varieties

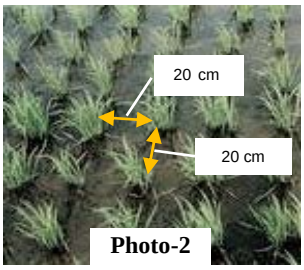


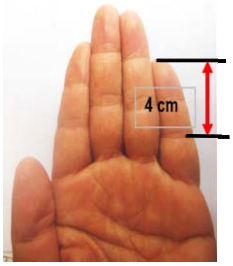
Photo-2

II.3 Numbers of Seedlings per Hill

2-3 seedlings per hill is appropriate

II.4 Proper Transplanting Depth

- Around 3 - 4 cm depth: deep planting causes poor tillering (= poor panicles numbers/hill)
- Deep transplanting inhibits tillering and growth (**Photo-3**).



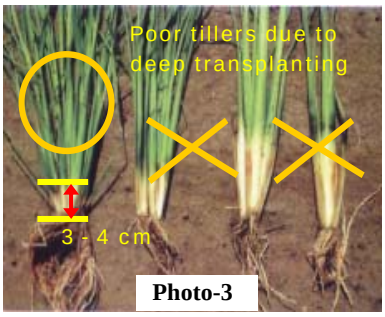


Photo-3

II.5 Preparation of Transplanting Guide Rope

Example for standard spacing : 20 cm x 20 cm

Tie a string to transplanting guide rope at every 40 cm for marking (**Fig.1 & Photo-4**), and transplant seedlngs at the marks and in-between the marks

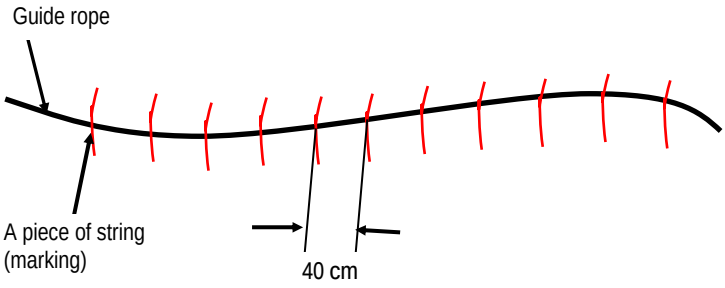


Fig.1 Guide Rope for Transplanting

Photo-4

II.6 Application of Basal Dressing

- Apply NPK (17-17-17) 200 kg/ha or 10 kg /500 m^2 via broad-casting before irrigating main field for puddling. After the application, but before the irrigation, plow the soil for mixing with the fertilizers.

Basal Dressing:	NPK (17-17-17)	10kg/ 500 m^2	- Broadcast fertilizers evenly in the field (2 times broadcasting by dividing the fertilizers into 2). Then, plow the field for mixing fertilizers & soil before irrigation for puddling (can do this work a few days before puddling) - After paddling, keep flood condition in the field till transplanting - Promotion of initial-growth and tillering - All amounts of phosphate and potash are applied as basal - **N role:** Promote vigor growth (stem and leaves) - **P role:** Promote growth, tiller and root development, flowering and grain setting - **K role:** Make strong stem and leaves to protect plant from disease and lodging

- Coop should secure fertilizers before starting a cropping season
- Coop should provide fertilizers and deliver it to coop members at beginning of the cropping season via credit or cash-on-delivery
- Measuring of NPK can use a pet bottle of 1.5 liter as below **(Photo-5)**;

1 kg of NPK (about 11 lines)

Photo-5

II.7 Puddling and Leveling

Puddling and leveling operation are very important to increase water holding capacity of soil, to control weeds and to improve even water distribution so as to achieve a uniform crop growth **(Photo-6, -7, -8)**

Puddling by hoe

Photo-6

Leveling by hoe or T-shape leveler

Photo-7

Well prepared plot for transplanting

Photo-8

II.8 Transplanting (TP)

- Uproot seedlings gently by using hoe without cutting many roots so as transplanting damage can be mitigated (**Photo-9)**
- Uprooted seedlings should be kept in watered basin to avoid desiccations (**Photo-10**)
- Firstly, transplant seedlings 20 cm space in both sides of the main plot by using TP guide rope, and then transplant seedlings every 20 cm space in-between both sides as below figure (in case of standard spacing)
- Or firstly transplant seedlings every 20 cm to a low by using TP guide rope and then use 20 cm long-stick to fix the next row space **(Photo-11 & Fig.2)** and continue transplanting (in case of standard spacing)
- Land owner should supervise casual labors to follow line planting practice
- Keep water about 3-4 cm depth (more than a half of the seedling height) for about 1 week just after

transplanting so as to promote rooting (**Photo-12**)

Photo-9

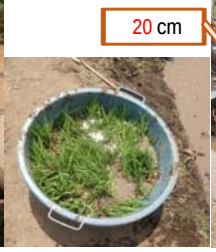


Photo-10

Photo-11

Photo-12

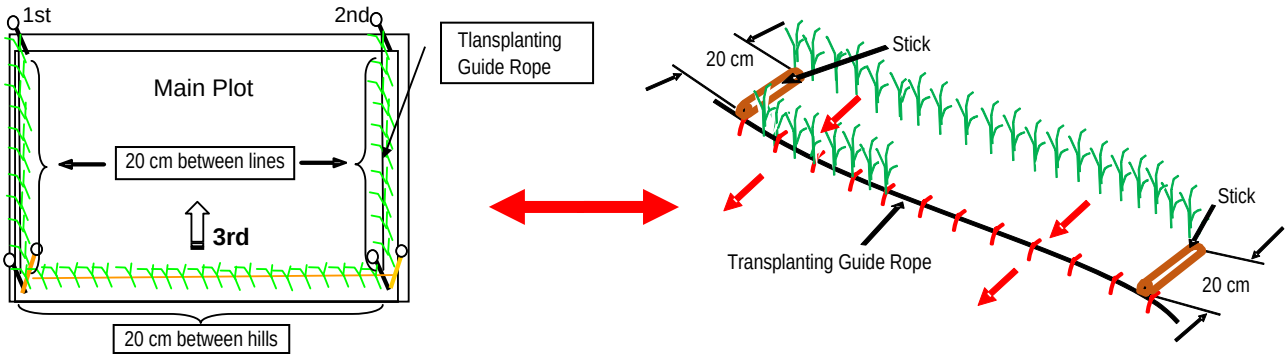
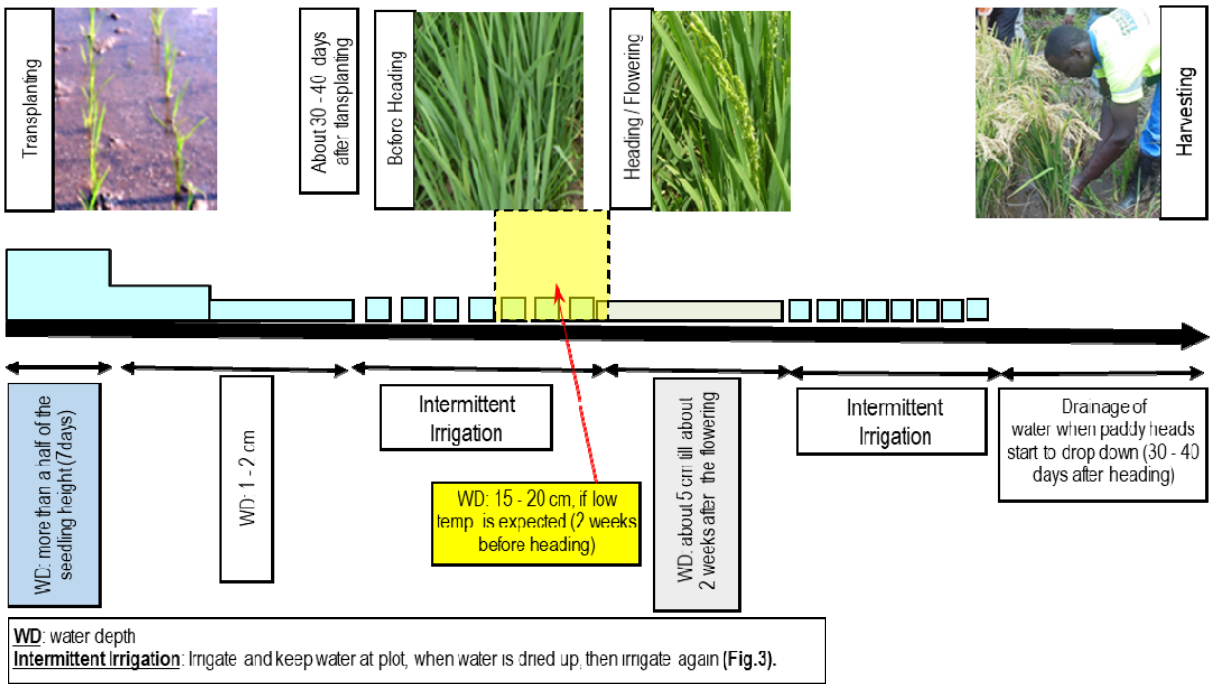


Fig.2 Transplanting

II.9 Water Management



Note:

Keep deep water (15 - 20 cm) during about 2 weeks before heading when/where cold damage to paddy (min. temperature is expected at less than 17 ^{o}C) is worried in high altitude areas

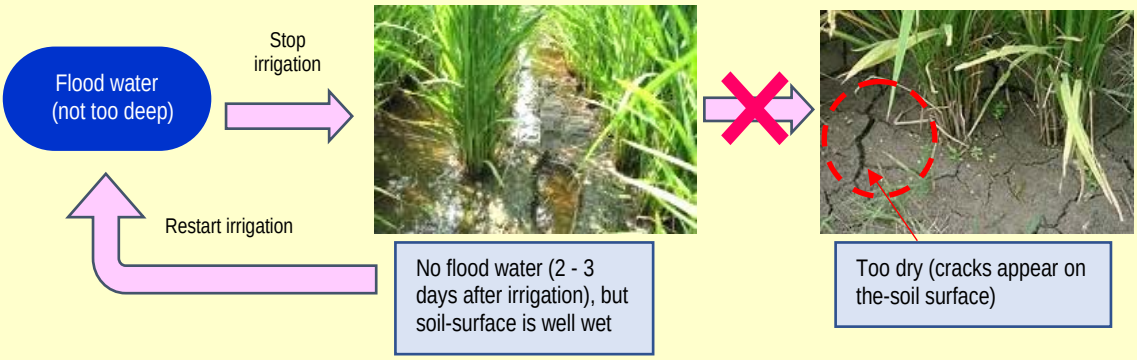


Fig.3 Image of Intermittent Irrigation

FFS-3: Field Training on 1st Topdressing and Pest Control

III. FFS-3: Field Training on 1st Topdressing and Pest Control

III.0 Point of Lecture and Practice in the FFS3

- Application of Urea for the 1st top dressing
- Weeding
- Pest control
- Mitigation of water logged problem

III.1 Application of Urea for 1st Top Dressing

1st Top dressing at tillering stage	Urea (46%)	2.5kg/ 500 m^2	- Application of Urea at about 3 weeks after transplanting date - Promotion of tillering

- Apply urea under a shallow irrigated condition **(Photo-1 & -2)** and mixing with soil with weeding practice, then keep flood condition (no drainage) for 7 days in the plot to avoid fertilizer runoff
- Measuring of Urea can use a pet bottle of 1.5 liter as below **(Photo-3)**;

Photo-1

Photo-2

1 kg of Urea (about 15 lines)

Photo-3

0.5kg of Urea (about 7 lines)

III.2 Weeding

- Cultural control method: good land preparation and flooding (keep water) in the field
- Preventive method: Use of paddy seeds without contamination of weed seeds and keep main field, soil bands and canals free from weeds (pick-up weeds at least before they bear seeds)
- Practice weeding several times before a canopy of rice plant covers the field
- Soil is well mixed up and down during the weeding **(Photo-4 & -5)**. Weeding during the tillering stage promotes tillering and spreading strong roots (better to combine with top-dressing)

Photo-4

Photo-5

III.3 Pest Control

- Most common pest: **Stalk-eyes Flies (*Diopsis thoracica)*** (**Photo-6**) prefers an aquatic habitat and attacks rice plant during nursery to tillering stages by larva (**Photo-7**) and causes dead heart (**Photo-8**). This pest will appear in morning & in evening
- When *diopsis* is seen in nursery or in main field, start spraying pesticides. Use Cypermetrine at rate of 2 ml per 1.0 litter of water: 30 ml of Cypermetrine to 15 litter's sprayer for 500m^2 (**Photo-9 & 10**). It is recommended spraying 1 time per week when pest density is high.
- Use protecting gear (mask, gloves, boots, cap, long-sleeve shirt & long pants) always during spraying agricultural chemicals, as they are poisonous substances penetrating body through bare skin
- Change the chemicals periodically to prevent from emerging tolerant pests/diseases

Photo-6

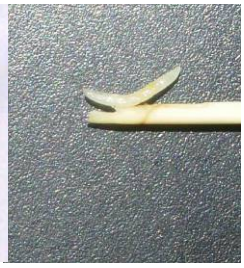


Photo-7

Photo-8

Photo-9

Photo-10

- ***Gryllotarpa Africana*** (mole cricket) (**Photo-11**)
  Mole cricket kills plants by cutting them off at the base (**Photo-12**). Keeping paddy field flooding mitigates the cricket damage.

Photo-11

Photo-12

III.4 Mitigation of Water Logged Problem

1) How to improve water logged plot (1):

- Make small ditch in water logged plot in the center of paddy field and drain excess water into the main canal **(Fig.1, Photo-13)**
- Make small ditch along to soil band **(Fig.2)**
- Carry in soils from nearby plot and well decomposed manure to the waterlogged area **(Fig.3)**
- Practice dredging of the main canal periodically

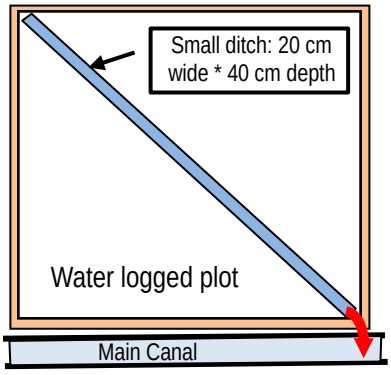


Fig.1 Drainage Ditch (diagonal)

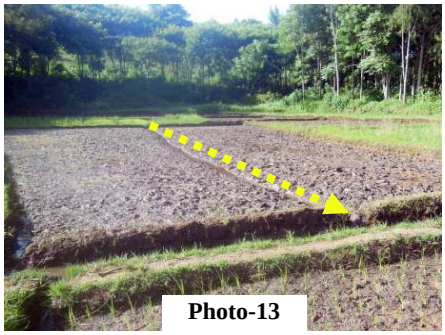


Photo-13

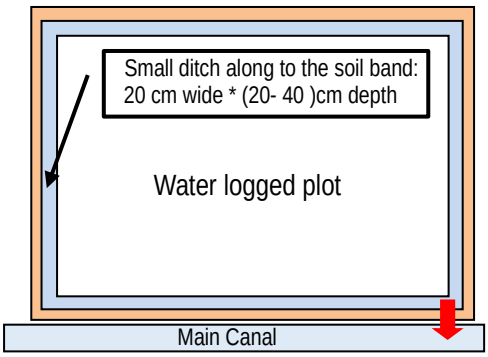


Fig.2 Drainage Ditch (along to soil band)

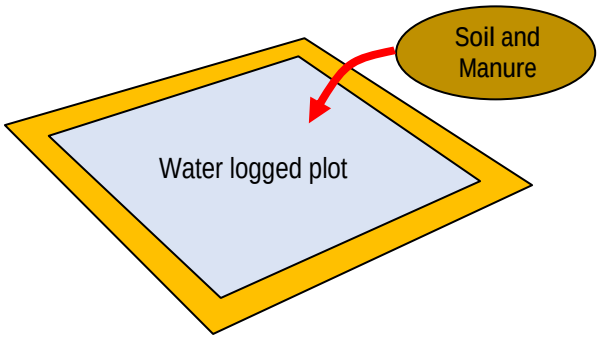


Fig.3 Carry in Soil and Manure

2) How to improve water logged plot (2):

- Prepare sorghum bundles by bunching of ten sorghum stems **(Photo-14)**
- Make ditch (30 cm Wide * 30 cm Depth) toward to drainage canal **(Photo-15)**
- Install sorghum stem bundles in the ditch **(Photo-16)**
- Bury ditch with soils and the end of sorghum stem bundles should cross over soil band and be exposed on drainage canal (**Photo-17**)

Photo-14 **Photo-15** **Photo-16** **Photo-17**

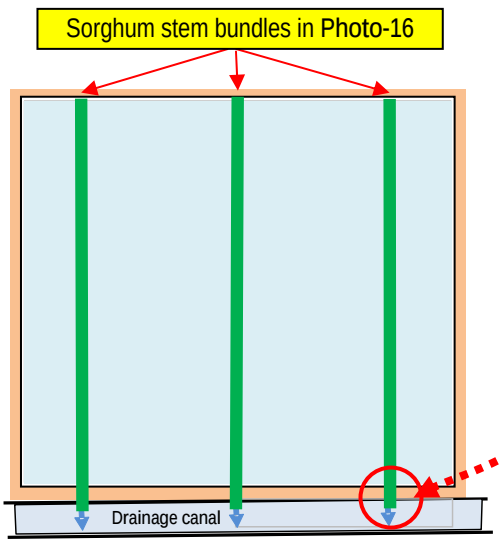


Fig.4 Solghum Stem Bunch Distribution in a Plot

FFS-4: Field Training on Panicle Initiation, 2nd Topdressing and Disease Control

IV. FFS-4: Field Traning on Panicle Initiation, 2nd Topdressing and Disease Control

IV.0 Point of Lecture and Practice in the FFS-4

- Panicle initiation and development
- Application of Urea for the 2nd top dressing
- Disease control
- Roguing operation

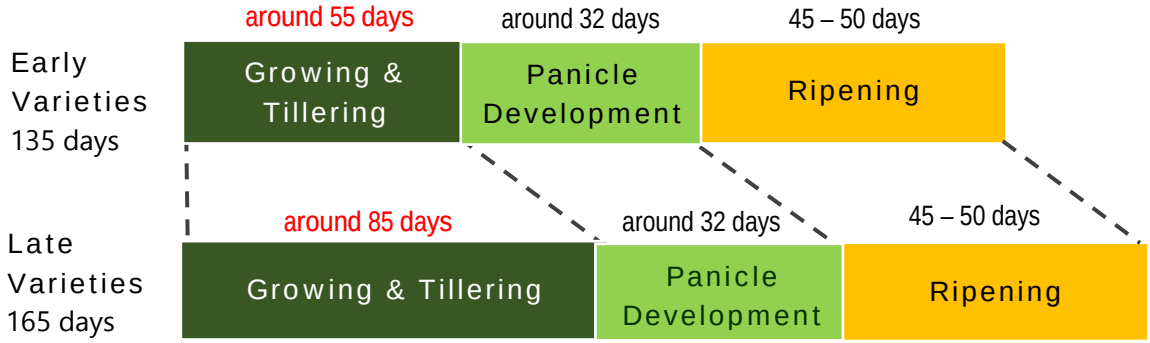
IV.1 Panicle Initiation and Development

- A panicle initiates to develop inside of rice stem at about 32 days before heading
- All varieties have the same duration (about 32 days) between the panicle initiation till the heading/flowering (panicle development period)

Days before heading (about)	Panicle Development
32 days	Panicle initiation
30 – 23 days	Major parts of a panicle start to develop
25 – 23 days	Grains are formed
23 – 16 days	Some grains start to degenerate
16 – 10 days	Pollen & a pistil start to develop (the most sensitive period to low temperature)
10 – 2 days	Pollen & a pistil finish to develop (the most sensitive period to low temperature)
0 day	Flowering in the same panicle starts within several hours after the heading

Note:

- ✧ Heading date: 40 –50 % of all rice plants in a plot are headed
- ✧ A paddy life period is manly determined by the period from sowing till the panicle initiation (growing & tillering period as shown below)



IV.2 Application of Urea for the 2nd Top Dresing

2nd Top Dressing: at panicle formation	Urea (46%)	2.5kg/ 500 m^2	- Application of Urea before/at booting stage (20 - 10 days before heading) as shown in **Fig.1**, around 7 - 9 weeks after transplanting in case of many varieties - Usually the top dressing aims at mitigating degradation of paddy spikelets ⇒ increasing % of full grain & grain weight - Application at panicle initiation period, if paddy growth condition is not good ⇒ increasing number of grains per panicle

IV.3 Disease Control

- Most common disease: Blast **(Photo-9, -10 and -11)**
  - ✧ Using resistant variety is the best way to avoid blast
  - ✧ Blast easily infests rice under temp. of 18 to 24 ℃ in cloudy or rainy weather
  - ✧ Kitazin (15ml/15lit for 5a), beam (15g/15lit for 5a) and tebuconazole (15ml/15lit for 5a) are popular fungicides against blast disease
  - ✧ They are commonly applied at 2 weeks after transplanting, at max. tillering stage and at booting stage

- ✧ Only chemical spraying is not an economic method (Integrated Pest Management)
- ✧ Avoiding excess application of nitrogen fertilizer to mitigate the blast infection
- ✧ Plowing rice straw into soil for supplying silica acid to make rice plant tolerant against blast


Photo-9


Photo-10


Photo-11

- Rice Yellow-mottle Virus
  - ✧ Appears during active tillering stage **(Photo-12)**

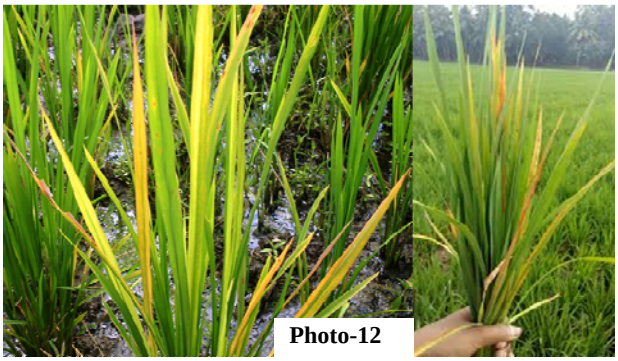


Photo-12

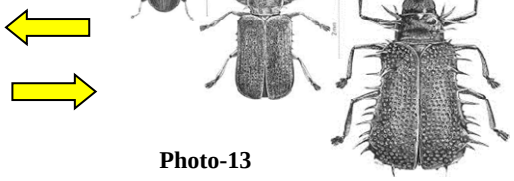


Photo-13

  - ✧ Use of tolerant/resistant varieties, such as Yun Yin, Yun Keng, Rumbuka, etc. by discontinuation and substitution of susceptible varieties
  - ✧ Destruction/burning of infected rice plant in the field
  - ✧ Change of nursery site and avoid exchanging seedlings with neighbor farmers
  - ✧ Control vectors **(Photo-13)** by insecticides, such as Cypermethrin, Sumicombi, etc.
- Use protecting gear (mask, gloves, boots, cap, long-sleeve shirt & long pants) always when spraying agricultural chemicals, as they are poisonous substances penetrating body through bare skin
- Change the chemicals periodically to prevent from emerging tolerant pests/diseases

IV.4 Rouging Operation

- Uproot off-type plants **(Photo-14)** from time to time in order to improve rice quality and to avoid degeneration of rice variety.
- At heading and before harvesting are good timing for the roguing operation. You can easily find out off-type plants in the field.

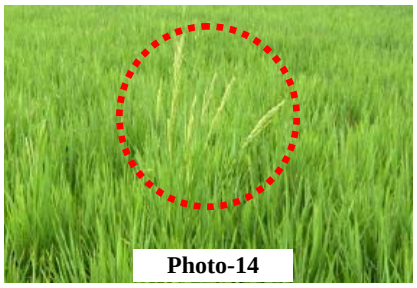


Photo-14

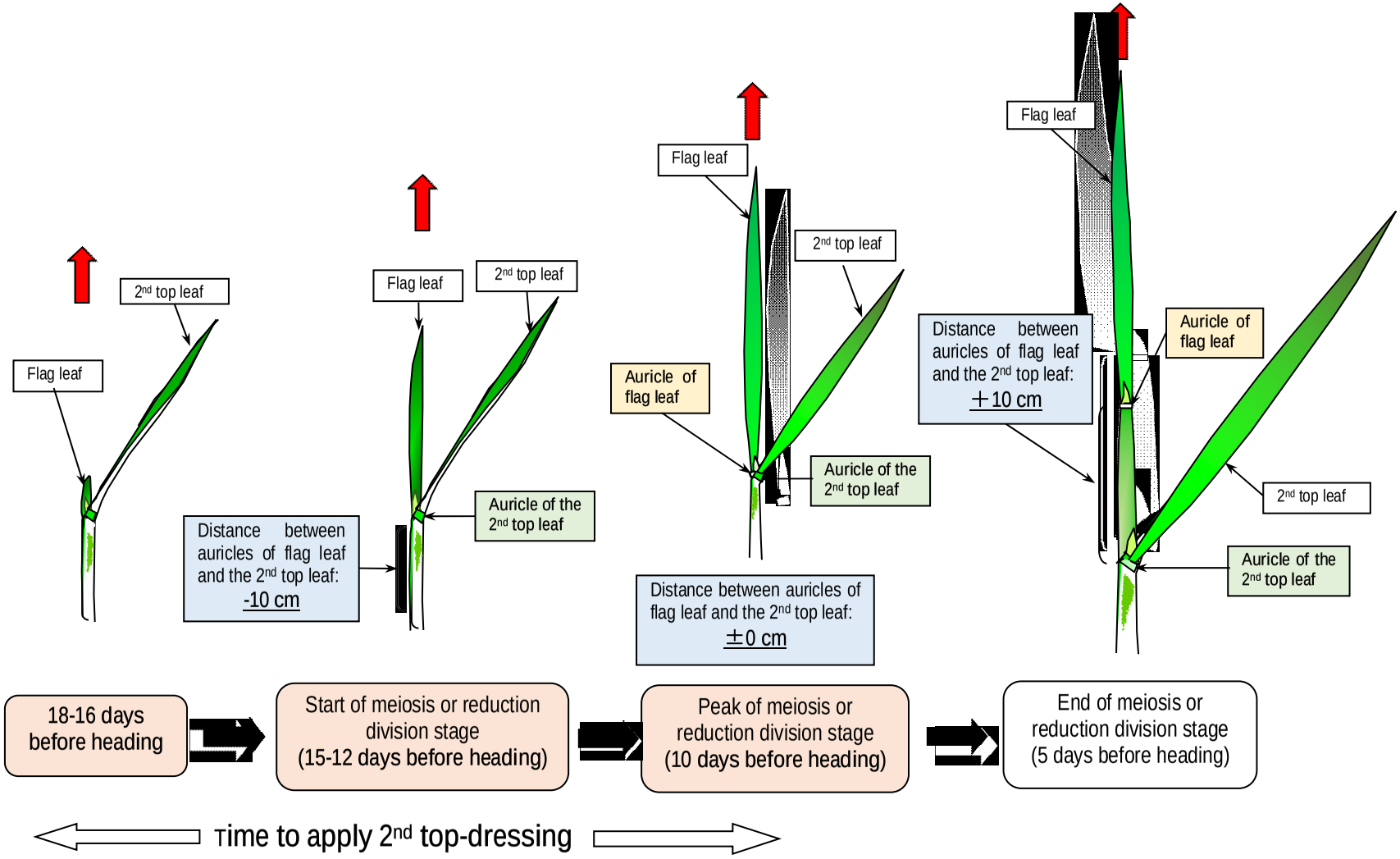


Fig.1 Time to Apply 2nd Top Dressing Urea: Distance between Auricles of Flag Leaf and the 2nd top Leaf

FFS-5: Field Training on Harvesting and Post-harvest Practice

V. FFS-5 Field Training on Harvesting and Post-harvest Practice

V.0 Points of Lecture and Practice in FFS-5

- Importance of right time harvest for yield and grain quality
- Judgment of harvesting time
- Reaping rice plant by sickle at ground level
- Threshing paddy rice by traditional methods, eucalyptus log thresher, foot pedal thresher and motorized threshing machine
- Winnowing paddy by machine or *Urutaro*
- Drying paddy by sun drying method
- Yield evaluation
- Bagging and storing paddy for long time
- Causes of paddy quality deterioration
- Improvement of soil fertility by using rice straw

V.1 Importance of Right Time Harvest in Terms of Yield and Quality

- Late harvest:

Deterioration of Grain Quality	Increasing of : - Cracked rice kernel **(Photo-1)**, - Rusty kernel **(Photo-2)** and other damaged kernel	 **Photo-1**  **Photo-2**
Decreasing of Yield	- Increasing of: Shattering, damage of bird/rodent - Bird scaring should be done from heading to harvest to avoid a yield loss caused by birds	

- Early harvest:

Deterioration of Grain Quality	Increasing of: Green grains **(Photo-3)**	 **Photo-3**

V.2 Judgment of Harvesting Time

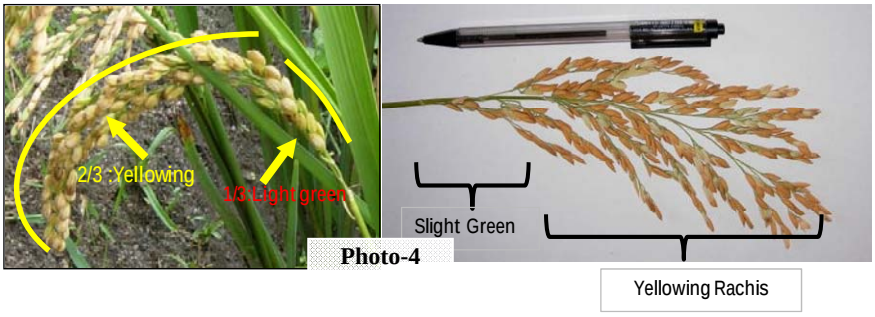


Photo-4

- Around 90 % of whole panicle in a plot become yellow with remaining slight green color rachis at panicle base (See **Photo-4**).
- Rough estimation of maturing period: 40 - 50 days after the heading
- Percentage of green spikelets becomes 10-15 % (85-90 % of spikelets become yellow)
- Starting of shattering is also one of criteria to harvest rice for easy shattering varieties (except for variety of Yun Keng which has a seed retention habit). Grab panicle lightly and pull for judging. If shattering is observed, then, start to harvest.


Photo-5

V.3 Reaping Rice Plant by Sickle at Ground Level

- Water should be completely drained 7-10 days prior to harvesting
- Early draining of water more than 10 days before increase cracked

grains.

- Cut the stems with a sickle about 10 cm above the ground to reduce stem borer in the field (**Photo -5**).

V.4 Threshing Paddy Rice by Traditional Mehods, Eucalyptus Log Thresher, Foot Pedal Thresher and Motorized Threshing Machine

- Thresh immediately after reaping rice to avoid quantity losses and deterioration of grain quality and do not keep reaped rice on wet paddy field for several days
- There are many ways of paddy threshing
  - ✧ Taditional methods to slam rice panicles against logs, tarpaulin spread over the ground, etc. or to beat harvested panicles by stick (**Photo-6, -7 and -8)**
  - ✧ Eucalyptus log thresher (**Photo-9 and Fig.1**)
  - ✧ Foot pedal thresher (**Photo-10**)
  - ✧ Motorized threshing machine **(Photo-11),** which has just started to be introduced in Rwanda

Photo-6

Photo-7

Photo-8

Photo-9

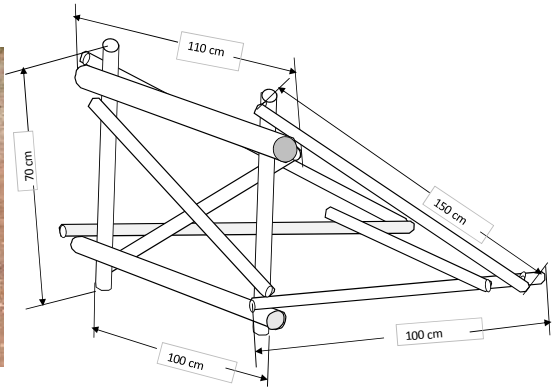


Fig.1 Threshing Device made of Eucalyptus Logs

Photo-10

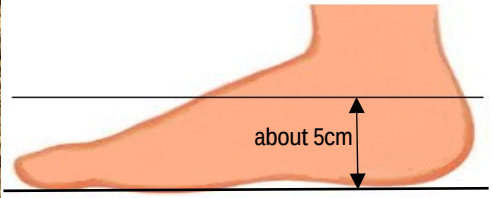
Photo-11

V.5 Drying Paddy by Sun Drying Method

- Grain moisture content (GMC) of the harvested paddy roughly ranges from 20 to 30 % depending on weather condition
- Adjusting grain moisture content to 14 % is necessary for dehusking/milling operation to minimize cracked grain and for long storage and less than 13 % for seeds makes long storage without deterioration

- Dry paddy properly to a safe GMC of 14 % by spreading in a thick layer (5 cm: **Photo-12**) on concrete drying yard or tarpaulins and turning over grains periodically (every 30 to 60 min) for even drying
- Sun-dry for 2-5 days (6-8 hours per day: **Photo-12**) depending on weather condition. Avoiding rapid dryimg (with 1 or 2 cm thickness of paddy layer and without turning over) of paddy within short period such as one day. Rapid drying causes increased crack grains which are easily to be broken rice during milling process
- Checking the grain moisture contents (GMC) by biting the de-husked rice
  - ✧ Be crushed by biting (about 20%)
  - ✧ Be cracked by biting without a sound (about 18%)
  - ✧ Be cracked with a click sound (about 15%)

Photo-12



V.6 Winnowing Paddy by Machine or Urutraro

- Winnow to separate chaff and empty grains from the well mature grains by using winnowing machine (**Photo-13)** or *Urutaro* (**Photo-14**).

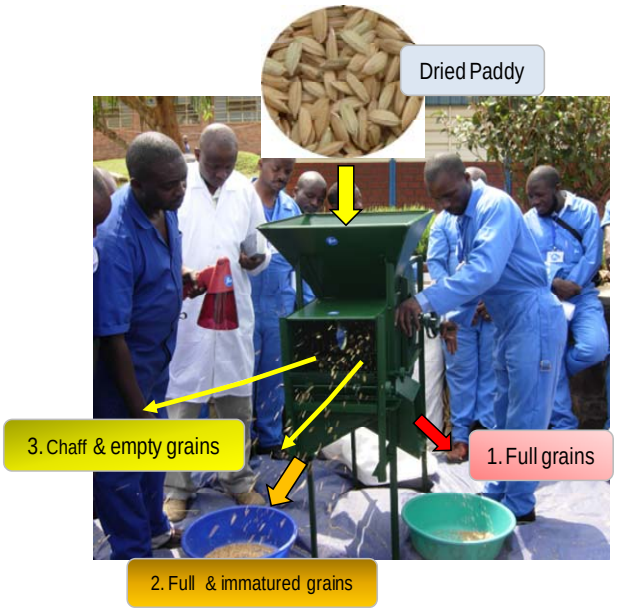


Photo-13

Photo-14

- Check cleanness of sample paddy with water after cleaning **(Photo-15)**. If there are many immature grains, winnow the paddy again

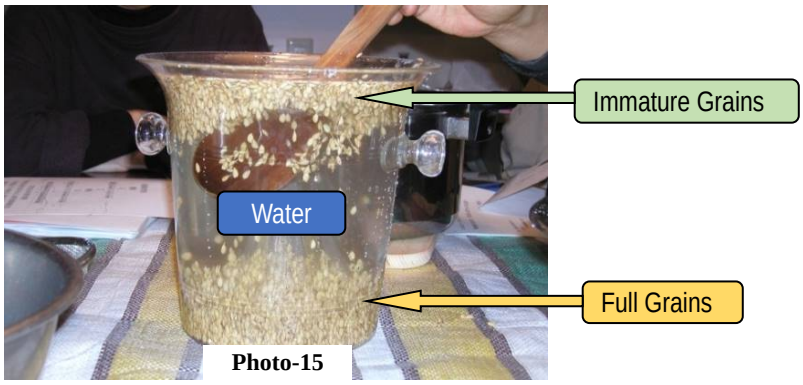


Photo-15

V.7 Yield Evaluation

- Weigh paddy and calculate yield per hectare (kg/ha) at 14 % grain moisture content as follow;
  - ✧ If 200 kg of paddy was harvested in 500 m^2 plot, yield per ha is calculated as follow;
    Yield (kg) /ha= 200 kg/500 m^2 x 10000 m^2 = 4,000 kg/ha
  - ✧ Moisture adjustment **(Fig.2)**
    Example Condition: 200 kg of paddy with 17 % grain moisture content (GMC).
    200 kg of paddy decrease to [***] kg at 14 % GMC as calculated below;

    [***] = (100-17)/(100-14) *200 = 193.0 kg at 14 % from 500 m^2
    Yield per ha: 193.0/500 x 10000 = 3,860 kg/ha = 3.86 ton/ha

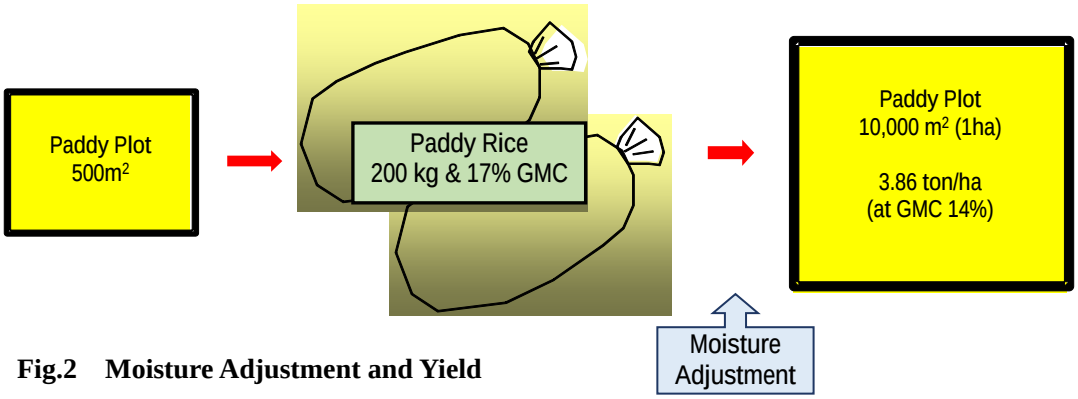


Fig.2 Moisture Adjustment and Yield

V.8 Bagging and Storing Paddy for Long Time

- Grains under 13 - 14 % of grain moisture content (GMC) can be stored for long time (6 - 12 months) without quality deterioration
- Store grain bags indoors on pallet or log to protect paddy under room temperature from moisture migration under good air ventilation **(Fig.3)**

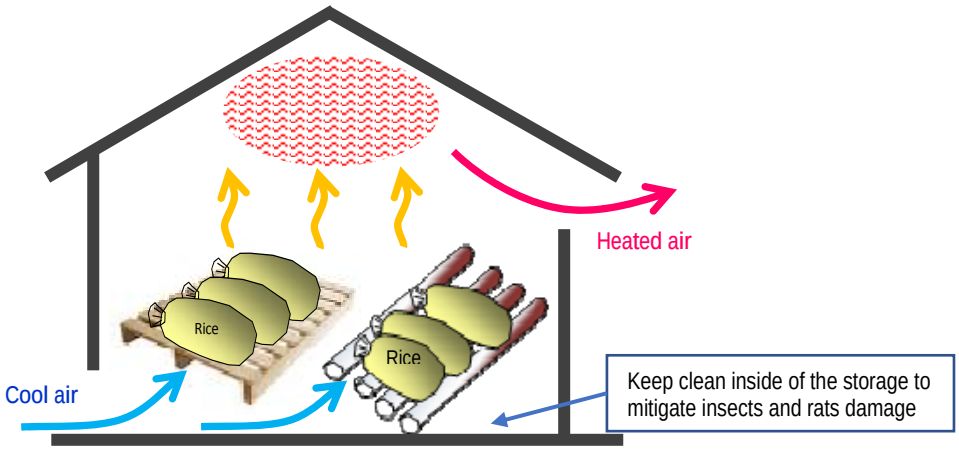


Fig.3 Paddy Storage with Good Ventilation

- Factor affecting quality and quantity consist of as follow:
  - ✧ Physical factors: temperature & humidity (the lower is the better)
  - ✧ Chemical factor: moisture, enzyme action, oxidation
  - ✧ Physiological factor: respiration, heat generation
  - ✧ Biological factor: pest, microorganism, rat

V.9 Causes of Paddy Quality Deterioration

Characteristics of Damaged Paddy	At Farmer Level	Beyond Farmers' Responsibility
1. Cracked paddy	✧ Late harvesting paddy ✧ Fast/Excess/Uneven drying of paddy ✧ Not stirring paddy while drying ✧ Early drainage of the field (Drain water earlier than 10 days before harvesting) ✧ Shock during threshing	✧ Type of variety ✧ Drought during the ripening stage ✧ Very high temperature during the ripening stage
2. Less cleaned paddy **1) Paddy mixed with stones or other foreign matters**	✧ Improper winnowing, cleaning of paddy ✧ Mixtures during drying paddy	
2) Embryo fermented or germinated grains	✧ Late harvesting paddy during heavy rain period ✧ Heaping un-threshed paddy in the field more than one day ✧ Storing not well-dried paddy ✧ Storing paddy under high temperature and/or high humidity	✧ Excessive rain during the ripening stage ✧ Type of variety
3) Immature grains	✧ Dense plant spacing ✧ Over top-dressing（N fertilizers) ✧ Early harvesting ✧ Less cleaned paddy	✧ High temperature after heading ✧ Less sunshine during the ripening stage
4) Green grains	✧ Excess number of flowers at the heading stage ✧ Over top-dressing (N fertilizers） ✧ Early harvesting	✧ Low temperature during the ripening stage ✧ Less sunshine during the ripening stage.
5) Mixed varieties	✧ Mixed varieties of self-produced seed (non-screening out other varieties in the field during seed production) ✧ Mixed varieties in the field while growing ✧ Not roguing other varieties from the field ✧ Mixing with other varieties after harvesting while drying and storing	✧ Mixture of other varieties in purchased seed
6) Mixed with insects	✧ Improper storing of paddy under high temperature condition and/or high humid condition ✧ Less clean paddy ✧ Dirty (no clean) storage condition	
3. Improper drying or over drying paddy	✧ Not drying at the appropriate moisture contents of 14% ✧ Over drying up to less than 13%	

V.10 Improvement of Soil Fertility by using Rice Straw

1) Compost making

- Compost provides many essential nutrients for plant growth, and improve soil structure and texture
- Necessary materials for making compoast
  - ✧ Rice straw (can be harvested 200 – 300 kg of dry rice straw from 500m^2), can be any plant residues such as maize straw, sorghum straw, tree leaves, vegetable peel, etc.
  - ✧ Urea (possible to use other nitrogen rich materials, such as poultry manure, cow dung, rice bran, etc.)
  - ✧ Tree logs, tree brabches or bunches of sorghum stem
  - ✧ Plastic sheet (cover a compost pile), preferebly
- Necessary conditions to produce good compost
  - ✧ Enough water (well-wet of rice straw)
  - ✧ Good aeration
  - ✧ Neutral acidity
  - ✧ Rich nitrogen source
- Compost piling **(Fig.4)**
  - ✧ Size of pile: 2.4 m (length) x 1.2 m (width) x 1.2 – 1.5 m (height), if 200 - 300 kg of rice straw
  - ✧ Soil base (15 cm height) shall be made before piling up rice straw
  - ✧ Several tree logs, tree brabches or bunches of sorgum stem shall be installed at the bottom of compost pile for areration

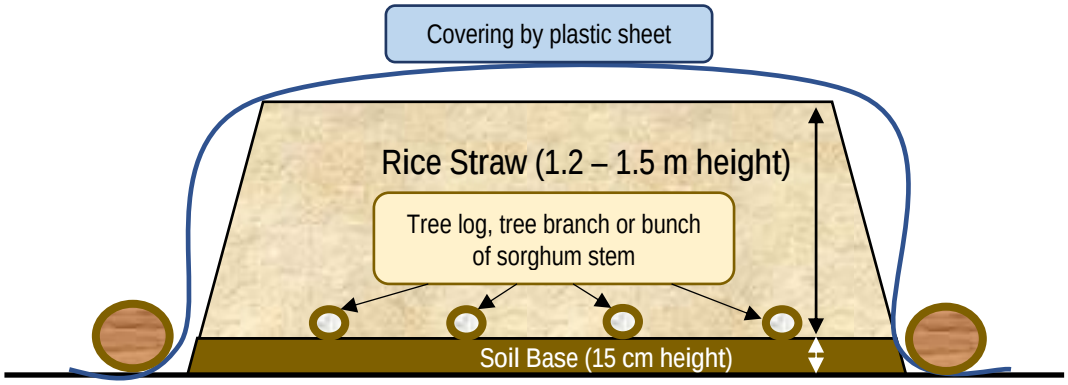


Fig.4 Image of Compost Pile

- Rice straw piling up process (200 - 300 kg of dry rice straw)
  - ✧ Watering to rice straw (100 - 150 lit. of water) and cut the straw in 3 (1/3 length) 1 day before piling up **(Fig.5)**

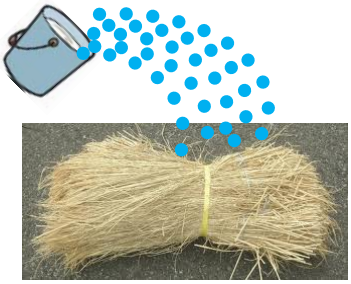


Fig.5 Watering to Rice Straw

  - ✧ Watering again to rice straw (300 - 450 lit. of water) immediate before piling up
  - ✧ Pile up well-wet rice straw
  - ✧ Trampling piled rice straw
  - ✧ One layer of rice straw is about 20 cm thickness after trampling
  - ✧ Distribute Urea evenly after every trampling (1.2 - 1.8 kg of Urea for 200 - 300 kg of rice straw)
  - ✧ Add a layer (about 5 cm) of farm yard manure or fine and fertile soil on the top of each rice straw layer

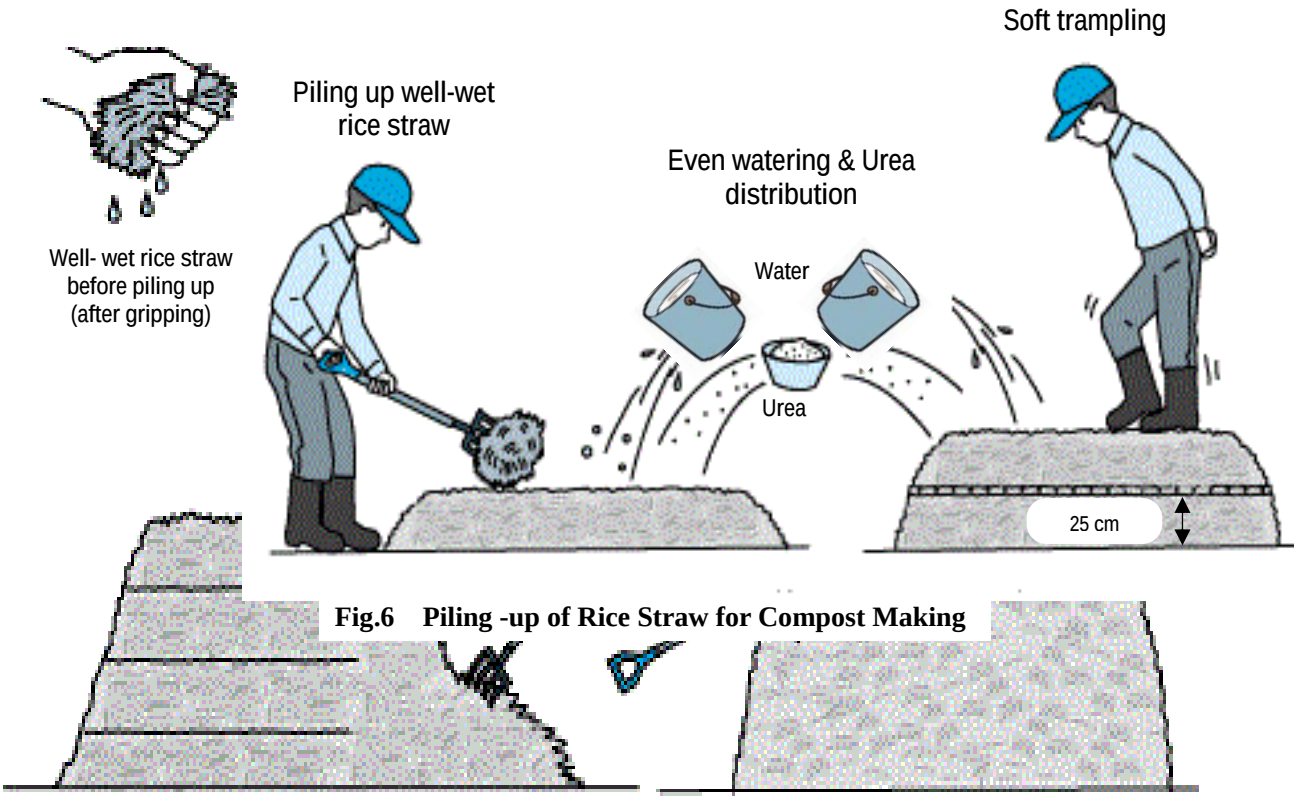


Fig.6 Piling -up of Rice Straw for Compost Making

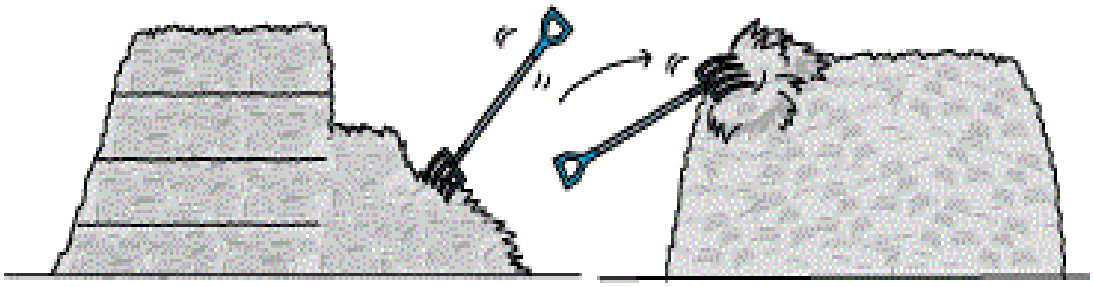


Fig.7 Turnig of Rice Straw Pile for Maturing Compost

- Maturing of cmpost is about 1 month after the turning when the heat is gone **(Photo-16)**

Photo-16

2) Rice straw plowing-in

Rice straw plowing in to paddy soil is very effective on rice plant growth in terms of the following points.

- Improvement of soil fertility
- Paddy soil becomes soft together with improvement of water holding capacity
- Strengthening of field resistance of rice plant against blast disease

- It takes about a season (6 months) to find a positive impact of rice straw plowing-in together with application of chemical fertilizers
- How to Plow Rice Straw in to Paddy Soil
  - ✧ Spread rice straw over a plot after harvest ideally after chopping (**Photo-17**).
  - ✧ Irrigate paddy plot 3 days prior to plowing-in
  - ✧ Plow soil depth around 30-40 cm deeply and place rice straw at bottom to avoid impediment of 2nd plowing, puddling and leveling operation by hoe (**Photo-18 and -19**) and keep plot in wet condition till transplanting operation
  - ✧ Rice straw plowed in previous season is well decomposed and become better manure ready to use by rice plant (**Photo-20**)


Photo-17


Photo-18


Photo-19


Photo-20

Table 1 Result of Rice Straw Effect on Growth of Rice in SMAP Demonstration and Training Plot in Jyambere Muhinzi wa Huye, District Huye, in 2018 A season

Variety	Rice Straw Application	Culm Length (cm)	Number of Hills /m2	Number of Panicles		Number of Grains per Panicle	% of Ripened Grains (%)	1000 Grain Weight (g)	Yield (kg/ha)
				per hill	per m^2				
Yuni Keng (Short grain)	+ RS	104.6	20.5	15.3	313.7	176.0	53.0	26.5	7,753
	- RS	103.0	18.6	15.3	284.6	165.6	47.9	24.1	5,440
	Ave.	**103.8**	**19.6**	**15.3**	**299.1**	**170.8**	**50.5**	**25.3**	**6,579**
Yuni Yen (Short grain)	+ RS	72.5	20.9	13.8	288.4	124.7	78.4	26.9	7,585
	- RS	71.6	20.9	14.6	305.1	105.8	61.7	26.2	5,194
	Ave.	**72.1**	**20.9**	**14.2**	**296.8**	**115.3**	**70.1**	**26.6**	**6,390**

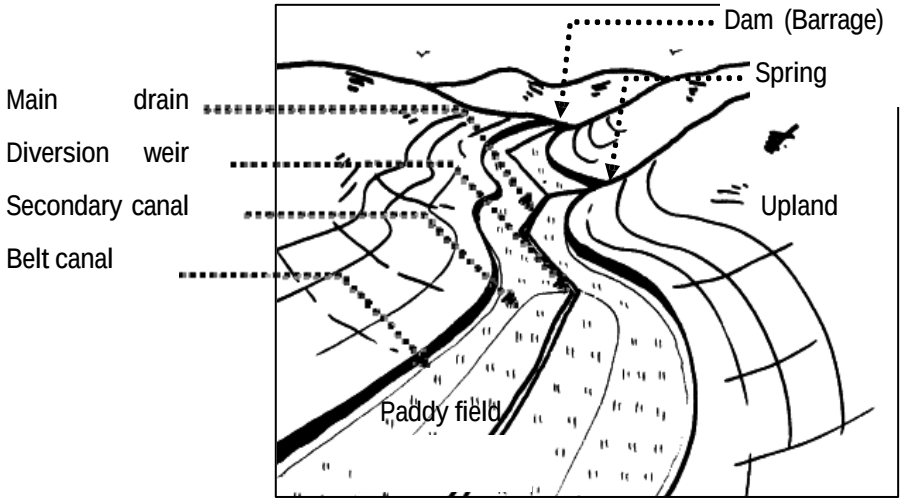
Note: +RS = with rice straw, -RS = without rice straw
Source: SMAP Team

Annex: Irrigation management

Annex

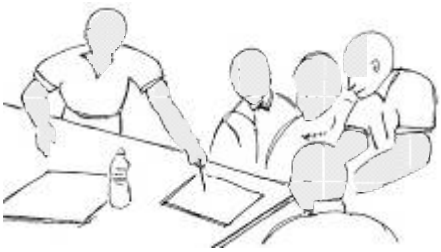
IRRIGATION MANAGEMENT

1. Schematic Diagram of Irrigation Facility



Dam, Spring
↓
Main drain
↓
Diversion weir
↓
Secondary canal, Belt canal
↓
Paddy field

2. Irrigation Schedules for Proper Use



Association leaders of coop hold a meeting within each canal and make a cropping calendar in the beginning of rice crop season

Coop submits the cropping calendar to WUA

WUA finalizes a water distribution schedule

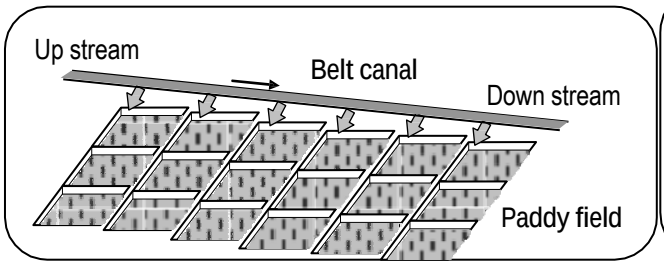
Cropping Calendar (Example)

Activities	Month											
	Jul.	Aug.	Sep.	Oct.	Nov	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
A season		**Paddy**		**ha**								
B season								**Paddy**		**ha**		

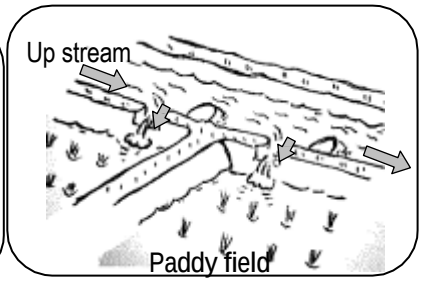
3. Water Distribution Methods

1) Continuous distribution

Each farmer irrigates to their paddy field continuously.



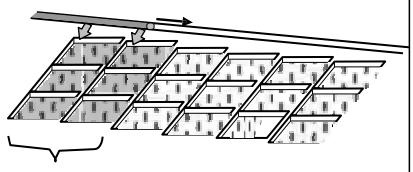
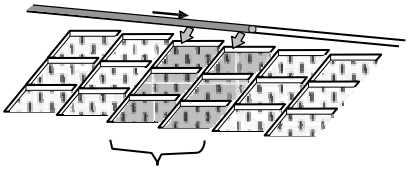
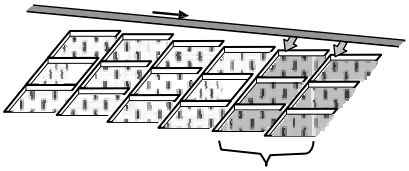
Schematic image of continuous irrigation



Schematic image of inlet

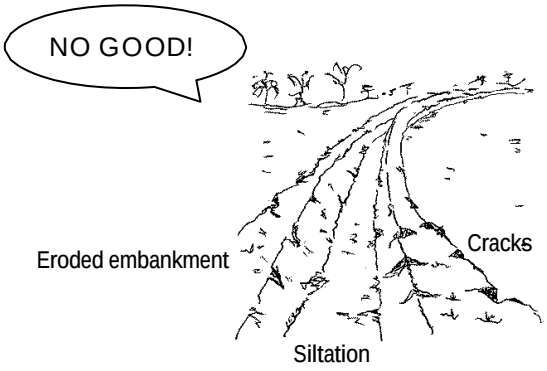
2) Rotational distribution (during water shortage period)

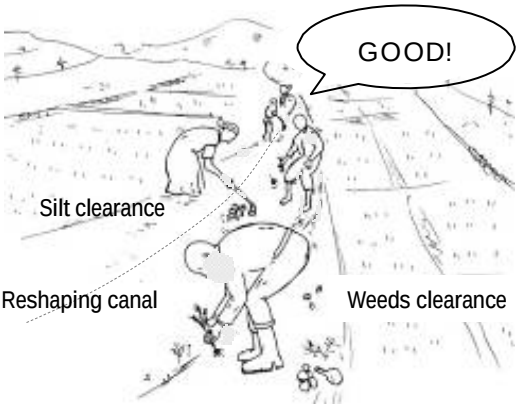
Farmers irrigate to their paddy fields in accordance with a rotational schedule. Every farmer shares the limited water resource each other.

1st Rotational area	2nd Rotational area	3rd Rotational area
		
Irrigation	Irrigation	Irrigation

4. Daily Maintenance of Irrigation Facilities

Maintain irrigation and drainage canals always clean and in good condition by daily maintenance





5. Simple Diversion Weir

1) Installation of simple division weir

		
1. Set up location	2. Carry out trees	3. Cut trees based on the canal size
		
4.Remove off the tree's skin	5.Assembling	6. Basic frame
		
7. Remove off the sedimentation	8.Set the frame in the canal	9.Suport the frame
		
10.Completion of installing	11.Stop water by local materials	12.Divert water to secondary canal

Photo-1 A Simple Diversion Weir (Jyambere Muhinzi Huye Cooperative)

2) Maintenance of simple division weir

Daily maintenance

- Remove silt, wood branches and weeds in front of soil bags to protect a simple division weir from damage and to keep enough water flow to each canal **(Fig.1)**

Maintenance when flood comes

- Remove soil bags installed to a simple diversion weir before flood comes to protect a canal- bank from flood damage **(Fig.2)**
- Appoint a person who oversees maintenance of simple division weirs, and remove soil bags by the person when flood comes
- Examples of not well-maintained a simple division weir **(Photo-2 and Photo-3)**

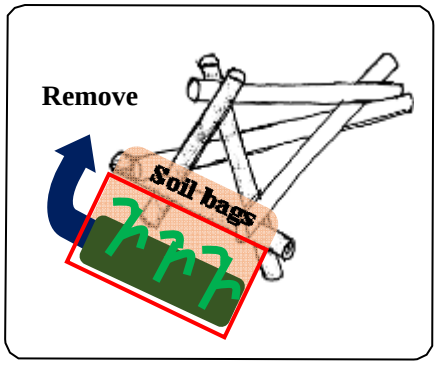


Fig.1 Daily Maintenance of Simple Division Weir

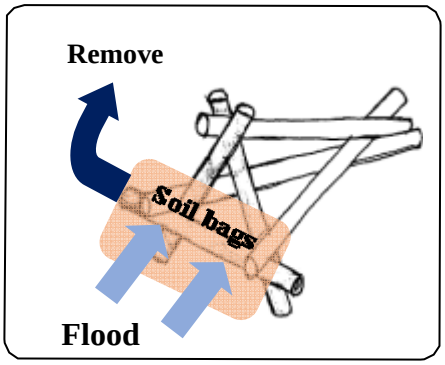


Fig.2 Maintenance during Flood

Photo-2 Drift wood branches on a simple diversion weir disturbs water flow in Gacenshero zone (Mushikiri Rice Growers Cooperative)

Photo-3 A damaged canal-bank by flood in Gacenshero zone (Mushikiri Rice Growers Cooperative)

Implementation Guideline
of
RAB-SMAP Activities
for
Horticulture Training Program






September 2019
Smallholder Market-Oriented Agriculture Project in Rwanda (SMAP)

Implementation Guidelines
of
RAB-SMAP Activities
for
Horticulture Training Program

Table of contents

1. Introduction of Guideline

1.1 Authority

This guideline was elaborated by "the Smallholder Market-oriented Agriculture Project, SMAP in Rwanda" financed by "Japan International Cooperation Agency (JICA)".

1.2 Background and Objective

(1) Background

JICA, in collaboration with "Rwanda Agriculture and Animal Resources Development Board, RAB" through "Ministry of Agriculture and Animal Resources, MINAGRI" and related target Districts, has implemented the SMAP since November 2014 to October 2019, in four Provinces for horticulture. The Project has aim to improve the ability of technical implementation and management for related agriculture officers, and to contribute to improve smallholders' incomes in Rwanda.

Through implementing SMAP in collaboration with above mentioned agencies concerned in horticulture, training materials were necessary in order to disseminate appropriate horticulture cultivation techniques not only SMAP but also other related horticulture projects. In response to this need, through a series of discussions with MINAGRI, RAB and other related agencies concerned, "Market oriented Agriculture Extension Package, MAEP" has been elaborated in June 2018 by SMAP.

Parallel with the SMAP activity, RAB officially decided to conduct horticulture extension activities by adopting SMAP approach with its own resources (referred to as RAB-SMAP). RAB-SMAP has been launched for the horticulture dissemination in nationwide since November 2016 with a technical support of SMAP. However, it is not easy for RAB officers who is transferred or freshman to organize training for governmental offices and the farmers properly and timely using MAEP or how to collaborate with districts, etc. Therefore, a guideline for the procedure of horticulture training program with a technical manual for them is urgently required.

(2) Objective

The objective of this guideline is to provide information on how RAB staff for horticulture shall organize training program to government offices properly and timely, etc. Thus, the guideline is prepared in user-friendly manner to every stakeholder.

Michio GOTO
SMAP Team Leader

2. Outline of the RAB-SMAP Activities

1) Characteristics of RAB-SMAP

RAB-SMAP activities are based on the market-oriented agriculture, "To Begin at the Market, to Conclude at the Market" to aim at increasing the horticulture production and farmers' incomes from vegetables cultivation. The main characteristics of RAB-SMAP are followings.

[Characteristics of RAB-SMAP]

1. Farming as Business

- Shift from "Grow and Sell" to "Grow to Sell"
- Start with Marketing, end with Marketing
- Market survey conducted by Farmers themselves

2. Husband & Wife are Business Partners not Employer & Employee

3. Prioritize Motivated Groups (District Office and Cooperative)

- Target group selected through Proposal system

4. Transferring Initiatives to Implement Technical Training

- SMAP activities are conducted by District Office from 2nd year onward

5. Maximize Synergy Effects of Training Components

- Flow of Activities which has Meaning: "Coop Management/ Gender" → "Marketing" → "FFS for Cultivation Technique".

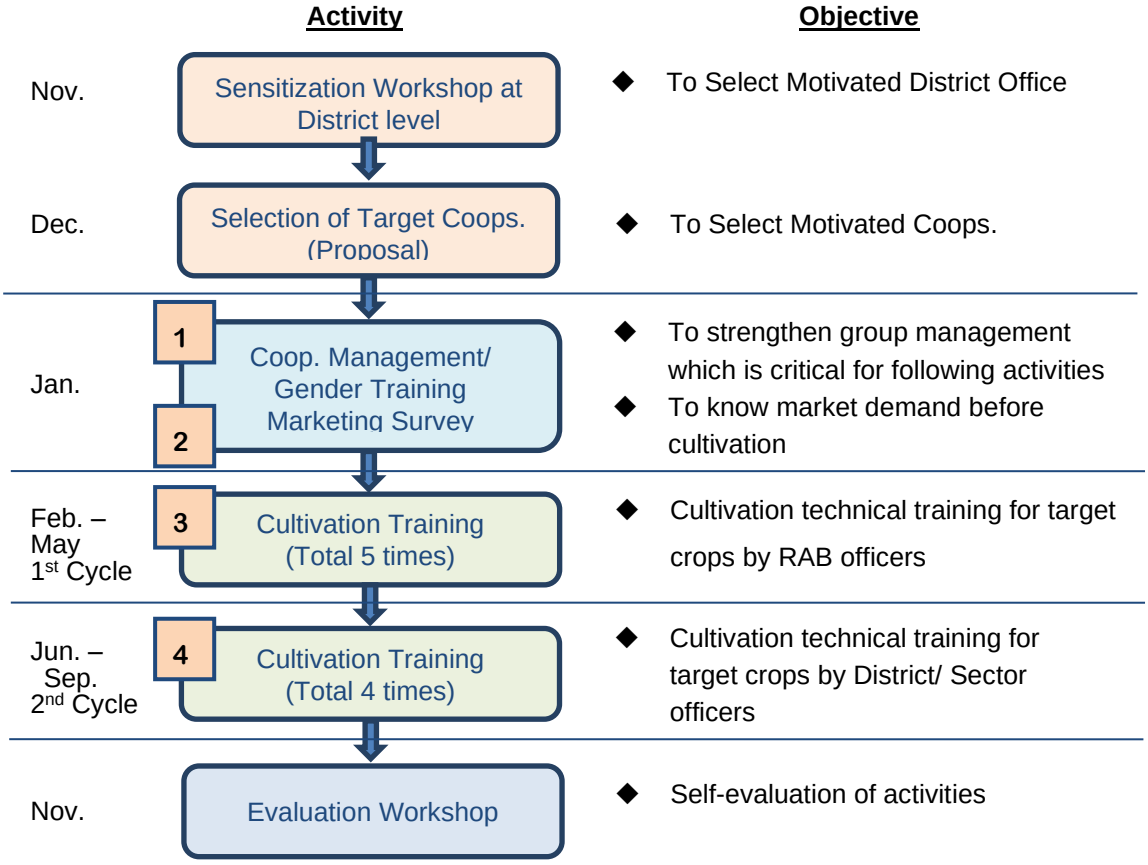
2) Procedure of RAB-SMAP Activities

Out of a Kickoff Workshop organized initially at cooperative level, the package of training includes (i) Cooperative Management and Gender Training, (ii) Marketing Training, (iii) Cultivation Training from FFS-1 to FFS-5 and (iv) Profit Analysis Workshop.

The series of training starts by Cooperative Management and Gender Training in order to ensure the dissemination of cultivation techniques, to increase transparency of the cooperative and to guarantee collective actions. After that, Marketing Training is conducted in order to select profitable crops by conducting a market survey.

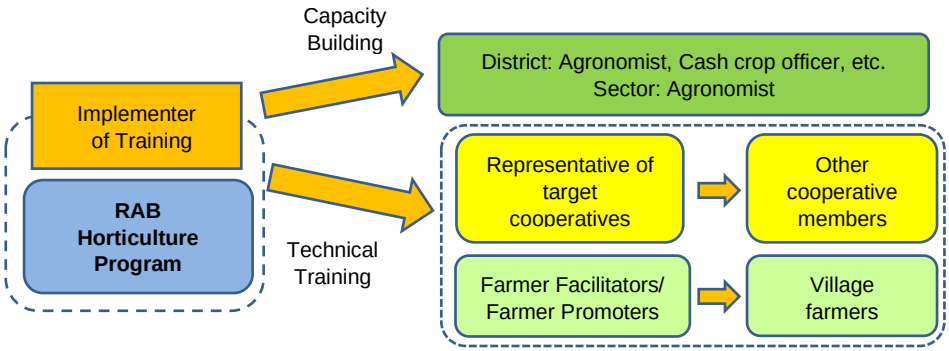
The selected crops are grown in Demonstration Training Farmland (referred to as "DT-Farm") for getting knowledge of cultivation techniques. The cycle of Cultivation Training includes five sessions of FFS as well as FFS-1: Nursery bed Preparation, FFS-2: Transplanting, FFS-3: Top dressing, FFS-4: Pest and diseases control and FFS-5: Harvesting. At the end of the cycle, a Profit Analysis Workshop is organized to review the farming activities done by cooperatives and confirm the progress of record keeping and calculate the net income. Annual flow of RAB-SMAP activities are shown as next figure.

Annual Flow of RAB-SMAP Activities

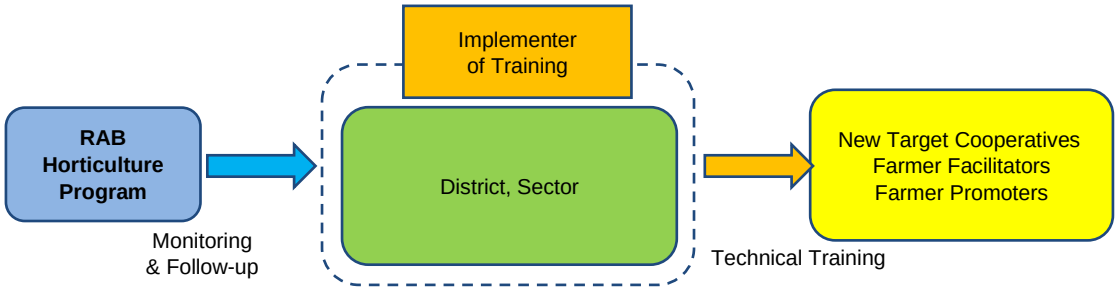


3. RAB-SMAP Implementation System

For sustainable implementation system at district and sector level, RAB-SMAP activities should be implemented by RAB in the 1st year in order to enhance the capacity of districts and sectors to disseminate the market-oriented agriculture. From the 2nd year, Districts and sectors become to implement it by themselves with the support from RAB. Implementation structure of RAB-SMAP is presented as follows.



Direct Support System by RAB-SMAP in the 1st year



Indirect Support System initiated by Target District (from the 2nd year)

4. RAB-SMAP Activities

<<Option>>

For selecting the target districts, "Sensitization Meeting at Provincial Level" should be conducted to share the objectives and schedule of RAB-SMAP activities and the selection process of target districts at Provincial level.

1) Sensitization Meeting at Provincial Level

Objective

To explain the RAB-SMAP outline and the selection process of target districts briefly to the district stakeholders. At this time, the application form (for district selection) is explained and distributed to the participants.

Arrangement

RAB officers invite concerned participants from the district such as i) Director of Agriculture, ii) District Agronomist Officers, iii) Cash Crop Officers, iv) District Cooperative Officers, v) Representative of Union of horticulture cooperatives, and vi) other stakeholders involved in horticulture activities.

2) Selection of Target Districts

Annually, RAB should select some target districts to implement RAB-SMAP Activities. After the sensitization meeting at provincial level, motivated districts fill in the Proposal Form (Appendix B-1) and submit it to the agreed RAB Station office. RAB officers conducts a scoring of districts by using an Evaluation Form for selecting the target Districts (Appendix B-2) according to the area covered by the concerned RAB Station.

Appendix B-1: Proposal Form for Districts Selection

Appendix B-2: Proposal Evaluation Form for Districts Selection

4.1 Sensitization Workshop at District Level

Objective

The objective of the Sensitization Workshop at district level is to introduce RAB-SMAP to District and Sector officers related to agriculture, especially horticulture, cooperative, gender and other potential officers.

Arrangement and activities

RAB officers should send an official request letter to the district leaders for inviting concerned participants to the Sensitization Workshop: for example, i) District Officers for Agriculture (Director of Agriculture, District Agronomist, Cash Crop Officer etc.) ii) Sector Agronomists officers, iii) Sector Cooperative Officers, iv) Other concerned stakeholders involved in horticulture activities in the District. Moreover, districts will be offered officially to prepare the short list of horticulture cooperatives which has a potential to be commercialized.

At this workshop, the RAB officers explain what is the RAB-SMAP, how to select the target cooperatives and how to implement the RAB-SMAP activities in a year and after 2nd year. At the same time, the RAB officers should explain how to continue the RAB-SMAP activities by Districts from 2nd year. RAB should make a Memorandum of Understanding (MoU) for continuously and sustainability conducting of the RAB-SMAP activities with Districts.

Sample of time schedule of the Sensitization Workshop

Time	Contents
8:00 - 8:10	Opening remarks and Introduction
8:10 – 8:40	Presentation on RAB-SMAP activities by RAB officers
8:40 - 8:50	Question and Answer
8:50 – 9:00	Closing remarks

Appendix A-1: RAB-SMAP Introduction Presentation to Districts_2019ver

Appendix A-2: Sample of Letter to Districts on Sensitization WS

<<Option>>

For selecting the horticulture cooperatives, it is better to adopt the proposal system. With the proposal system, motivated cooperatives can be fairly selected by scoring of proposal from each cooperative. If the proposal system is adopted, the contents of application form for cooperative selection and deadline for submission are explained and discussed during this half day workshop. In addition, filling the proposal format by cooperatives should be supported by Sector Agronomist.

Appendix B-3: Proposal Form for Cooperative Selection in Kinyarwanda

4.2 Selection of Target Cooperatives

Objective

The objective of this activity is to select the target cooperatives by RAB in collaboration with Districts.

Arrangement and activities

According to the short list of horticulture cooperatives submitted by the district, RAB decide the date in order to visit the candidate cooperatives for an interview. When the RAB officers visit and observe the cooperatives' field, the form of criteria for cooperative selection should be filled up. The target cooperative should be decided based on the scoring.

Appendix A-3: Criteria for Cooperative Selection RAB-SMAP_March 2019

<<Option>>

In the case that proposal system is adopted for selecting the target cooperatives, RAB officers in collaboration with district officers (Unit of Agriculture) conduct a pre-selection of cooperatives by evaluating the proposal form by scoring with "Proposal Evaluation Form for Cooperative Selection in English".

The preselected cooperatives are visited on field in order to verify the information provided by applicants, check availability of cooperative's farmland and availability of water resource. The cooperatives with high scores are selected. The accessibility of Demonstration Training Farm (DT-F), the motivation of cooperative (with responsible sector Agronomist) and availability of irrigation water are the main selection criteria.

Appendix B-4: Proposal Evaluation Form for Cooperative Selection in English

4.3 Kickoff Workshop with Target Cooperatives

Objective

Before starting trainings, it is necessary to hold a Kickoff Workshop with each target cooperative in order to confirm training modalities and to make agreement on implementation framework of trainings and clarify the roles and responsibilities of each stakeholder, RAB, District/ Sector and Cooperatives.

Arrangement and activities

The target cooperative with project staffs decide meeting day and place for meeting and invite participants to attend meeting. The meeting place can be any place nearby cooperative farmland, where member used to meet. It is better to invite the cooperative board members, some cooperative model farmers and farmer promoters of the target cooperative. If District and Sector Agronomists are available, they should attend the workshop to mobilize farmers to attend that meeting.

Within the Kickoff Workshop, the implementation framework of training program is confirmed as well as the roles and responsibilities for each stakeholder. It is important to identify the location of

demonstration training farm.

This activity can be combined with Cooperative management and Gender mainstreaming training mentioned in 4.7 and marketing training in 4.8 depends on the availability of budget.

Sample of time schedule of the Kickoff Workshop

Time	Contents
8:00 - 8:10	Opening remarks and Introduction
8:10 – 8:40	Presentation on RAB-SMAP activities by RAB officers
8:40 - 8:50	Question and Answer
8:50 – 9:00	Closing remarks

4.4 Baseline survey

Objective

Baseline survey is essential for the implementers such as RAB and Districts to monitor the changes and progress of target cooperative brought from the RAB-SMAP activities. Moreover, it helps the target cooperatives to know and understand their current situation. The baseline survey should be done before the cultivation training start.

Arrangement and activities

RAB officers distribute the Attachment "Baseline-End-line format for Cooperative in Kinyarwanda" to the target cooperatives. When the cooperative members fill up the baseline survey format with the amount, income, and cost of the vegetable production in cooperative's farmland in last one year, the gross profit can be calculated automatically.

AppendixA-4: Baseline- End-line format for Cooperative in Kinyarwanda

4.5 ToT for Cooperative Management and Gender Mainstreaming

Objective

Cooperative management and gender mainstreaming in RAB-SMAP is a "BOND to strengthen activities which will increase the **yield** and **profit** of cooperative".

The production techniques introduced by SMAP are all very simple, and they don't require big machinery nor newly advanced technologies or expensive inputs. By introducing a small changes in how farmers used to grow the vegetables, they would find that the crops are different from how it used to be; increase in amount, good quality, and cheaper input as understanding the right timing and right dozes to apply pesticides and fertilizers. Thus, the cultivation techniques introduced by RAB-SMAP require much group work and communications between the members and here comes the "cooperative management".

RAB-SMAP strengthens the cooperative to increase productivity and profit. Because the activities carried out in cooperative are linked on the Family members' activities, the training topics is built on

two parts; "**family**", which is the smallest unit behind the cooperative members, and "**cooperative**".

Arrangement and activities

The training activity starts from "family" parts, namely "Gender" and "Family Budgeting" topics which the participants take time to discuss and review their own situation and think whether there are any in-balance and/or inequality. Based on these two topics, cooperative management would be discussed in four different topics to understand about the basics of operating "Cooperative". These four different topics are; Understanding Cooperative, Leadership, Record management and Bookkeeping.

It is better to use the banner of blank format for the group work in the training.

The number of participants depends on the budget available for this activity. However, as much as possible, gender balance is considered by inviting the same number of male and female participants.

Within two days at least, the training is organized in a conference room where the participants can conduct some group exercises out of the plenary sessions. This activity can be combined with the Kickoff Workshop in 4.5 and Marketing Training in 4.8 depends on the availability of budget.

Sample of time schedule of the ToT on Cooperative Management and Gender Mainstreaming

	Time	Content
Day 1	08:00 -	Registration
	09:00	Opening, Introduction to SMAP
	09:30	Introduction to Coop Management/ Gender Training
	09:45	GENDER Session
	12:30	Lunch Break
	13:30	Recap + FAMILY BUDGETING Session
	15:30	Recap + COOPERATIVE Session
Day 2	08:00	Recap + LEADERSHIP Session
	10:00	Recap + RECORD MANAGEMENT session
	12:30	Lunch
	13:30	Recap + BOOK KEEPING + Recap
	15:00	・ Brief Explanation of GEL ・ Recap of Coop Management/ Gender ・ How to disseminate your learning to other members?
	16:00	Closing

4.6 ToT for Market Survey

Objective

Marketing survey is a main concept in RAB-SMAP activities to understand the "market-oriented agriculture" and concept of RAB-SMAP, "Grow to Sell."

Arrangement and activities

The training activity starts from "Basic Knowledge of Marketing Activities" for understanding what market-oriented agriculture is. It is required for farmers to make decision of crops selection and an annual action plan, etc. based on reliable market information. In this session, participants should understand what kind of information they need to collect in the market, how to collect the information and how to select most profitable market for them.

Generally, on the second day of the training, RAB officers should arrange the transportation means from the workshop venue to nearby the market. In addition, it is better to inform to the representatives or in-charge person of the certain market before. After conducting the market survey in the certain market, participants should return to the hall and continue to receive the training.

The training materials of the marketing training are MAEP, Marketing Technical Manual for Market-oriented Agriculture organized by RAB and SMAP in March 2018.

The number of participants depends on the budget available for this activity. However, as much as possible, gender balance is considered by inviting the same number of male and female participants.

Within two days at least, the training is organized in a conference room where the participants can conduct some group exercises out of the plenary sessions.

This activity can be combined with the Kickoff Workshop in 4.5 and Cooperative management and Gender mainstreaming training mentioned in 4.7 depends on the availability of budget.

Sample of time schedule of the Marketing Training

[1st day]

Time	Contents
8:00 － 8:30	Registration
8:30 － 9:00	Opening Remarks and Self-Introduction
9:00 － 11:00	Basic knowledge of Marketing
11:15 － 12:30	Lunch Break
12:30 － 13:30	Participatory Market Survey
13:30 － 14:00	Question and Answer

[2nd day]

Time	Contents
7:30 － 10:30	Registration and Participatory Market Survey in the Market
10:30 － 12:30	Crop Selection
12:30 － 13:30	Lunch Break
13:30 － 14:00	Recapitulation, Question and Answer, Closing remarks

4.7 Field training (including cultivation training from FFS-1 to FFS-5)

Objective

For internalizing the cultivation techniques of the vegetables, RAB officers should conduct a series of technical training from sowing to harvesting at the Demonstration and Training Farm (DT-Farm) in the cooperatives' field. Moreover, during the field training, the cooperatives should conduct other related activities and training themselves such as market survey, crop selection, making farming schedule, training for cooperative management and gender mainstreaming etc.

Arrangement and activities

After the ToT for Marketing and before the cultivation training, the cooperatives should start the market survey at all the markets which can be target market. The cooperative members who participated the ToT should instruct other cooperative members to do market survey. Then the cooperatives should select the target crops and decide the farming schedule.

The cooperative members who participated in the ToT for Cooperative Management and Gender Mainstreaming should conduct the same training to the other cooperative members. For example, the training for a few of themes of the contents can be conducted in their own monthly meeting.

For cultivation training, RAB officers should request the cooperatives to establish DT-Farm where most of cooperative members can easily access. The detail arrangement and activities of each FFS are mentioned following attachment.

All cooperative members can participate the cultivation training and Sector Agronomist in-charge of the sector where the cooperative is locating.

Appendix A-5: Implementation Guideline of FFSs

4.8 End-line Survey and Profit Analysis Workshop

Objective

The objective of the End-line Survey and Profit Analysis Workshop is to make the target cooperatives evaluate the progress and result of their activities in a year. Moreover, RAB can monitor and find the effect of RAB-SMAP activities in the target cooperatives.

Arrangement and activities

RAB officers should distribute the same format "Baseline-End-line format for Cooperative in Kinyarwanda" as an evaluation survey and request the target cooperatives to fill it up.

In the Profit Analysis Workshop, the RAB officers and cooperative members should confirm the result, changes and challenges through the cooperative's activities in one year and share it with District related officers.

The number of participants depends on the budget available for this activity. However, as much as possible, gender balance is considered by inviting the same number of male and female participants.

For one day, the workshop is organized in a conference room where the participants can conduct some group exercises out of the plenary sessions.

Sample of time schedule of the Profit Analysis Workshop

Time	Contents
8:00 - 8:10	Opening remarks and Introduction
8:10 – 8:40	Sharing the result of the cooperative (Profit and other activities)
8:40 - 9:30	Question and Answer, Recommendation and other comments from stakeholders; RAB officers, District officers and Sector

Time	Contents
	officers
9:30 - 9:50	Sharing the Action Plan by the cooperative
9:50 – 10:00	Closing remarks

Appendix A-6-1: Workshop for Profit Analysis and Evaluation of Action Plan

Appendix A-6-2: Input Cost Calculation Form

Appendix A-6-3: Sales Income Calculation Form

4.9 Monitoring and Evaluation

Objective

RAB officers should visit the target cooperatives at least once in two weeks for monitoring activity. There are mainly two objectives for monitoring activity, 1) to know the progress of plant growth so that RAB officers can decide the appropriate date of the next cultivation training, and 2) to identify the problems or needs which farmers are facing in their cultivation. RAB officers have a responsibility to take actions against such farmers' obstacles.

Besides, RAB officers should evaluate the cultivation activity including marketing, cooperative management, and gender with beneficially farmers. The Objectives of evaluation are 1) to review farmers' cultivation activity, and 2) to improve the future cultivation activity based on their self-evaluation of the last activity. Therefore, the evaluation must be conducted in every cultivation period.

Arrangement and activities

Monitoring and evaluation activities should start early days of the beginning of cultivation season or directly after cultivation training session. It can be done by field monitoring visit or monitoring phone calls to farmers. RAB officers should cooperate District Agronomist and Sector Agronomist to implement monitoring and evaluation activity.

Before monitoring visit, RAB officers must investigate the suitable day for visit in order to meet many farmers on the field so that RAB officers' remarks will reach as many farmers as possible. For example, the day of collective activities. Then, RAB officers will need to inform cooperative leaders about the visit and its objective and target farmers to invite.

Main activities for monitoring field visit are:

- Field observation: RAB officers should observe and evaluate the implementation and adoption of cultivation techniques, which farmers learnt from cultivation trainings in the cooperative field and individual farmers as well. He will give necessary remarks if required.
- Plant check: RAB officers should check health conditions of the plants, such as plant growth, pest and diseases, flowers and fruits in order to recommend necessary practice to make for plant management.
- Record and bookkeeping check: RAB officers should monitor how farmers record cooperative farming activities, expenditures and incomes which will facilitate profit analysis activities.

- Farmer's interview: RAB officers should make interview with farmers in order to observe their understanding on new learnt techniques, challenges and countermeasures taken. After the interview, RAB officers should give farmers some remarks, advises or recommendations regarding his findings.
- Farmers' self-evaluation: At each end of the cultivation period, RAB officers should facilitate farmers' self-evaluation of the cultivation activity. Farmers are expected to identify the issues which they faced during the cultivation activity. RAB officers should help famers to think how to overcome the issues and how to improve their cultivation activity in the next season. RAB officers should also encourage farmers to continue to practice the new learnt technique.

Before the end of visit, RAB staff will make closing remarks and announce future schedule and plans.

Appendixes:

Appendix A-1. RAB-SMAP Introduction Presentation to Districts

Appendix A-2. Sample of Invitation Letter to Districts on Sensitization Workshop

Appendix A-3. Criteria for Cooperative Selection

Appendix A-4. Baseline-End-line Format for Cooperative in Kinyarwanda

Appendix A-5. Implementation Guideline of FFSs

Appendix A-6. Profit Analysis Workshop Materials

Appendix A-6-1. Workshop for Profit Analysis and Evaluation of Action Plan

Appendix A-6-2. Input Cost Calculation Form

Appendix A-6-3. Sales Income Calculation Form

Appendix A-7. MoU Materials

Appendix A-7-1. Memorandum and Understanding between RAB and Districts

Appendix A-7-2. MoU_Annex1, 2 & 3

Appendix A-8. List of MAEP (Technical Training Materials)

Appendix A-9. Annual Schedule of RAB-SMAP Activity and Budget

Appendix B-1. Proposal Form for Districts Selection

Appendix B-2. Proposal Evaluation Form for Districts Selection

Appendix B-3. Proposal Form for Cooperative Selection in Kinyarwanda

Appendix B-4. Proposal Evaluation Form for Cooperative Selection in English

Gusobanura igikorwa cy'ubuhinzi bw'imboga bucirirtse buhingira Isoko

(RAB-SMAP)

Gashyantare-Werurwe 2019

1

Intego z'igikorwa

- Kurwanya imirire mibi n'igwingira ry'abana biciye mukubona imboga zihagije barya
- Kongera ubushobozi mu gushyira mu bikorwa no kunoza tekinike ku buhinzi bw'imboga kubafatanya bikorwa ba RAB (Akarere/Imirenge)
- Guhindura ubuhinzi busanzwe bukorwa n'abahinzi bacirirtse bibanda guhingira isoko
- Gufasha mu kongera inyungu abahinzi bacirirtse bavana muguhinga imboga

2

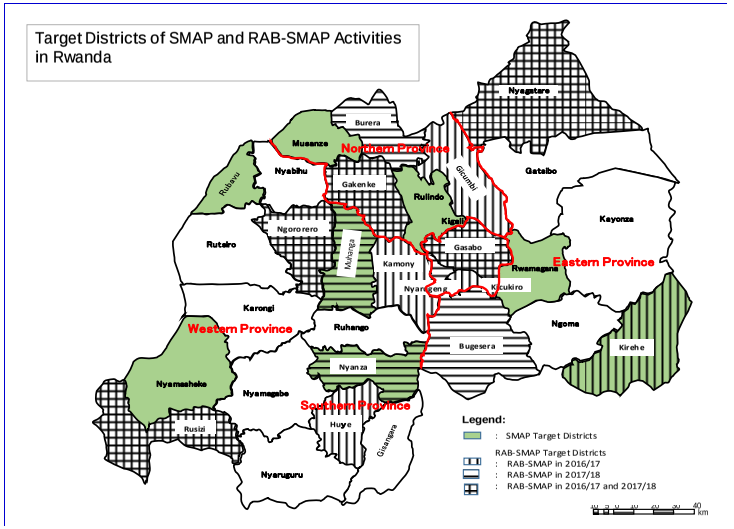
Aho igikorwa kizakorerwa

- Mu turere 10 mu gihugu aritwo: G**atsibo, Kayonza, Ngoma, Nyabihu, Rutsiro, Karongi, Nyamagabe, Nyaruguru, Gisagara na Ruhango**

Inzego zishinzwe kubishyira mu bikorwa no kubikurikirana

- Minisiteri y'Ubuhinzi n'Ubworozi (MINAGRI)
  - Ikigo cy'igihugu gishinzwe guteza imbere ubuhinzi (RAB)
- Uturere twatoranyijwe n'Imirenge

3



4

Ibyagezweho mu bikorwa bya RAB-SMAP

Akarere	Umubare w'amakoperative yahuguwe	Umubare w'abahinzi bahagarariye abandi bahuguwe	Umubare w'abanyamuryango bahuguwe n'ababahagarariye
Gasabo	5	20	727
Nyarugenge	5	20	348
Nyagatare	5	20	161
Bugesera	5	20	343
Ngororero	5	20	90
Rusizi	5	20	184
Muhanga	5	20	2,864
Nyanza	5	20	150
Burera	5	20	2,434
Gakenke	5	20	174
Igiteranyo	**50**	**200**	**7,475**

5

Amafoto y'ibikorwa bya RAB-SMAP

Inana zo gutangiza ibikorwa bya RAB SMAP mu karere ka Gasabo

Amahugurwa ya RAB SMAP ku buringanire n'imicungire ya koperative

Ubushakashatsi ku isoko bukozwe n'abaanyamuryango ba koperative mu

Amahugurwa ya RAB SMAP yo mu murima mu karere ka Gasabo (FFS1)

6

Amafoto y'ibikorwa bya RAB-SMAP

Amahugurwa yo mu murima mu karere ka Nyarugenge (kugemura puwalo)

Amahugurwa yo gutera imvaruganda (NPK 171717) ya koperative zo mu karere ka Nyarugenge.

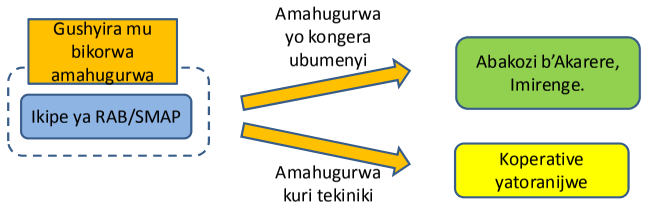
Amahugurwa yo kurinda indwara no gukoresha neza imiti y'ibihingwa mu karere ka Nyarugenge

Gusura no gukurikirana amakoperative ya RAB-SMAP mu karere ka Gakenke.

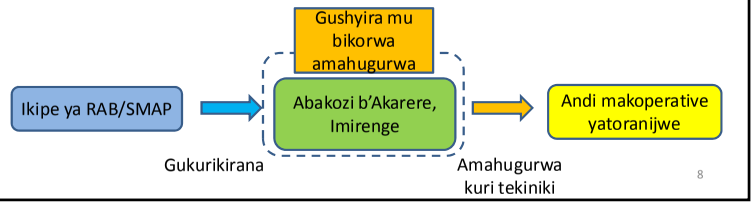
7

Inzira zo gushyira mu bikorwa amahugurwa ya tekiniki

Umwaka wa mbere (2019)



Umwaka wa 2 gukomeza (2020 – 2021)



8

Uburyo bw'imikoranire muri kino gikorwa nu turere

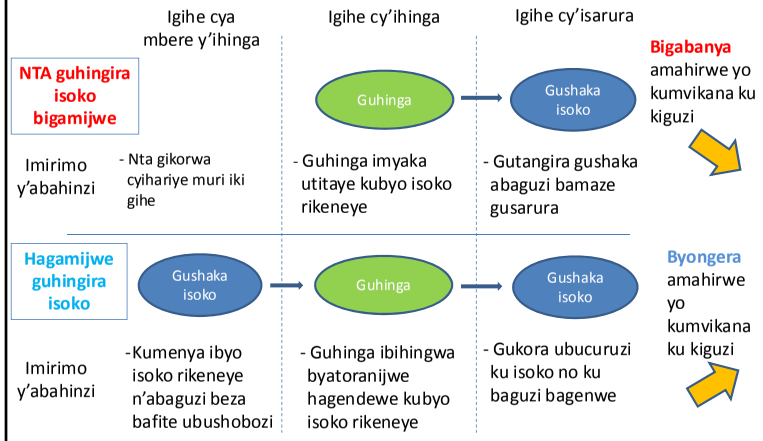
- Mu mwaka wa mbere w'ibikorwa (2019)
  - RAB-SMAP izatanga amahugurwa yose ateganyijwe kubahinzi nabakozi b'uturere n'imirenge ibasanze kumirima yama koperative yatoranyijwe
- Mu mwaka wa 2 no gukomeza (2020 – 2021)
  - Uturere tuzitoranyiriza andi ma koperative yo guhugurwa kandi banaya hugure
  - RAB-SMAP izajya ikorana n'uturere mu gukurikirana ibikorwa/amahugurwa
  - Amasezerano y'Ubwumvikane (MoU) azakorwa hagati ya RAB n'uturere kugira ngo ibikorwa byinjizwe mu mihigo y'uturere igikorwa gikorerwamo.

9

ISHINGIRO RY'UBURYO BWO GUHINGIRA ISOKO N'UBURYO BW'IYAMAMAZABUHINZI BUKORESHA GUHUGURA ABAZAHUGURA ABANDI.

10

Inyito y'Uburyo bwo guhinga uhingira isoko



Tangira ushaka isoko usoze ushaka isoko!

11

Ibikorwa bishingiye ku buryo bwo guhingira isoko

- Tangira ushaka isoko usoze ushaka isoko.
- Ibikorwa byo kureba itandukaniro ry'amasoko y'umusaruro n'abaguzi b'ingenzi baboneka hafi aho.

Gukora inyigo ku isoko	Gukora gahunda y'ihinga
Abahinzi barikorera ubwabo inyigo y'isoko bagamije gushoraho.	Nyuma y'inyigo y'isoko, abahinzi bakora gahunda y'ihinga bagendeye ku makuru yabonetse ku isoko.

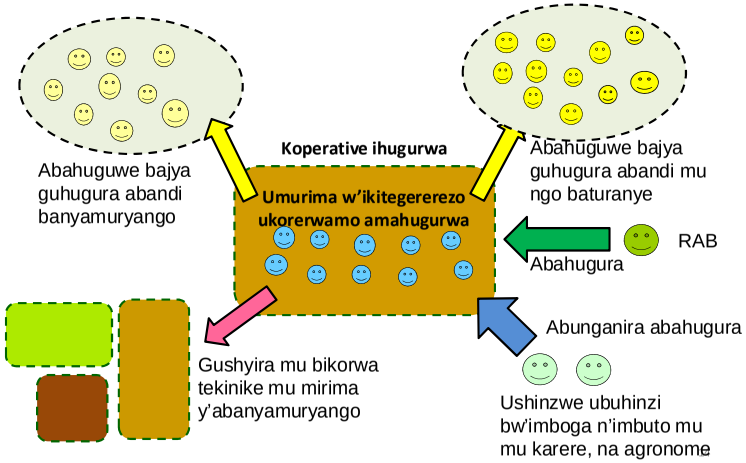
12

Uburyo bwo Guhugura abahugura abandi muri RAB/SMAP

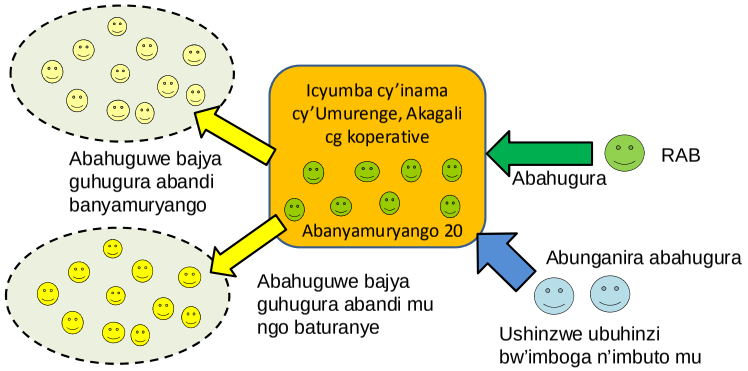
Ingingo y'amahugurwa	Aho amahugurwa abera	
• Tekiniki z'ubuhinzi	Umurima w'ikitegererezo wo guhugurirwamo ushyirwa kuri koperative yatoranyijwe Guhugurirwa mu kazi (mu murima)	
• Gushaka isoko • Uburinganire/ Imicungire ya koperative	Icyumba cy'inama cy'Umurenge cg Akagari cg koperative Guhugurirwa mu ishuri	

13

Uburyo bwo Guhugura abahugura abandi kuri tekiniki z'ubuhinzi



Amahugurwa y'abahugura abandi ku Gushaka isoko, uburinganire n'imicungire ya koperative



15

Imbumbe y'ibikorwa mu iyamamazabuhinzi bw'imboga buhingira isoko (MAEP)

1. Guhitamo amakoperative azahabwa amahugurwa
2. Amahugurwa ku buringanire, Imiyoborere n'imicungire ya Koperative
3. Amahugurwa ku Gushaka amasoko
4. Inyigo y'itangiriro (baseline survey)
5. Amahugurwa ku buhinzi (bw'imboga)
6. Isuzuma ryo mu cyiciro cya mbere no mu mpera (midterm and end evaluation)

16

Uruhererekane rw'amahugurwa ku buhinzi bw'imboga

	Activity/Month	1	2	3	4	5	6	7	8	9	10	11	12	1
1	Guhitamo amakopeartive azahugurwa			▲										
2	Inama zo gutangiza ibikorwa mu makoperative yatoranijwe			▲										
3	Amahugurwa ku buringanire n'imicungire ya koperative no gushaka isoko			↔										
4	Inyigo y'itangiriro			▲										
5	Amahugurwa ku buhinzi				←			→		←			→	
8	Gukurikirana no kugenzura								▲					▲

17

Amahugurwa ku buringanire n'imicungire ya Koperative

- **Ikigamijwe**
  Guteza imbere ihame ry'uburinganire no kumenya uburyo nyabwo bwo gucunga koperative.
- **Ingingo z'amahugurwa**
  Ihame ry'uburinganire, Kubika neza ibitabo, Imicungire ya koperative, Imiyoborere myiza, etc.

Amahugurwa ku gushaka amasoko

- **Ingingo z'amahugurwa**
  Ubumenyi bw'ibanze mu gushaka amasoko, Guhitamo ibihingwa, Gukora gahunda y'ibikorwa
- **Ishyira mu bikorwa**
  Gukora inyigo ku isoko bikozwe n'abahinzi ubwabo

Amahugurwa ku buhinzi (FFS-1)

- **Ingingo z'amahugurwa**
  Gukora gahunda y'ihinga, Isimburanyabihingwa, Gutegura imbuto, Gufata ibipimo mu murima, Gukora ubuhumbikiro.
- **Ibihingwa bigamijwe muri FFS**
  Ibihingwa byemezwa n'abahinzi bivuye ku makuru y'ibyavuye ku bushakashatsi ku isoko (urugero: Inyanya, Intoryi, Amashu, n'ibindi)

Amahugurwa ku buhinzi (FFS-2)

- **Ingingo z'amahugurwa**
  Ibiranga urugemwe rwiza, Intera yo kugemuriraho, Gukora imitabo, Kwicira (kuri karoti)




Amahugurwa ku buhinzi (FFS-3)

- **Ingingo z'amahugurwa**
  Kwongeramo ifumbire bwa mbere,Gusasira no Gukora imborera mu byatsi



Amahugurwa ku buhinzi (FFS-4)

- **Ingingo z'amahugurwa**
  Kwongeramo ifumbire bwa kabiri, Kurinda ibihingwa, gukoresha imiti ivura ibihingwa, Indwara n'ibyonnyi.



Amahugurwa ku buhinzi (FFS-5)

- **Ingingo z'amahugurwa**
  Igihe cyo gusarura, Uburyo bwo gusarura, Uburyo bwo gutwara umusaruro , Kujonjora





Gahunda y'agateganyo yo guhitamo amakoperative azahugurwa

Mu mpera za Gashyantare: Inama tekinike ya mbere muri buri karere katoranijwe

Kumenya amakoperative akorera mu karere: RAB izahabwa urutonde rw'amakoperative ahinga imboga ruzakorwa n'akarere.

Guhitamo koperative 5 zihabwa amahirwe menshi: RAB izahitamo ifatanyije n'abashinzwe ubuhinzi mu karere.

Gusura imirima bikozwe na RAB n'akarere: RAB n'akarere bazasura ayo makoperative 5 bayasuzume bakoresheje ifishi y'isuzuma

Kwemeza no gutangariza akarere ibyemejwe: RAB izemeza koperative 1 nk'iyatoranijwe guhugurwa na RAB SMAP bigendeye ku manota zabonye mu kuzisura.

25

Abahinzi bishimira umusaruro babonye wamashu nyuma yamahugurwa ya RAB-SMAP aho babona ishu y'ibiro 5-6Kg kuva kuri 1-2 kg babonaga cyera

26

Murakoze cyane

27

Appendix A-2. Sample of Invitation Letter to Districts on Sensitization Workshop

REPUBLIC OF RWANDA
RWANDA AGRICULTURE AND ANIMAL RESOURCES DEVELOPMENT BOARD (RAB)
Office of the Director General
Kigali Rwanda

Kigali, on……../……./
Ref N°.....

To: Mayor of……

Subject: Introduction meeting at district

Dear Sir / Madam,

RAB are going to implement RAB-SMAP (Smallholder Market-oriented Agriculture Project) activities during this ..... Cropping seasons as a direct implementation of the initiative in ..... Districts countrywide.

In this connection we would like to request your District to organize a one day sensitization meeting to the Director of agriculture and Animal Resources, Cash Crop Officer, District Agronomist officer, all sector agronomists and sector cooperatives officers to get more explanations on the selection of target horticulture cooperatives.

The District is request to invite sector staffs and avail the meeting room on the decided date.

In case there is need of further explanations, please contact ....., the Program Leader of RAB Horticulture Program, on Cell Phone .....

I thank you for our usual good collaboration.

……
Director General of RAB

VEGETABLE COOPERATIVE LIST PER DISTRICT

No	Name of cooperative	Location of cooperative	Main Crops cultivated	Date of cooperative creation	Members		Cooperative Land size	Name of Cooperative representative& Contact
					Male	Female		

CRITERIA FOR COOPERATIVE SELECTION

No	Criteria	Observation	Score
1	Level of registration (District or RCA)		
2	Willingness to be given the training		
3	Availability of farmland (<1 ha)		
4	Cultivation of vegetables as main crop done year round;		
5	Availability of water for irrigation;		
6	Willingness to devote DT-farm site		
7	Willingness to devote manpower for DT-farm		
8	Willingness to devote necessary inputs		
9	Sector agronomist is willing to support the training and periodical monitoring		
10	Number of cooperative members (<10 pers);		
11	Availability of markets for vegetables;		
12	Transportation facilities		
13	Owned facility and equipment (Eg. Sprayer, Hoes,.)		
14	Supporting by other government program or donor/NGO (confirmation of duplication with other programs);		
15	Bank account availability; Capital, cash in hand and in bank		
16	Previous embezzlement (Kunyereza umutungo)		
17	Functioning status of supervisory committee		
18	Current problems and training needs		
19	Leadership and Personality of President		
20	Input supply in the locality		

**Score: Bad (0), Good (1)*

Appendix A-4. Baseline-End-line Format for Cooperative in Kinyarwanda

Ifishi yo kugenzura umusaruro n'Urwunguko (Umurima wa koperative)

Itariki y'Inyigo: _____. Izina rya Agronome:_____. .

Izina rya koperative: _____Umurenge: _____Akarere: _____Intara:_____.

Ubuso bwose bw'umurima: m_____X m _____ Cyangwa Hegitari _____ Umubare w'abanyamuryango: _____(Gabo: _____ Gore: _____).

	(1) Izina ry'igihingwa n'ubwoko bwacyo/	(2) Igihe cyahingiwemo (Ukwezi/ Umwaka kugera Ukwezi /Umwaka)	(3) Ubuso cyahinzweho (M x M cg Ha)		(4) Umusaruro wose wabonetse (kg)	(5) Ikigereranyo cy'umusaruro kuri hegitari Ha (kg/ha)	(6) Ingano y'ibyagurishijwe (kg)	(7) Ikigereranyo cy'ibyagurishijwe kuri Ha (kg/ha)	(8) Igiciro ku kilo (RWF/kg)	(9) Ayabonetse yose hamwe (RWF)	(10) Igishoro cyose (RWF)	(11) Inyungu nyayo (RWF)
			M X M (M^2)	Ha		(4) ÷(3)		(6) ÷(3)		(6) X (8)		(9) - (10)
1	Igihingwa cya 1:											
2	Igihingwa cya 2:											
3	Ikindi gihingwa:											
4	Ikindi gihingwa:											
5	Ikindi gihingwa:											
6	Ikindi gihingwa:											
7	Ikindi gihingwa:											
8	Ikindi gihingwa:											
9	Ikindi gihingwa:											
10	Ikindi gihingwa:											
11	Ikindi gihingwa:											
12	Ikindi gihingwa:											

ANDI MAKURU WATANGA:

ICYITONDERWA:

Subiza ibibazo byose byo mu tuzu tudafite irangi. Utuzu twijimye huzuzwa n'umukozi w'umushinga.

1. Izina ry'igihingwa n'ubwoko bwacyo: Erekana izina ry'igihingwa n'ubwoko. Ibihingwa dushaka ni imboga gusa arizo umushinga ukoreraho amahugurwa.

2 Igihe cyahingiwemo: Erekana ukwezi/umwaka ihinga ryatangiriye kugeza ukwezi/umwaka cyasaruriwemo

3 Ubuso cyahinzweho (M x M cyangwa Ha): Aho biruhije kugereranya ubuso muri hegitari, bishobora kubarwa mu burebure n'ubugari bw'umurima na metero kare.

4 Umusaruro wose wabonetse (kg): Abahinzi bagomba kwerekana umusaruro wose wabonetse mu biro kg ku buso icyo gihingwa cyahinzweho. Umusaruro wose ubarirwamo ibijya ku isoko (umusaruro mwiza) n'ibidacuruzwa cg ibyangiritse

5 Ikigereranyo cy'umusaruro kuri hegitari (kg/ha): Ni Umusaruro wose ubariyemo ibijya ku isoko n'ibidacuruzwa ugabanije ubuso byahinzweho (Aha huzuzwa n'umukozi w'umushinga abariye ku gisika 2 na 3)

6 Ingano y'ibyagurishijwe (kg): Ni umusururo wagurishijwe ni ukuvuga umusaruro wose dukuyemo ibidacuruzwa cg ibyangiritse

7 Ikigereranyo cy'ibyagurishijwe kuri Ha (kg/ha): Ni umusaruro wose dukuyemo ibidacuruzwa kugabanya ubuso byahinzweho (Ibi bibarwa n'umukozi w'umushinga yifashishije igisika cya 3 na 6)

8 Igiciro ku kilo (RWF/kg): Aho bacuruje bakoresheje ibundi buryo butari umunzani, bigomba kugereranywa mu biro (Urugero:agafuka ka Azamu, umubare w'amashu…)

9 Ayabonetse yose hamwe (RWF): Ni igiciro ku kilo dukubye ibiro byose byacurujwe (Ibi bibarwa wifashishije igisika cya 6 na 8)

10 Igishoro cyose (RWF): Ni igiteranyo cy'ibyaguzwe birimo:
- Ayaguzwe imbuto/n'ibikoresho byo gutera, ifumbire mvaruganda n'imborera, Imiti, isaso,...
- Ayishyuwe abakozi mu gukora ubuhumbikiro, kubwitako, kuhira, kurima, kongeramo ifumbire mvaruganda, kubagara, gukoramo isuku, gutera imiti, gushingirira, gusarura, ...
- Ayishyuwe kuhira no kuvomerera n'ubwikorezi

11 Inyungu nyayo (RWF): Ayabonetse yose hamwe dukuyemo igishoro cyose (Ibi bibarwa wifashishije igisika cya 9 ukuyemo 10)

Implementation Guideline of FFS-1

Preparation (Before 1 week of the Training)

- ✓ **Land:** Prepare the land for the making of nursery bed. It should be no weeds and at least ploughed two times. Decide the layout of nursery bed using a measuring tape.
- ✓ **Tools:** Prepare the necessary items and materials. Usually, the target cooperative can prepare most of the items except office tools such as Flipchart and Marker.

Items		
Flipchart Stand	Flipchart	Maker for Flipchart
Bench or Chair for Training	Copy of Training Material	
Agricultural Tools		
Hoe	Small Hoe	Trident Hoe
Bucket	Watering Can	Measuring Tape
Plastic Rope	Seed for Target Crops	Sprayer*
Cultivation Materials		
Mulching Material	Manure or Compost	Wooden Sticks
Banana Leafs & Stems	Plastic Pot & Tray (if possible)	Fungicide*
Pesticide*		

Note: * It is needed for daily management during from FFS-1 to FFS-2

Training (Day of FFS-1)

Registration: 8:00-8:30

Theoretical Training: 8:30 – 10:00 (1.5 hours)

- ➢ **Training material: H-G-01, H-G-02, H-G-03**

Training Topics:

1) Considerations of Market Requirement and Field Environment
2) Crop Rotation
3) Seed Preparation
4) Sowing and Raising Seedlings
5) Raising Seedlings in Nursery Bed
6) Raising Seedling in Nursery Pot made by Local Materials
7) Measurement Method on Field

Practical Training: 10:00 – 12:30 (2.5 hours)

Procedure:

1) Measure the land by measuring tape and put the wooden stick to make a nursery bed layout.
2) Make a guide rope for nursery bed by using plastic rope and wooden stick which put after measuring.
3) Plough and make the nursery bed by hoes.
4) Apply manure to the nursery bed and mix it with soil well.
5) Make leveling on the top of the ridge.
6) Make a sowing furrow on the nursery bed using the wooden stick with proper space by crop.
7) Sow the vegetable seeds to the sowing furrows with proper space by crop and cover it with soil.
8) Apply mulching material and much amount of water on the planted ridge.
9) Make planting pods by banana leafs
10) Mix two-thirds of soil and one-third of compost and fill it in the planting pods.
11) Sow seed in the planting pods and apply enough amount of water.

Wrap-up: 12:30 – 13:00 (0.5 hours)

Topics:

- To remind the training topics, ask the participants about newly learned knowledge or technics.
- Explain the daily management of nursery bed till the FFS-2 and also tell the tentative schedule of next FFS.

Payment

- Payment of allowance to the participants

Implementation Guideline of FFS-2

Preparation (Before 1 week of Training)

- ✓ **Land:** Prepare the land for transplanting ridge. It should be no weeds and at least ploughed two times. Decide the layout of transplanting ridge using a measuring tape.
- ✓ **Tools:** Prepare the necessary items and materials. Usually, the target cooperative can prepare most of the items except office tools such as Flipchart and Marker.

Items		
Flipchart Stand	Flipchart	Maker for Flipchart
Bench or Chair for Training	Copy of Training Material	
Agricultural Tools		
Hoe	Small Hoe	Trident Hoe
Bucket	Watering Can	Measuring Tape
Plastic Rope	Sprayer*	
Cultivation Materials		
Mulching Material	Manure / Compost	Wooden Sticks
Fertilizer NPK (17-17-17)	Fungicide*	Pesticide*

Note: *: It is needed for daily management during from FFS-2 to FFS-3

Training (Day of FFS-2)

Registration: 8:00-8:30

Theoretical Training: 8:30 – 10:00 (1.5 hours)

- ➢ **Training material: No.01 of target crops**

Training Topics:

1) Field Preparation
2) Field Layout and time of transplanting in each crop
3) Making planting ridge
4) Appropriate Up-rooting method and characteristic of appropriate seedlings
5) Advantage of mulching and ridging

Practical Training: 10:00 – 12:30 (2.5 hours)

Procedure:

1) Observe the nursery bed and discuss the management of the bed and the growth of seedlings.
2) Measure the land by measuring tape and put the wooden stick to make a planting ridge layout.
3) Make a guide rope for planting ridge by using plastic rope and wooden stick which put after measuring.
4) Plough and make the planting ridge by hoes.
5) Apply manure to the planting ridge and mix it with soil well.
6) Make leveling on the top of the ridge.
7) Apply water to the nursery bed and show how to up-root seedlings without any damage.
8) Explain the characteristic of appropriate seedlings.
9) Up-root the seedlings and transplant it on the planting ridge, and then apply water for the transplanted seedlings.
10) Conduct 1st thinning the Carrot and French bean seedlings (If cultivated).
11) Apply 1st top-dressing to the Carrot and French bean and apply water to the seedlings.

Wrap-up: 12:30 – 13:00 (0.5 hours)

Topics:

- To remind the training topics, ask the participants about newly learned knowledge or technics.
- Explain the daily management of farmland till the FFS-3 and also tell the tentative schedule of next FFS.

Payment

- Payment of allowance to the participants

Implementation Guideline of FFS-3

Preparation (Before 1 week of Training)

- ✓ **Land:** Prepare the land for transplanting ridge. It should be no weeds and at least ploughed two times. Decide the layout of transplanting ridge using a measuring tape. Find out the flat space for making rich husk charcoal and compost.
- ✓ **Tools:** Prepare the necessary items and materials. Usually, the target cooperative can prepare most of the items except rice husk office tools such as Flipchart and Marker.

Items		
Flipchart Stand	Flipchart	Maker for Flipchart
Bench or Chair for Training	Copy of Training Material	Match or Lighter
Agricultural Tools		
Hoe	Small Hoe	Trident Hoe
Bucket	Watering Can	Measuring Tape
Plastic Rope	Sprayer*	
Cultivation Materials		
Mulching Material	Manure or Compost	Wooden Sticks
Rice Husk	Material for Compost Making	Wooden Pole
Fertilizer NPK (17-17-17)	Fungicide*	Pesticide*

Note: *: It is needed for daily management during from FFS-3 to FFS-4

Training (Day of FFS-3)

Registration: 8:00-8:30

Start Making Rice Husk Charcoal: 8:30-8:45 (If avairable)

Theoretical Training: 8:45 – 10:15 (1.5 hours)

- ➢ **Training material: H-G-04, H-G-05 and No.01 of target crops**

Training Topics:

1) Rice Husk Charcoal making
2) Field Preparation, Field Layout and Transplanting time of remaining crops, e.g. Onion, Sweet Pepper and Eggplant
3) Making planting ridge
4) Top-dressing
5) Compost making

Practical Training: 10:15 – 12:45 (2.5 hours)

Procedure:

1) Observe the nursery bed and discuss the management of the bed and the growth of seedlings.
2) Measure the land by measuring tape and put the wooden stick to make a planting ridge layout.
3) Make a guide rope for planting ridge by using plastic rope and wooden stick which put after measuring.
4) Plough and make the planting ridge by hoes.
5) Apply manure to the planting ridge and mix it with soil well and make leveling on the top of the ridge.
7) Apply water to the nursery bed and show how to up-root seedlings without any damage.
8) Explain the characteristic of appropriate seedlings.
9) Up-root the seedlings and transplant it on the planting ridge, and then apply water for the transplanted seedlings.
10) Apply 1st top-dressing to the crops which are transplanted at the last FFS and apply water.
10) Conduct 2nd thinning the Carrot seedlings and apply 2nd top-dressing (If cultivated).
11) Make compost with grasses and cow dung and/or livestock's dung.
12) Spread the rice husk charcoal and apply water to avoid the over burning.

Wrap-up: 12:45 – 13:15 (0.5 hours)

Topics:

- To remind the training topics, ask the participants about newly learned knowledge or technics.
- Explain the daily management of farmland till the FFS-4 and also tell the tentative schedule of next FFS.

Payment

- Payment of allowance to the participants

Implementation Guideline of FFS-4

Preparation (Before 1 week of Training)

- ✓ **Land:** Observe the farmland and find-out any disease or damage of pests for showing at the practical training.
- ✓ **Tools:** Prepare the necessary items and materials. Usually, the target cooperative can prepare most of the items except office tools such as Flipchart and Marker.

Items		
Flipchart Stand	Flipchart	Maker for Flipchart
Bench or Chair for Training	Copy of Training Material	
Agricultural Tools		
Hoe	Small Hoe	Trident Hoe
Bucket	Watering Can	Sprayer
Spoon for Measuring	Glove for Spraying	Mask for Spraying
Cultivation Materials		
Fertilizer NPK (17-17-17)	Fungicide	Pesticide

Training (Day of FFS-4)

Registration: 8:00-8:30

Theoretical Training: 8:30 – 10:00 (1.5 hours)

- **Training material: H-G-06, H-G-07 and No.02 of target crops**

Training Topics:

1) IPM
2) Agricultural chemicals and the appropriate applying method (e.g. Type, Dosage, etc.)
3) Appropriate wear for applying agricultural chemicals (e.g. Mask, Glove, Cap, Goggle, etc.)
3) Diseases and Pests and the Control Method of the Target Crops

Practical Training: 10:00 – 12:30 (2.5 hours)

Procedure:

1) Explain the Diseases and Pest at the Training Field with showing the affected crops.
2) Explain the appropriate cloth for Spraying on the field.
3) Explain the appropriate dosage of Agricultural chemicals on the field.
4) Applying the Agricultural Chemicals on the field.
5) 2nd top-dressing for target crops.
6) Observe the Condition of the Compost and Turn over it.
7) Harvest the crops (If possible)

Wrap-up: 12:30 – 13:00 (0.5 hours)

Topics:

- To remind the training topics, ask the participants about newly learned knowledge or technics.
- Explain the daily management of farmland till the FFS-5 and also tell the tentative schedule of next FFS.

Payment

- Payment of allowance to the participants

Implementation Guideline of FFS-5

Preparation (Before 1 week of Training)

- ✓ **Crop:** Check the degree of ripeness of target crops. Observe the farmland and find-out any disease or damage of pests for showing at the practical training.
- ✓ **Tools:** Prepare the necessary items and materials. Usually, the target cooperative can prepare most of the items except office tools such as Flipchart and Marker.

Items		
Flipchart Stand	Flipchart	Maker for Flipchart
Bench or Chair for Training	Copy of Training Material	Self-evaluation format
Agricultural Tools		
Small Hoe	Scissors for harvesting	Plastic Container
Bucket	Weight Scale	

Training (Day of FFS-5)

Registration: 8:00-8:30

Theoretical Training: 8:30 – 9:30 (1.0 hours)

- ➢ **Training material: H-G-08**

Training Topics:

1) Appropriate Harvesting Period
2) Appropriate Harvesting Tools
3) Appropriate Container or Box for Transportation
3) Appropriate Place for keeping the produce.

Practical Training: 9:30 – 11:00 (1.5 hours)

Procedure:

1) Explain the Diseases and Pest at the Training Field with showing the affected crops.
2) Explain the appropriate maturing stage of each target crop.
3) Explain the harvesting using the appropriate tools (e.g. Scissors, Panga, etc.)
4) Explain the appropriate container for transportation.
5) Observe the Condition of the Compost and Turn over it.
6) Second top-dressing for the target crops (If necessary)

Review and Self-evaluation: 11:00 – 12:00 (1 hour)

Topics:

- Explain the importance of review and Self-evaluation of Cooperative Activities.
- Explain the topics of Review and Self-evaluation format.
- Decide the date of submission of the format to the officers.

Wrap-up: 12:00 – 12:30 (0.5 hours)

Topics:

- To remind the training topics, ask the participants about newly learned knowledge or technics.
- Explain the daily management of farmland till the harvesting and also tell the tentative schedule of next FFS.

Payment

- ➢ Payment of allowance to the participants

1

WORKSHOP FOR PROFIT ANALYSIS AND EVALUATION OF ACTION PLAN

2

Purpose of Profit Analysis

- To Know Whether Your Commercial Agriculture is Profitable, or Not.
- To Know Which Crops are Profitable or Less Profitable.
- To Know What Kinds of Production Costs are Significant in Your Production.

3

Step of Profit Analysis

1. Calculation of Sales Income in Each Crop
2. Calculation of Production Costs in Each Crop
3. Subtract the Production Costs from the Sales Income

4

Practice for Profit Analysis

1. Please Prepare Your Record Book for Sales Income and Production Costs.
2. Select One Crop for Your Practice for Profit Analysis
3. Fill up the “Inputs Cost Calculation Sheet” and Sales Amount Calculation Sheet” for Your selected Crop Based on Your Record Book.
4. Calculate Net Income on Your Selected Crop and Share the Information of Profits with Your Group Members

Required Material
- Record Book for Production Costs and Sales Income
- Practice Sheets of “Input cost calculation” and “sales amount calculation”
- Pen

5

Evaluation of Action Plan

- Action Plan Needs to be Evaluated at least Once in Half Year.
- Without Evaluation, Action Plan Becomes Meaningless.
- If There is Problems to Complete the Activity, Necessary Future Action should be Discussed with Cooperative Members.
- After Discussion, the Action Plan Has to be Revised to be More Practical Plan

6

Evaluation of Action Plan

Priority	Objective	Activity	Started on Time (Yes or No)	Reason of Delay or Failure (If Its not on schedule)	Necessary Future Action

After Evaluation, Please Discuss about Revising Your Action Plan

7

Revising Action Plan

Priority	Objective	Activity	Stage	Resources	Implementer...
		Activity from Former Action Plan			
		~~Activity from Former Action Plan~~			
		Activity form Necessary Future Action			

Please Continue Activity, If Its Important and not Completed

Please Delete Activity, If It is not Important or not Practical.

Please Add Necessary Activity from the Evaluation of Action Plan

Appendix A-6-2. Input Cost Calculation Form

Input Cost Calculation

Name of Cooperative: Crop Name:

Cultivation Area: Cultivation Period:

Date	Cost Item	RWF	Remarks

Total _____

Appendix A-6-3. Sales Income Calculation Form

Sales Income Calculation

Name of Cooperative: Crop Name:

Cultivation Area: Cultivation Period:

Date	Amount (kg)	Unit Price (RWF/kg)	Income (RWF)	Buyer Infomation

Total Income _____

REPUBLIC OF RWANDA

RWANDA AGRICULTURE AND ANIMAL RESOURCES DEVELOPMENT BOARD

(RAB)

PARTNERSHIP AGREEMENT TO PROMOTE HORTICULTURE PRODUCTION

between

RWANDA AGRICULTURE AND ANIMAL RESOURCES DEVELOPMENT BOARD (RAB)

And

NYARUGENGE DISTRICT

Kigali, January 2019

This partnership agreement is made by and between:

Rwanda Agriculture and Animal Resources Development Board (RAB), having its principal place of business at Rubirizi Cell, Kanombe Sector, Kicukiro District - Kigali City, P.O. Box 5016 Kigali - Rwanda, Website: www.rab.gov.rw represented by **Patrick KARANGWA (PhD),** the Director General**,** hereinafter referred to as "**RAB**";

and

Nyarugenge District, having its principal place of business at Nyamata, Website: http://www.nyarugenge.gov.rw, represented by **Mrs. KAYISIME NZARAMBA, the District Mayor,** hereinafter referred to as "**The District**";

WHEREAS, RAB aims to increase smallholder famers' income by implementing RAB/SMAP activity with utilizing Market-oriented Agriculture Extension Package (MAEP) through empowering District extension officers and target cooperatives countrywide.

WHEREAS, in Eastern Province, RAB/SMAP Program selected Nyarugenge District as a target District. In the 1st project year starting from January to December 2018, RAB provided necessary support to carry out RAB/SMAP activity and trainings for District officers so that they can conduct RAB/SMAP activity by themselves from the 2nd project year, starting from January to December 2019.

WHEREAS, RAB will continue to provide technical supports to Nyarugenge District in order to continue implementation of RAB/SMAP activity by their efforts.

WHEREAS, Nyarugenge District desired to be a target District of RAB/SMAP and ensure concerned District and Sector officers participated in all RAB/SMAP technical trainings in the 1st program year. From the 2nd year, Nyarugenge District committed to continue RAB/SMAP activities to expand SMAP techniques utilizing MAEP to all Sectors of the District. In order to do so, Nyarugenge District agreed to include RAB/SMAP activity into the District performance contract to secure necessary budget and human resource arrangement.

WHEREAS, the all parties have negotiated and have reached to certain understandings, and formal agreement to evidence and formalize such understandings is required.

NOW THEREFORE, the parties have agreed as follows:

Article 1: Purpose

The purpose of this agreement is to create a partnership and to clarify roles and responsibilities between RAB and the District to sustain RAB/SMAP (Smallholder Market-oriented Agriculture Project) activities.

An annual work schedule on the horticulture training program is shown in Annex 1.

Article 2: Duties and Responsibilities of the District

In this agreement, the District has following responsibilities:

- The District shall act as a coordinator to implement RAB/SMAP activities such as 1) Selecting 5 target cooperatives every year, 2) Organizing a series of trainings such as Cooperative management, Marketing, and FFS (Farmer Field School) 3 Conducting monitoring and follow up of target cooperatives.
- The District shall make an activity schedule and inform RAB in advance so that they can make a plan to participate;
- The District has to prepare quarterly and annual activity reports to share the progress of activities with RAB.

Article 3: Duties and Responsibilities of RAB

In this agreement, RAB has following responsibilities:

- To provide technical follow up and backstopping to the District;
- To provides supplementary trainings to District officers if deemed necessary to continue RAB/SMAP activities.

Article 4: Costs and work sharing and its review

Both parties to this agreement have agreed on the annual costs and work sharing to implement RAB/SMAP activity. Details of costs and work sharing are shown in Annex 2 and Annex 3.

Every year, both parties shall agree on the new costs and work sharing for the concerned year.

Article 5: Reporting

The result of Baseline and End-line survey shall be submitted by the District to RAB in each year.

Article 6: Conflict resolution

Both Parties shall attempt in good faith to negotiate a settlement to any dispute between them arising out of or in connection with the agreement.

If both parties cannot settle the dispute amicably, the agreement shall be terminated.

Article 7: Amendment and Termination

Any amendment on this agreement shall be made through mutual agreement by both parties and put in writing, signed and dated prior to any changes being affected.

Any of both parties in writing, may terminate the agreement by giving in writing a notification of thirty (30) days' notice to the other party.

Article 8: Duration

This agreement is effective from the date of signature and will be effective forever in the District as they have to disseminate all time the Horticulture cultivation techniques to the District farmers.

IN WITNESS WHEREOF, the respective parties have executed this partnership agreement on the dates indicated below.

Done at Nyarugenge on _____

Signature_____	Signature _____
Mrs. XXXXXXX	**Mr. XXXXXXX**
District Mayor,	**Director General,**
Nyarugenge District	Rwanda Agriculture and Animal Resources Development Board (RAB)

Annex 1 Annual Work Schedule on Horticulture Training Program (2018/19 to 2019/20)

	Major Activity for Horticulture Training Program	2nd Project Year																																		Concerned
		2019																									2020										
		Apr			May			Jun			Jul			Aug			Sept			Oct			Nov			Dec			Jan			Feb			Mar			
		E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
1	**Announcement of selecting target coops by proposal approach**		■	■	■																																DAOs, SA, Coop
	Final decision of the target coop.				■																																DAOs, DCO
2	**Kick off Workshop at the Target Coop**				■																																SA,SCO, Coop
3	**Purchase and Delivery of Inputs of Training**					■																															District Office
4	**TOT for Gender/ Organization Training and Marketing Training**					■																															RAB, DAOs, DCO, DGO, SA, SCO, Coop
5	**Baseline and End-line survey**					Baseline ■	■	■	■																									End-line ■	■	■	SA, SCO, Coop
6	**Field Training**										First Cropping												Second Cropping														
	1) Marketing survey and planting plan making					■	■													■	■																Coop
	2) Gender/ organization training					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	SA, SCO, Coop
	3) FFS-1 Seedbed making, Cropping plan, Cropping map							■	■														■	■													RAB, DAOs, SA, SCO, Coop, FP
	4) FFS-2 Transplanting										■	■														■	■										
	5) FFS-3 1st Topdressing													■	■														■	■								
	6) FFS-4 2nd Top Dressing, Pest and disease management															■	■														■	■						
	7) FFS-5 Harvesting																	■	■																		
7	**Monitoring Activity for Target Coops**								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	DAOs, SA, SCO

Note: DAOs: District Agriculture Officers, DCO: District Cooperative Officer, DGO: District Gender Officer, SA: Sector Agronomist, SCO: Sector Cooperative Officer, Coop: Cooperative Farmers, FP: Farmers Promotor

Annex 2 Work Sharing and Cost Sharing on Horticulture Training

Mandatory Activity

Major Activity for Horticulture Training Program	District	RAB	Cooperative	Budget	Stakeholders concerned
1 Sensitization workshop				included in regular activity	RAB
Organizer		◎			
Material		◎			
2 Commencement of selecting target coops by proposal approach				included in regular activity	DAOs, SA, RAB
Explanation of proposal to coops	◎	○			
Evaluation and Selection of target coops	◎	○			
3 Kick off WS at the Target Coops				80,000	DAOs, SA, RAB
Organizer/Explanation of Implementation	◎	○			
4 TOT training for Gender/ Organization Marketing to target coops				2,740,000	DAOs, SA, RAB
Organizer	◎				
Lecturer	○	○			
Training Material		◎			
5 Baseline & Endline Survey to the target coops	◎			included in regular activity	DOAs, SA
6 Preparation of Inputs for FFS Training	◎				District Office
7 FFS Training in the 2nd Year (First Cropping)					RAB, DAOs, DCO, SA, SCO, Coop, FP
Organizer	◎				
Lecturer	◎	◎			
Farming inputs & Equipment			◎		
Training Material		◎			
Follow up	◎	○			
1) FFS-1 Seedbed making, Cropping plan, Cropping map					
2) FFS-2 Transplanting					
3) FFS-3 1st Topdressing					
4) FFS-4 Pest and disease management					
5) FFS-5 2nd Topdressing				2,160,000	
8 FFS Training in the 2nd Year (Second Cropping)					
Organizer	◎				
Lecturer	◎	◎			
Farming inputs & Equipment			◎		
Training Material		◎			
Follow up	◎				
1) FFS-1 Seedbed making, Cropping plan, Cropping map					
2) FFS-2 Transplanting					
3) FFS-3 1st Topdressing					
4) FFS-4 Pest and disease management				1,348,000	
9 Monitoring Activity for Target Coops	◎			included in regular activity	SA
10 Meeting with Stakeholders in the Horticulture Program	◎	○			all stakeholders
Total				**6,328,000**	

Note: DAOs: District Agricultural Officers, DCO: District Cooperative Officer, SA: Sector Agronomist, SCO: Sector Cooperative Officer, Coop: Cooperative Farmers, FP: Farmers Promotor

Annex 3 Budget for SMAP Activity for the 2nd Project Year (Draft)

2) Mandatory Activities

	Activity / Cost Item	Budget	Responsible Stakeholders	Remarks
1	**Kick off workshop for target coops**			
	Transportation to District office	80,000	District Office	RWF8,000 X 2person X5coops.
	Total	**80,000**		
2	**TOT training for Gender and Organization and Marketing to target cooperatives**			
	Venue	200,000	District Office	RWF50,000 X 4days
	Lunch	560,000	District Office	RWF3,500 X 40person X 4days
	Transportation for RAB officers	160,000	RAB	RWF20,000 X 2person X 4days
	Transportation for sector officers	320,000	District Office	RWF8,000 X 2person X 5sectors X 4days
	Transportation for target farmers	640,000	District Office	RWF8,000 X 4person X 5coops X 4days
	Training material	800,000	RAB	Textbook, Banner
	Stationary	60,000	District Office	Flipchart, marker, pen, note, etc.
	Total	**2,740,000**		
3	**FFS Training for the 1st Cropping Period**			
	Transportation for RAB officers	200,000	RAB	RWF20,000 X 2person X 5times
	Transportation for district officer	80,000	District Office	RWF8,000 X 2person X 5times
	Transportation for sector officer	320,000	District Office	RWF8,000 X 2person X 4sector X 5times
	Transportation for farmers	960,000	District Office	RWF8,000 X 6person X 4coops X 5times
	Farming inputs & equipment	100,000	Target Cooperatives	Seeds, fertilizer, etc.
	Training material	500,000	RAB	Textbook
	Total	**2,160,000**		
4	**FFS Training for the 2nd Cropping Period**			
	Transportation for RAB officers	160,000	RAB	RWF20,000 X 2person X 4times
	Transportation for district officer	64,000	District Office	RWF8,000 X 2person X 4times
	Transportation for sector officer	256,000	District Office	RWF8,000 X 2person X 4sector X 4times
	Transportation for farmers	768,000	District Office	RWF8,000 X 6person X 4coops X 4times
	Farming inputs & equipment	100,000	Target Cooperatives	Seeds, fertilizer, etc.
	Total	**1,348,000**		
	G. Total	**6,328,000**		

Cost Sharing

District Office	4,308,000
RAB	1,820,000
Target Cooperatives	200,000
Total	**6,328,000**

NOTE:
The amount of budget indicated above is a draft version referred from the past experience of the RAB/SMAP activities, and is not a part of commitment of this MoU. The budget plan will be finalized as actual activities are arranged with consultation of RAB.

Appendix A-8. List of MAEP (Technical Training Materials)

No.	Title of Technical Training Materials	English	Kinyarwanda	Remarks
1	SMAP Cooperative Management and Gender Mainstreaming Technical Manual	✔	✔	Banner is useful for the training.
2	SMAP Marketing Technical Manual	✔	✔	-
3	SMAP Horticulture Technical Manual	✔	✔	-
4	SMAP Rice Cultivation Technical	✔	✔	-

Appendix A-9. Annual Schedule of RAB-SMAP Activity and Budget

1) Annual Schedule of RAB-SMAP Activity

RAB-SMAP Activities for HorticultureTraining Program	1st year																								2nd year									Stakeholders Concemed
	Apr			May			Jun			Jul			Aug			Sept			Oct			Nov			Dec			Jan			Feb			Mar			
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
1 **Sensitization Workshop at District Level**																																				RAB, DAOs, DCO (SA)
2 **Selection of Target Cooperatives**																																				
Anouncement of selecting target coops (by proposal approach)																																				RAB, DAOs, SA, Coop
Final decision of the target coops																																				RAB, DAOs,DCO
3 **Kickoff Workshop with Target Cooperatives**																																				RAB, DAOs, SA, SCO, SEDO, Coop
4 **Baseline survey**					Baseline																															SA, SCO, Coop
5 **ToT for Cooperative Management and Gender Mainstreaming**																																				RAB, DAOs, DCO, DGO, SA, SCO, SEDO, Coop
6 **ToT for Marketing**																																				RAB, DAOs, DCO, DGO, SA, SCO, SEDO, Coop
7 **Field Training**								First Cropping Period															Second Cropping Period													
1) Market survey																																				Coop
2) Crop Selection and Making Farming Schedule																																				Coop
3) Cooperative Management and Gender Mainstreaming																																				SA, SCO, SEDO, Coop
4) FFS-1 Nursery making, Cropping plan, Cropping map																																				RAB, DAOs, SA, SCO, SEDO, Coop (FP, etc.)
5) FFS-2 Transplanting																																				
6) FFS-3 1st Top dressing																																				
7) FFS-4 2nd Top dressing, Pest and disease management																																				
8) FFS-5 Harvesting																																	End-line			
8 **End-line Survey and Profit Analysis Workshop**																																				All stakeholders
9 **Monitoring and Evaluation**																																				DAOs, SA, SCO, SEDO

Note: DAOs: District Agriculture Officers, DCO: District Cooperative Officer, DGO: District Gender Officer, SA: Sector Agronomist, SCO: Sector Cooperative Officer, SEDO: Social Environmental Development Officer (Cell), Coop: Cooperative Farmers
Note: TOT : Ttrainig of Trainers

2) Budget of RAB-SMAP Activity in 2018

Proposed budget for RAB-SMAP activity in 2018 B&C

No.	Activity	Contents	Period	Participants	TOT No.	Budget
1	Explanation WS in Provinces	- Explanation of proposal selection process of target districts - Explanation of proposal form - Explanation of MoU	1 day	At least 2 Representatives of District offices	1	2,480,000
2	Selection of Target Districts	- Proposal evaluation submitted by District Office - Announcement of target district - Conclusion of MoU	Around 2 weeks	-	1	2,330,000
3	Explanation WS in Target Districts	- Explanation of proposal selection process of target coops. - Explanation of proposal form	2 days	At least 2 Representatives of District/ and 139 Sector officers in target District	1	2,970,000
4	Selection of Target Cooperatives	- Proposal evaluation submitted by District office - Site observation of candidate cooperatives - Selection of core and satellite cooperatives - Announcement of target cooperatives	Around 2 weeks	-	1	6,325,000
5	Kick-off WS at target cooperatives	- Explanation of activity and schedule to cooperative farmers	4 days	- At leats 10 Target Districts/ 50 Sector officers -50 Target cooperative farmers	1	9,920,000
6-1	Organization/ Gender Training	- Cooperative Management - Gender Mainstreaming - Accounting and Record Keeping	2 days	- At least 10 Target Districts/ 50 Sector officers - 50 Target cooperative farmers represented by 4(2 male,2 female) farmers each	2	17,890,000
6-2	Marketing Training	- Market survey - Crop selection based on market information - Baseline survey	2 days	- At least 10 Target Districts/ 50 Sector officers - 50 Target cooperative farmers represented by 4(2 male,2 female) farmers each	3	17,890,000
6-3	Cultivation Training	- Cultivation technology training through FFS extension system - Target crops are selected based on result of market survey done by target coop farmers	5 days per a cultivation seasons	- At least 10 Target Districts/ 50 Sector officers - 50 Target cooperative farmers - 4 Concerned farmer facilitators(2 male,2 female)/ promoters	4	46,800,000
7	Profit Analysis Workshop	- Calculation of net profits utilizing information of farm input costs and sales income from record book.	1 day, every end of cultivation season	- At least 10 Target Districts/ 50 Sector officers - 50 Target cooperative farmers - 4 Concerned farmer facilitators(2 male,2 female)/ promoters	5	9,360,000
8	Conducting Baseline and End-line survey	- Collecting information of target farmers' net income before and after participation of the RAB-SMAP activity	Around 2 weeks per each survey	- At least 10 Target Districts/ 50 Sector officers - Target cooperative farmers	1, 3	22,650,000
9	Monitoring and Follow-up visit to target cooperatives	- Site observation of target cooperatives. (Monitoring with CIP cooperatives)	1 day per every month	- Target District/ Sector officers - Target cooperative farmers	6, 7	10,820,000
10	Monitoring and Evaluation Meeting at Target Districts	- Self evaluation of Activity - Result of end-line survey - Discussion about challenge and strategy	1 day per every end of cultivation season	- Target District/ Sector officers	8	4,160,000
11	Monitoring and Evaluation Meeting at Central Level	- Sharing progress of activity in all target provinces - Discussion about challenge and strategy	1 day per a year	- RAB zone and central officers	9	2,500,000
12	Consumables (flip chart, marker pens, A4 sheets, pens, notebooks),training materials (Cost for printout of 4000 leaflets 200 booklets), stationaries and agricultural supplies (vegetable seeds, fertilizers and pesticides)					25,000,000
TOTAL BUDGET FOR 2018 B&C						**181,095,000**

Appendix A-9. Annual Schedule of RAB-SMAP Activity and Budget

Proposed budget for RAB-SMAP activity in 2018 A						
No.	**Activity**	**Contents**	**Period**	**Participants**	**TOT No.**	**Budget**
6-2	Marketing Training	- Market survey - Crop selection based on market information - Baseline survey	2 days	- Target District/ Sector officers - Target cooperative farmers	3	8,945,000
6-3	Cultivation Training	- Cultivation technology training through FFS extension system - Target crops are selected based on result of market survey done by target coop farmers	5 days per a cultivation seasons	- Target District/ Sector officers - Target cooperative farmers - Concerned farmer facilitator/ promoter	4	23,400,000
7	Profit Analysis Workshop	- Calculation of net profits utilizing information of farm input costs and sales income from record book.	1 day, every end of cultivation season	- Target District/ Sector officers - Target cooperative farmers - Concerned farmer facilitator/ promoter	5	4,680,000
8	Conducting Baseline and End-line survey	- Collecting information of target farmers' net income before and after participation of the RAB-SMAP activity	Around 2 weeks per each survey	- Target District/ Sector officers - Target cooperative farmers	1, 3	11,325,000
9	Monitoring and Follow-up visit to target cooperatives	- Site observation of target cooperatives. (Monitoring with CIP cooperatives)	1 day per every month	- Target District/ Sector officers - Target cooperative farmers	6, 7	5,410,000
10	Monitoring and Evaluation Meeting at Target Districts	- Self evaluation of Activity - Result of end-line survey - Discussion about challenge and strategy	1 day per every end of cultivation season	- Target District/ Sector officers	8	2,080,000
11	Monitoring and Evaluation Meeting at Central Level	- Sharing progress of activity in all target provinces - Discussion about challenge and strategy	1 day per a year	- RAB zone and central officers	9	1,250,000
12	Consumables(flip chart, marker pens, A4 sheets, pens, notebooks),training materials(Cost for printout of 4000 leaflets 200 booklets),stationaries and agricultural supplies(vegetable seeds,fertilizers and pesticides)					12,000,000
TOTAL BUDGET FOR 2018 A						**69,090,000**
GRAND TOTAL BUDGET FOR 2018 A,B&C						**250,185,000**
Source: RAB-SMAP July 2017						

Proposal Form for Selecting Target Districts of SMAP Activity

The proposal of selecting implementing districts has four main considerations: **Motivation**, **Resources Availability and Mobilization**, **Geographical Conditions** and **Socio-economic Considerations**. You are requested to provide information of your district using the format given by ticking in the appropriate box or filling in the blank spaces.

1. General Information

1.1	Name of the District	
1.2	Size of Land (km2)	
1.3	Population of the District	
1.4	Distance from District Office to Kigali (km)	
1.5	Distance form District Office to Province Capital (km)	
1.6	No. of Administrative Units: - Sector - Cell	
1.7	No. of Agricultural Extension Staffs (Agronomist, Cooperative, and other related officers): - District - Sector - Cell	
1.8	No. of RAB Staffs:	
1.9	No. of NAEB Staffs:	
1.10	No. of Horticulture Cooperatives (Vegetable):	

2. Motivation

2.1	Do you want to implement SMAP approach in your district? ***	❑ Yes	❑ No	
2.3	District Staff Motivation ***			
	1) Please gauge the motivational level of your extension staff in terms of working with smallholder horticulture farmers using limited resources? ***	❑ High	❑ Medium	❑ Low
	2) Please gauge the willingness of extension staff to learn and apply new ideas and/or approaches? ***	❑ High	❑ Medium	❑ Low
2.4	Is the District Office willing to provide office space to SMAP team in order to efficiently carry out the project activity? ***	❑ Yes	❑ No	
2.5	Is the District Office willing to conclude Minutes of Understanding (MoU) among the District Office, RAB, NAEB and SMAP Project Team to agree human resources and budgetary allocation for the next year's SMAP activities? ***	❑ Yes	❑ No	

2.6 Is the District Office willing to include the SMAP project activity into the "District Performance Contact" from the 2nd project year? *** ❑ Yes ❑ No

2.7 Please identify 3 major challenges under the following sections. *

1) Horticulture Crop Production

2) Marketing

2.8 Agricultural Projects/Programs in the District: in the table below, please indicate major projects/programs for the last 5 years. *

Name of Project/ Programs	Main Activities	Donor	Target Group	Number of T. Groups	Date of Completion

3. Resource Availability and Mobilization

3.1 Extension Staffs: in the table below, please provide information on numbers of farm families and extension staff at divisional and location levels. **

Name of Sector	No. Farmer Households	No. Sector Agronomists	No. Coop Officers	No. Farmer Promotors	No. Farmer Facilitators

3.2 Availability of Functional Office Equipment in District Office**

Type of Equipment	Number	Condition
PC (Desktop & Laptop)		
Printer		
Photocopy		
Projector		
Other:		
Other:		
Other:		

3.3 Vehicle and Motorcycle Availability **

Please indicate the number of vehicles and motorcycles which are utilized by extension activities in good condition.

1) Number of motor vehicles in good condition in the district. _____
2) Number of motor vehicles in good condition in the sectors. _____
3) Number of motorcycles in good condition in the district. _____
4) Number of motorcycles in good condition in the sectors.

4. Geographic Conditions

4.1 Climatic Conditions

1) Rainfall: please provide information in the table below. *

Mean Annual Rainfall in last 5 Years (mm)				
2010	2011	2012	2013	2014

Source of Data: _____

2) Temperature (Calculous) (2014): please provide information in the table below. *

Month	Maximum	Minimum	Diurnal Temperature
January			
February			
March			
April			
May			
Jun			
July			
August			
September			
October			
November			
December			

Source of Data: _____

4.2 Resource of Water

1) What is the main source of water for irrigation in the ❑ Permanent River ❑ Lake _____

district? ❑ Spring ❑ Dam ❑ Water pan

2) Comment on suitability of water for irrigation from the main source.

4.3 Information of Main Roads in District **

Name of Road	Connecting From To	Status	Condition	Connecting Main Market
	~	❑ Turmeric ❑ Earth	❑ Good ❑ Medium ❑ Poor	
	~	❑ Turmeric ❑ Earth	❑ Good ❑ Medium ❑ Poor	
	~	❑ Turmeric ❑ Earth	❑ Good ❑ Medium ❑ Poor	
	~	❑ Turmeric ❑ Earth	❑ Good ❑ Medium ❑ Poor	
	~	❑ Turmeric ❑ Earth	❑ Good ❑ Medium ❑ Poor	
	~	❑ Turmeric ❑ Earth	❑ Good ❑ Medium ❑ Poor	

4.4 Repair and maintenance of unclassified roads: involvement of community and stakeholders.

1) Are community members willing to participate by providing labor and resources in road repair and maintenance? ** ❑ Yes ❑ No

2) Are there stakeholders willing to support community to repair and maintain rural access and farm roads? ** ❑ Yes ❑ No

3) List the major stakeholders who would be willing to support road repairs.

5. Socio-Economic Conditions

5.1 List of Major Market in District **

Name of Market	Sector	Scale		
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector
		❑ Provincial	❑ District	❑ Sector

5.2 Markets and Market Infrastructure *

1) Names of nearest wholesale markets in your district. *

2) Names of main exporters operating in your district. *

3) Names of horticulture processors operating in your district. *

4) Names of cooling facilities/produce collection centers (public & private) in your district. *

5.3 What are the major crops in the district? Where those coops are transported and consumed? (within district, outside of district, Kigali, etc.)

5.4 Farm Input Suppliers ** ❑ Adequate ❑ Moderately Adequate

Does the district have adequate farm input suppliers providing horticulture inputs? ❑ Not Adequate

5.5 Involvement of Cooperatives in Horticulture Production

1) Are there cooperatives involved in group production for export market? ❑ Yes ❑ No

2) Are there cooperatives involved in group production for domestic market? ❑ Yes ❑ No

3) Are there cooperatives involved in contract farming? ❑ Yes ❑ No

5.6 Farm Labor

1) Who is the main provider of farm labor ❑ Family labor ❑ Hired labor

2) How is the level of dependence on labor hired from outside the district? ❑ High ❑ Medium ❑Low

6. Additional Information to be submitted

Please submit 1) List of Horticulture Cooperatives in the district with detail information, and 2) Topographic map of the district with this application form.

Name of District Agricultural Officer: :_____

Signature : _____

Name of Mayor:_____

Signature : _____

Date : _____

Stamp : _____

Proposal Evaluation Form for the Selection of SMAP Target Districts

Evaluation Form

1. General Information:

Correspond No. in Proposal	Information		
1.1	Name of District		
1.2	Size of Land (km2)		
1.3	Population of the District		
1.4	Distance from District Office to Kigali (km)		
1.5	Distance from District Office to Province Capital (km)		
1.6	No. of Administrative Units	Sector	
		Cell	
1.7	No. of Agricultural Extension Staffs (Agronomist, Cooperative, and other related officers)	District	
		Sector	
		Cell	
1.8	No. of RAB Staffs		
1.9	No. of NAEB Staffs		
1.10	No. of Horticulture Cooperatives (Vegetable)		

Section 1 Critical Criteria

Correspond No. in Proposal	Question	Answer	
2.1	Do you want to implement SMAP approach in your district	❑ Yes	❑ No
2.3	1) Please gauge the motivational level of your extension staff in terms of working with smallholder horticulture farmers using limited resources? ***	❑ High	❑ Medium/ ❑ Low
	2) Please gauge the willingness of extension staff to learn and apply new ideas and/or approaches? ***	❑ High	❑ Medium/ ❑ Low
2.4	Is the District Office willing to provide office space to SMAP team in order to efficiently carry out the project activity? ***	❑ Yes	❑ No
2.5	Is the District Office willing to conclude Minutes of Understanding (MoU) among the District Office, RAB, NAEB and SMAP Project Team to agree human resources and budgetary allocation for the next year's SMAP activities? ***	❑ Yes	❑ No
2.6	Is the District Office willing to include the SMAP project activity into the "District Performance Contact" from the 2nd project year? ***	❑ Yes	❑ No
2.8	Are there any Agricultural Project/ Program in your district which approach may conflict against SMAP approach?	❑ No	❑ Yes
	All items are checked positively **Next step:**	❑ Yes **➔ Proceed to Section 2**	❑ No **➔ To be rejected**

Section 2 Scoring of Key Result Area

Key Result Area: Eligibility of District

Assessment Criteria	Correspond No. in Proposal	Actual Data/ Question	Description / Point Score		
			0	3	6
1. Accessibility from Kigali	1.4	km	❑ 101km～	❑ 51km ～100km	❑ ～50km
2. Duplication of Other Agricultural Project/ Program Support	2.8	Project/ Program Name:	❑ There is no other Project. Or, there is project not related to SMAP activity.	❑ There is other agriculture related project which may be able to collaborate with SMAP	
3. Availability of Extension Staffs	3.1	Are Agronomists assigned in all sectors?	❑ Less than half sectors	❑ More than half sectors	❑ All sectors
	3.1	Are Coop Officers assigned in all sectors?	❑ Less than half sectors	❑ More than half sectors	❑ All sectors

Assessment Criteria	Correspond No. in Proposal	Actual Data/ Question	Description / Point Score		
			0	3	6
	3.1	Number of Households per A Sector Agronomist	❑ 4001 <	❑ 2001 < 4000	❑ > 2000
4. Availability of office Equipment	3.2	Number/ Condition of Equipment	❑ Not Adequate	❑ Moderately Adequate	❑ Adequate
	3.2	Internet Network	❑ No		❑ Yes
5. Availability of transportation	3.3	How many vehicles District have?	❑ 0	❑ 1-2	❑ 3 <
	3.3	All Sectors have at least one motor cycle for extension work.	❑ No		❑ Yes
Number of Ticked Items (A)					
Coefficient Rate (B)			**x 0**	**x 3**	**x 6**
Weighted Score (A) x (B)					
Sub Total Score (C)					

Key Result Area: Geographic/ Social Condition

Assessment Criteria	Correspond No. in Proposal	Actual Data in Proposal/ Question	Description / Point Score		
			0	1	2
1. Road Condition	4.3	Is the District Main Market connected with turmeric road with good condition?	❑ No		❑ Yes
	4.3	Number of Main Roads which are turmeric and good conditions.	❑ 0	❑ 1-2	❑ ≧3
	4.3	Is there any poor condition main road (Turmeric and Earth)	❑ Yes		❑ No
2. Community and Stakeholders involvement of infrastructure maintenance	4.4	1) Are community members willing to participate by providing labor and resources?	❑ No	❑ Yes	
	4,4	2) Are there stakeholders willing to support community?	❑ No	❑ Yes	
	4.4	3) How many stakeholders listed?	❑ 0-2	❑ ≧3	
3. Market Condition	5.1	Is there Provincial Level Market? (Representative market in the province)	❑ No		❑ Yes
	5.1	Number of District Level Markets	❑ 0-2	❑ 3-4	❑ ≧5
4. Input Supply in District	5.4		❑ Not Adequate	❑ Moderately Adequate	❑ Adequate
Number of Ticked Items (D)					
Coefficient Rate (E)			**x 0**	**x 1**	**x 2**
Weighted Score (D) x (E)					
Sub Total Score (F)					

Grand Total Score:

Sub Total Score of Key Result Area: Eligibility of District (C)	
Sub Total Score of Key Result Area: Geographic/ Social Condition (F)	
Grand Total: (C)+(F)	

Inyandiko isaba ubufasha mu bya tekinike ku buhinzi bw'imboga mu mushinga SMAP

Incamake y'umushinga SMAP

SMAP ni umwe mu Mishinga ya MINAGRI uterwa inkunga n'ikigo cy'Ubufatanye Mpuzamahanga cy'Abayapani (JICA). Ishyirwa mu bikorwa ry'umushinga rishinzwe cyane cyane Ikigo cy'Ubuhinzi mu Rwanda (RAB), Ikigo cy'Igihugu cyo guteza imbere ubuhinzi bw'ibyoherezwa mu mahanga (NAEB) hamwe n'ubuyobozi bw'uturere n'imirenge. Umushinga ufite intego yo kongera inyungu ku musaruro w'imboga n'umuceri mu ntara zose z'igihugu (Uburasirazuba, Amajyepfo, Amajyaruguru n'Uburengerazuba) binyuze mu gutanga bufasha mubya tekiniki. Mu gisata cy'ubuhinzi bw'imboga, amahugurwa akubiyemo tekinike zo gushaka amakuru ku masoko, gukora gahunda y'ibikorwa n'isesengura ry'ibibazo, gukora inama zihuza abahinzi n'abafatanyabikorwa mu buhinzi bw'imboga no gukora amahugurwa ku buhinzi bw'imboga. **Mu mahugurwa, umushinga uha amakoperative akorana nawo amahugurwa kuri tekinike z'ingirakamaro kandi z'ingenzi ushingiye cyane cyane ku byo abahinzi bakeneye n'ibyo isoko rikeneye.** Umushinga SMAP ukomoka ku wabanje witwa PiCROPP wakoreye mu turere twa Bugesera na Ngoma mu ntara y'Uburasirazuba mu 2011 kugera 2013, ukaba warakoranye na koperative 35 zihinga imboga. Abahinzi bakoranye na PiCROPP bongereye inyungu yabo ku buryo bugaragara biciye mu kubongerera ubumenyi na tekiniki.

Impamvu Koperative igomba kuzuza inyandiko isaba ubufasha

Impamvu yo gukora inyandiko isaba ubufasha ni ukureba ubushake bwa Koperative bwo kwinjira mu bikorwa by'umushinga, ubushobozi bwabo mu gukorera no kwita ku murima w'ikitegererezo, uburyo bazabyakira bakabigira ibyabo gukorana n'umushinga n'ubushake bw'abagronome b'imirenge kuzaba hafi ayo makoperative. Nyuma yo kubisuzuma, amakoperative azafashwa azatoranywa na ba Agronome b'Uturere. **Iyi nyandiko isaba izuzuzwa na buri Koperative ibyifuza ifashijwe na Agronome w'Umirenge ibarizwamo. Amakoperative arasabwa kwemeza cyangwa kuzuza iyi nyandiko bakazayishyikiriza Agronome w'Akarere babinyujije kuri Agronome w'Umurenge.**

Inyandiko isaba (Kuzuza ibisabwa byose)

1. Amakuru rusange kuri Koperative

1.1 Izina rya koperative:

1.2 Aho ibarizwa
- Akagari: _____
- Umurenge: _____
- Akarere:

1.3 Ukwezi ni umutaka koperative yatangiye — Ukwezi: — Umuwaka:

1.4 Amazina ya Perezida (Nimero ya Telefoni): (Tel:)

Igihe yatorewe niba yaragiyeho binyuze mu matora:

1.5 Ibihingwa byose Koperative ihinga (bitondeke byose):

1.6 Ibihingwa by'ingenzi Koperative ihinga:
Igihingwa cya mbere cy'ingenzi:
Igihingwa cya 2 cy'ingenzi:
Igihingwa cya 3 cy'ingenzi:

1.7 Uko umurima wa koperative ungana: (ari)
(Udashyizemo imirima y'abantu ku giti cyabo)

1.8 Ibiranga umurima wa koperative: (Ibisubizo byinshi birashoboka.)
- ❑ Umurima ni uwa koperative
- ❑ Muhinga ubutaka mwatijwe na leta

	❑ Umurima ni umukodeshanyo
1.9 Uko umurima wa koperative ukoreshwa	❑ Uhingwa mu buryo bwa rusange muri koperative ❑ Uhingwa n'abanyamuryango ku giti cyabo ❑ Ubundi buryo (buvuge_____)
1.10 Intera iri kuva ku murima kugera ku biro by'umurenge:	(km)
1.11 Haboneka amazi yo kuhira imyaka mu gihe cy'izuba:	❑ Yego ❑ Oya
(Niba 1.11 ari Yego) Ayo mazi aturuka he?:	❑ Umugezi ❑ Isoko ❑ Ikidendezi ❑ Ikiyaga ❑ Ikidamu ❑ Icyobo gifata amazi ❑ Ahandi ( )
(Niba 1.11 ari Yego) Ni amazi ahoraho?:	❑ Yego ❑ Oya
(Niba 1.11 ari Yego) Hari intera ingana ite kuva ku murima ugera ku mazi	m
(Niba 1.11 ari Yego) Ni ubuhe buryo bukoreshwa mu kuhira:	❑ Arozuwari ❑ Ipombo banyonga ❑ Moteri yo kuvomera ❑ Kuyobora amazi mu murima ❑ Ubundi buryo( )
1.12 Ibikorwa bibyara inyungu bafite: (Ibisubizo byinshi birashoboka.)	❑ Umusaruro w'imboga/imbuto ❑ Umusaruro w'ibinyampeke ❑ Ubworozi ❑ Gukusanya no gucuruza umusaruro ❑ Inguzanyo zicirirtse ❑ Gucuruza inyongeramusaruro ❑ Gutunganya ibikomoka ku musaruro ❑ Ibindi (sobanura: _____) ❑ Ibindi (sobanura: _____) ❑ Ibindi (sobanura: _____)
1.13 Ibikorwa birebana n'ubuhinzi bw'imboga: (Ibisubizo byinshi birashoboka.)	❑ Guhinga buri wese ku giti cye ❑ Guhingira hamwe muri koperative ❑ Kugurisha umusaruro buri wese ku giti cye ❑ Kugurishiriza hamwe umusaruro muri Koperative ❑ Kugura inyongeramusaruro buri wese ku giti cye ❑ Kugurira hamwe inyongeramusaruro nka Koperative ❑ Gukora ubushakashatsi ku masoko ❑ Ibindi (Sobanura: _____) ❑ Ibindi (Sobanura: _____)
1.14 Umubare w'abanyamuryango bose hamwe:	Bose: Abagabo: Abagore:
Ibyiciro by'imyaka y'abanyamuryango	Muri 20: Muri 30 : Muri 40: Hejuru ya 50:
1.15 Umubare w'abagize komite nyobozi:	Bose: (Abagabo: Abagore:)

1.16 Amazina ya komite zindi n'umubare w'abagize buri komite:	Izina rya komite: Umubare: ,(Abagabo: Abagore:) Izina rya komite: Umubare: ,(Abagabo: Abagore:) Izina rya komite: Umubare: ,(Abagabo: Abagore:)
1.17 Umusanzu wa buri mwaka:	(RWF / ku munyamuryango)
1.18 Ijanisha ry'abawutanze:	(%)
1.19 Koperative ifite ubuzima gatozi bwa RCA:	❑ Yego ❑ Oya ❑Ubw'agateganyo
1.20 Ibikoresho batunze: (Ibisubizo byinshi birashoboka.)	❑ Ibiro ❑ Ububiko ❑ Ibindi (sobanura: _____) ❑ Ibindi (sobanura: _____)
1.21 Inshuro Inama Rusange iterana: - Ijanisha ry'abanyamuryango bitabira Inama Rusange:	(Inshuro mu mwaka) (%)
1.22 Itariki Inama Rusange iheruka guterana	Itariki: Ukwezi: Umwaka:
1.23 Gahunda y'umunsi y'inama rusange iheruka	⇒ ⇒ ⇒
1.24 Inshuro Inama ya komite nyobozi iterana:	(Inshuro mu mwaka) Itariki inama ya komite nyobozi iheruka yabereyeho:
1.25 Inshuro bakora igenzura:	(Inshuro mu mwaka) Itariki igenzura riheruka ryabereye:
1.26 Hari indi nfashanyo ya Leta cyangwa abaterankunga mwabonye mu myaka 3 ishize:	❑ Yego 1) Amazina y'uwatanze imfashanyo: _____ Ibigize imfashanyo: _____ 2) Amazina y'uwatanze imfashanyo: _____ Ibigize imfashanyo: _____ 3) Amazina y'uwatanze imfashanyo: _____ Ibigize imfashanyo: _____ ❑ Oya
1.27 Inyungu yabonetse muri koperative mu gihe cy'ihinga rishize (Gicurasi - Ukwakira 2014):	RWF
1.28 Ni ayahe masoko manini mushoraho umusaruro:	
1.29 Mufite konti muri banki	❑ Yego (sobanura: _____) ❑ Oya

2. Ubushake bwa Koperative bwo gukorana n'umushinga

2.1 Abanyamuryango bose bemeranywa gufashwa n'umushinga SMAP?	❑ Yego ❑ Oya

2.2	Koperative yemeranya intego z'umushinga SMAP?	❑ Yego ❑ Oya
2.3	Koperative yemera gutanga ahazashyirwa umurima w'ikitegererezo? (umurima w'ikitegererezo ungana na ari 3 cg 4.)	❑ Yego ❑ Oya
2.4	Koperative yemera kuzatanga umwanya n'abantu bo gukorera umurima w'ikitegererezo buri munsi?	❑ Yego ❑ Oya

3. Ubufasha mu bya tekinike bukenewe

3.1	Andika ibibazo n'imbogamizi Koperative ihura nabyo mu byerekeranye n'ubuhinzi bw'imboga, isoko ry'umusaruro n'imicungire yak operative niba bihari.	
3.2	Andika ubufasha koperative itegereje ku mushinga SMAP, uvuge n'impamvu.	

4. Ubushake bwa Agronome w'umurenge mu gufasha koperative

4.1	Agronome w'umurenge afite ubushake bwo gubufasha NAEB na RAB mu gutegura no gutanga amahugurwa ku buhinzi bw'imboga no gushaka isoko ry'umusaruro?	❑ Yego ❑ Oya
4.2	Agronome w'umurenge afite ubushake bwo guha koperative amahugurwa ku miyoborere n'iterambere yifashisha imfashanyigisho yateguwe n'umushinga?	❑ Yego ❑ Oya
4.3	Agronome w'umurenge afite ubushake bwo gukurikirana buri gihe ikwirakwizwa ry'ubumenyi n'ikoranabuhanga mu banyamuryango ba Koperative n'abandi batari abanyamuryango?	❑ Yego ❑ Oya

5. Umukono wa perezida wa koperative na Agronome w'umurenge

Umukono wa Perezida wa Koperative: _____

Amazina: _____

Itariki: _____

Umukono wa Agronome w'Umurenge: _____

Amazina: _____

Itariki: _____

Umukono w'Ushinzwe iterambere ry'amakoperative mu Murenge: _____

Amazina: _____

Itariki: _____

Proposal Evaluation Form for the Selection of Core Cooperatives in the SMAP

General Concept and Procedure of the Proposal Evaluation

General Concept:

For the selection of appropriate subject cooperatives that will be supported by the Project, this form assesses each candidate cooperative according to specific criteria which fall under four key result areas as follows:

1) Eligibility of cooperative as "core cooperative"
2) Cooperative's willingness to participate in the Project and to devote DT-Farm site and workload for O&M of DT-Farm and understanding of the Project concept
3) Sector Agronomist's willingness to support the cooperative
4) Capability of cooperative in O&M of DT-farm and dissemination of farming techniques to other cooperatives

Procedure:

The guide in accomplishing this form is enumerated below:

1) Fill up the general information of name of cooperative and location
2) To tick correspond items in critical criteria of Section-1
3) In case that all items are ticked "Yes" in Section-1, proceed to Section-2. If any item is ticked "No", that cooperative is to be rejected.
4) For each assessment criterion in the given key result area of the Section-2, indicate the actual data
5) Indicate the corresponding point score for each criterion by ticking the appropriate box which corresponds to the actual data.
6) To get the raw score for each point score per key result area, get the total number of check marks falling under each point score.
7) To get the weighted score for each point score per key result area, multiply the raw score by the point score.
8) To get the sub-total score earned per KRA, get the sum of the weighted scores.
9) To get the total weighted score earned, get the sum of the sub-total weighted scores of the 4 key result areas.
10) Indicate the descriptive rating of the candidate primary cooperative

Evaluation Form

General Information:

Name of Cooperative		
Location	Cell	
	Sector	
	District	
Name of Cooperative President		
Name of Sector Agronomist		

Section-1 Critical Criteria

Key Result Area	Assessment Criteria	Correspond No. in Proposal	Actual Data	
			Yes	No
Eligibility of Cooperative	1. Cooperative has never been supported by SMAP.	1.1	❑	❑
	2. Cooperative is cultivating vegetable at least two cultivation seasons per a year.	1.6	❑	❑
	3. Water source is available in dry season	1.10	❑	❑
Cooperative's Willingness	4. All the members agree with SMAP assistance	2.1	❑	❑
	5. All the members agree with the Project concept.	2.2	❑	❑
	6. Cooperative is willing to devote DT-Farm site	2.3	❑	❑
	7. Cooperative is willing to devote manpower for O&M of DT-Farm.	2.4	❑	❑
	8. Cooperative is willing to devote necessary farm inputs for properly management of DT farm.	2.5	❑	❑
	9. Cooperative's needs in not only money & in-kind items. (Technical assistance is included in their needs.)	3.2	❑	❑
SA's Willingness	10. Sector agronomist is willing to support the training.	4.1	❑	❑
	11 Sector agronomist is willing to provide organizational	4.2	❑	❑

Key Result Area	Assessment Criteria	Correspond No. in Proposal	Actual Data	
			Yes	No
	development training.			
	12. Sector agronomist is willing to do periodical monitoring.	4.3	❑	❑
Cooperative's Willingness	13. With signature of Cooperative's President	5	❑	❑
Sector Officers' Willingness	14. With signature of Sector Agronomist and Sector Cooperative Officer (if available)	5	❑	❑
	All items are checked "Yes". **Next step:**		❑ **➔ Proceed to Section-2**	❑ **➔ To be rejected**

Section-2 Scoring of Key Result Area

Key Result Area: Eligibility of Cooperative

Assessment Criteria	Correspond No. in Proposal	Actual Data	Description / Point Score		
			0	3	6
1. Duplication of SMAP Support	1.2	Name of Sector:	❑ Any core cooperative in the sector has been supported by SMAP.	❑ Any satellite cooperative in the sector has been supported by SMAP.	❑ Sector has never been supported.
2. Cooperative has cooperative farmland where members work together	1.7		❑ No		❑ Yes
3. Accessibility from Sector Office	1.9		❑ More than 10 km	❑ 5-10 km	❑ Less than 5 km
4. Duplication of other Public Program Support	1.25		❑ 1 and more	❑ 0	❑ -
5. Other public program support (Currently) which can be expected synergy effect	1.25		❑ No	❑ Yes	❑ -
Number of Ticked Items (A)					
Coefficient Rate (B)			**x 0**	**x 3**	**x 6**
Weighted Score (A) x (B)					
Sub Total Score (C)					

Key Result Area: Capability of Cooperative

Assessment Criteria	Correspond No. in Proposal	Actual Data in Proposal	Description / Point Score		
			0	1	2
1. Operation History	1.3		❑ Less than 1 years	❑ 1 -3 year	❑ More than 3 years
2. Size of Cooperative Farmland	1.7		❑ Less than 10 a	❑ 10-30 a	❑ More than 30 a
3. Frequency of cooperative work at cooperative farmland	1.7		❑ 0 time / week or cooperative land is not available	❑ 1 -2 times/ week	❑ 3times or more/ week
4. Farmland Ownership	1.8		❑ Land Lease	❑ Gov. Land with Permission	❑ Owned by Cooperative
5. Cooperative consists of more than30% of Female Members	1.13		❑ No		❑ Yes
6. Majority of age group of members	1.13		❑ Above 50's	❑ 40's	❑ 20's or 30's
7. Board of Cooperative consists of more than 30% of female member	1.14		❑ No		❑ Yes
8. Membership fee	1.17		❑ Less than 30%	❑ 30-60%	❑ More than 60%

Assessment Criteria	Correspond No. in Proposal	Actual Data in Proposal	Description / Point Score		
			0	1	2
Collection Rate					
9. Registration to RCA	1.18		❑ No	❑ On process	❑ Yes
10. Office owing	1.19		❑ No	❑ Under Construction	❑ Yes
11. No. of Owned Facility	1.19		❑ 0	❑ 1-2	❑ 3 or more
12. Frequency of GA	1.20		❑ 0 time/year	❑ 1 time/year	❑ 2 times or more/year
13. Attending Rate of Member to GA	1.20		❑ Less than 40%	❑ 40-80%	❑ More than 80%
14. Frequency of Board Member Meeting	1.23		❑ 0 time/year	❑ 1 time/year	❑ 2 times or more/year
15. Frequency of Auditing	1.24		❑ 0 time/year	❑ -	❑ 1 time or more/year
16. Bank Account	1.28		❑ Not yet opened	❑ -	❑ Opened
Number of Ticked Items (D)					
Coefficient Rate (E)			**x 0**	**x 1**	**x 2**
Weighted Score (D) x (E)					
Sub Total Score (F)					

Grand Total Score:

Sub Total Score of Key Result Area: Eligibility of Cooperative (C)	
Sub Total Score of Key Result Area: Capability of Cooperative (F)	
Grand Total: (C)+(F)	

Implementation Guidelines
of
SMAP Activities
for
Rice Training Program






September 2019
Smallholder Market-Oriented Agriculture Project in Rwanda (SMAP)

Implementation Guidelines
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SMAP Activities
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1. Introduction of Guidelines

1.1 Authority

This guideline was prepared by the Smallholder Market-Oriented Agriculture Project (SMAP) in Rwanda financed by Japan International Cooperation Agency (JICA).

1.2 Background and Objective

(1) Background

In order to increase agricultural incomes of smallholders in rice cooperatives, SMAP supported one (1) rice cooperative in the target district (Rwamagana, Kirehe, Kayonza, Gisagara, Huye and Ruhango Districts) to improve paddy yield through the series of Farmer Field School (FFS) utilizing the training material prepared by the RAB Rice Team and SMAP and authorized as a national material by RAB. After the SMAP support in each district, the district has done same activities as SMAP by their own human and financial resources under the technical support by SMAP. After the support by SMAP and districts, target cooperatives have applied SMAP rice cultivation techniques and improved paddy yield. As a result, the yield has increased by 67% and 24% in the cooperatives supported by SMAP and districts, respectively.

In order to facilitate the support to the cooperatives by the district as well as to disseminate the SMAP outputs in all rice cooperatives in Rwanda, this guideline on how to arrange the series of FFS was prepared.

(2) Objective

The objective of the guideline is to provide information on how FFS for rice shall be organized to rice FFS facilitators, fulltime agronomist of rice cooperatives, and government officers concerned. Thus, the guideline is prepared in user-friendly manner for everybody.

Michio GOTO
SMAP Team Leader

2. Arrangement of Rice Training

In this chapter, objective, necessary items and arrangements of the following trainings or activities are introduced.

(1) Farmer Field School (FFS) -1 to FFS-4
(2) Water Management Training
(3) Cooperative Management Training
(4) Monitoring Activity

2.1 FFS-1 (Nursery Preparation)

Objective:

To train cooperative members on how to establish proper nursery including seed treatment at demonstration training farm

Approximate Time Required: 5 hours (9:00 am to 13:00 pm)

FFS-1 should be organized **before or at the same time with nursery preparation by cooperative**. You shall decide the date of FFS-1 based on their cropping calendar.

Before FFS-1, the following activities should be done.

(1) Seed preparation like seed disinfection and soaking
(2) Identification of nursery by making soil bands based on the area of demonstration training farm

These activities should be done **before FFS-1.** Proposed time schedule for arrangement of FFS-1 is shown in the following table.

Table 2.1.1: Schedule for Arrangement of FFS-1

Activity	Day							
	-7	-6	-5	-4	-3	-2	-1	0
Decision of date of FFS-1 and notification to participants	▼							
Preparation of necessary items for FFS-1							▼	
Seed preparation				■	■	■	■	
Making soil bands for identification of nursery							▼	
FFS-1								▼

2.1.1 Preparation of Seeds

(1) Necessary Items

- Seeds which are sowed in the demonstration training farm
- Small bags for seed disinfection
- Beam or Benlate (fungicide)
- Basin for seed disinfection and soaking

(2) Necessary Arrangements

- Do seed preparation as follows (See the Hands-on Rice Cultivation Techniques for FFS in Rwanda for detail.);

(1) Measure seeds for sowing based on the area of the demonstration training farm (Seed rate is 30 kg/ha),

(2) Put measured seeds into small bags and disinfect the seeds by Beam or Benlate,

(3) After disinfection, air-dry the seeds for around 4hours,

(4) Soak the seeds for around 48 to 72 hours, and

(5) Incubate the soaked seeds for 24 hours under wet condition.

- Schedule for seed preparation is shown in the following table. Seed preparation should be started **four days before FFS-1**.

Table 2.1.2: Schedule for Seed Preparation

Day	1	2	3	4	5
Activity	Disinfection by Beam or Benelate	Air-dry of seeds from 6:00 am to 10:00 am	Soaking seeds from 10:00 am on Day 2 to 6:00 am on Day 4	Incubation from 6:00 am for 24 hours	**FFS-1**

- Identify the size of nursery by making soil bands based on the seed rate. (**Seed rate: 70 gm/m^2, Width of one nursery bed: 1 m**)

2.1.2 Preparation of Training

(1) Necessary Items for FFS-1

- Materials shown in Table 2.1.3

(2) Necessary Arrangements for FFS-1

- Prepare materials shown in Table 2.1.3.
- Notify participants of date of FFS-1 **one week before together with cooperative president and cooperative fulltime agronomist.**
- Participants of FFS-1 shall be board members, zone leaders and association leaders of cooperative.
- Lecturer shall be mainly rice FFS facilitators or cooperative fulltime agronomist.

Table 2.1.3: List of Necessary Materials for FFS-1

No.	Item
1	Incubated seeds
2	Basins
3	Measuring tape (50 m)
4	Hoes
5	Hemp rope (2 rolls)
6	NPK (Based on area of nursery, 12.5 gm/m^2)
7	500 ml pet bottle cap for measuring NPK
8	Wooden pegs for making nursery
9	Dry grasses for mulching
10	Wooden labels for marking varieties

2.2 FFS-2 (Transplanting)

Objective:

To train cooperative members on how to make proper land preparation, proper transplanting, fertilizer application together with water management in rice cultivation at demonstration training farm

Approximate Time Required: 5 hours (9:00 am to 13:00 pm)

Date of FFS-2 should be decided through **the monitoring of growth of seedlings**. Expected date of FFS-2 is **20 days to 25 days after sowing**. Proposed time schedule for arrangement of FFS-2 is shown in the following table.

Table 2.2.1: Schedule for Arrangement of FFS-2

Activity	Day											
	-	～	-14	～	-7	-6	-5	-4	-3	-2	-1	0
FFS-1	▼											
Monitoring of seedlings	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
First plowing (**Two weeks before FFS-2**)			▼									
Decision of date of FFS-2 and notification to participants					▼							
Second plowing and making soil bands if necessary									▼			
Preparation of necessary items for FFS-2											▼	
FFS-2												▼

(1) Necessary Items for FFS-2

- Materials shown in Table 2.2.2

Table 2.2.2: List of Necessary Materials for FFS-2

No.	Item
1	Basins
2	Measuring tape (50 m)
3	Plastic rope with 30 cm mark by marker pen
4	10 cm length of plastic rope (many pieces)
5	NPK (Based on area of demonstration training farm, 2 kg /100 m^2)
6	Wooden pegs for making transplanting layout
7	Wooden labels for marking varieties

(2) Necessary Arrangements for FFS-2

- Monitor the growth of seedlings in order to decide date of FFS-2.
- Prepare materials shown in Table 2.2.2.
- Notify participants of date of FFS-2 **one week before together with cooperative president and cooperative fulltime agronomist**.
- Participants of FFS-2 shall be board members, zone leaders and association leaders of cooperative.
- Do first plowing and second plowing in the demonstration training farm 14 days and 3 days before FFS-2 respectively. After second plowing, water should be kept in the plot. If level of the paddy plot is not uniform, ask cooperative members to demarcate the plot to sub plots to make leveling easy. (See the Hands-on Rice Cultivation Techniques for FFS in Rwanda for detail for detail.)
- Lecturer shall be mainly rice FFS facilitators or cooperative fulltime agronomist.
- **Water should be kept after transplanting** for rooting.

Photo 3.6.1: Plot Demarcation

2.3 FFS-3 (Top Dressing and Pest Management)

Objective:

To train cooperative members on how to apply top dressing, disease and pest management, roguing, weeding and mitigation of horizontal percolation at demonstration training farm

Approximate Time Required: 5 hours (9:00 am to 13:00 pm)

After FFS-2, plot owner of the demonstration training farm shall care the growth of paddy. FFS-3 should

be organized 30 days after FFS-2. Proposed time schedule for arrangement of FFS-3 is shown in the following table.

Table 2.3.1: Schedule for Arrangement of FFS-3

Activity	Day								
	0	4	8	12	16	20	24	28	30
FFS-2	▼								
Monitoring of the demonstration training farm	▬	▬	▬	▬	▬	▬	▬	▬	▬
WMT						▼			
Decision of date of FFS-3 and notification to participants							▼		
Preparation of necessary items for FFS-3							▼		
FFS-3									▼

(1) Necessary Items for FFS-3

- Materials shown in Table 2.3.2.

Table 2.3.2: List of Necessary Materials for FFS-3

No.	Item
1	Basins
2	Hoes
3	Cypermetrine
4	Syringe
5	Sprayer
6	Mask
7	Rubber glove
8	Urea (Based on area of demonstration training farm, 0.5 kg /100 m^2
9	1.5 lit pet bottle for measuring Urea

(2) Necessary Arrangements for FFS-3

- Prepare materials shown in Table 2.3.2.
- Notify participants of date of FFS-3 **one week before together with cooperative president and cooperative fulltime agronomist**.
- Participants of FFS-3 shall be board members, zone leaders and association leaders of cooperative.
- Lecturer shall be mainly rice FFS facilitators or cooperative fulltime agronomist.

2.4 FFS-4 (Harvesting)

Objective:

To train cooperative members on how to harvest rice on time together with post-harvest operation practice, and yield evaluation

Approximate Time Required: 5 hours (9:00 am to 13:00 pm)

After FFS-3, plot owner of the demonstration training farm shall care the growth of paddy. You shall judge when you should organize FFS-4 based on the monitoring result and decide date of FFS-4. Proper harvesting time is when percentage of green spikelets becomes 10 to 15 %. (See the Hands-on Rice Cultivation Techniques for FFS in Rwanda for detail for detail.). Proposed time schedule for arrangement of FFS-4 is shown in the following table.

Table 2.4.1: Schedule for Arrangement of FFS-4

Activity	Day									
	-	～	-7	-6	-5	-4	-3	-2	-1	0
FFS-3	▼									
Monitoring of the demonstration training farm	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
Decision of date of FFS-4 and notification to participants			▼							
Preparation of necessary items for FFS-4									▼	
FFS-4										▼

(1) Necessary Items for FFS-4

- Materials shown in Table 2.4.2

Table 2.4.2: List of Necessary Materials for FFS-4

No.	Item
1	Sickles
2	Plastic sheet
3	Urutaro or Winnower
4	Measuring tape (50 m)
5	Basins
6	Small balance for measuring reaped paddy
7	Thresher made of eucalyptus logs

(2) Necessary Arrangements for FFS-4

[Before FFS-4]

- Prepare materials shown in Table 2.4.2.
- Notify participants of date of FFS-4 **one week before together with cooperative president and cooperative fulltime agronomist**.
- Participants of FFS-4 shall be board members, zone leaders and association leaders of cooperative.
- Make a thresher made of eucalyptus logs before FFS-4 in collaboration with cooperative members.
- Lecturer shall be mainly rice FFS facilitators or cooperative fulltime agronomist.

[Yield Evaluation for Demonstration Training Farm during FFS-4]

- Select 2 places for reaping and measure 9 m^2 (3m * 3m) from the **same variety** in the demonstration training farm as shown in Figure 3.9.1.
- Reap paddy within 9 m^2 (3m *3 m).
- Thresh the reaped paddy using a thresher made of eucalyptus logs on plastic sheets.
- Measure the weight of threshed paddy using small balance.

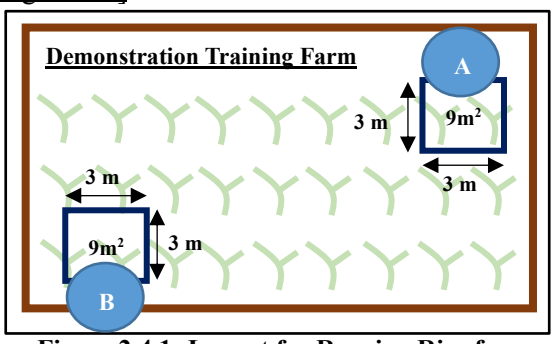

Figure 2.4.1: Layout for Reaping Rice for Yield Evaluation in the Demonstration Farm

- Calcurate the yield at 14 % grain moisture content based on the following fomula. (When you have a moisture meter, you shall measure grain moisture content after measuring weight of paddy. But if you do not have a moisture meter, you shall assume that moisture content of paddy is **28 %**.).

Yield (kg/ha) in one plot = [(Wight of paddy (kg)) x (100-30) / 86] x [10,000 (m^2) / 9 (m^2)]

Average of yield (kg/ha) in the demonstration training farm = [Yield in Plot A + Yield in Plot B] / 2

- Share the yield to participants to let them understand the impact of rice cultivation techniques introduced by FFS.
  - ➢ **Important thing to let participants follow rice cultivation techniques.**

2.5 Water Management Training (WMT)

Objective:

To train cooperative members on importance of cooperation between cooperative and WUO, role of WUO, maintenance of irrigation facilities, how to prepare water distribution plan and how to install simple division weirs made of eucalyptus logs and soil bags

Approximate Time Required: 5 hours (9:00 am to 13:00 pm)

WMT should be organized between the time of FFS-2 and FFS-3. Proposed time schedule for arrangement of WMT is shown in the following table.

Table 2.5.1: Schedule for Arrangement of Water Management Training

Activity	Day									
	-	～	-7	-6	-5	-4	-3	-2	-1	0
FFS-2	▼									
Decision of date of WMT and notification to participants			▼							
Preparation of necessary items for WMT									▼	
WMT										▼

(1) Necessary Items for WMT

- Materials shown in Table 2.5.2

Table 2.5.2: List of Necessary Materials for Water Management Training

No.	Item
1	Eucalyptus logs (3 pieces to 5 pieces, based on the width of canal to install a division weir)
2	Nail (1 kg)
3	50 kg weight of soil bags (4 pieces to 8 pieces, based on the width of canal to install a division weir)
4	Hoes
5	Hammer
6	Panga

(2) Necessary Arrangements for WMT

- Prepare materials shown in Table 2.5.2.
- Notify participants of date of WMT **one week before together with cooperative president and cooperative fulltime agronomist**.
- Participants of WMT shall be board members, zone leaders and association leaders of cooperative and WUO.
- Lecturer shall be mainly rice FFS facilitators or cooperative fulltime agronomist.

2.6 Cooperative Management Training

Objective:

To train cooperative members on basics and essentials of cooperative management and gender issues to strengthen the cooperative and ensure that both men and female are gaining fruitful result, such as increase in production and efficiency of sharing workload

Necessary items and arrangements are shown in the followings.

(1) Necessary Items

- Stationary (Scotch Tape, Marker Pen and Notebook)

(2) Necessary Arrangements

- Decide a venue cooperative management training (You had better select your cooperative office.)
- Notify participants of date of cooperative management training **one week before together with**

cooperative president and cooperative fulltime agronomist.

- Participants of cooperative management training shall be board members, accountant, zone leaders and association leaders of cooperative.
- Lecturer shall be mainly rice FFS facilitators, cooperative president, or cooperative fulltime agronomist.

2.7 Monitoring Activity

Objective:

To monitor growth of paddy to conduct each training on time and get good yield in demonstration training farm

Monitoring activities consist of i) monitoring of growth of paddy in the demonstration training farm and ii) monitoring of farmer to farmer extension. These activities should be done by you in collaboration with **cooperative fulltime agronomist and sector agronomist**.

2.7.1 Monitoring of Growth of Paddy

Monitoring of growth of paddy in the demonstration training farm is important to conduct each training on proper time. Especially, times of FFS-2 (transplanting) and FFS-4 (harvesting) are decided based on the monitoring result. If some problems occur in the demonstration training farm such as damage by pest or insect and water shortage, you and cooperative fulltime agronomist shall give instructions to plot owner of the demonstration training farm to take actions. Proposed monitoring system is shown in the following figure.

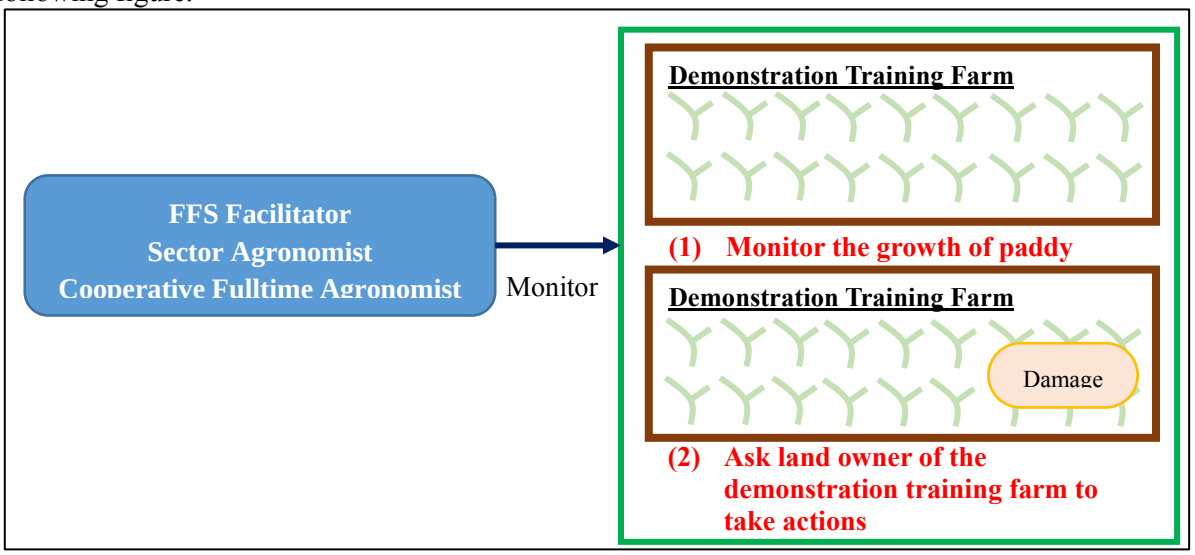

Figure 2.7.1: Monitoring System of the Demonstration Training Farm

2.7.2 Monitoring of Farmer to Farmer Extension

Concept figure of farmer to farmer extension is shown in Figure 2.7.2. Paricipants of FFS conducted by you shall share their what they learnt from each FFS with other cooperative memebrs. The participants are asked to organize mini-FFS to disseminate their obtained techniques. You shall facilitate organizing mini FFS by the participants after each training in collaboration with sector agrnomist and cooperative fulltime agronomist. These mini FFSs shall be monitored.

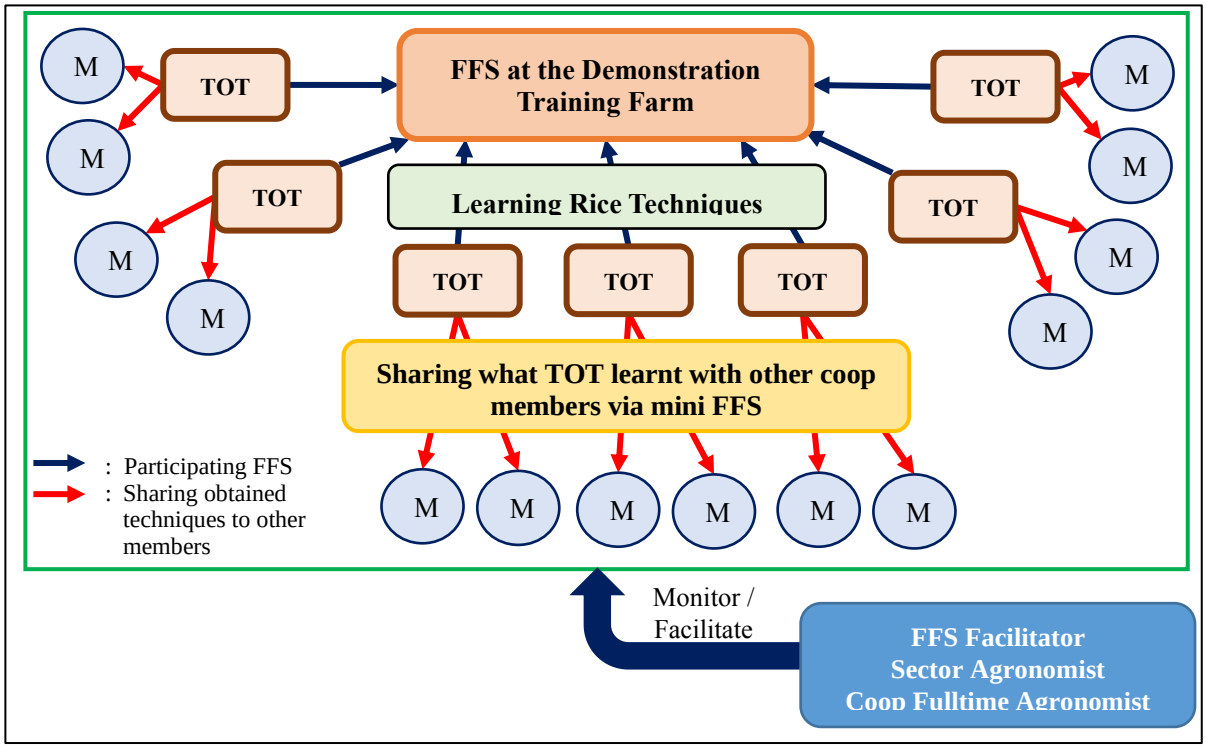

Figure 2.7.2: Concept Figure of Farmer to Farmer Extension

Appendix 1
Check List for Arrangement of Trainings

Check List for Arrangement of Trainings

1.	**FFS-1** ☞ **page 2-1 to 2-2**
☐	Prepare seeds from **four days before FFS-1**
☐	Prepare materials for FFS-1
☐	Notify participants of date of FFS-1 **one week before**
☐	Make soil bands to identify nursery before FFS-1
☐	Give a lecture in FFS-1
2.	**FFS-2** ☞ **page 2-2 to 2-3**
☐	Monitor growth of seedlings in the nursery
☐	Prepare materials for FFS-2
☐	Notify participants of date of FFS-2 **one week before**
☐	Do first plowing and second plowing 14 days and 3 days before FFS-2
☐	Give a lecture in FFS-2
3.	**FFS-3** ☞ **page 2-3 to 2-4**
☐	Monitor growth of paddy in the demonstration training farm
☐	Prepare materials for FFS-3
☐	Notify participants of date of FFS-3 **one week before**
☐	Give a lecture in FFS-3
4.	**FFS-4** ☞ **page 2-4 to 2-5**
☐	Monitor growth of paddy in the demonstration training farm
☐	Prepare materials for FFS-4
☐	Notify participants of date of FFS-4 **one week before**
☐	Give a lecture in FFS-4
☐	Calculate and share yield in the demonstration training farm in FFS-4
☐	Dry harvested paddy after FFS-4 and measure the weight which a rice miller collects
☐	Calculate yield after collecting paddy by rice miller and record the yield
5.	**Water Management Training** ☞ **page 2-6**
☐	Prepare materials for water management training
☐	Notify participants of date of water management training **one week before**
☐	Give a lecture in water management training
6.	**Cooperative Management Training** ☞ **page 2-6 to 2-7**
☐	Decide a venue for cooperative management training
☐	Prepare materials for cooperative management training
☐	Notify participants of date of cooperative management training **one week before**
☐	Give a lecture in cooperative management training
7.	**Monitoring Activities** ☞ **page 2-7 to 2-8**
☐	Monitor growth of paddy in the demonstration training farm
☐	Monitor farmer to farmer extension by the participants in FFS