Metta
Development
Foundation

LIFT

FARMER FIELD SCHOOL
(UPLAND RICE)

FACILITATOR'S HAND BOOK

CONTENT

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Project Coordinator

Metta Development Foundation

CHAPTER (1)

FARMER FIELD SCHOOL

(FFS)

CHAPTER 1

FARMER FIELD SCHOOL (FFS)

Background History

Farmer Field School (FFS) evolved as a response to address some key challenges that resulted from the frequent use of synthetic chemicals in agriculture. The word "Farmer Field School" actually derived from the Indonesian expression of Sekolah Lapangan meaning field school.

The first field school began in 1989 in Central Java, Indonesia in an effort to address the problems of unwanted pests, insects appearing in rice in huge quantities as a consequence of massive use of chemical insecticides. The quick success of FFS in containing those pest insects opened up a new horizon in pest management and FFS gradually became a unique approach in Integrated Pest Management (IPM). Farmers all across Asia enthusiastically responded to FFS. Using FFS, farmers were able to successfully manage the common problem of pests and reduce pesticide use in rice from 75 percent to almost nil. At the same time rice yields increased and profit margins grew.

The area and scope of FFS continued to grow and the use of FFS expanded from rice to other crops. Soon FFS emerged as a standard approach in agricultural extension. FFS is now the most successful and effective extension approach not only in agriculture but in many other sectors which have adapted the approach with great success.

Pioneering work of Metta Development Foundation for Farmer Field School (FFS)

For the purpose to improve basic food security, Metta Development Foundation has introduced the Farmer Field School in lowland rice planting. It has been carried out to significantly increase the yield rate of rice belonging to the farmers who has participated in this project. The average of rice yield rate was increased from 2 tons per hectare (40 baskets per acre) to 5 tons per hectare (100 baskets per acre). This is the lowest cost of cultivation without using fertilizer and pesticide.

FFS has been carrying out by Metta Development Foundation coordinating with the local organizations and village community people. Since 2001, it was started in Kachin State and Shan State, and in 2005, FFS has been extended to 500 villages and they are in operation.

Metta Development Foundation and Livelihoods and Food Security Trust Fund (LIFT)

With 12 years experience of Farmer Field School, and based on the agricultural needs of local indigenous farmers, programs for farmers' sustainable income and programs for locals' food security have been further coordinated and implemented in accordance with the environmental protection. In order to put into practice for food security of indigenous people living in the hill region, they need to acquire their own agricultural knowledge so that they can make the right decision well. For this reason, it is prerequisite to enhance their performance first.

This project was conducted from December 2011 to December 2013 for farmers to acquire skill in upland rice production by Metta Development foundation, cooperating with local people, which has conducted series of farmer extension trainings, funded by LIFT. It was meant to promote, based on the former accomplishments, the extension of upland rice cultivation that is really needed in the hill region.

Concept of FFS

Farming is a matter of decision making, decisions about which crop to grow, which variety to use, which management practices to apply, how much capital to invest, how much area to cultivate, and so on. The success of farming depends on better decision-making and the decisions are determined by the overall understanding of the above issues. Farmers by tradition have a wealth of experience, but they also have many conceptions and fears , as many of them did not have a formal opportunity to study the basics of science.

Farmer Field School provides farmers with the basics they need, so that with their diverse experience and the given scientific knowledge they become expert decision makers and ultimately can make significant improvements in production and income in a sustainable manner.

The particular subjects on which FFS provides farmers basic education are agro-ecology, agronomy, soil science, plant protection, water management, economics, social science etc., using a non-formal approach. As the school is established in the field, and the students are farmers, called Farmer Field School (FFS).

The methodologies used in FFS

People generally say,

"When we hear we remember some
When we see we remember more
When we do we remember the most,
But when we discover we never forget."

Discovery based methods are the key to FFS. While these methods provide the primary bases of FFS, there are other methods too, which are generally used to set and facilitate the discovery process.FFS in all aspects is a natural process of learning. The methodologies used in FFS are primarily intended to create more natural opportunities for farmers, so that they learn from actual situations on a continuous basis. In doing so the common methodologies used are:

Season-long field study

FFS is actually a place for season-long study. If the FFS is on rice, it is a season-long study of rice, if it is of vegetables; it is a season-long study of vegetables. To facilitate such study farmers require a study field.

In the study field, they grow crops and establish studies and experiments to learn various issues of crop production, such as soil management, water management, pest management, etc.

The studies are generally classified into two categories, one is general study, which is common in most of the FFS and the other is concept-specific study which is basedon the need and the interests of the farmers.

Action research

Problems are countless, and they are very common to farmers' regular life. Solving a problem may help the farmers for the time being, but it does not help unless they learn how to solve the next problem, as new problems continue to emerge with new issues. Therefore, the next important methodology used in FFS is to guide farmers with the problem solving process. The methodology used in problem solving is as common as the methodology used by researchers while solving a particular problem. Farmers are usually provided with guidelines on how to set up experiments or conduct action research. The action research they 4 conduct is based on their problems and the issues they identify during field observation and agro-ecosystem analysis, which is a regular weekly activity of FFS.

Participatory planning

FFS usually begins with a planning process. During the planning, the general purpose and the working methodologies of FFS are explained to the community. They are then asked about their specific expectations. Based on cause and effect analysis the expectations are then prioritized into specific objectives of FFS. The objectives are then qualified and quantified with specific measurable indicators so that after a certain period, the community can assess the progress of FFS.

Based on the indicators, specific activities of FFS are determined. Later, an action plan is prepared identifying the needed materials and determining a tentative schedule to perform the activities. The activities of FFS begin immediately after the action plan is prepared. The action plan actually acts as a guideline for the farmers to work together and maintain their regular responsibilities. The action plan is usually prepared for one season or one full year based on the nature of FFS. If the FFS works on the crops the action plan is prepared for one season.

Working in group

As the saying goes "Two brains are usually better than one and similarly three brains are better than two," working alone one can learn some but working in group one can learn more as it provides more opportunities of learning. Besides, as individuals, trying new can be difficult, but with groups support it becomes easier. Working in group, therefore, is an important methodology of FFS. FFS is usually organized for a group of about 25 farmers of a community with common interests. This number is roughly the number that can comfortably work together.

These 25 are then divided into small groups of five so that all members can better participate in field observations, analysis, discussion, and presentations. In small groups they grow crops, establish studies and experiments, and monitor and analyze them. The findings then are presented and shared in the large group, which provides each group an equal opportunity to learn from the other.

Working in groups also provides the opportunity to build unity and solidarity among the farmers. It also builds leadership in each of the farmers as everyone, while working in FFS, has the chance to be leader of the small and large group.

Participatory Monitoring and Evaluation (PME)

The introduction of PME to FFS provided a unique opportunity to farmers to understand the results of their work. PME is usually organized at the end of the crop season. During PME, which uses a number of tools, farmers in groups systematically evaluate which activity of FFS worked well and which not.

This actually leads them to identify the particular successes and challenges, provides them with opportunity to revise the old plan and prepare a new one.

The simultaneous process of planning, which is done at the beginning, and monitoring and evaluation, which is done at the end of the season, helps the communities to gain skills in planning, monitoring and evaluation, and they gradually become efficient in 1) problem identification, 2) goal setting, 3) action plan development, and 4) monitoring and evaluation. The process further guides them in how to continue the development efforts even after the FFS has graduated.

Field Day

Farmer Field School usually begins with 25 farmers who form the core group of farmers in the village. The group participates in all the regular activities of FFS and is therefore, the primary beneficiaries of FFS. But the ultimate benefits of FFS are targeted to the entire community of a village. Since FFS is a very intensive process of learning it is difficult to accommodate more than 25 farmers in a FFS.

Therefore, it begins with a manageable group of 20-25 farmers. Through working in the FFS, farmers usually gain a significant amount of knowledge in various aspects of farming. The field day provides an important opportunity for dissemination of such knowledge among all the farmers in the community.

The field day is usually organized towards the end of the FFS or during the graduation of the FFS. During field day while presenting the learning to a diverse group of people, which include community farmers, village leaders and government officials including extension workers and specialists, farmers gain tremendous encouragement and recognition.

The recognition from such a diverse group helps them become established as important resource persons in the community. In such a way the field day becomes an informal knowledge and experience sharing channel.

The principles of FFS

The following principles are adopted in FFS. For the facilitators, these principles serve as guidelines on how to facilitate the farmers to grow crops and other activities.

Grow a healthy crop

A healthy crop is free from disease and other infestations and it has a higher degree of resistance and therefore, can recover from injuries and damage associated with insect attack and disease infestation much quicker than weaker crop. Quality seeds and seedlings, good and resistant varieties, balanced nutrients and appropriate management practices provide the foundation of a healthy crop.

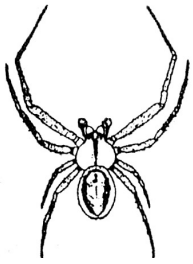
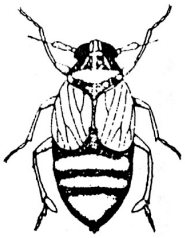
Mistakes in any of them usually results in poor establishment of the crop, which becomes highly vulnerable to insect and diseases. To recover the situation, farmers usually opt for pesticides, which hardly help, as it does not hit the main problem. The actual pest management does not rely on one single activity; rather it is a process to understand how to grow a healthy crop. Farmers in FFS are guided with this process.

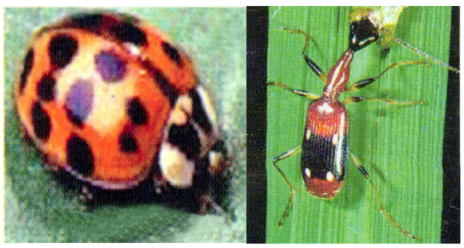
Conserve the natural enemies

Insects are often misunderstood as harmful. No insect is actually harmful unless its population grew into damaging numbers. Besides, many insects such as parasites, predators and pathogens have long been recognized as beneficial by nature.. Because, they control and destroy the pests which damage the crops and insects which carry the diseases.

Recent research shows that microbial antagonists and competitors of plant diseases are also important. Vetebrate natural enemies are also essential for control systems. Conservation implies avoiding inappropriate pesticides applications as they kill the natural agents and the improving soil organic matter necessary for beneficial soil microorganisms.

Natural enemy habitat protection and development are more active methods of conserving natural enemies (e.g. owl houses, mulching for spiders, floral nectaries for parasites). Inoculation or inundation of reared natural enemies may be possible under special circumstances but usually only after conservation efforts have already been implemented.



Observe the crop regularly

Carrying out a particular operation to manage a crop requires close and regular observation of the field, particularly the conditions of plant, soil, water, weeds, and climate such as temperature, sunlight, humidity etc as crop development is primarily determined by the combined effect of all of these. Decisions taken without such observation are blind, in most cases inappropriate, which lead to the use of unwanted chemicals on the fields. Regular field observation provides farmers with the opportunity to study and understand the field situation through an analytical process known as Agro-ecosystem Analysis (AESA), which provides the basis to make decisions regarding

the activity which is most appropriate at the particular stage of a crop. As a result, the crop performs better, unwanted costs are minimized and yield level improves. Through regular observation, farmers learn how crop physiology and morphology changes with a change in the climate and other factors that govern the crop production.

Regard farmers as experts

This principle underlies the fact that farmers need to eliminate their dependency on others to solve their problems. This is only possible when they become experts in their own fields. Therefore, developing farmer as experts has been adopted as a key principle of FFS. Many, however, consider this as the ultimate goal of FFS. An expert is an expert not because he knows everything but because he knows how to know unknown things. Similarly, very often, learning ends when someone has learnt a particular thing. But learning will never end when someone learns how to continue learning. FFS provides farmers with a process to continue learning for their whole life. They are actually guided with the learning principles so that they know how to carry on learning and become experts in an unknown field.

Structures of a FFS

Study plot

FFS comprises a study plot where farmers grow crops and set up a field studies and carry out particular experiments to conduct problem based action research. The area of the study plot can be from half an acre to one acre. The study plot is usually set up near the village so most farmers have easy access to participate

Meeting place

A meeting place is needed in FFS to facilitate discussions among farmers. Farmers first gather in the meeting place to hear necessary guidelines from the facilitators. They then, in small groups, go out to the field and observe and monitor the field studies using a format commonly known as AESA. After the field visit, they return to the meeting place to process the field visits and continue discussions and sharing. A meeting place should:

1. have facilities for writing
2. have protected from sun and rain
3. have space for hanging papers
4. be close to the study field

Participants

FFS participants are farmers. Selection criteria of farmers:

1. Those who are interested and committed to participate regularly
2. They are full time farmers
3. Women farmers are equally encouraged to participate

Facilitator

1. Should be a graduate of TOT course
2. Should be seriously committed

FFS Committee

Every FFS has a committee comprising 3 members (chairman, secretary and treasurer). Their major roles are to organize farmers and maintain the day- to- day activities of FFS.

Curriculum of FFS

The curriculum usually contains some compulsory subjects as well as subjects that are determined by the farmers based on their needs and interests. The compulsory subjects contain the basics of crop production, while subjects chosen by farmers are released to their regular constraints in farming. A typical curriculum contains the following subjects.

Planning

1. Community mapping
2. Goal setting
3. Baseline and goal analysis
4. Action plan

Seed and Seedlings

1. The importance and criteria of quality seeds/seedlings
2. Seed sorting with salt solution
3. Production of quality seed
4. Production of quality seedlings

Soil

1. Role and importance of micro-organisms and organic manure
2. Production of IMO, compost, plant juice, etc.
3. Essential elements, functions and importance (group dynamic)
4. Availability and loss of nutrients and recycling of crop residue/rice straw
5. Growing green manure
6. Nutrient cycle (group cycle)

Agro-ecology

1. The ecosystem and agro-ecosystem
2. Components and interactions of agro-ecosystem
3. Principles of Farmer Field School
4. Agro-ecosystem analysis

Morphology and physiology

1. Growth phases and stages
2. Study of morphology; seeds, tillers, panicle initiation, flowering (herbarium)
3. Nutrient uptake (practical)
4. Effect of pesticides on human health and environment (practical)

Plant protection

1. Insect collection and identification
2. Life cycle of insect (insect zoo)
3. Herbal pesticide
4. Disease triangle (group dynamic)

Participatory Monitoring and Evaluation (PME)

1. Monitoring and evaluation
2. Reviewing and planning

Session structure of FFS for upland rice training

FFS sessions on rice are usually held on weekly basis. A session usually lasts for four hours. The whole session is divided into three parts as follows. After a very brief recapitulation of the previous week's activities, AESA begins, and lasts for around 2 hours.

The next activity is a team building or energizer exercise, which lasts from 15 minutes to 1 hour based on the type of activity. The team building exercise provides team spirit, while energizer provides new enthusiasm to the group. The final activity of the session is carried out on a topic selected earlier or on an issue arising from the field visit. This activity usually lasts for one to one and half hour.

Agro-ecosystem Analysis (AESA)

- Collection of data on the field development
- Compilation of data
- Processing and analysis of the observation
- Presentation, discussion and validation in large group

Team building

Group dynamic activity or group activity games or icebreakers

Entertainment for leisure or energizers

CHAPTER (2)

FACILITATION

CHAPTER 2

FACILITATION

The skills needed for facilitating a FFS

Two important skills are crucial for facilitating a FFS; one of them is technical and the other is social. Both skills, however, are equally important. The primary aspect of technical skill is to guide farmers with confidence on how to produce better crops, while the fundamental aspect of social skill is to assist them in becoming better decision-makers as well as better problem solvers. FFS facilitators are usually provided such skills through organizing season-long training where they receive an opportunity for learning and practicing such skills simultaneously. The duration of the training is usually three to five months, depending on the crop cycle.

The adult education- the key to facilitation

Education for children is often like filling a cup with tea, milk and sugar, while adult education is more like stirring an already full cup to blend the ingredients in a new way. Farmers have long experience and knowledge, and by blending such experience and knowledge in a group, new knowledge can be created. Therefore, the key to facilitation is to learn how to blend farmers' experiences and knowledge. Creating a learning environment that facilitates spontaneous sharing among them is an important means of achieving this.

Difference between adults and children

Adults	Children
Have experience	Have no experience
More ability to think	No or less ability to think
Have more knowledge	No or less knowledge in life
Have much responsibility	Too young to have any responsibility
Have honor	Have only fear

Based on such difference, it is unwise to use the same methods in teaching adults and children.

The principles of adult education

1. Learning is meant for improvement in life.
2. Adults feel more comfortable learning through facilitation rather than teaching.
3. Learning becomes more effective when it happens in a group.
4. A greater part of learning comes from sharing. Thus, respect other's opinions so that everyone feels encouraged to share.
5. While learning, never feel that you are learning alone, but rather that you have more to share.
6. The most effective learning is the learning that comes through our own discovery.
7. The best thing to learn is to learn " how to learn" – a process that enables people to learning.
8. Analyze the learning so that you can generate new learning.
9. Learning can be boring without fun, so make fun to make it more interesting.
10. .Mistakes provide wonderful opportunities for learning. So do not feel embarrassed. when there are mistakes as they provide wonderful opportunities to learn from.
11. Document your learning so that others can learn from what you have learnt.

What is facilitation?

The meaning of facilitation varies based on the subjects or issues that are to be dealt with. Facilitation, in general terms, means guiding a group of people to attain their desired expectations. In FFS, it means to facilitate an interactive learning process for the farmers so that they are more competent in decision- making for improving their crops and living in a sustainable manner.

The role of a facilitator

In such interactive learning process, facilitator's role is to create a good learning environment by:

1. *Making more and more opportunities for learning* – through field studies and experiments and through interactive discussions and analysis based on agro-ecosystem analysis.
2. *Ensuring that everyone is participating in the learning process*-every farmer is actively participating in the agro-ecosystem analysis and in the subsequent discussions.
3. *Finding a comfortable place to process the group meetings and discussions*-not necessarily a luxurious one but there has to be enough space to sit comfortably and to have discussions without being disturbed by outsiders or outside traffic.
4. *Laying out the norms for group- work and the rules for discussions with the participants* that everyone has an opportunity to share as well as an opportunity to ask questions.
5. *Enabling thorough analysis among the farmers*- most often sharing goes on without analysis and this does not produce any outcome or learning. Therefore, a thorough and critical analysis is important to an interactive discussion.
6. Summarizing and consolidating the discussion to draw a precise learning.

How to be a good facilitator

The quality of facilitation depends on the actual level of confidence and the overall understanding of the subject matter and the peoples who are to be dealt with. Confidence is something that cannot be built within a day or week. This would essentially require continuous practice and adequate preparation. Therefore, one cannot expect to be a good facilitator instantaneously.

The following points, however, are good tips to practice to become a better facilitator.

To be a good facilitator requires good preparation- the topic, the materials needed, and the methods to be used to facilitate the session. Better preparation makes one more confident in facilitation over time.

A better understanding of the expected outcomes of the session or the group-work is essential as this will help to determine what to talk about and what not to talk about and most importantly which methodologies will be most effective.

Practicing self- evaluation at the end of each session is the most practical way to improve facilitation. This helps one identify his or her particular strengths and weaknesses, providing an opportunity for improvement. Continuing practice of such self-evaluation will eventually make one a very good facilitator.

The most important job for a facilitator is to create a good learning environment as mentioned earlier. The facilitator must see that the participants are interacting and learning. To make sure this happens requires good preparation, about the subject, the venue and other supporting materials.

Selecting an appropriate venue is part of a good learning environment. An appropriate venue means the participants have enough space to sit comfortably, and there are adequate facilities needed for the session as well as no outside disturbances.

Use of appropriate time and effective tools can make facilitation much easier. The facilitator needs to be careful in selecting the time of the session; the time must be decided based on the convenience of both the participants and the facilitator himself. The tools must be prepared ahead of time by the facilitator.

A better understanding of the participants, particularly their education, understanding levels, expectations, etc. is also useful. This helps the facilitator when making decisions regarding the content of the facilitation such as the use of particular methodologies or tools and choosing the most effective for the specific group.

For quality facilitation, the facilitator must try to use the most effective methods and an attractive style of facilitation. It is valuable to be familiar with the use of many different styles and methods.

The facilitator must be confident and very clear about what he or she is teaching. To make sure that happens, the facilitator, from time to time, must ask questions of the participants.

The facilitator needs to be patient. Loss of temper could make the facilitation worse; therefore, the facilitator should be prepared for the many different scenarios that may arise.

During facilitation, participants may overemphasize note taking rather than listening to the facilitator. The facilitator, therefore, needs to make clear the importance of listening and participating and that if there are things that need to be noted they will be supplied as written materials.

Presentation is an important thing in facilitation. The facilitator needs to talk with smiling face, making eye contact with the participants and asking them questions. This will create a very congenial and comfortable atmosphere and will help establish a good relationship between the facilitators and the participants.

Humour can also play an important role in facilitation in many different ways. It allows for a change in pace and an opportunity for participants and facilitators to connect in a different way. In addition, the facilitator needs to practice ice-breakers and ways to energizer or refresh participants and the learning environment

CHAPTER (3)

FFS PLANNING

CHAPTER 3

FFS PLANNING

Introduction

The success of Farmer Field School (FFS) in the community relies heavily on careful planning. The process involves several steps. The first step is to explain to the farmers in the community about FFS, particularly its overall objective and methodologies, so that a very clear uniform understanding about what FFS can actually do is achieved.

Objective

The objective of the planning process is to provide farmers with adequate skills so that they are able to

- Identify their major problems and specific reasons for the problems and accordingly set up goals and objectives,
- Prepare an action plan with a specific timeframe and necessary activities and supports and
- Develop particular mechanisms for working together to achieve those goals and objectives.

Community FFS means

1. The whole community
2. Their needs
3. Their desires
4. Their abilities and resources
5. Their plan
6. Their implementation
7. Their evaluation
8. Their continuance and
9. Ultimately, they master the process of community development

Steps of community FFS planning

1. FFS site selection
2. Organize village meeting and explain to the villagers
3. Farmers selection
4. General agreement
5. Community mapping
6. Goal setting
7. Baseline and goal analysis
8. Action plan (planning matrix)
9. Preliminary workshop with village leaders

Site selection

Site selection is the very first activity of the FFS. Selection of an important and useful site can spread the impact of FFS very quickly to a larger number of beneficiaries. A good site can make the facilitation easier. The first criterion of selection a site for FFS is the demand and the request of the farmers of the area or the village. A site needs to be selected jointly by the FFS team and the local leaders of the community. Representation of community leaders in site selection is important to provide the community with a sense of ownership of the FFS.

Village meeting

The village meeting is the next activity of FFS. During the meeting, the villagers are introduced the concept of the FFS. This should be done very clearly. For this, the FFS team needs to prepare well. The team can prepare special posters based on the outputs and achievement of FFS in other places. They can bring pictures and some histories along with them to share with the new community how other farmers are making progress. The meeting can also highlight some cost and return analysis to explain potential gain for farmers from FFS.

Farmer selection

Selecting appropriate farmers for FFS is very crucial since these farmers will have to share their

learning with other farmers in the community. Selection criteria of farmers are already mentioned in section 1. Based on those criteria, it is very important that the community identifies and selects those farmers. The facilitator and the other members of the FFS team 18 should explain the importance of the criteria. Selecting farmers by the community again provides the community with an important feeling of ownership of the FFS.

General agreement

Once the farmers are selected, a general agreement should be made with the selected farmers assuring their active participation in all the activities of the FFS

Community Mapping

Introduction

Community mapping is the first exercise done by all farmers and facilitator of FFS together. This initial activity provides an element of group feeling among all farmers. The map, drawn during the exercise, indicates different important resources and their locations in the community. The map is considered as the base map of the community and serves as reference during different discussions.

Objectives

- Identify the available resources and their locations in the community and
- Create a feeling among the farmers that they belong to a community.

Materials

Brown papers, markers, color pens, pencils, rulers and erasers

Time

Two hours

When most appropriate for facilitation

At the very beginning of FFS

Steps

1. Explain what community mapping is.
2. Discuss the objectives of the exercise.

3. Explain the procedure.
4. Start the procedure by deciding on the boundary of the map.
5. Then decide the items and resources that should be included in the map.
6. Decide on the landmarks first.
7. Define signs and symbols for different items.
8. Divide the participants into small groups (5-6 in one group).
9. Tell each group to draw a map of the community.
10. Start the drawing from the landmarks.
11. Use different colors.
12. The top of the map should be the north.
13. Use legends.
14. Present the map from each group and organize discussions and come to common agreement on various items and their location on the map, and
15. Accordingly revise and finalize.

Goal Setting

Introduction

FFS goals are determined based on the expectations of the farmers of FFS. They are first asked what they actually expect from the FFS. Based on those expectations, on cause and effect analysis basis, the overall goal and the objectives of the FFS are set up. The overall goal is called the bigger goal and the objectives are called smaller goals.

Objectives

- Identify specific expectations of the farmers of FFS
- Generalize those expectations into common goals based on cause and effects basis

Materials

Flash cards, markers, and tapes

Time

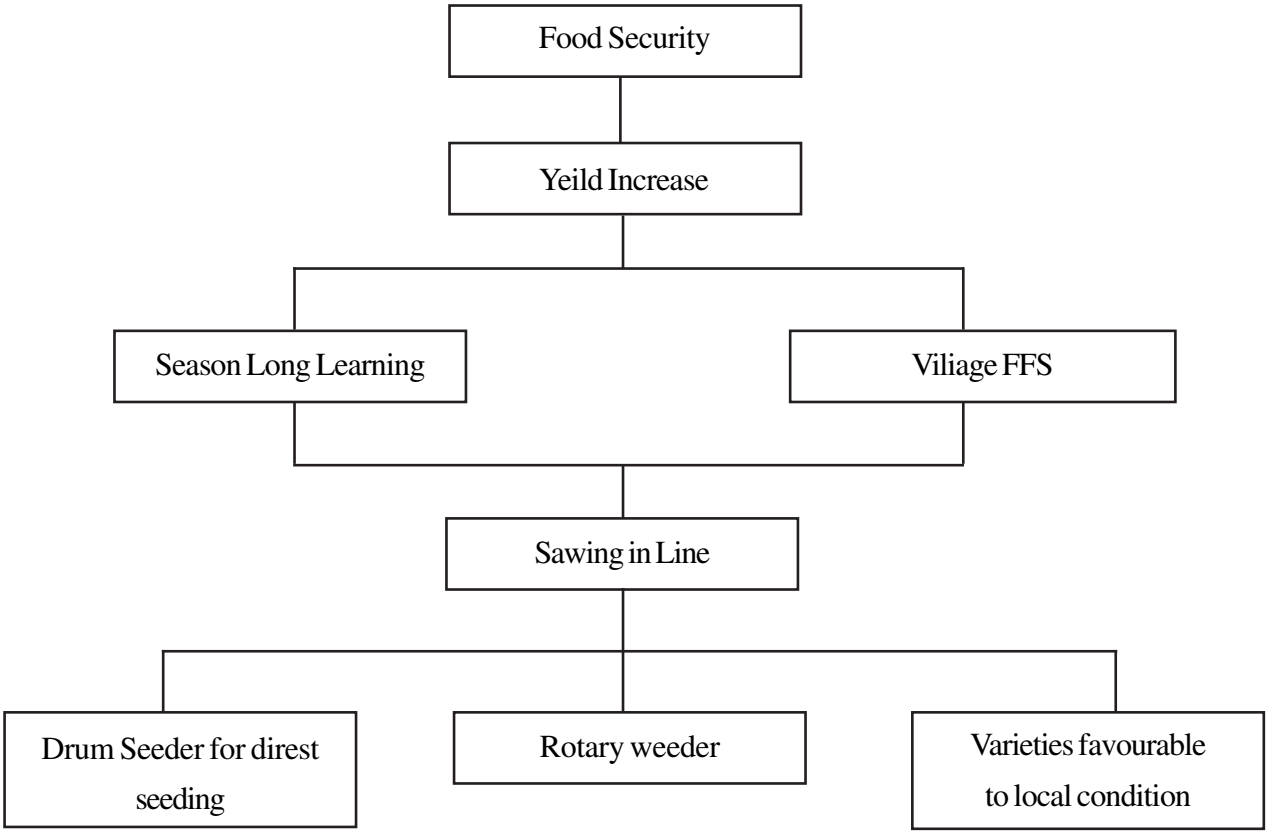
1.5-2 hours

Steps

1. Explain the objectives of the session.
2. Distribute some flash cards to the farmers, and ask them to write down their most important expectations on the flash cards (one expectation on each card, allow one person to write maximum two expectations).
3. Group the expectations based on their nature.
4. Arrange them on cause and effect basis.
5. Explain that all these expectations, arranged on cause and effect basis, are now the goals of FFS. The expectations on the upper line are the bigger goals and on the lower lines are the smaller goals. Achieving smaller goals will help to achieve the bigger goals.

Note: Some expectations you may not be able to arrange into groups. Put them aside. Similarly, some expectations may not be addressed by the FFS in the first year or may not be reached by the FFS at all. Those expectations need to be clarified to the farmers so that they have no misunderstandings about what FFS is planning to do.

A sample output of goal setting exercise



Baseline and Goal Analysis

Introduction

While goals are set in the goal setting exercises, these exercises determine the indicators for both goals and baseline situation of the community, specifically on crop production, yield, current management practices ,their problems, etc., so that over the years they can compare the improvements. Analysis of the baseline and subsequent goals helps the farmers to determine the appropriate activities required to achieve those goals.

Objectives

- Analyze the goals to qualify and quantify with specific results and indicators.
- Assess the current situation of the community and determine the baseline information in different aspects for comparisons.

Materials

Brown sheets, marker pens, and adhesive tapes

Times

Two hours

Steps

1. The session must follow the goal setting session.
2. First hang the output of goal session on a wall so that everybody can see his or her goals.
3. Explain the importance of the session.
4. Write down the goals on a paper, one by one.
5. Against each goal discuss baseline situation and determine specific figures.
6. Then quantify/ qualify the goals and set up specific results and indicators under each goal.
7. Summarize the whole session and explain to the farmers that these specific results indicators are now the specific target of the FFS.
8. Tell the farmers that the next session will determine which specific activities will be needed to achieve the results/indicators.

Action Plan (Planning Matrix)

Introduction

Once the activities are identified, they are placed into a matrix with specific time, responsibilities and necessary materials or supports needed to perform them. The matrix then becomes the action plan and serves as the guideline for the FFS. Through this, farmers, group leaders, and facilitators will become aware of their duties and responsibilities. The process provides the farmers in FFS with a great sense of ownership of the FFS, as they prepared the plan together. This participatory process greatly enhances farmers' and community's ability for planning.

Objectives

- Identify the specific activities, particular time, and responsibilities and support needed to acquire the results/goals of the FFS and
- Prepare the action plan for the FFS.

Materials

Brown sheets, marker pens and adhesive tapes

Time

1-2 hours

Weekly activities

1st week	Ballot box test
2nd week	Seed/seedlings
3rd week	Compost, nutrients
4th week	Making compost/green manure
5th week	Layout and transplanting
6th week	SRI and transplantation of rice
7th week	Agro-ecosystem, food web and food chain
8th week	Agro-ecosystem analyses (AESA)
9th week	AESA, Growth phase, importance of water
10th week	AESA, Insect collection and identification
11th week	AESA, Specific topic/ regular session
12th week	AESA, Specific insect/disease management
13th week	AESA, Nutrient uptake, effect of pesticides etc.
14th week	AESA, Micro-organisms
15th week	AESA, Disease triangle

CHAPTER (4)

FIELD STUDIES

CHAPTER 4

THE FIELD STUDIES

Importance of the field studies

The field studies provide farmers with an opportunity to learn from the actual situation. Farmers traditionally have much experience, and though they know many things that happen in the field, they do not always know why and how such things happen. For example, they know crop physiology and morphology change with time but they do not know how they change.

Once farmers are provided with the basic principles of crop physiology and morphology, they are to apply this to other areas as well, learning many things that are once overlook. Farmers in FFS are given all the basic principles of crop production. Using the principles they can study all the aspects of a crop. This requires setting up field studies so that the learning comes from real conditions.

Types of field studies

Generally two types of field studies are used in FFS; they are general study and concept specific study. In addition, based on particular problems appearing in the field, another type of study is widely used, known as action research.

General study

In the case of general study, the selected field is divided into two parts. In one part , crops are grown with the traditional or conventional methods farmers usually apply in their own fields, while in the other part, crops are grown with a standard set of practices that evolved based on the ecological principles of crop production, known as IPM or SRI practices.

Farmers in both parts and on a regular basis, monitor the changes, particularly of the plants, through close observation and by collecting systematic data on various aspects such as plant height, plant color,

growth and production of tillers and leaves, infestation and population of harmful and beneficial insects, disease infestation, water condition, weed infestation and general environmental conditions such as temperature, humidity, rainfall, sunshine etc.

They analyze the data in groups and based on the analysis, make important decisions that are appropriate in such field conditions, and accordingly, carry out regular operations in the IPM section.

In the other section they maintain operations as farmers usually do in such conditions. They continue the process until the harvest. After the harvest, they measure the yields and make a cost and return analysis and share the results within the groups as well as with other farmers in the community.

Action Research

In FFS, field visit or agro-ecosystem analysis produces many questions in the minds of farmers. Some of the questions come from the existing problems of the field, while others are farmer's curiosity about particular aspects of the crop. Most of these questions are usually solved through group discussions, based on the sharing of farmer's existing knowledge and experiences, but some require special attention since their answers are not known to them. These unknown questions form the basis for conducting action research or setup experiments in FFS.

An experiment comprises a number of treatments and replications. A small group of farmers can establish one treatment or one replication of a treatment. The experiments are monitored and observed as regularly as the other studies. The results of the experiment produce particular solutions to the problem. Continuous practice of this problem solving process makes farmers as equal to other experts and ultimately they become more efficient in problem solving and decision-making.

Learning objectives

- Learn the experimentation process
- Learn how to solve a particular problem

When most appropriate for facilitation

Any time in FFS

Time needed

3 hours

Material needed

Problem, paper, markers, and adhesive tape.

Steps

1. Let the participants identify a particular problem during their field visit.
2. Ask them to discuss the root causes of the problem.
3. Based on the discussion, ask them to prioritize the most key causes, and consider a hypothesis that this problem is because of this or that…
4. Now ask them how they could validate the hypothesis. Explain them that it would require them testing all the possible causes separately. Each cause could be a separate treatment.
5. Explain them, to be sure of the causes each treatment requires to be tested in several locations. Each location could be considered a replication.
6. Tell them that each small group can establish one treatment, or if there is less number of treatments, then each small group can establish few replications of a treatment.
7. Tell them to monitor and observe each replication and record important data on regular basis.
8. In the end compile all the data together and share the results.

Discussion questions

1. What is meant by problem?

2. What are the root-causes of the problem?

3. Which is the ultimate result? Which is the actual cause of the problem?

4. How do you learn that?

5. What is experimentation?

6. What are the important requirements to conduct an experiment?

7. What do you mean by treatment and replication?

8. Is it possible for farmers to do research?

9. What are the most effective ways of problem solving?

10. Can this process of problem solving be useful to solve other problems?

CHAPTER (5)
SUPPORTING LESSION FOR UP-LAND RICE

CHAPTER 5

SUPPORTING LESSONS FOR UPLAND RICE TRAINING

Quality Seed

Introduction

Quality seed is the foundation of a healthy crop. Irrespective of other management practices, use of quality seeds alone can enhance rice yield by as much as 20%. Many seed-borne diseases can be successfully controlled by using quality seeds. Many communities, however, are not aware of the fact that seeds are different from ordinary rice: an important reason why most farmers in Myanmar use their ordinary rice as seeds.

As a result, not only do they lose significant amounts of production, but it also brings many unwanted concerns to them such as infestation of pests and diseases. Farmers, generally, use three to four times more seed than they actually require for transplanting. By using quality seed, seed requirement can be drastically reduced.

Learning objectives

- Learn about the importance of quality seed
- Study the characteristics of quality seed

When most appropriate for facilitation

Before seedling preparation

Time needed

1-1.5 hours

Material needed

Ordinary rice, poster papers, markers, tape and pieces of cloth

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Distribute to each group a handful of seeds.
4. Tell them to sort the seeds according to the categories below;
   - spotted seeds
   - unfilled seeds
   - good seeds (uniform in size, shape and color)
   - seeds that are not uniform in size , shape and color.
   - seeds of other varieties
   - non seed materials
5. Tell them to count and find out the percentage of seeds of each category.
6. Ask them to present the results to the big group.
7. Consolidate the discussions.

Discussion questions

1. What is quality seed?
2. Why do we need quality seeds?
3. Discuss the characteristics of quality seeds.
4. What percentage of your seed is good quality?
5. What are the other seeds?
6. What happens when you use those seeds?
7. How can we get quality seeds?

Characteristics of quality seeds

- Quality seeds are uniform in size, shape and color.
- They are free from disease and insect infestation.
- Have good vigor and viability.
- Germination is over 98% for rice
- Impurity is less than 1%

Preparation

All the material should be collected before the session.

Seed Sorting with Salt Solution

Introduction

High density seeds have more ability to produce strong seedlings than usual seeds. At the initial stage, seedlings take up nutrients only from seed. As the size of the endosperm, which serves as the primary source of nutrients to the seedling, is larger in high density seed, it provides more nutrients to the seedling. Stronger and healthy seedlings have more resistance to adverse conditions and, therefore, are less likely to have insect and disease infestation. Like quality seed, quality seedling is an important input of growing a healthy crop.

Learning objectives

- Learn how to select high density seeds
- Study the importance of using high density seeds

When most appropriate for facilitation

After quality seed session

Time needed

1 hr

Materials needed

Seeds, salt, egg, container or water bucket

Steps

1. Explain the objectives to the participants.
2. Ask them to share their experience of seed selection.
3. Discuss the importance of seed selection.
4. Show them how to prepare salt solution and sort out high density seeds. See the guidelines in the box below.
5. Discuss the process as well as the benefits of seed sorting.

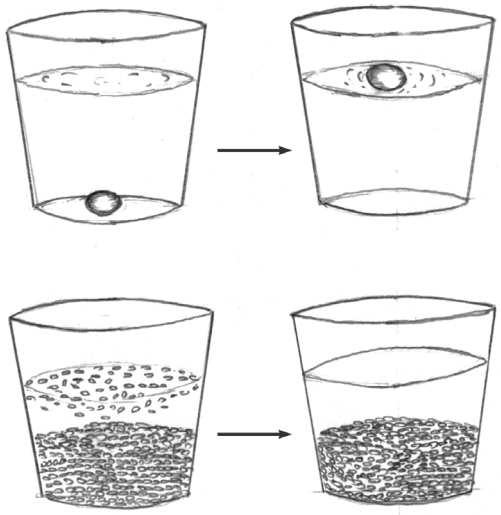
Discussion questions

1) Why do we need to select high density seeds?

2) Discuss the advantage of using high density seeds.

3) What can happen if we do not select full grain or high density seeds?

How to separate high density seeds



• Take an adequate amount of water (6-10 liters) in a bucket.

• Put an egg into it. The egg will sink to the bottom of the bucket.

• Add salt to the water in the bucket until the egg completely floats on the water surface.

• Put the seeds to be sorted out into the water solution.

• Stir all the seeds and after a few minutes remove those seeds that float on the water surface.

• Collect the seeds that settled at the bottom of the bucket.

• These are high density seeds. Wash the seeds in water after collection.

Preparation

• All materials need to be collected before the beginning of the season.

Soil and Soil Fertility Conservation

Soil Conservation

Introduction

Farmers do not tend to pay special attention to soil conservation. It is essential to have a discussion with the farmers about the soil conservation which plays a key role in carrying out to improve the yield of upland rice and other crops. However, farmers who practiced the shifting cultivation for only one or two years, they do not usually encounter soil fertility problems in cultivating rice and other crops during this period. The reason for conserving the soil is that the nutrients in the soil tend to deplete. Discussion with the farmers should be made about the fact that soil erosion is one of the factors for such soil depletion, and should develop the methods which they can easily understand and adopt.

Learning objectives

- Learn the importance of soil conservation/method
- Study the methods of soil erosion
- Learn conservation methods for soil erosion

When most appropriate for facilitation

Before planting the crop

Time needed

2 hours

Materials needed

Brown paper, marker pens, hillside ground

Steps

1. Explain the objectives to the participants.
2. Divided them into small groups.
3. Distribute each group with brown paper and marker pens.
4. Ask them to mention about the importance of learning with respect to soil conservation by each group member, and to have them discuss the methods of soil erosion as follows:
   - Water erosion
   - Other means

5. Present the results to the large group
6. Consolidate the discussions

Discussion questions

1. What is soil degradation?
2. Why does soil degrade?
3. Why is soil conservation important in increasing the crop yield?
4. How to conserve the soil without degradation? (to learn the methods of soil conservation)
5. How does soil degradation affect on crops?

Discussion on result

Soil degradation factors are:

- Water erosion
- Planting of single variety crop for long term
- Using of chemical
- Wind erosion

If there is no soil conservation, the yield rate of rice and other crops will be decreased due to the depletion of soil nutrients. Therefore, soil conservation is the crucial necessity that is essential to consider in crop cultivation.

Conservation for improved soil fertility

Maintain with the following methods:

- Maintain the water erosion by channel with lock and spill along contour (or) planting of trees which can maintain the soil
- Planting of rice by row along contour

Preparation of lesson for soil conservation

Collect all the materials before the start of the program

Soil Conservation by Channel with Lock and Spill along Contour

Introduction

Perform as follows for practical discussion with participants/farmers on soil conservation by channel with lock and spill along contour. It must be aware that soil erosion means it happens on hillside, not in flatland. When constructing the soil conservation channel along contour, for eight feet x ten feet long channel, the depth must be one and a half feet deep, for two feet long channel, the depth must be six inches deep, and for the width, may be deemed as appropriate. The reason is that the nutrients contained in rain water are settled below the one and a half feet deep channel, and by water seeping through below the channel to the range between thirty and forty feet, the nutrients are spread into the field. Excess water is transported away from the field by six inches deep channel. (This excess water contains no nutrient.)

Learning objectives

• Study the consequence of soil conservation by channel system

• Study the relationship between soil conservation by channel system and increased crop yield

The most appropriate time for facilitation

Before planting period/before selecting the field site

Time needed

1hour

Steps

1. Explain the objectives to the participants
2. Share their experience of soil conservation (among groups)
3. Discuss the importance of channel system
4. Describe the matter on the ground or with the map
5. Describe the result

Discussion questions

1. Why does the channel system construct?
2. Is it easy to practice?
3. Is it appropriate to grow nutrient conservation plant and soil conservation plant together in this system?
4. Describe the advantage of increasing crop yield by channel system

Discussion on result

- Channel system is able to protect soil erosion and provide the soil with nutrient.
- It is appropriate to grow vigorous rootlets plants together (legumes) in channel system. Plant close to the lower side of the channel.

Production of Indigenous Micro Organisms (IMO)

Introduction

Micro-organisms are tiny animals that cannot be seen with naked eyes. They live in huge quantities in soil and are responsible for most of the biological changes in soil. Indigenous micro-organisms (IMO) are usually collected from the local forest and cultured with rice bran or steamed rice. They are used in compost making to accelerate the decomposition process. They are also directly applied to soil. The use of IMO enhances the availability of soil nutrients for plants. Two methods are generally used for IMO preparation. They are commonly known as the Steamed Rice method and the Dochakin method.

Learning objective

- Understand the roles, functions and importance of micro-organisms
- Learn how to produce IMO

When most appropriate for facilitation

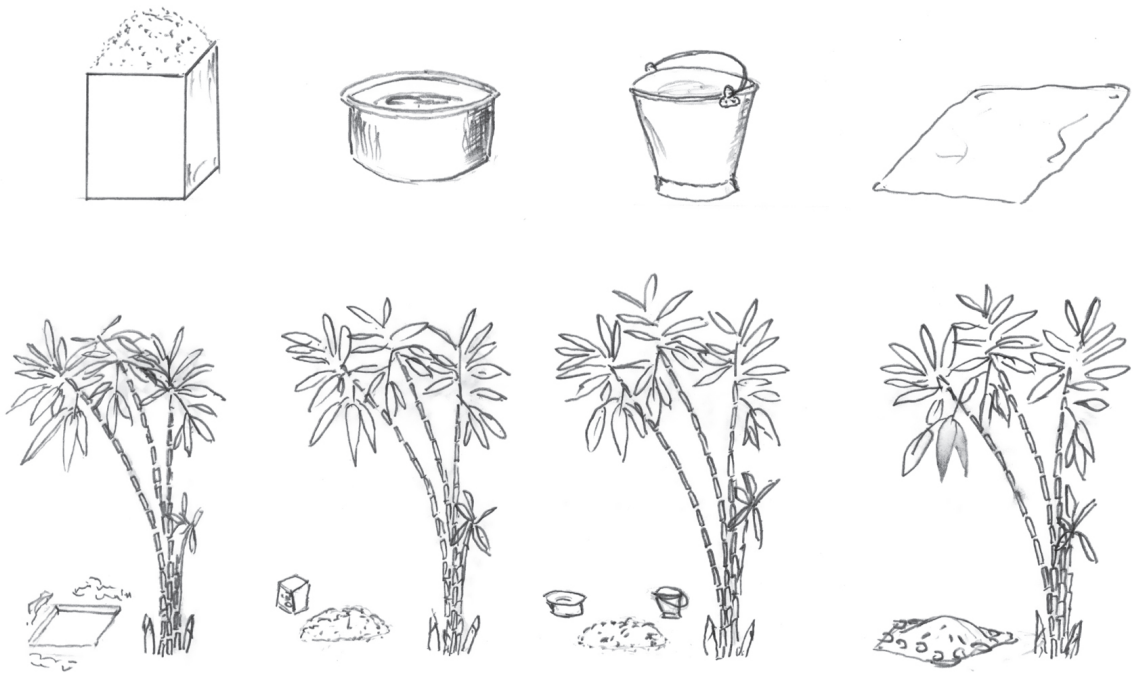
After FFS planning

Time needed

2 hrs

Materials needed

Dochakin method: rice bran, crude sugar, top soil, water, plastic



Steps

1. Explain the objectives of the session.
2. Divide the participants into small groups.
3. Ask the small groups what they know about IMO.
4. Ask them to present their understanding to the large group.
5. Validate their presentations by sharing the appropriate roles and functions of IMO.
6. Consolidate them all.
7. Explain how to collect IMO.
8. Distribute the materials.
9. Assign each small group to collect their own IMO, which will later be used in compost preparation.

Discussion questions

1) What is an IMO?

2) What are the functions of IMO?

3) Where can we find them?

4) What are the different methods of IMO collection?

5) What are the uses?

Preparation

Materials needed for IMO collection and multiplication should be ready beforehand.

Production of IMOs using Dochakin

- Collect local top soil from an area of 3 x 3 feet under natural forest or bamboo shade
- Mix it with rice bran.
- Pour molasses/crude sugar solution into water, and then mix them thoroughly. 60% moisture is good for microorganisms, too much could be a problem and less water is not favorable for the growth of microorganisms.
- Cover them with a plastic sheet to protect from rainwater and evaporation.
- Wait for 3 days. On the third day, whitish color microorganisms (Dochakin) will appear and produce sweet odor with acidic smell.

Production of compost

Introduction

Microorganisms in huge quantities live in soil. They require very similar elements as plants to survive. Unlike plants, microorganisms cannot take up carbon directly from air. The use of compost in soil provides a greater amount of organic carbon to the microorganisms. As a result, they grow and multiply quickly. The decomposition of the body of these microorganisms supplies more nutrients to the plants. That is how compost provides benefits to the plants. Compost itself has some nutrients but too little to meet the requirements of crops. Compost helps to improve the soil structure and water holding capacity of soil as well.

Compost can be prepared in many ways. The important thing in compost preparation is the decomposition process. Use of microorganisms and manipulation of compost environment helps in accelerating the decomposition process. The faster the decomposition, the quicker will be the preparation of compost. Plants, straw, leaves, grass, weeds, animal manures, etc., are widely used for compost preparation.

Learning objectives

- Understand the importance of compost
- Learn how to make compost

When most appropriate for facilitation

Compost can be prepared anytime of the year, but in FFS, the preparation must start after the planning session, usually in March and April.

Time needed

2 hrs

Materials needed

IMOs/Dochakin, rice husks, manure, leaves, grass, straw, plastic sheet and water.

Steps

1. Explain the objectives to the participants.
2. Discuss the roles and functions of compost.
3. Discuss different methods of compost production.
4. Show how to produce compost using Dochakin.

5. Discuss how compost will be applied in fields.
6. Ask each farmer to produce their own compost.

Discussion questions

1) What are the most important advantages of compost?

2) What are the functions of compost?

3) What are the most available materials to prepare compost?

4) What are the most effective methods?

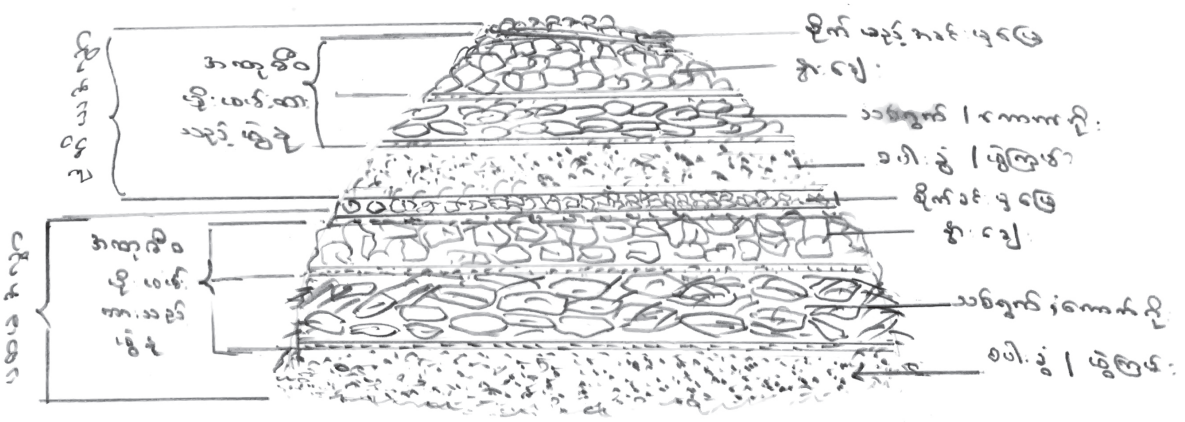
5) What is the most ideal time to apply compost in soils and why?

Preparation

1) Prepare dochakin and other raw materials well ahead.

Production of compost

- First pile rice husks about 6 inches on the ground and spread in a circle (8-10 feet diameter). Then, add 6 inches high of cow dung.
- If the rice husk and cow dung are dry, spray some water.
- Spread Dochakin thinly over cow dung.
- Cover the Dochakin with straw about 6 inches thick and apply water (about 60% moisture level).
- Repeat the last 3 steps 4-5 times.
- Cover the top with rice husk and apply water.
- Finally, cover the compost heap with plastic sheet or banana leaves to prevent it from drying.
- After 3-4 weeks, turn the compost, pile it up in another place and apply water.
- In around 6-8 weeks, the compost will be mature enough to apply in the field.



Green manure

Introduction

Nitrogen provided through inorganic sources is not useful for microorganisms living in soil as they cannot take it up. Therefore, there is a need to supply nitrogen through organic sources. Green manure is the most useful source of organic nitrogen. It helps the microorganisms to multiply greatly in soil. Green manure also has other benefits. It adds carbon to soil which is also essential for microorganism. Green manure as compost improves soil structure. The common crops grown as green manure are legumes, such as sun hemp, mung bean, cowpea etc.

Learning objectives

- Study the importance and uses of green manure
- Encourage farmers to grow green manure

When most appropriate for facilitation

2-3 weeks before the harvesting time

Time needed

1 hr

Materials needed

Green manure seeds, poster papers and markers

Steps

1. Explain the objectives to the farmers.
2. Discuss and brainstorm the importance of green manure.
3. Discuss different methods of green manure production.
4. Identify the particular field in FFS to grow green manure.
5. Broadcast some seeds and ask the farmers to complete the broadcasting.
6. Encourage all farmers to make similar practice in their field.

Discussion questions

1. What is green manure?
2. What are the uses of green manure?
3. What kinds of plant are good for green manure?
4. How is green manure grown?
5. What are the ideal times to grow green manure?

Preparation

Collection of green manure seeds.

Nutrient cycle

Introduction

The rice plant takes up most of its nutrients from soil. Only a small part of these nutrients forms the grains that we eat. The large part remains with the straw. If this straw is recycled to the soil, a significant amount of nutrient loss will be prevented. Rice straw, instead of burning, can be successfully used as compost. Plowing the field after harvesting rice also helps to cover the leftover straw with soil. This can also prevent the loss.

Learning objectives

- Understand the importance of rice straw
- Discuss different methods of recycling rice straw

When most appropriate for facilitation

One or two weeks before harvesting.

Time needed

1 hr

Materials needed

Poster papers, marker pen and adhesive tape

Steps

1. Explain the objectives to the farmers.
2. Divide them into small groups.

3. Ask each small group to draw the nutrient cycle of the rice field.
4. Make presentation and discuss how nutrients are lost from rice fields.
5. Discuss how this loss could be prevented (the importance of recycling rice straw).

Discussion questions

1. What is the nutrient cycle?
2. What does the plant get from soil?
3. Why is recycling important?
4. How can we recycle rice straw?
5. What are the contents of rice straw?
6. What happens if we do not recycle rice straw?

Preparation

None

Contents of rice straw

1. Rice plants obtain 50-80% of N from soil. Fertilized rice field get larger quantities.
2. Most of the nutrients taken up by rice plants remain in rice straw.
3. 1 ha of rice straw (8 tons/ha yield) contains 66kg N, 6kg P, 160kg K equivalent to 147 kg Urea, 31kg TSP and 320kg MP.
4. If rice straw is recycled, these amounts of nutrient will be saved.

Essential elements

Introduction

Building a plant is like building a house. To build a house a number of materials are needed, and the size of the house depends on the quantities of the material. Similarly, the size of the plant depends on the quantities of elements that it needs. A plant requires 16-20 essential elements for growth. Although they vary in quantities, they all are equally essential to the plant. However, plants need some elements/nutrients in greater quantities. These are called major elements, such as Nitrogen, Phosphate, Potassium, Carbon, Hydrogen, Oxygen, Calcium, Magnesium and Sulphur. The elements that are needed in small quantities are called trace elements, such as Manganese, Boron, Iron, Mo, Chlorine, Zinc and copper. The growth of a plant is particularly determined by the smooth supply and availability of all the elements in a proportionate order. Therefore, to balance the availability of nutrients in soil is essential to grow a better crop.

Learning objectives

- Learn what the essential elements are
- Understand the role of different major elements in growing a better crop
- Study the need for balancing the availability of nutrients in soil

When most appropriate for facilitation

In the middle of FFS

Time needed

1.5-2 hrs

Materials needed

Sticks, string, hard paper, knives, scissors and adhesive tapes

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Distribute different amount of materials, such as sticks, adhesive tapes, hard paper.
4. Ask each group to use the materials and build a house of their choice.
5. Place the houses together in a line.

6. Ask the groups to observe the houses and discuss why some houses are big and some are small, and why some groups could not even build a house.
7. Consolidate the discussions.

Discussion questions

1. Why are some houses big and some small?
2. Why do some plants produce more yield than others?
3. How many elements are needed by plants?
4. What are the names of these elements?
5. What are the functions of these elements?
6. If a plant shows signs of deficiency, what can we do?
7. What is the appearance of a plant that has no nitrogen?
8. What is the appearance of a plant that has no potassium?
9. What is the appearance of a plant that has no phosphorous?
10. Where can we get these elements?
11. What are the essential elements and what do we mean by essential?

Preparation

Building materials should be collected before the session.

Tips

• Provide 1-2 groups with materials in due proportions. For other groups, give them some materials in smaller quantities in order to see that the finished houses are different from each other.

• As the size and the strength of the house depend on the amount and use of materials, some houses will be stronger and bigger than others. Explain to the participants that the size of plant will depend on the type and the amount of nutrients available to it.

Concentrated Nutrient Solution

Introduction

In natural farming, it is easy to prepare and an effective method among many alternative ways for

improved soil fertility. Whether soil fertility is good or not depends on how much living micro-organisms contain in the soil. Concentrated nutrient solution contributes considerably to micro-organisms in the soil for active proliferation. Some chemicals in the soil tend to be in the stage where plants cannot take up. When there is chemical reaction, only then it becomes the stage where plants can take up. By adding the concentrated nutrient solution into the soil, it aids the chemical reaction. The concentrated nutrient solution is a simple method to improve the chemical properties in the soil, and produces nutrient needed for plants by means of plant juice as well.

Learning Objective

- Understand a method for improving soil fertility
- Understand the production method of how nutrient solution needed for plant can be produced by plants.
- Understand the effective method of improving soil fertility by using raw materials that can be easily available from surrounding field.

When most appropriate for facilitation

Vegetative growth period of rice plant

Steps

1. Explain the objective to the participants, and divide them into small groups.
2. Ask each group to collect the leaves from nearby field.
3. Ask each group to dig each pit with the dimension of 3 ft wide, 4 ft long and 2 ft deep.
4. Make a small reservoir by spreading a piece of water resistant plastic sheet inside the pit.
5. Fill with water into the pit until it reaches two third of the pit.
6. Fill up the plastic bag with the collected leaves, manure and microbes (a little), layer by layer until the bag is full. Then, tie the opening of the bag and immerse it in the water. Leave it 7 to 10 days.

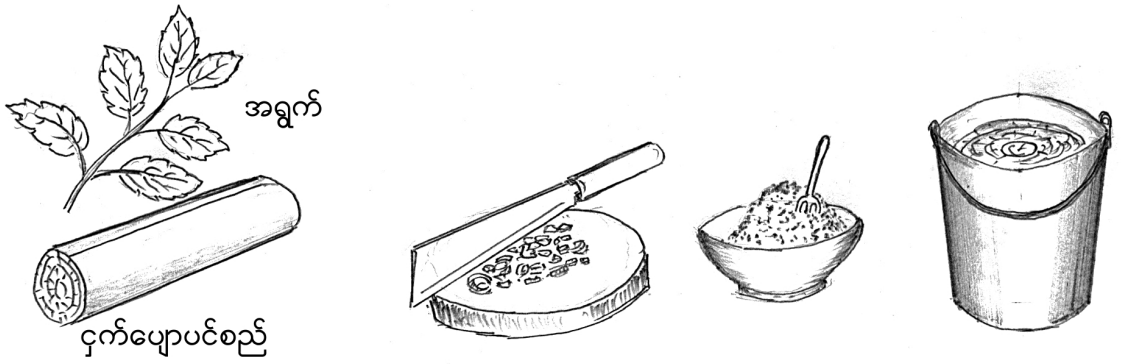
When the colour of the water turns light yellow (plain tea colour), mix with water at the ratio of (water 2: nutrient solution 1). Then it can be used in the field.

Remark: Not to spray. Pour it at the base of the plant.
When it touches the leaf, it tends to burn the leaf.

Production of Plant Juice (plant hormone)

Introduction

Plant juice is made of plant leaves and crude sugar. It is widely believed that plant juice improves the performance of microorganisms living on the surface of leaves and stems. It also improves soil quality through enhancing the population of soil microbes and thereby, accelerates the crop growth. During compost preparation it can be used with Dochakin or IMO.



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Learning objectives

- Understand the importance of plant juice
- Learn how to make plant juice

When most appropriate for facilitation

During soil fertility management sessions

Time needed

1.5-2 hours

Materials needed

Crude sugar, paper, succulent plant parts (preferably young leaves), banana stalks, bucket and string.

Steps

1. Explain the objectives.
2. Discuss and brainstorm the functions and uses of plant juice.
3. Demonstrate the preparation of plant juice using guidelines provided in the box.
4. Encourage farmers to prepare and test the use in their fields.

Discussion questions

1) What is plant juice?

2) What are its uses?

3) What kinds of materials can be used?

4) Is it possible for everyone to prepare and apply plant juice in one's own field?

5) What are the difficulties and how can they be minimized?

Preparation

Collect sugar, bucket and string.

Production of plant juice

• Collect adequate amount of succulent plant leaves, such as banana stalk, vegetable leaves, Jammani leaves (local plant).

• Chop the leaves into small pieces.

• Mix them with crude sugar at the ratio of 2:1 (2 parts leaves, 1 part sugar) by weight basis.

• Put the mixture into a bucket, cover it with paper and tie up.

• Keep the bucket in a dark place for 7 to 10 days.

• Usually by this time, the leaves will be fermented. If fermentation takes longer, wait for few more days.

• After the leaves are fermented, extract the juice.

• Dilute the juice to make 0.2% solution (1 cup juice to 500 cups water) and spray over the surface of plants.

Production of Fruit Juice

Introduction

Fruit juice is made of ripened sweet fruit, such as papaya, banana, mango, pumpkin, pineapple etc. The use of fruit juice is very similar to that of plant juice. Sweet fruits with crude sugar are allowed to ferment for a number of days. The extracted juice is then sprayed on plant leaves. It can be applied to soil to improve the microbial activities.

Learning objectives

- Understand the importance of fruit juice
- Learn how to make fruit juice

When most appropriate for facilitation

During soil fertility management sessions

Time needed

1hour

Material needed

Ripened sweet fruits (banana, papaya, pumpkin), crude sugar, paper, bucket and string.

Steps

1. Explain the objectives.
2. Discuss and brainstorm the functions and uses of fruit juice.
3. Demonstrate the preparation of fruit juice using guidelines provided in the box.
4. Encourage farmers to prepare and test the uses in their fields.

Discussion questions

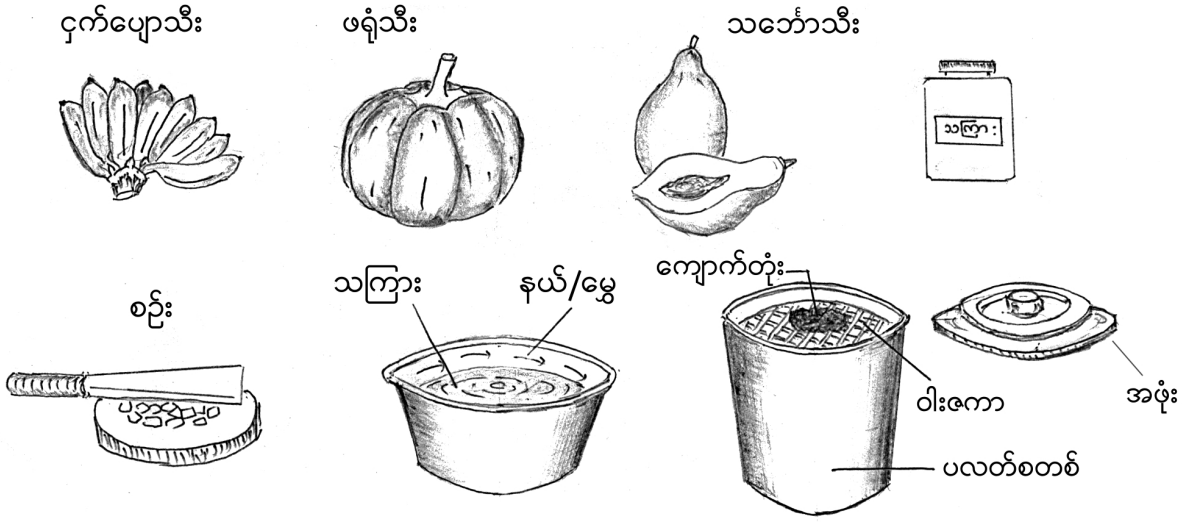
1) What is fruit juice?

2) What are its uses?

3) What materials are needed?

4) How does it improve the growth of the crop?

5) Which methods are most effective, and why?



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Preparation

Collect all the needed materials beforehand

Production of Fruit Juice

• Collect an adequate amount of ripened or over ripened fruits such as banana, papaya, pineapple, tomato, potato, yam, radish, carrot, pumpkin, etc.

• Crush the fruit and mix with crude sugar at the ratio of 2:1 (2 parts fruit to 1 part sugar by weight).

• Put the mixture into a bucket, cover it with paper and tie up.

• Keep the bucket in a dark place until the fruit is fermented.

• When fermentation is completed, extract the juice.

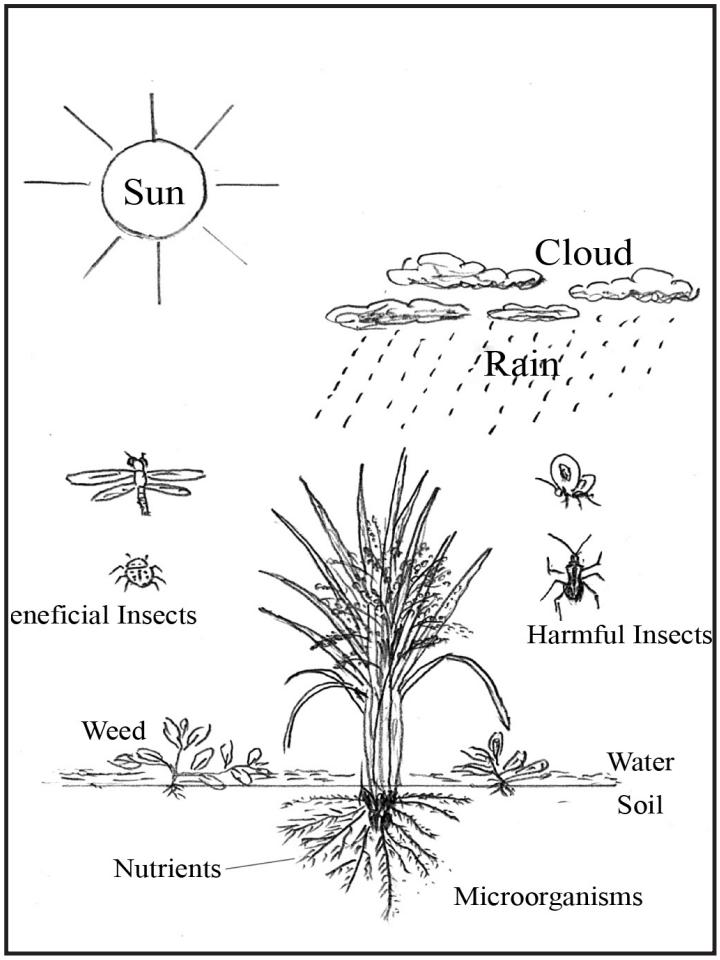
• Dilute the juice to make 0.2% solution (1 cup juice to 500 cups water) spray over the surface of plants.

Agro-Ecology

Basic understanding of Agro-Ecology

Introduction

The things that we see and feel in and around a crop field together form the agro-ecosystem of that particular crop. The things we usually see are soil, water, plants, weeds, insects, diseases, etc. Besides these, there are things we cannot see but we can feel, such as air, temperature, humidity, etc. They all are equally important for the crop and are called important components of agro-ecosystem of that particular crop. The growth of a crop is determined by the combined effect of the interaction between and among these components. Therefore, to study the components and observe their regular changes are crucially important to know which management practices suit the crop best at different times.



Learning objectives

Understand agro-ecosystem, its components and their influences on the growth and production of crop.

When most appropriate for facilitation

One week after transplanting

Time needed

1.5 – 2 hrs

Materials needed

Note book, poster papers, pencils, color pens, markers and adhesive tape.

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Let each group visit a rice field for around 20 minutes.
4. Ask the group to write down the things they observe and feel (something they cannot see but they can feel such as air, humidity, temperature etc.) in the rice field.
5. After they have returned, ask them to draw all the things that they have seen on a piece of wall paper. For example, the rice plant should be in the middle, soil, water at the bottom and sun, air, insects at the top.
6. Organize presentation from each group and give them the discussion questions given below.
7. Validate their presentation by sharing again your views.

Discussion questions

1) What is agro-ecosystem?

2) What are the components of an agro-ecosystem?

3) What is the interaction between and among the components?

4) Why do we need to study them?

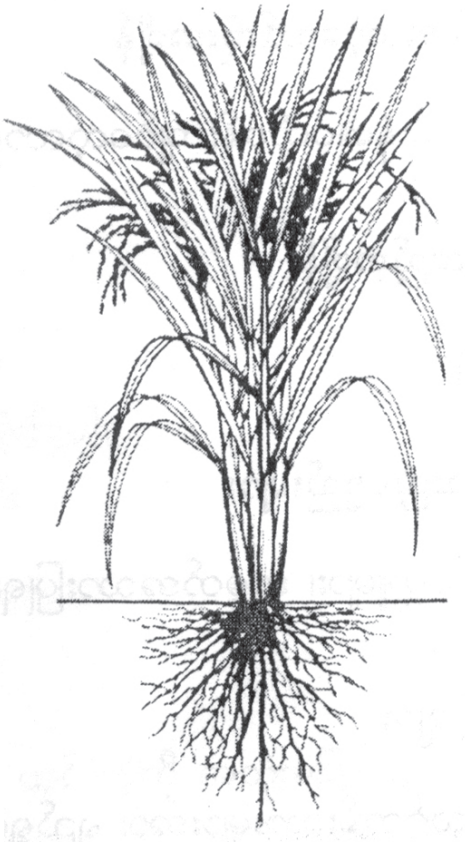
Preparation

None

Growing a healthy Crop

Introduction

Healthy plants have a better degree of resistance and can recover quickly from damage done by insects or disease. It is a major concern to farmers. Production of a healthy crop must start with quality seeds, seedlings, good varieties and adequate amounts of nutrients needed by the plants. In addition, once the crop is established, the field needs to be visited on a regular basis to see the particular conditions of the crop. Analysis of the conditions will help to carryout particular operations in the field. Therefore, field observation is very important.



In a rice field, there are insects that do no harm to rice plants. The number of such insects is larger than the number of insects that usually damage plants. These beneficial insects must be preserved as they destroy the harmful insects. The ultimate goal of the FFS is to make farmers become experts.

The practice of regular field observations and subsequent analysis to carry out operations in field actually leads farmers to become expert in crop production. The major principles adopted in FFS for crop production are:

1) Grow a healthy crop
2) Conserve natural enemies
3) Observe field regularly
4) Make the farmers become experts

Learning objectives

- Learn the basic principles of crop production
- Study how to grow a healthy crop

When most appropriate for facilitation

Before agro-ecosystem session

Time needed

2 hrs

Materials needed

Poster papers, markers and adhesive tapes

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Ask each group to discuss and write down their understanding about how to grow a healthy crop.
4. Organize presentations (during presentation, you will notice most of the groups mention that use of quality seed, good variety, water management, controlling insects, diseases etc. are necessary to grow a healthy crop. However, they have failed to realize that a healthy crop does not require controlling diseases or insects as it is already free from diseases or insects infestation. Therefore, tell them we want to grow a crop that is healthy, not infested with diseases, and then explain them how to grow a healthy crop. The session will ultimately draw the farmers' attention to grow a healthy crop.)

Discussion questions

1) What are the principles of growing a healthy crop?

2) Why do we need to grow a healthy crop?

3) How do we grow a healthy crop?

How to grow a healthy crop

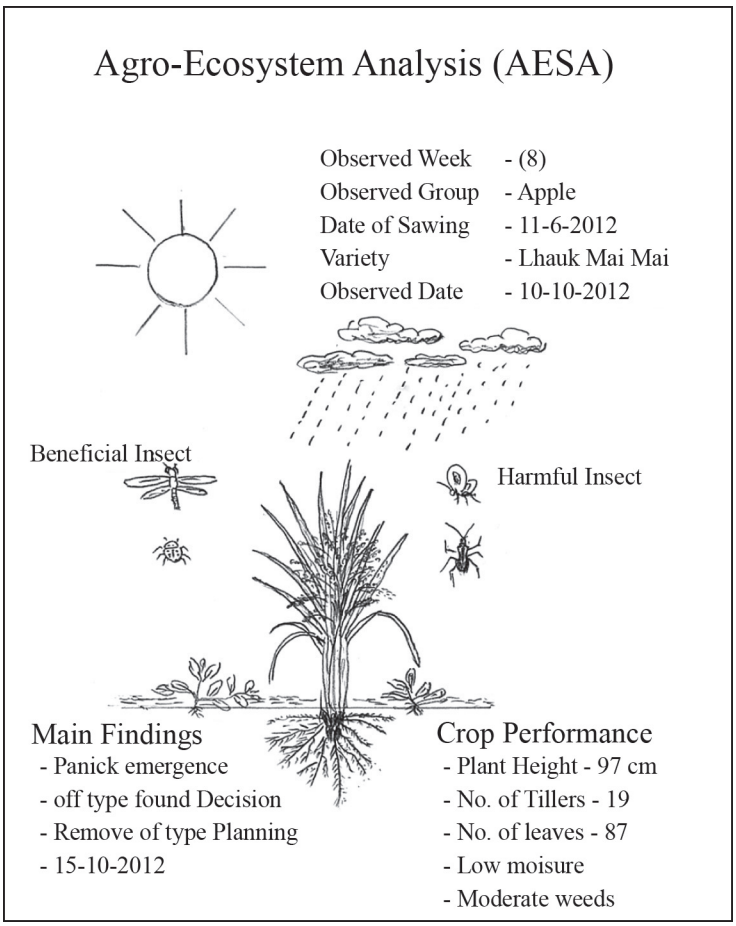
1. Use quality seeds
2. Use appropriate variety
3. Prepare quality seedlings
4. Carefully uproot and transplant the seedlings
5. Use appropriate spacing and time of transplanting
6. Apply adequate amount of compost and manure
7. Maintain appropriate water management practice
8. Control weeds when necessary
9. Regularly visit the field

10. Do not apply pesticides as they are not needed in rice production
11. Hang the guidelines at the meeting place of FFS so that it serves as a reminder to farmers

Regular AESA

Introduction

To be an expert in decision-making required regular field observation and analysis of the agro-ecosystem. Agro-ecosystem analysis is actually a process of placing things together that are studied regularly and analyzing them systematically for actions needed to manage the crop. Through this session each week, farmers will study and analyze the components of the rice agro-ecosystem such as plants, environment, soil, water, weeds, insects, diseases, pests and natural enemies, and accordingly make the decisions for carrying out the operations to manage their rice effectively and efficiently.



Learning objectives

- Build the capacity of observation and decision making skill of farmers.
- Decide what management practices are needed at different periods to manage a crop.

When most appropriate for facilitation

Each week, after two weeks of transplantation, up to the flowering stage

Time needed

2-3 hrs

Materials needed

Notebook, poster papers, colored pens, markers, adhesive tapes and pencils

Steps

1. Provide necessary briefing to the participants depending on the stage of rice (please see the guide questions)
2. Give necessary guidelines on how to conduct the agro-ecosystem analysis (see guidelines below)
3. Allow each group 45 minutes to one hour to observe in the field and collect necessary data.
4. Let the groups process their data and analyze the field conditions. Use the guide questions for analysis. Allow 30 minutes for data processing and preparation of presentation.
5. Share the presentations with the large group and discuss important changes in the field. (During this presentation, facilitators should ask questions to each group about important points that the group missed).
6. Validate the decisions and plans of the groups.

How to conduct AESA

1) Go to the field and observe the field conditions to get an overall idea of the field condition.

2) Randomly choose 20 hills diagonally across the field.

3) For each hill, examine the insect and disease infestation. While examining, count the number of both harmful and beneficial insects. Count the number of egg mass, larvae, pupa, nymph and adults for each insect, and also the number of infested leaves.

4) For diseases, count the infested leaves.

5) Count the number of tillers, leaves and measure the plant height and notice the plant color.

6) Observe water level and weed infestation.

7) Record all the data in the regular weekly data collection format.

8) Now return to the meeting place and make a drawing on wall paper. Draw the correct average number of tillers per hill. Color the plant according to the field conditions and draw signs if there are infestations.

9) Draw beneficial insects on the left side of the plant and harmful on the right side.

10)On the top draw weather conditions.

11) Place other information as appeared in the illustration below.

12)Keep records of all weekly data and preserve the drawings.

Effect of Pesticides on Human Health and Environment

Introduction

The main learning of this exercise is about "hazard." Pesticides are poison. Without touching it, one cannot spray it. Therefore, they are just hazards, and cannot use it safe. Pesticides poison the soil, air and water. They always cause harm to living environment. When sprayed in the field, they disappear instantly into the environment. It poisons water, food, livestock feed and atmosphere.

Pesticides cause many problems to human and harming severely to human health. They can cause cancer, birth defect and body immune system failure. This practice is to demonstrate how it is overlooked the extent to which these pesticides are contacting with human while spraying.

Learning objectives

- Expose the extent to which pesticides poison while spraying it.
- Build awareness that pesticides are harmful to human and environment.

When most appropriate for facilitation

At the maximum tillering stage. Make this arrangement in the morning, when there are more dews on leaf surface.

Time needed

1.5 hr to 2 hr

Materials needed

Sprayer, water based dye, bucket, poster papers, white cloth (or) white paper, markers, adhesive tapes

Steps

1. Explain the objectives to the participants.
2. Call for a volunteer and two others to assist him/her in spraying dye mixed with water in the rice field.
3. Cover the whole body of volunteer with white cloth (or) white paper (including face, hands and feet) in such a way that there are spaces for breathing and looking, and hands can move freely.
4. Blend the dye with water, and pour into the sprayer.
5. Let the volunteer spray the dye solution in the field until all the solution is used up.
6. When the spraying is done, let all the participants examine the whole body of the volunteer, and observe which parts of the body are the most contaminated with red dye.
7. Let the participants to discuss the severity of the contamination of those particular parts of the body.
8. Discuss how pesticides poison the water, soil, animals and the whole environment.

Discussion questions

1. Which parts of the body are most contaminated by spraying?
2. Which part is more contaminated and to what extent the effect is?
3. How does it feel after spraying? Share the experience as much as possible.
4. How do the pesticides harm the animal, soil, water and environment?
5. How do the pesticides affect human health in the long term?
6. Can we protect such poisoning?

Drawing & Illustration

Draw a picture of a spraying person wearing white cloth, which shows that how the dye has stained red on the different parts of the body.

Preparation

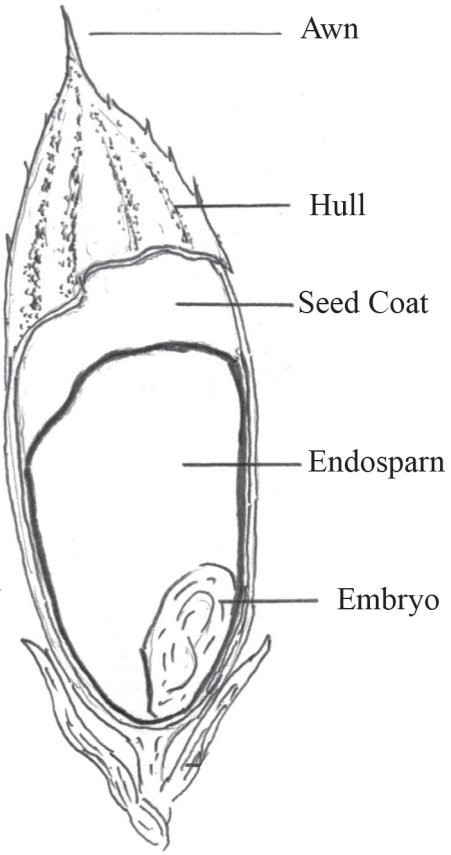
Red dye and white cloth or white paper, for adequately covering the whole body of a spraying person, should be available before the whole process.

Rice morphology and physiology

Seed morphology

Introduction

Seed morphology means the study of different external parts of the seed, particularly the functions of different parts. By studying seed morphology one can gain a very solid understanding about quality seed.



Morphology of Rice Seed

Learning objectives

- Study the different parts of a seed
- Learn about seed viability, germination and vigor of seed

When most appropriate for facilitation

Before seedling preparation

Time needed

1-1.5 hrs

Materials needed

Seeds, paper, pencils, color pencils and magnifying glass

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Distribute a few seeds to each group.
4. Ask each group to draw a complete seed.

5. Ask them now to de-husk and dissect some seeds and observe different parts of those seeds.
6. Ask them to draw and label those parts.
7. Ask each group to discuss the functions of different parts of the seed and write them down.
8. Validate the seed parts and their functions by the large group with additional input from you.

Discussion questions

1) What is seed morphology?

2) What are the parts of a seed?

3) What are the functions of those parts?

4) What is seed viability?

5) What is seed vigor?

6) How does seed germinate?

7) Which seeds are good seeds?

Rice morphology at different growth stages

Introduction

Rice plant morphology changes with the age of the plant. At early stages, particularly during tillering stages, shoots and leaves grow quickly. Therefore, plants can recover from damages at these stages faster than other stages. At panicle initiation stage, which is the beginning of reproduction, plants require more water and nutrients. Water stress at this time can cause significant yield loss. At flowering and repining stage, flag leaf is more important as photosynthesis occurs mostly through this leaf. The study of plant morphology tells us how a rice plant absorbs nutrients through roots and transports them to different parts of the plant. Similarly, it tells how plant leaves produce food and accumulate it into grains.

Learning objectives

- Understand the plant's physiological process at different stages
- Identify appropriate activities needed at a particular stage to facilitate the growth of a healthy crop

When most appropriate for facilitation

1) Early tillering stage
2) Mid tillering stage
3) Maximum tillering stage
4) Panicle initiation stage
5) Booting stage
6) Flowering stage
7) Dough stage
8) Ripening stage

Time needed

1.5-2 hrs

Materials needed

Specimen rice plant, poster papers, color pens and pencils and magnifying glass

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Ask each group to visit the rice field and observe rice plants closely.
4. Carefully uproot a specimen plant to study the sizes of its different parts.
5. Measure the size and draw on poster paper with appropriate labels.
6. Discuss and share the functions
7. Validate the functions with additional sharing from facilitator.

Discussion questions

1) Why do we need to study rice morphology?

2) What are the functions of different parts of rice plant? What are the functions of roots, leaves, stems, etc?

3) Which part at this stage is most important?

4) What will happen if some tillers are removed at this tillering stage?

5) What kind of insects can be a problem at this stage?

6) How many tillers are at this stage? Do you expect that all the tillers will produce panicle?

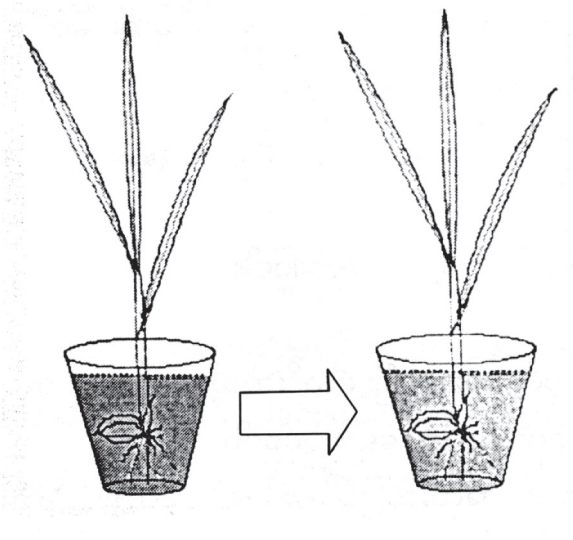
7) At which stage water is crucial?

8) What important activities are needed at this stage?

Nutrient uptake

Introduction

This is a practical session in FFS, studying how nutrients are absorbed and transported to different parts of a plant. The session will provide farmers an understanding of how systemic insecticides enter into a plant and then move to different parts. Through this exercise, farmers will see that after the use of insecticides, the entire plant becomes poisoned. Irrespective of being either harmful or beneficial, insecticides kill all insects that feed on the plant, though insecticides are meant to kill only the harmful insects.



Learning objectives

- Demonstrate to farmers how nutrients move from soil to plants
- Show how systemic insecticides kill beneficial insects
- How systemic insecticide, after application in rice field, can affect human health

When most appropriate for facilitation

Anytime, but sunny days are most suitable

Time needed

2 hrs

Materials needed

Plants, red food color, glass, water, water bottles, poster papers, markers and adhesive tapes

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Give each group a water bottle, and ask them to fill the bottle with water and mix a small amount of red food color with the water.
4. Ask them to collect a succulent, preferably transparent young plant.
5. Carefully wash the plant root with water.
6. Put the plant into the bottle with red colored water, keep the bottle in sunlight.
7. Wait for half an hour to one hour.
8. By that time, you will find that the entire plant has become red. Ask the participants why the plant has become red.
9. Now, discuss how pesticides moves to plants and discuss the consequences as well.

Discussion questions

1) Why did the plant become red?

2) How do the nutrients move to the plant?

3) When we apply insecticides to the soil, what happens?

4) When we consume food grown with pesticides what happens?

5) How can we avoid using the terrible chemicals?

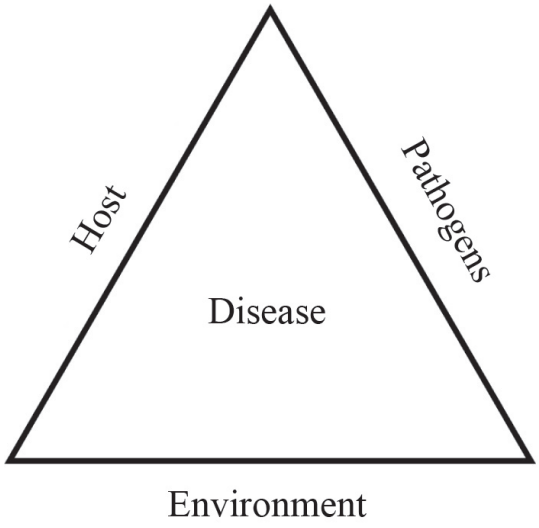
Preparation

All materials should be ready beforehand.

Disease Triangle

Introduction

A disease is an interaction between a pathogen and a host in a favorable environment. For any disease, the pathogen requires a favorable environment such as temperature, humidity, rainfall, foggy day, etc. to grow and multiply. In unfavorable conditions, the disease pathogen cannot survive. Therefore, there will be no disease found. For a disease to occur, a susceptible host is required. If the host is resistant to the pathogen, then there will be no disease. The exercise will provide farmers with an understanding of the disease triangle. Such understanding is useful to give an early forecast and to take adequate precautions against a disease. The session will also encourage farmers to use resistant varieties of plants to prevent the occurrence of common rice diseases.



Disease Triangle

Learning objectives

- Understand the relationship between and among the host, pathogen and environment.
- Learn the importance of varietal resistance for disease management

When most appropriate for facilitation

It can be facilitated anytime as a special topic at the end of AESA session.

Time needed

45 minutes

Material needed

Papers and markers

Steps

1. Explain the objectives.
2. Prepare 8 pieces of paper, 1m x 15cm.
3. Write down the following labels, one on each paper.
   - Resistant variety
   - Susceptible variety
   - Pathogen (e.g. BLB)
   - No pathogen
   - Favorable environment
   - Unfavorable environment
   - Yes
   - No
4. Ask for 8 volunteers. Provide each volunteer with each piece of paper.
5. Put the resistant variety, favorable environment and no pathogen volunteers together to form a triangle. Ask the participants whether disease can appear in this condition. Hopefully, most of them would say NO as this is not a condition for disease. Ask the "no" volunteer to stay in the centre of the triangle.
6. Now, call all the rest of the volunteers except the one labeled with "yes" to form another triangle. Ask the participants if disease can appear at this condition. Hopefully, most of them will answer YES. Ask them to explain.
7. Ask all the volunteers to return to their seats.
8. Now call all the susceptible variety, favorable environment and pathogen volunteers to form a triangle. Ask the participants whether disease can appear during these conditions. Most of them will answer YES. Ask them why. And now, call "yes" volunteer to come and stay in the centre of the triangle.
9. Discuss all those different conditions in a large group and summarize them all.

Discussion questions

1) What is plant disease?

2) Can a disease occur in the following conditions?

- susceptible variety, unfavorable environment and no pathogen
- resistant host, presence of pathogen, favorable environment
- susceptible host, favorable environment, presence of pathogen

3) What factors enhance the development of a disease?

4) Can a disease occur in the absence of any of these factors?

Preparation

Prepare labels for each participant's role.

CHAPTER (6)

UP-LAND RICE FARMING METHODS

CHAPTER 6

UPLAND RICE FARMING METHODS

System of Rice Intensification (Upland SRI)

Introduction

In growing to boost the rice yield, System of Rice Intensification varies according to the various planting places and conditions. When growing with the SRI, i.e. System of Rice Intensification, it is found that it increases the yield rate of 2 to 3 times.

Similarly, if the upland rice is grown with upland system of rice intensification (upland SRI), there is a potential for high yield. Based on the facts of upland soil fertility, moisture conservation, easy weeding and organic fertilizer input, etc., suitable systems can be applied.

Proliferation of weeds (weeds always grow vigorously unless and until the rice plants touch each other to make a canopy) is the major problem. Thus, only by using line sowing and square sowing systems, it will be fast and easy for weeding. This will save the cost of weeding, and be freed of weeds. While the square sowing system, which can use weed control tools, is likely to reduce number of hills (number of plant) per acre, system of wider spacing between rows, and closer spacing within plants is especially suitable for flat land upland rice where farm tools are to be used.

The following systems are suitable for improving upland rice:

1. Adopting the system of rice intensification
2. Reducing the cost by applying the cost saving methods of weeding.
3. Practicing the ways of fast and on time weeding to achieve assured increased rice yield.

Learning objectives

- Understand the system of rice intensification for upland rice

When most appropriate for facilitation

- Early period for growing upland rice
- After sorting of rice seed by salt solution method

Time needed

2 hr

Materials needed

1. Seed, field/plot
2. Instruments for ploughing, harrowing, and leveling
3. Seeders

Preparation

• Field, where practical planting will take place, must be well prepared (leveling complete)

• Must prepare the sturdiness of the instruments beforehand. Must collect materials needed for adjustment and retightening.

Steps

1. Explain the objective of the lesson.
2. Divide them into small groups.
3. Provide questionnaires for group discussion.
4. Perform practical sowing by group.

Discussion questions

1. Why does upland rice acre become decrease?
2. What is the main problem in upland rice farming?
3. Discuss the advantages and disadvantages of broadcasting system.
4. How can pre-emptive action be taken against weeds in upland rice? Why quick planting should be made after the land is properly prepared?
5. What are the advantages of line sowing?
6. If considerable acres were to be extended in farming, how should it be proceed with the manual seeders and line drawing and leveling instruments?

The main facts to be observed in upland rice intensification system are:

1. Use of quality seed
2. Line sowing
3. Uniform depth of seed
4. Uniform spacing of seed
5. Proper land preparation/ leveling
6. Preparation of uniform sowing line
7. Proper leveling and covering of seed
8. Timely weeding within 15 to 20 days after planting
9. Adequate use of organic fertilizer

Square Sowing Method

Introduction

Method is important in upland farming. Square sowing method is also one of the methods of increasing the crop yield. Direct seeding is generally practiced for upland rice. Because proper spacing and depth of the plant is important in sowing the seed, the depth of the seed should not be more than one and a half inches. The spacing of the plant can greatly control the mini environment and plant population of upland field. By using appropriate plant spacing, infestation of pest and disease can be controlled. In addition, it also gives considerable support in collecting data for Agro-Eco System Analysis (AESA). Based on rice variety and soil fertility, the plant spacing must be determined. Square sowing in row method is found that it has many advantages in field activities than conventional sowing method. Especially it is easier in weeding.

Learning objective

Study the benefit of square sowing method.

Time needed

1 hr

Materials needed

Rice seed, rope and measuring tape, seeder (jet planter)

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Let them have discussion by groups of experiences in other sowing methods.
4. Let every group to manage sowing method.
5. Let them have discussion on advantages and disadvantages of this sowing method.

Discussion questions

1. Why is square sowing method needed?
2. In seeding, why it should be in proper depth?
3. What is plant spacing? How does it influence on plant growth?
4. What is the benefit of square sowing?

Preparation

Timely seeding in the upland field is the most suitable for this study. Therefore, it is better if the field is the study plot.

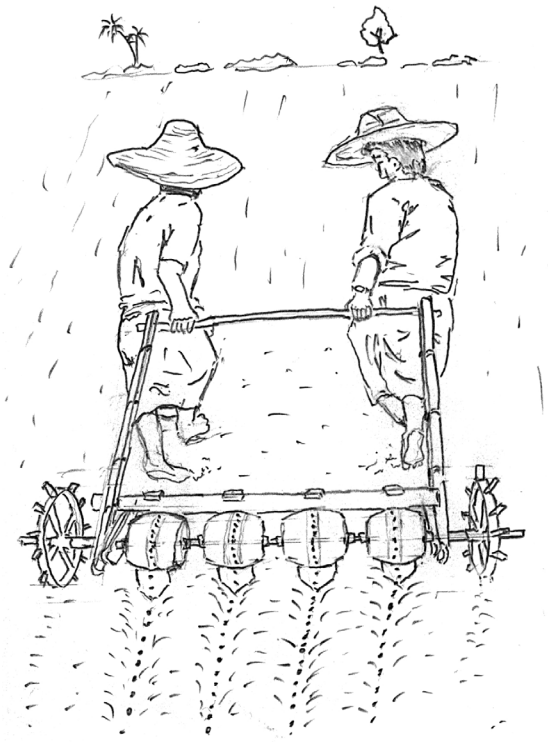
Discussion on results

1. The reasons for requiring square sowing are:
   - Control greatly of mini environment and plant population in upland field
   - Control infestation of pest and disease
   - Facilitate in collecting data of (AESA)
   - Make it easier in weeding
   - Convenient and easy for data collection
2. Determining the proper depth in seeding is to ensure the seed germination and good tillering.
3. Plant spacing means determining of distance between rows and distance between plants. It contributes to rapid vegetative growth because of having good aeration, equal sunlight, and easier in weeding.

Upland Rice Intensified Sowing by Seeder

(a) Seeding with combined seeder

- Sow promptly after the land is well prepared by ploughing, harrowing and leveling. If sowing is not done promptly after the land is prepared, weed will grow ahead. When it rains, the ground becomes hardened, and it may have difficulty in drawing the instruments.
- In sowing with the use of combined seeder, make sure the roller, which turns the seed box, turning continuously; the furrow is in proper depth, whether or not seeds are dropping, and whether or not seeds are still remaining in the seed boxes.



(b) Seeding with ordinary seeder

- When furrowing with the five teethed harrow, strictly follow the method in such a way that the outlying lines must be overlapped so that would result in four furrows per drawing.
- Make sure that the seeds in the seeder with four boxes drilling properly into four furrows.

(c) Other seeding methods

- Use seeding by hand when seeder is inconvenient.
- It is more convenient by using seeder box than seeding by hand.
- Whichever methods is used for seeding, adequate and effective leveling must be done for the seed to be covered properly at the depth of one and a half inches, for conserving the moisture effectively and saving the rice plant from lodging.

Weeds

Introduction

The plants, which are growing naturally in the crop field without being planted by human, are called weeds. Because the weeds compete with crop for nutrient, serve as habitat for the pests and diseases, and hamper the crop development, weeds in the field are usually eliminated until not a single weed remains. But careful observation will show that the weeds are, by nature, very interesting.

Nature and general aspects of weeds

The weeds can grow and flourish in harsh weather and land where crops are difficult to grow and develop. The weeds, by its nature, can develop in any circumstances where there is drought, heavy rain, fertile soil, poor soil fertility, over acidity and salinity of soil etc. Since it has such different kinds of qualities, it may be called the master who guides the conditions of water and soil for human. If the nature of the weeds were fully understood, considerable knowledge will be acquired, and can be used well not only as human food, and in agriculture, but also as medicines.

Weeds can be classified as annual and perennial weeds depending on their growth life. The weeds can grow in any weather, in any soil types, and its species can multiply with different patterns. In such species multiplication, comparing its seed and plant propagation etc. with seed and plant propagation of human grown crops, rate of its growth is higher, and its multiplication is faster.

Soil conservers

Weeds maintain the soil erosion due to the rain drops. Weeds which are growing in the slope land protect to minimize the loss of top soils from runoff water. Weeds play an important role in refilling compost into the field. Therefore, even the weeds, which are removed from the crop field, are found not useless but useful for the soil if it is applied effectively.

Types of weeds

Weeds may be generally classified into three types. One is called grass type which has circular stem and hollow. Triangle shape stem without hollow is called small flowered umbrella type, and broad leaf with intertwined veins and square or round stem is classified as broad leaf type.

Goose grass small flowered broad leaf

umbrella plant Japanese laxative

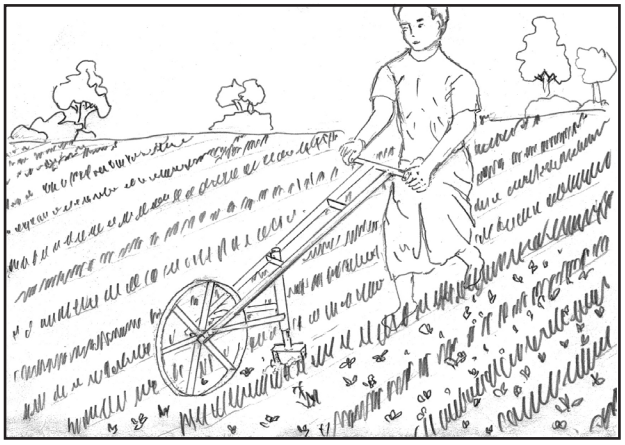
(circular stem and hollow) (without hollow) (leaf with intertwined veins)

Competition of weeds with plants

Weed problem tends to be the main discussion whenever the farmers discuss about the difficult issues encountered in upland rice planting. Weeds compete with crops for sunlight, water and nutrients in reference to consumption. As weeds are local, they are much better than crops which came from other parts with regard to growth. Therefore, upland rice farmers have to devote 30-60% of their working time in weeding job.

Weeds management

We have to suppress the weeds with different methods for optimum development of crops that we have planted. Summer ploughing by soil inverting after harvest, relay cropping and crop planting by soil covering, they are weed control methods by regions. The most effective methods in upland rice management are: well managed ploughing and harrowing when land preparation is made, use of appropriate rice weeding instruments (rotary weeder, small hoe) and proper planting systems (line sowing, square sowing) by regions.



Learning objectives

• Understand the nature and the types of weeds

• Familiarize with local weeds

• Understand the role of weeds in relation with ecosystem

• Study the most effective control of weeds and methods

When most appropriate for facilitation

During crop growing period starting from 15 days after crops are planted.

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Ask each group to go into the field and collect as much weed varieties as possible.
4. Ask them to classify the weed varieties when they return to the training venue.
5. Distribute each questionnaire among each group and let them discuss.
6. Let them submit their discussions from the small groups to the large group.
7. Consolidate the proposals and summarize it.
8. Ask one person from each group to come forward to compete by mentioning the name of the weed associated with the weed type, which is classified by the small groups.

Remark: After the competition, make an arrangement of acknowledging the group for much and most of the information.

Discussion questions

1. What is weed?
2. Discuss about the type and characteristic of weed.
3. How does weed compete and interfere with the crops?
4. Are the weeds not beneficial to human at all? Please discuss.
5. Discuss about the farm instruments used for controlling weed.
6. Why is weed control important?
7. Discuss in group about the methods of weed control.

Study on Seed Production

Introduction

It is one of the problems in obtaining the quality seed for production of upland rice in village areas. Therefore, farmers, who are producing the upland rice, have to substitute grains with seeds. If a single variety is planted annually and continuously, the seed vigour becomes low and consequently, characteristic, growth and ability to resist pest and disease of the plant become low, and the yield rate is also decreased.

Because the farmers have used only grain in planting, there is a loss in yield rate from 10-20% (10 to 20 percent). If the farmers could produce the seed themselves for upland rice farming, the yield will increase significantly, and it would help much for family food security. This study provides many opportunities for farmers in learning the quality seed production methods.

Learning objectives

• Study the importance and benefits of quality seed

• Study the different production methods of quality seed

Materials needed:

Quality seed (or) basic seed

When most appropriate for facilitation

From the time when upland rice is started sowing to harvest time

Steps

1. Select the proper site for seed production within the observation plot at the Farmer Field School.
2. Collect needed amount of quality seed (basic seed).
3. Explain and discuss with farmers about the importance of quality seeds.
4. Sow the seed by using the assigned planting method.
5. Discuss together with reference to field visit activities.
6. Regular field visit once a week, and collect the necessary data.
7. Timely clearing of weeds.
8. Discard the infected plants and off-types when found.
9. Harvest at appropriate time and do the threshing, drying and storing separately and systematically.
10. After harvesting and storing, share their own findings between the farmers and discuss.

When the seeds, which are produced with the above methods, are compared with the other grains, which are produced with the conventional methods, the quality is much higher and as good as the seeds, which are produced from the seed farms of Myanma Agriculture Service (MAS). The steps, with reference to sowing and producing of upland rice seed which is learned here, can be practiced not only for rice but also for seeds of other crops.

Discussion questions

1. What are the characteristics of quality seeds?
2. How do you understand about quality seeds?
3. Why is it crucial important to produce seed by farmers themselves?
4. What procedures are to be taken for producing the quality seed?
5. What will happen to the seed production if the weeds cannot be cleared in time?
6. What is the off-type roguing? What will happen if off-type roguing is not done?
7. What will happen if harvesting is done earlier or later than the appropriate time in seed production?
8. Is there any difference between the seeds, produced by you, and the grains, produced conventionally by the farmers? What is the difference?
9. When quality seed is produced, how is it stored?

Rice Line Sowing Method along Contour

Introduction

Explain the participants/farmers that rice line sowing along contour is one of the soil conservation methods, and that rice seed should be sown in line system. To do so, line/ furrow instruments (rake) or ploughing with bullock/cattle is applied. Rice seed rate and the distance between rows/furrows should be determined depending on soil fertility condition. As rice seeds are sown in line along contour on the slope side, the growing rice plants provide better protection from soil erosion by water. Explain that it is much easier in weeding.

Learning objective

Study the increased benefits with regard to line sowing.

When most appropriate for facilitation

Before planting, and before selection of field site.

Steps

1. Explain the objectives to the participants
2. Mention the results

Discussion question

Why do we practice line sowing?

Discussion on result

Line sowing protects the soil erosion by water, and it provides advantage for easy weeding. Therefore, line sowing is done along contour.

Soil Moisture Management

Introduction

Most of the farmers do not understand the importance of moisture management in upland farming. Without enough moisture, rice and other crops at large cannot survive. Thus, discussion should be made with reference to the importance of moisture management in performing to acquire high yield for upland rice and other crops. Although the soil has sufficient nutrients needed for the plants, without the moisture in the soil, the plants cannot take up the nutrients well. Only if the moisture is present in the soil, the nutrients can dissolve properly, so that the plants can absorb them well. For the moisture to exist in the soil at all time, there must be enough organic materials which can conserve water/moisture in the soil.

Upland farming largely relies on the rain. Rain starting period, amount of rainfall and distribution of rainfall pattern are varied by the regions. But farmer must place the seed into the ground taking into account of the period when the soil moisture is assured. Planting time can be managed as necessary at the site where irrigation is possible.

Learning objectives

- Study the nature of soil moisture management
- Study the benefit of soil moisture management

Time needed

1 hour

Materials needed

Paper, marker pen

Steps

1. Explain the objective to the participants.
2. Divide them into small groups.
3. Demonstrate the soil moisture management.
4. Arrange every group to activate.

Discussion questions

1. Why is it necessary to understand the nature of soil moisture management?
2. Describe the benefit of soil moisture management.
3. Describe the importance of the relationship between moisture and organic material.

4. Discuss the difference between soil without moisture and soil with moisture

Discussion on result

• The nature of moisture management must be understood because moisture is important for crops in absorbing the nutrients in the soil well.

• Benefits of moisture management are:

- Learned that crop does not develop without moisture in the soil.

- Supplementing the organic materials into the soil because of their importance in soil moisture conservation.

- Providing the stream water in upland rice planting period (transition period) if there was drought and the land became dry.

- Development of important pulp (colloid) only by moisture through organic materials so that the plant can absorb the nutrients from the soil.

Cropping Systems and Cropping Patterns

Introduction

Growing continuously the same crop in the same plot year after year causes the yield decrease. It exacerbates pest and disease infestation. Thus, it should be systematically carried out with various methods, changing various cropping patterns, and by rotating the various crops, one crop after another, in the same plot. It is very important to select the proper crop planting method, cropping pattern and crop rotation for evenly acquiring plant nutrients, avoiding pest and disease infestation, and soil conservation.

Learning objectives

Understanding of farming techniques, cropping patterns and crop rotation

When most appropriate for facilitation

Before planting season

Immediate completion of planting season (so that planning could be done)

Time needed

2 hrs

Materials needed

Large size paper, marker pen, colour pencil, paper tape

Discussion questions

1. What are the advantages and disadvantages of the single crop in the same plot when planting in large areas?
2. What are the benefits if mixed cropping is done?
3. What are the problems that might be faced when the same crop is planted continuously year after year?
4. Draw the crop rotation pattern of four types of crops, i.e. corn, groundnut, upland rice and soybean which will be planted one crop per year within four years. Discuss the justification.
5. Draw a two years cropping pattern of three types of crops, i.e. groundnut, upland rice and niger. Discuss the justification.

Points to be considered in proper selection of crops, planting techniques, cropping pattern and crop rotation

1. Nutrients intakes of plant, nature of root penetration and plant size
2. Required condition for protection from soil erosion of upland
3. Closer plant spacing and nature of soil cover
4. Requirement of farmer's family and market
5. Whether the crop prefers shading or not
6. Crop type complementary to soil fertility condition
7. Types of infested pest and disease
8. Planting with frequent input of leguminous crops

Determining Factors for Life Period of Upland Rice Plant

Introduction

In determining the life period of upland rice, it is generally similar to the lowland rice in three phases, i.e. vegetative phase, reproductive phase and ripening phase. However, as for vegetative phase, it is found that there is only two sub phases in upland rice, such as early and late vegetative phase. As for lowland rice, it is found that there are three sub phases. Reproductive and ripening phases of upland rice are similar to that of lowland rice.

Vegetative phase

Vegetative phase is the total number of days resulted by subtracting the (65) days that it takes in reproduction and ripening from the whole lifespan of rice plant. It means upland rice variety with life period of 145 days can be regarded as 80 days for its vegetative growth period. Over 90% of upland rice varieties are seasonal rice, and their life period cannot be fixed due to the photosensitivity.

In studying the vegetative phase of upland rice from the botanical perspective, it is found that there are only two types of life period, i.e. early and late vegetative phase. The early vegetative phase is determined the time between seed germination and initial tillering. In upland rice planting, depending on the operational activities such as soil nutrient management, use of good variety and genetic purity, land preparation, cultivation, weed management, and pest and disease control etc., the total number of this period of early vegetative growth would be different. In line with this process, the period of late vegetative phase cannot be fixed. Therefore, if upland rice planting process is managed properly at vegetative phase, the upland rice yield would certainly be increased.

Learning objectives

- Learn the growth stages of upland rice
- Learn the characteristics of upland rice in each growth stage
- Acquire the skill of plant management by period

Time needed

1 hr

Materials needed:

Rice plant, brown paper, marker pen, adhesive tape

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Visit the field and collect the rice plant sample from one's own plot.
4. Discuss by groups about the functions of the parts of the rice plant.
5. Share the discussions within the large group.

Discussion questions

1) Why is it important the new leaves and tillers to sprout from the plant?
2) How does the weather affect the plant growth?
3) Why is it necessary the leaves at the top of the rice plant to remain survive until the end of the rice season?
4) Why is it different in ways the rice plant is nurtured in each life period? How are they nurtured in each phase?

Reproductive phase

In any rice variety, reproductive phase occurs 65 days before maturity. There are two periods, i.e. period of panicle initiation and period of booting and panicle development. Good panicle development stage can determine the number of grains. As it is the time of managing for adequate nutrients, it is necessary to obtain enough moisture. It is the phase where the flag leaf ends.

Learning objectives

- Learn the natural and morphological aspects of the reproductive phase
- Learn why panicle initiation and panicle development stages are important in increasing rice yield.
- Learn the physiology of rice plant

Time needed

1 hr

Materials needed:

Rice plant in reproductive phase, paper, marker pen, magnifying glass

Steps

1. Explain the objective to the participants.
2. Let the participants to learn the rice plant by halving the stem.
3. Let the participants to discuss the learning by small groups, and submit the collective discussions to the large group.

Discussion questions

1) How many stages are there in reproductive phase? Describe the nature of these phases.

2) Is it necessary to apply full nutrients in reproductive phase? Is moisture necessary in this phase?

3) Are there all tillers in initiation stage in your plot?

4) Why some of the panicles are more developed in the same plot?

5) What are the main functions of this phase?

Ripening phase

Between 30 and 35 days before harvest

Learning objectives

Learn the importance of flowering, milky stage and dough stage and ripening stage.

When most appropriate for facilitation

Rice ripening phase

Time needed

1 hr

Steps

1. Explain the objectives to the participants.
2. Divide them into small groups.
3. Discuss and illustrate about ripening phase.
4. Submit to and discuss in the large group.

Discussion questions

- Why is it important to take up the nutrients in ripening phase?
- What kind of lesson acquired for the next season? How can it assist the other farmers?

References

1. Metta Development Foundation's promotional Farmer's Handbook for basic field development

2. Series of training pamphlets from Farmer Field School, Training of Trainers (TOT)

3. Pamphlet of pests infestation on rice plant published by Plant Protection Division, Myanma Agriculture Service

4. Pamphlet on weeds (U Saw Lei Wah)