



Farmer Field School Facilitator Manual

For Tea Smallholders in Vietnam



A better
deal for
farmers



Rainforest
Alliance



Acknowledgement

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What is the FFS and why do we use this training method?

The project “Integrating Smallholders into Quality and Sustainable Tea Supply Chains in Vietnam” funded by IDH and Unilever and implemented by Rainforest Alliance in collaboration with Veco aims to train tea factories and smallholder farmers in the Sustainable Agriculture Network (SAN) Standard that leads to Rainforest Alliance certification as well as on increasing productivity and efficiency and tea quality. The training of smallholders will be conducted by lead-farmers selected by the participating factories through so-called Farmer Field Schools (FFS). This training manual is designed specifically for the training of the lead farmers and to support the lead-farmers in running their own FFS.

The FFS training methodology is well suited for the training of farmers. Adult persons learn in a different way than young persons. Lectures and demonstrations whereby farmers passively watch a trainer are generally not effective. In a FFS, farmers are encouraged to explore and discover for themselves. Knowledge obtained this way is more easily internalized and put into practice after the training is over. All the sessions take the abilities, knowledge and experience of the participants as their starting point, and FFS activities are designed to deepen them. The final goal of the FFS is to empower farmers to become effective managers of their tea production.

The FFS process is guided by a facilitator (the lead farmer) who has been trained in a FFS himself. By using the FFS methodology to train the lead farmers, it is hoped that lead farmers will find it easier to conduct the FFS themselves as there is no difference between “being trained” and “being the trainer”. This manual will serve as back up to the lead farmers by providing a detailed description of all the sessions and studies that form part of the FFS. The manual is supplemented by a number of hand-outs and a manual with group dynamics activities.

This training manual covers all exercises and studies that are part of the FFS. The SAN standards are covered in the first nine sessions and can also be organized separately. However, for the remaining sessions it is essential to have a study field. Since these sessions deal with the different aspects of the management of the tea crop they are best organized during the relevant phase of the growth of the tea crop. As a consequence, the FFS covers the complete annual production cycle of the tea. To cover all sessions included in this guide, the FFS should meet once every two weeks.

The FFS was developed in the 1980s by the FAO to train farmers in Integrated Pest Management. Different projects by FAO and other donors successfully trained hundreds of thousand farmers in South and South-East Asia, first in rice IPM but then also in many other crops. FFS for IPM in tea were developed in 1995 in Vietnam and used in Phu Tho and Thai Nguyen provinces. The Unilever supported project in Kenya brought the tea FFS to a completely different level. The current IDH-Unilever-Rainforest Alliance project brings the FFS back to Vietnam! The sessions included in this guide draw upon the experience in these different countries as well as RA's training program on SAN standards.

How to set up and facilitate a FFS

General FFS program

The FFS program consists of two parts. The first part concentrates on the compliance with the requirements of the SAN standards. The second part focuses on the Good Agriculture Practices of tea cultivation, and it goes along with the annual farming cycle of tea farming. The class meets once every two weeks, on a fixed day of the week. The VECO field staff conducts FFS sessions with the lead farmers according to this Manual, and the lead farmers repeat the same session with their own group.

Preparation prior to the start of the FFS program

- Selecting lead farmers and identifying participants
- Training lead farmers on facilitation skills and making a training plan
- Establishing a FFS field and selecting a meeting place

Basic requirements

- Facilitator: 1 person
- Trainees: 15 - 20 farmers per class (if more, then consider adding one more facilitator or splitting the class)
- One study field for pest and disease observations and for special topics (e.g. plucking exercise). This field can serve at the same time as a demo field. (Minimum size of the field should be 300 m2.)
- One meeting room or place to sit outside (close to the study field, having enough chairs, tables, blackboard etc., It could be the house of a farmer.)
- Set of training materials (based on the details in each training exercise)
- Notebooks and pens for the participants

General outline of each session

Time	Duration	Activity	Leader
07.55 - 08.00	5 mins	Arrival, registration	Group Monitor
08.00 - 08.10	10 mins	Start: Recap of the day's program	Facilitator
08.10 - 08.30	20 mins	Field observation	Subgroups
08.30 - 09.00	30 mins	Data Processing	Subgroups
09.00 - 09.30	30 mins	Plenary discussion	Facilitator
09.30 - 09.50	20 mins	Group dynamics / break	Facilitator
09.50 - 11.50	2 hours	Special topic	Facilitator
11.50 - 11.55	5 mins	Summary	Facilitator
11.55 - 12.05	10 mins	Announcements / next meeting program	Facilitator, Group
12.05		Departure	Monitor

Note: This daily schedule is for the sessions whereby the participants go to the field to observe the state of the tea plants. To save time, trainers and participants should meet at the field. If the field observation is not necessary for the field session, the time between 08:10 and 09:30 can be used for another exercise.



Tea field ecosystem observation & analysis

Introduction

The health of the tea bush is determined by its environment. This environment includes physical factors (i.e. sun, rain, wind and soil nutrients) and biological factors (i.e. pests, diseases and weeds). If we understand the whole system of interactions, we can use this knowledge to reduce the negative impact of pests and diseases and improve the health of the tea bushes. By learning how to observe the tea field, how to analyse the field situation and how to make the proper decisions for their tea field management, FFS participants will be able to more effectively apply field inputs such as pesticides and fertilizers, thereby reducing the negative impacts of such inputs, while at the same time optimizing tea field yield and quality. This process is called “ecosystem analysis” and will be conducted during every session of the FFS.



Introduction

By the end of the lesson, participants will:

- Understand what is meant by tea field ecosystem and be able to analyze the elements of the tea field ecosystem and their relationships
- Be able to take management decisions based on the analysis of the tea field ecosystem

Duration

90 minutes

Teaching tools

A0 paper (one for each group), A4 paper, color crayons (one box for each group), pencils, rulers, adhesive tape, plastic bags

Teaching tools

- 1 large poster with the photos of the predators in tea farms (provided by the project)
- Flipchart and markers
- Notebooks and pens

Teaching Processes

Step 1 - The definition of tea plantation ecosystem

- 1 Trainer starts the class with greetings, state the expected output upon completion of this lesson.
- 2 He/she raises the question: What should we observe when we go to the tea field?
- 3 Trainer records all statements possibly made by farmers on the board. Trainer will add elements not listed by the farmers. Trainer will ask some questions how the different element relate to each other. (See notes for the Trainer.)

- 4 Trainer makes conclusion: A combination of above stated above creates a tea field ecosystem.
- 5 Trainer then asks if the area around the tea field is influencing the tea ecosystem? How do they relate? What would happen if the trees around the tea field would be cut? What do the RA/SAN standards say about the forest and other natural areas?
- 6 The following questions will be given to the class for discussion:
What happens to each component in the ecosystem when:
 - *Spraying chemicals to eradicate all insects and spider*
 - *Tea field is provided with much fertilizer and there is much sunlight.*
 - *Plantation is fertilized in little sunny but cloudy weather conditions*
- 7 Trainer then asks the participants (make sure some male and some female farmers volunteer to answer): What is the ecosystem about? How do ecosystems become sustainable? Trainer explains what happens once the ecosystem has been destroyed.
- 8 Then the trainer discusses with the participants what and how they will observe the tea field ecosystem during the rest of the FFS. For example:
 - ✓ Five bushes will be observed randomly
 - ✓ Plant: observe the plant height, color of leaves, deficiency symptoms, etc.
 - ✓ Pests: observe and count pests at different places on the plant.
 - ✓ Diseases: observe leaves and stems and identify any visible disease symptoms.
 - ✓ Natural enemies: observe and count parasitoids, predators, diseased insects, etc.
 - ✓ Weeds: observe weeds in the field and their intensity.
 - ✓ Shade trees: how is the shade density?
 - ✓ Water availability in the field.
 - ✓ Soil: observe the soil conditions of the field. Observe the slope and location.
 - ✓ Weather: observe the weather condition.

Note: Step 1 should only be done at the first meeting of the FFS. In the following meetings the class could go directly to Step 2.

Step 2 - Relation amongst components in Ecosystem

- 1 Trainer divides the participants in groups of 5-6 persons. (These groups will not change during the following weeks doing this activity.)
- 2 The groups will visit the tea field for 30 minutes to observe the ecosystem. Walk across the field and observe keenly each of these plants selected and record your observations.
- 3 While walking in the field, manually collect insects or other unknown things in plastic bags. Collect plant parts with unknown disease symptoms.
- 4 The group talks about the crop situation. The trainer will ask questions to initiate the discussion and to stimulate critical thinking.
- 5 Return to the meeting place. Each group will then analyze the field situation in detail and present their observations on the A0 paper (in a drawing or any other means as agreed by the class).





- 6 Make sure to cover all ecosystem elements in the presentation. Try to show the interaction between pests and natural enemies
- 7 Each group will discuss the situation of the field and make a crop management recommendation. Write the field situation and the management recommendation on the bottom of the A0 paper.
- 8 The small groups then join each other in the plenary meeting and a member of each group will now present their analysis in front of all participants. A different person will present each week. Members of the other groups will ask for clarifications.
- 9 The trainer will facilitate the discussion by asking guiding questions and makes sure that all participants are actively involved in this process. (See example questions below.)
- 10 Summarize the present situation of the field. Make sure all participants agree but also pay attention that groups may have made different observations as not all parts of the tea field will be the same.
- 11 Formulate a common conclusion on what management decision needs to be taken. When different groups have different ideas about what to do, discuss this problem in more detail involving the whole class. The whole class should support the decision on what field management is required!
- 12 Make sure that the required activities (based on the decision) will be carried out. Agree who will do what and by when.

Questions to facilitate the discussions:

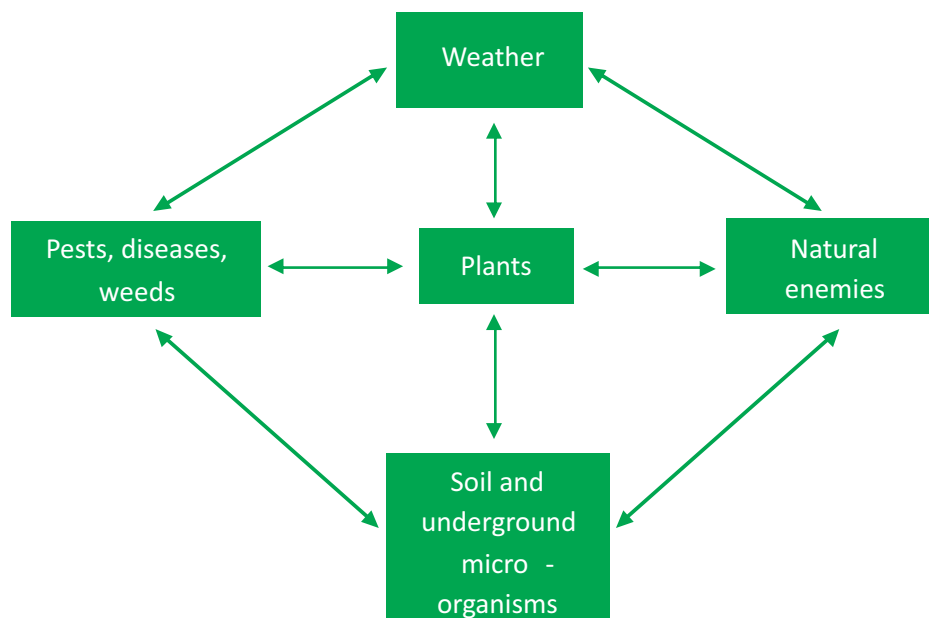
- 1 What aspect is most important at this moment?
- 2 Is there a big change with last week?
- 3 What kind of change?
- 4 Is there any serious pest or disease outbreak?
- 5 What is the situation of the beneficial insects?
- 6 Is there a balance in the field between pests and natural enemies?
- 7 Is the current weather favorable for the development of pests and diseases?
- 8 How will the weather develop in the coming week? Is that favorable for the pests and disease?
- 9 Do you think the crop is healthy?
- 10 What is the condition of the soil? Is the soil humid enough?
- 11 What about the shade trees? Do some areas have too much or too little shade?
- 12 Are you expecting any problems to emerge during the coming time?
- 13 What problems? How can we avoid it? How can we be prepared?
- 14 What management practices are needed at this moment?
- 15 Are the management practices in line with the SAN/RA standards? (For example, no banned pesticide is being proposed.)
- 16 When will it be done? Who will do it? Make sure that responsibilities for all activities are being discussed.
- 17 Summarize the actions to be taken.

Notes for farmer trainer

Definition of tea field ecosystem

Tea field ecosystem is a combination of tea bushes, other plants, organisms and surrounding environment that interact

Relationship of components in the ecosystem



Answers for discussion questions

What happens to each component in the ecosystem when:

- Spraying chemicals to eradicate all insects and spider: ecosystem imbalance; when all insects die, there will be no food for spider, leading to the death of this insect.
- Tea field is provided with much fertilizer and there is much sunlight: if too much fertilizer is provided under sunny weather, plants could die and soil organisms (for example, worms) could be poisoned and die → soil will become compacted and dry because worms do not make air tunnels anymore, soil will also become less fertile because organic matter is not broken down by soil organisms and added to the soil.
- Plantation is fertilized under little sunny but cloudy weather conditions: Plants will grow fast but this condition also facilitates the growth of pests → but **helpful organisms will also eat more and develop faster ...**





Wildlife / biodiversity in the farm

Objective

By the end of the session, the participants are able to:

- Identify wildlife that are present on the farm, including predators for tea pests
- Understand the importance of the predators and the biodiversity on the farm
- Understand how to protect the predators and the biodiversity on the farm
- Develop a wildlife/predator inventory of a farm
- Develop a wildlife/predator protection program of a farm

Duration

2 hours

Teaching tools

- 1 large poster with the photos of the predators in tea farms (provided by the project)
- Flipchart and markers
- Notebooks and pens

Teaching process

Step 1:

Ask the participants to name the wildlife that is present on their farm. As the participants say the names, note them down on the flipchart. At this point, the participants are likely to only mention the mammals they have seen around, if any.

Step 2:

Show the poster to the participants. Ask them whether they have seen any of the predators in their farms. If they have seen any of them, ask them to identify their names (local names are fine). As the participants speak out the names of the predators, note them down on the flipchart. If there is any predator that the participants cannot identify, tell them the names and note them down on the flipchart.

Encourage them to identify not only the insects but also birds. Let them know that birds are also important predators for pests, such as caterpillars.

Guide the discussion in a way that the participants can realize that the predators (beneficial insects and birds) are also wildlife on the farm and are important part of the biodiversity on the farm.

Step 3:

Ask the participants what pest each predator eats. As the participants speak out the names of the pests, note them down on the flipchart, next to the names of the predators. If they cannot name all the pests that a predator eats, the facilitator can provide the answers.



Step 4:

Ask the participants to go to the field with their notebook and pen, and walk through one row of tea bushes. Ask them to observe the presence of predators. Ask them to write down the names of the predators they saw into their notebook. Also, write down names of any animal they do not know. Participants can catch these to bring to the class room for further identification. If possible, ask them to also write down the numbers of each predator.

Step 5:

Once the participants come back to the session, ask them which predator they saw and how many. If there are many predators observed in the field, let the participants discuss the importance of having many predators. If there is hardly any predator observed in the field, it is important for the participants to realize their absence and discuss reasons why they are absent.

Step 6:

Ask the participants what happen when they spray pesticide. Let them discuss the effect of pesticide on predators, and encourage them to understand the fact that pesticide spray kills predators, as well as pests.



When a pesticide is sprayed, ladybugs (predators) are killed easily, and they are the first to be killed. On the other hand, red spider mites (pests) protect themselves underneath their web and can survive a pesticide spray.

Technical information to convey to the participants

In the absence of predators, pests can multiply much faster than before. As the life cycle of a predator is much longer than that of a pest, it takes much longer for the predator population to recover, as opposed to a pest population. Pesticide spray can destroy the delicate balance of between predators and pests, and can even cause a pest outbreak in some occasions. We need to be very cautious about pesticide use, and think twice before we spray.





Step 7:

Ask the participants how they can protect the predators on their farms and increase their population. Lead the discussion in a way that the participants can realize the importance of protecting the habitats of predators, such as streams, rivers, lakes, swamps, grasses, bushes, forests and native species of trees.

These habitats can be protected through the following methods:

- Keeping natural vegetation near the ecosystems
- Controlling weeds manually
- Planting native tree species
- Establishing conservation areas
- Reducing the spray of herbicides and insecticides

As for the birds, it is also important to respect the following to maintain/increase their population:

- No hunting
- Not keeping them caged as pets

Step 8:

Let the participants decide which of the above practices they can start implementing on their farms. Participants should reflect upon their own farms, and share their ideas on how they will protect the habitats of predators to increase their population. Once they make their decisions on the practices that they are going to implement, ask them to write these down into their notebook. This will become a “Wildlife/predator protection program” of each farm, which is one of the requirements of the Sustainable Agriculture Standard.

Encourage the participants to observe the presence of predators and other wildlife of their farms and write them down in their notebook. This will be their “Wildlife/predator inventory” for their farm, which is also a requirement of the Sustainable Agriculture Standard.

As for the FFS demo field, all of the above will be practiced. The effect of the practice will be observed during the field visit of the upcoming FFS sessions.

Buffer zone/ vegetative barriers

Objective

By the end of the session, the participants are able to:

- Identify the areas to be protected within and around their farms
- Understand how these areas should be protected
- Develop an ecosystem conservation program of a farm
- Draw a farm sketch
- Mark the conservation activities on their farm sketch

Duration

2 hours

Location for this session

Due to the nature of the exercise, it is better to conduct this session at a farm that has areas to be protected within or around the farm. The areas to be protected include the following:

- Rivers
- Streams
- Lakes
- Forests
- Houses
- Frequently-used roads
- School
- Hospital

It is not recommended to select a farm that is surrounded only by other farms and has none of the above within or around the farm.

Prior to the session, select a suitable farm and identify in advance where is the area to be protected that can be used for the exercise.

Teaching tools

- Bamboo sticks that have been painted in yellow or red
- Flipchart and markers
- Notebooks and pens (*Participants should bring the ones that have been distributed to them in the first session.*)

Teaching process

Step 1:

Take the participants to the spot, where they can observe the area to be protected within/around the farm. For example, if the farm is next to a stream, take the participants to the spot of the farm where they can see the stream. (Note: To facilitate the explanation of the teaching process, I will continue to use a “stream” as an example. In the real case, please adjust the discussion according to the area to be protected.)





Step 2:

As the participants see the stream, ask them, “What happens if a farmer sprays the entire tea plot, including the parts next to the stream?” The participants are likely to answer, “Some chemical will enter into the stream.” Then ask them what could be the negative consequences of the chemical entering the stream. The following points should be identified.

- The fish in the stream may die or may get contaminated.
- The water in the stream gets contaminated, and if any people fetch the water or swim in the water downstream, their health will be affected.
- The aquatic plants in the stream may be killed.

Step 3:

Ask the participants what should be done to prevent the drift of chemicals from entering the stream. Lead the discussion in a way that they realize the following options of protection:

Three options for protection

1) Buffer zone

They can establish a buffer zone for the part of the farm that is right next to the stream. They should not spray tea bushes that are in the buffer zone. As for the tea bushes in the buffer zone, non-chemical control should be applied, such as biological control and manual/mechanical control of pests.

The width of the buffer zone depends on the type of the spraying machine used. For example, a motorized sprayer causes much more drift than a knapsack sprayer and needs a larger buffer zone. It also depends on the slope of the farm, as there is more drift when the farm has a slope towards the stream. The width of the buffer zone can be 5m and above, depending on these conditions.

2) Vegetative barrier

They can establish vegetative barrier next to the stream. By planting trees and bushes along the stream, the chemical drift can be blocked by natural plants. They should select plants that grow high and thick so that they serve as barriers.

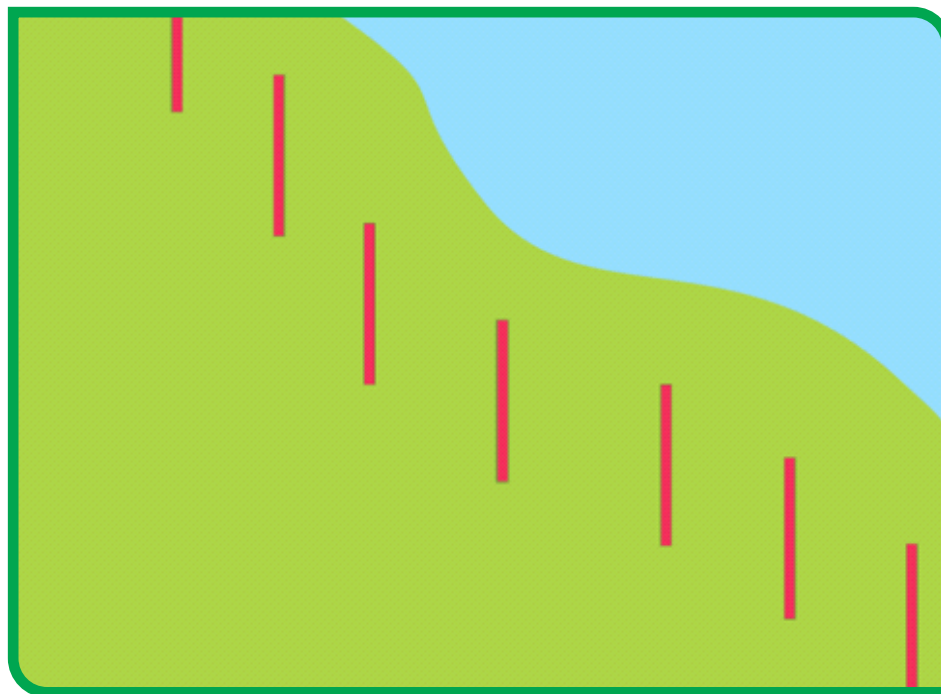
This solution takes time, as the trees and bushes need time to grow. Until the vegetative barrier is established and become effective, this solution needs to be combined with the establishment of buffer zones.

3) Keeping distance between the stream and the crop

This solution is possible only in a long run and for a farm that has a significant size, as most farmers are not willing to sacrifice their tea bushes to keep the distance. When possible, the areas right next to the stream should be left for the natural vegetation to grow on its own and not used for tea cultivation. When a farm opts for this solution, the areas next to a stream can be gradually converted into conservation areas each year.

Step 4:

Bring out the sticks to establish the buffer zone. Distribute the sticks to the participants, and ask them to put them in line in a way a buffer zone is clearly identified. (See the drawing below.) The sticks mean that the areas beyond the sticks should not be sprayed.



Step 5:

Tell the participants that if they are using contracted workers for spraying, these persons need to be clearly informed about the buffer zones and that the areas beyond the sticks should not be sprayed.

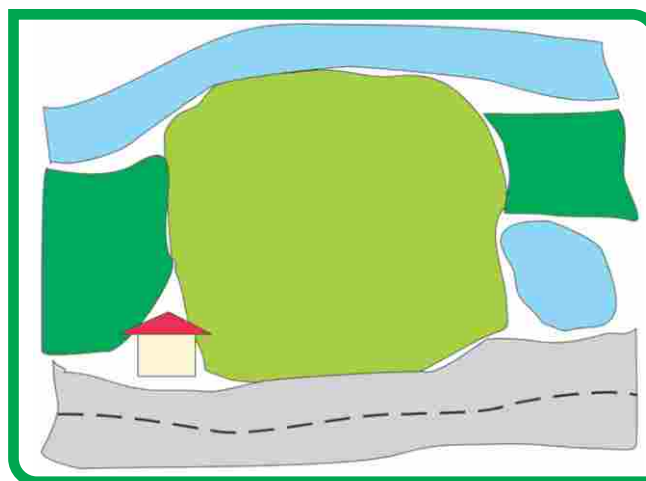
Step 6:

Go back to the location where the participants can sit down and write in their notebooks.

Step 7:

Ask the participants to open a notebook and draw a simple sketch of their farm. In the sketch, it should be clear what surrounds the farm. (See the below example.) If there is any ecosystem (e.g. springs, streams) within the farm, that should also be identified. A farm sketch is one of the requirements of the SAN standard.

If the participants were not sure how to draw a sketch, draw an example on a flipchart for the participants to see.





Step 8:

After the participants finish drawing the sketch, ask them to identify the areas to be protected within or around the farm. If there is any of the below, that should be protected.

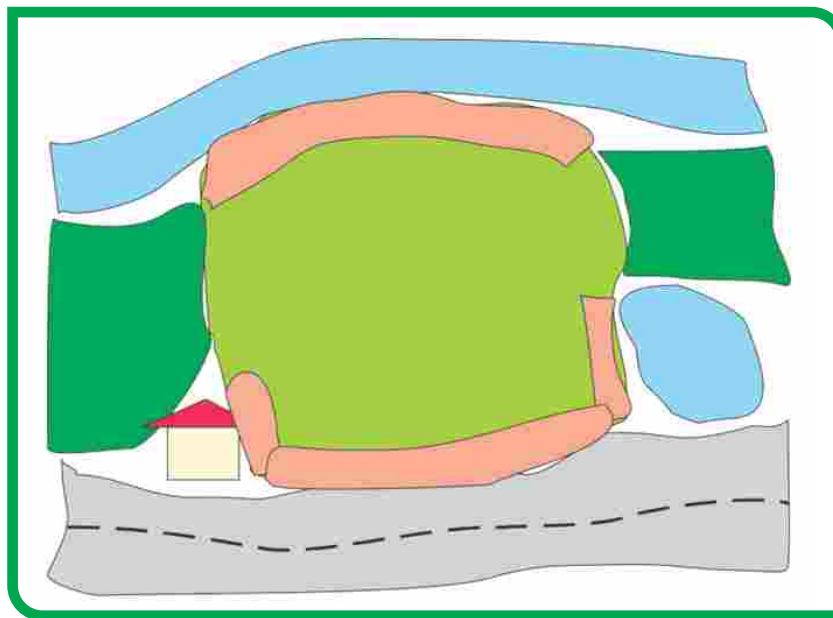
- Rivers
- Streams
- Lakes
- Swamps
- Wetlands
- Forests
- Houses
- Frequently-used roads
- School
- Hospital

Step 9:

Ask the participants to decide how these areas should be protected. They can decide from the three options discussed earlier (i.e. Buffer zone, Vegetative barrier, Keeping distance). Once they make their decision, it should be written down in their notebook. This will be considered as part of the “Ecosystem conservation program” of the farm, which is a requirement of the SAN standard.

Step 10:

Ask the participants to mark their decision into their farm sketch. For example, if a participant has decided to establish a buffer zone, the areas of buffer zone should be indicated in his/her farm sketch. (See the example below where the buffer zone is indicated in brown color.)



Step 11:

Ask the participants to put their decision into practice. Those who decided to establish buffer zones need to mark the areas with sticks and stop spraying chemicals there. Those who decided to establish vegetative barriers need to start planting trees and bushes. Those who decided to keep the distance need to convert the areas with natural vegetation gradually. Ask them to start implementing the practice that they have selected once they go home. One month after this session, the FFS participants should go and visit some participants to observe the effect of the practice selected for implementation.

Soil erosion control/ Weed management

Objective

By the end of the session, the participants are able to:

- Learn the importance of soil erosion control
- Distinguish soft weeds and noxious weeds
- Understand how to increase soft weeds and reduce noxious weeds on a farm
- Establish a soil conservation program of their farm

Duration

2 hours

Location for this session

Due to the nature of the exercise, it is better to conduct this session at a farm that has erosion problems. Select a farm where soil erosion problems can be observed. (See examples below.)





Teaching tools

- Flipchart and markers
- Notebooks and pens (Participants should bring the ones that have been distributed to them in the first session.)

Teaching process

Step 1:

Ask the participants to go around the farm to identify where there is a problem of soil erosion.

Step 2:

Once a spot with soil erosion is identified, ask all the participants to gather at the spot. Looking at the soil erosion, ask the participants what are the causes of soil erosion. Below are the likely causes. There can be others.

- Removal of ground cover, for example because of over-application of herbicides
- Digging of slope to construct houses or roads

Step 3:

Looking at the soil erosion, ask the participants what are the negative consequences of soil erosion. The following impacts should be identified through the discussion.

- Loss of soil fertility
- Tea farm gradually collapsing
- Loss of top soil (which is the part of soil that is most fertile)
- Decrease in tea production
- Eroded soil particles causing sedimentations in rivers and streams

Step 4:

Ask the participants what can be done to prevent and to control soil erosion. Draw their attention to the areas with steep slope (e.g. at the edges of the farm where there is no tea). Discuss the effects of spraying too much herbicides.

Technical information to convey to the participants

The areas with steep slope (e.g. at the edges of the farm where there is no tea) is most susceptible to soil erosion. Application of herbicide on steep slopes always worsens soil erosion. These areas should not be sprayed with herbicide and should be cut manually. Manual weeding in this way allows a vegetative cover to be kept over the soil at a low height, which will protect the soil from erosion.

Step 5:

If the participants agree not to spray herbicide, even if it is only at the edges of the farm with steep slope and where there is no tea bush, ask them to write it down in their notebook. This becomes part of the “Soil conservation program” of their farm, which is part of the SAN standard requirements.

Step 6:

Ask the participants to go out to the field and bring back any weeds they find in the field.

Step 7:

Once the participants come back with bunch of weeds, ask them to separate those weeds into the following two categories.

1) Noxious weeds

Weeds that grow very aggressively and compete with tea for nutrients. They are hard and have strong root systems, and are difficult to be removed. These weeds affect the growth of tea, and should be eliminated from the field.

2) Soft weeds

Weeds that grow slowly and are easy to control. If they are maintained at a lower height, they do not compete too much with tea. Some of them are edible herbs.



Participants trying to separate the weeds into soft weeds and noxious weeds

At first, the participants may think all the weeds are noxious weeds, but encourage their discussion so that they can eventually realize that some weeds they find in the field are soft weeds.

Step 8:

Once the weeds are separated into the two categories, discuss how these two should be managed differently.

1) Management of noxious weeds

These weeds need to be eliminated from the field as much as possible. During manual weeding, these weeds should be pulled out with their roots. The weeds that have been pulled out should be taken out from the farm and should be left to dry in a fallow area or at the edges of the farm.



1) Management of soft weeds

These weeds should be maintained at a low height by cutting them at ground level so that they serve as vegetative ground cover, especially at the areas with slope. They should not be eliminated with herbicide spraying. By keeping them on the farm at a low height, these weeds protect the soil from erosion and prevent the noxious weeds from growing.



Discussing the importance of soft weeds and how to manage them

Step 9:

If the participants agree to manage soft weeds and noxious weeds differently on their farm, ask them to write it down into their notebook. This also forms part of their “Soil conservation plan.”

Step 10:

Ask them to start implementing the practices that they have decided to adopt and have wrote down in their notebook today.

As for the FFS demo field, the recommended practices must be implemented, and the effect of soil erosion control and weed management will be observed in the next FFS session.

Waste management

Objectives

By the end of the session, the participants are able to:

- Classify the waste into 5 different categories
- Manage each type of waste appropriately
- Develop a waste management program of their farm

Duration

2 hours

Teaching tools

- Flipchart and markers
- Notebooks and pens (*Participants should bring the ones that have been distributed to them in the first session.*)

Teaching process

Step 1:

Go to a farm with a fair amount of waste. Ask the participants to go around the farm to collect the wastes they find.

Step 2:

Once the participants are back, put all the wastes into one pile, and explain the following 5 categories of waste and ask them to divide the wastes into these 5 categories.

1) Organic waste

Kitchen waste, ashes from firewood, farm residue, such as maize husks and rice husks, animal waste from chicken, pigs, goats and cows, weeded plants, pruned branches, etc.

2) Recyclable waste

Plastics, metals, papers and cans that can be sold to waste collectors.

3) Non-recyclable plastics

Plastics sachets and bags that cannot be sold to waste collectors.

4) Non-recyclable sharp materials

Glasses and ceramics that cannot be sold to waste collectors. These sharp materials can cause injuries if not managed carefully.

5) Toxic waste

Empty chemical containers. They can be bottles or sachets. They contain chemical residue and can affect human health if they are not managed properly.



Step 3:

Discuss with the participants how each category of waste should be managed. The following are possible options of waste management, and each group should decide on their own what would be the best solution for them. *(Even if no waste in a particular groups was found on the farm, groups should discuss the management options.)* They can also decide on a short-term solution, which may not be the best solution, while planning for a better long-term solution.

1) Organic waste

- Each member makes compost at their farm. *(See Session 5 for more details on compost making.)*

2) Recyclable waste

- Each farm sells them to a waste collector.
- The group collects them from the members and takes them to a recycling company.

3) Non-recyclable plastics

- Each farm buries them at their farm as a short term solution.
- The group finds a waste collector or company that can take their waste at a charge.
- The tea factory takes the waste from the group and finds a way of disposal.

4) Non-recyclable sharp materials

- Each farm buries them at their farm as a short term solution.
- The group finds a waste collector or company that can take their waste at a charge.
- The tea factory takes the waste from the group and finds a way of disposal.

5) Toxic waste

- Each farm keeps them in a bag and stores them in a section of their chemical storage, as a short term solution.
- The group finds a waste management company that can take their waste at a charge.
- The group negotiates with the chemical supplier so that the supplier takes the empty containers back.
- The tea factory takes the empty containers from the group and finds a way of disposal.
- The tea factory negotiates with the chemical supplier so that the supplier takes the empty containers back.

Step 4:

Once the participants decide what they are going to do with each type of waste, ask them to write the decisions down in their notebook. This becomes their “Waste management program”, which is a requirement of the SAN standard. In the program, they should also write down by when this solution will be implemented at their farm.

Composting

Objectives

By the end of the lesson, the participants are able to:

- Understand the materials and methodology for “hot” composting of organic wastes

Time needed

120 minutes

Materials:

- Large sheets of paper
- Marker
- Organic wastes (e.g. leaf litter, kitchen waste, tea pruning material, water hyacinth or residues of crops, etc.)
- Animal manure
- Rice straw
- Water
- Materials to cover the pile, such as banana leaves or empty bags bamboo poles for aeration and posts
- Plastic twine
- Long metal sticks (to measure the temperature). See the discussion.

Method:

(The facilitator with some farmers may prepare the compost 1-2 months before the season for use in the study fields. This exercise is only to introduce the concept of "proper" composting and walk farmers through the steps involved in preparing compost as part of the regular FFS season.)

There are many ways that people have found to build compost piles. The facilitators are encouraged to ask around to find other "recipes" and, of course, to experiment. The basic requirement of all (hot) compost piles is that:

- 1 The compost pile be large enough so that the heat generated is greater than the heat lost to the outside. This means that a "cubic" shaped pile is better than a wider, flat pile.
- 2 The compost pile receives enough oxygen so that the aerobic process of breakdown by microbes can take place. Therefore, hot compost heaps are built above the ground.
- 3 Organic materials are put in as alternating layers to better ensure a mixture and aeration of the pile.
- 4 The pile needs to be “turned” or mixed up in order to bring the less- processed materials from the outside, to the inside, and to add oxygen to the pile. This should be done about once per month.
- 5 The pile needs to be kept moist, in order to promote microbial growth, but not too wet (causing anaerobic conditions). That's why the heap is covered to protect it from too much rain.





Method:

- 1 Explain the objective and the procedure of this exercise to the participants.
- 2 Ask the farmers if one of them, or some other farmers they know, practises composting.
- 3 Review this general process and summarize key aspects, such as temperature, moisture, smell, etc.
- 4 Start building a "proper" hot compost heap, as follows:

Step 1. Prepare compost area

Select a site that does not flood. Choose a shaded and well-drained area. For drainage, bare soil is better than a hard surface such as concrete.

Step 2. Gather Materials

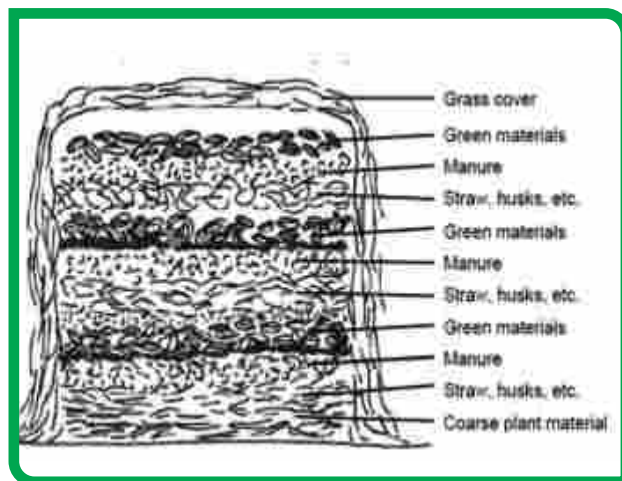
Gather all materials together at the compost area. The exact amount of each material used varies on what is available. The basic mixture should include:

- Green plant material of all kinds (around 50 %);
- Straw or similar carbon-rich material (20 - 30 %) (some rice husks can also be mixed in but the amount used should not be too much);
- Animal manure (best mixed as liquid) (20 - 30 %).

The green material will provide carbon and nitrogen, the straw mostly carbon, while the animal manure provides nitrogen and food for bacteria. Mixing certain types of materials or changing the proportions can make a difference in the rate of decomposition. Achieving the best mix is more an art gained through experience than an exact science.

Step 3. Piling the materials

- 1 Make a heap in a series of layers - each layer is about 15 - 25 cm thick.
- 2 The first layer should be with coarse and woody materials such as thin sticks or twigs. This will ensure good air circulation and drainage.
- 3 Add a layer of more difficult to compost materials, such as rice straw, rice husks or leaves and stems of maize
- 4 Add the animal manure (wet) to cover the plant material
- 5 Add the green material that is easily composted, such as fresh grass, leaves, vegetables and fruit residues
- 6 Ash and sugar water/EM can then be lightly sprinkled onto these layers, to accelerate the process of decomposition.
- 7 Repeat all these layers except the first layer of coarse material, until the heap reaches a height of 1 to 1.5 m. The last layer is again green material.



Each layer should be laid down by starting at the edge of the pile so that the heap does not collapse. Care should be taken to avoid pressing the materials too much or walking on the heap while building it. If the materials are too much compacted, this will reduce the airflow in the heap and cause the composting process to develop slowly or not at all. Air vents, made out of bamboo canes with holes cut in them and placed both vertically and horizontally throughout the heap, will improve the air circulation.

Step 4. Water compost heap

Water the whole pile well until all is sufficiently moist. Use water with sugar dissolved in it. (The moisture must be such that one can take a handful of the material and it may be squeezed without crumbling but no water should come out.)



The squeeze test:

The material is too wet if water can be squeezed out of a handful and too dry if the material doesn't form a ball when squeezed.

Step 5. Cover compost heap

The heap should be covered to protect it against evaporation and heavy rain, as this will wash away the nutrients. Use bags, grass or banana leaves for this.

- 1 Monitor the pile weekly and add water as needed. If the centre of the pile becomes dried out, white and "chalky" means you need more water.
- 2 Assign groups on a weekly basis to measure temperature daily. When the temperature goes up to at least 65°C and then goes down to about 25 - 30 °C, turn the pile bringing the outside materials to the centre, and the centre materials to the outside.
- 3 Turning should be done at least once when the temperature has gone down but it would be better to do it twice. If the temperature no longer goes up significantly, there is no more need to turn the compost.

The pile will be completed when the compost is of a dark brown, crumbly consistency, with the odour of fresh earth and when the temperature has cooled down to 25 - 30 °C. This may take three months, depending on the climate.

Discussions:

- 1 Plot temperature on a weekly basis. Explain why the temperature changes. What happens to the materials in the compost heap when the temperature goes up?
- 2 Why does the volume of the compost decrease? Is this good or not? Why or why not?
- 3 What is the function of water in composting? What is the function of oxygen? Why do we have to mix compost?
- 4 How can composting be used as a disease management and soil improvement strategy?
- 5 What are farmers' reasons for using or not using compost? Explain.
- 6 What are farmers' practices on preparing and using compost? Explain.
- 7 What other materials in your locality are used to make compost?
- 8 What can be done to facilitate preparation of compost?





Note for the facilitator:

Not all organic waste can be used directly as organic fertiliser. Most types of organic waste have to be first composted or broken down by micro-organisms in a warm, moist, aerated environment (hot composting). Particularly animal manures should be hot composted so that all parasites and other disease organisms will be killed.

The materials for composting should be selected in such a way that there is a good mix of materials rich in carbon (C) and rich in nitrogen (N). The composting process needs air and humidity and therefore the construction of the compost heap needs attention. The materials are first heaped together in layers, making sure that air can enter the compost heap. The humidity of the heap should be adjusted so that the heap is neither too wet nor too dry. Normally, within 3-4 days the temperature of the heap will rise, thereby speeding up the basic degradation process of nature, which normally occurs slowly in organic wastes that fall onto the surface of the ground. The final product of the process is compost or humus, which improves the structure and moisture-retention properties of the soil, and supplies plant nutrients as the compost finally breaks down to mineral matter.

Compost improves the soil structure, which is important for long-term productivity of farming. Furthermore, compost contains micro-elements that crops need in addition to NPK. In Vietnam, some materials that are commonly used for making compost are water hyacinth, leaves of plants from the bean family, ash from rice straw, animal as well as human manure. Human manure is not allowed in organic farming but many other materials can be used for composting depending on the locality. What is important is that it makes use of materials that are available and at the lowest cost.

In Vietnam, farmers practice either the "hot" or the "cold" method for preparing compost. "Cold" compost is prepared in a pit in the ground; "hot" compost is normally prepared above the ground. Each method has its own advantages and disadvantages. The "cold" process of composting is an anaerobic process. Due to the lack of oxygen, micro-organisms are not able to "burn" (oxidize) the organic matter and therefore the temperature of the organic matter does not increase (hence the term "cold" composting). However, the result is a rotting process, which does not kill weed seeds and disease-pathogens in the compost. The "hot" process of composting is an aerobic process. Oxygen is present for the micro-organisms to be able to carry out activity that leads to the increase in temperature (hence the term "hot" composting) and eventually the decomposition of the organic matter. The result of a good "hot" composting process is compost that is free from disease pathogens and weed seeds. However, a large volume of the organic material is lost in the process. Almost all organic standards in the world do not allow farmers to use animal manure unless it has gone through a "hot" composting process. Because of the value of animal manure as a fertiliser, "hot" composting is the recommended composting method for organic farmers.

The concept of proper composting especially to kill pathogens in diseased crop residues or animal manure is not yet fully understood in Vietnam. Farmers often leave disease-contaminated crop residues in the fields or in canals. Farmers also use fresh manure as organic fertilizer. Both practices bring problems for crops as well as humans. If the crop residues carry disease pathogens, the disease continues to spread. On the other hand, fresh manure carries pathogens and eggs of parasites that may affect humans. For instance, the disease-causing organism of tetanus, a bacterial disease, is transmitted through animal manure. The tetanus bacteria may enter human bodies through open wounds.

Facilitators and farmers need to understand the role of the elements carbon and nitrogen in the composting process, i.e., the proper combination of plant and animal materials that can give a good ratio of the elements to obtain a good composting process and output. In this activity we will prepare compost so that participants understand the principles of preparing and using compost properly as a disease management and soil improvement strategy.

Waste water management

Objectives

By the end of the lesson, the participants are able to:

- Understand the importance of proper waste water management
- Identify the best option of waste water management for their farm
- Develop a waste water management program for their farm

Duration

2 hours

Location for this session

In order to demonstrate different alternatives of waste water management, the facilitator needs to prepare three demonstration spots for this session in advance. The three possible alternatives of waste management are the following:

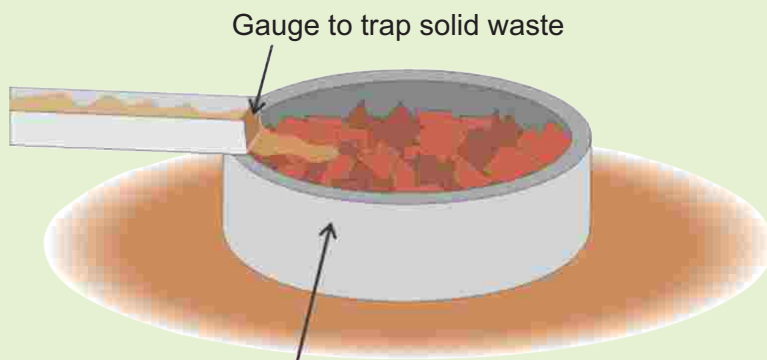
1) Soak pit

Soak pit is an effective solution when there is not much space for waste water management, as it takes very little space to set up.

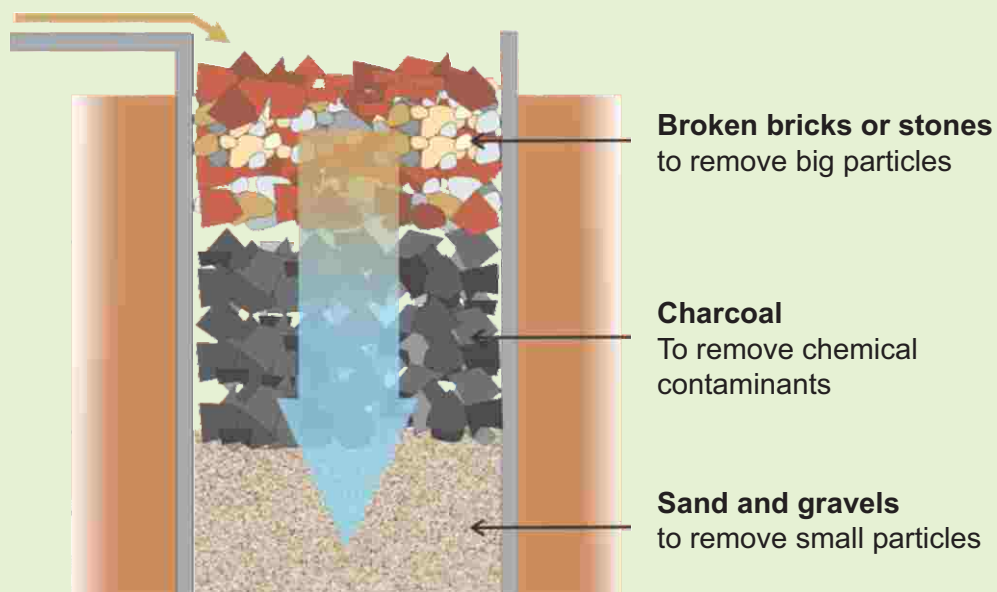
It is an effective solution where houses are discharging waste water directly into a drainage canal without any treatment.



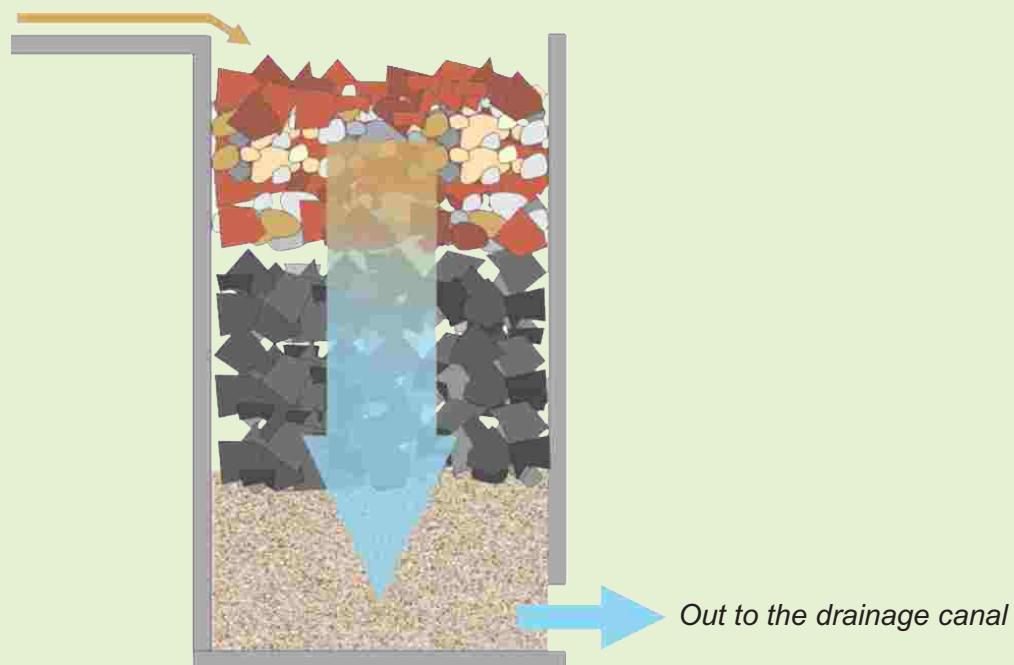
It requires a metal drum, some stones, charcoal and sand to construct. See the drawings below.



Make sure that you keep a certain portion above the ground level to prevent surface water from flowing inside. If the surface water goes into the soak pit, it will overflow very quickly.



If there is a drainage canal, the filtered water can be discharged into the drainage canal, instead of infiltrating it into the soil. Please see the drawing below.



In order for the participants to be able to see how to prepare a soak pit, only the materials should be prepared in advance. During the demonstration of an FFS day, set up a soak pit together with the participants.

2) Filtration with biological plants

This is a viable solution when there is enough space to set up a decantation pond or a canal whereby you can put plants that absorb a lot of water and has a capacity to filter contaminated water.



As for water hyacinth, make sure that you put them in a contained place whereby they cannot multiply beyond the limit. Water hyacinth is an invasive species and multiplies very quickly. Never put it into a stream or into other aquatic ecosystems.

3) Discharge into a fallow land

This solution requires least work and investment, but there needs to be a fallow land towards which the waste water can be discharged. The waste water needs to be infiltrated into the soil, and cannot be stagnated on the surface. Plants (e.g. bananas) can help the water to be absorbed more quickly. This solution is only possible when there is such fallow area.





Teaching tools

- Materials for setting up a soak pit:
 - Metal drum
 - Stones (or broken bricks)
 - Charcoal
 - Sand (or gravels)
- Flipchart and markers
- Notebooks and pens (*Participants should bring the ones that have been distributed to them in the first session.*)

Teaching process

Step 1:

Ask the participants what are the negatives consequences of poor waste water management. The following should be identified.

- Contamination of streams and rivers
- Negative impacts on the plants and animals living in the water
- Increase in mosquitos
- Bad smell in the area
- Increase in stomach problems caused by water-borne bacteria

Step 2:

Take the participants to the three locations to show the options of waste water management. At each location, explain the details. At the location for the soak pit, construct the soak pit with together with the participants so that they can see how it is built.

Step 3:

Come back to the class, and ask the participants which option is most suitable for their own condition. Once each participant takes his/her decision, ask them to write it down into their notebook. This becomes their “Waste water management program”, which is one of the requirements of the SAN standard. In the program, they should also write down by when this solution will be implemented at their farm.

Pest and disease management

Lesson 1: Management of Tea Green Leafhopper/ Tea Mosquito Bug (*Empoasca flavescens* Fabr./ *Helopeltis theivora* Warter)

Objectives:

By the end of the lesson, learners will be able to:

- Recognize tea green leafhopper and tea mosquito bug
- List damage symptoms of tea green leafhopper and tea mosquito bug
- Identify effective control methods that are safe, environmental friendly and ensure the tea quality.

Duration

60 minutes

Teaching materials/tools:

- Situation exercises
- Lesson plan
- Several specimen of tea green leafhopper/ tea mosquito bug (*if no specimen are present than 4 pictures could be used*)
- Samples of fresh tea buds damaged by tea green leafhopper/ tea mosquito bug
- Situation exercises
- Sheets of A0 paper (one for each small group)

Teaching processes

Step 1: Introduction

- Trainer comes into the class and shows specimen of tea green leafhopper and tea mosquito bug and damaged leaves for the entire class.
 - *Do you know what kinds of insect pests they are?*
- Trainer collects all answers/opinions and gives an introduction about the two pests for the whole class.
- He/she directs the class to the lesson subject: in order to have a better understanding of the damage and control measures against tea green leafhoppers and tea mosquito bugs, we are going to discuss techniques to control and prevent your tea plantation from tea green leafhoppers and tea mosquito bugs.

Step 2: Situation Analysis

- The class will be divided into groups of 5-6 participants. Each group will get a copy of the Situation Analysis for group discussion on the questions raised. The discussion outputs will be filled in the given blank tables on A0 paper. Duration of the discussion is 20 minutes.
- Trainer will observe groups' discussion and support the groups which fail to reach a common agreement.



Step 3: Presentation by groups / plenary discussion

Each groups will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.

Step 4: Conclusion & Lesson learnt

- All comments/ideas from groups are collected; agree & underline main ideas.
- Trainer then summarizes main damage symptoms, identification & management of tea green leafhoppers and tea mosquito bugs: symptoms, tea plantation damaged, the appearance time on the plantations, preventive methods and control measures.
- Trainer checks the understanding of learners with questions:
 - What plantation is usually damaged by tea green leafhopper?
 - What does the symptom caused by tea mosquito bug look like?
 - What measures can we take to avoid tea mosquito bug and green leafhopper to develop?
 - What can we do to control these pests when their numbers are too high?

Notes for Trainer

Situation exercise

In a regular meeting held by Lien Huong village tea growers, the issue of prevention and control of tea green leafhopper and tea mosquito bug were brought up. Members discussed energetically about damage symptoms of these pests and how to manage them with different measures. Please help them to fill this table with correct information and explain why when you present the results:

Aspect	Tea mosquito bug	Tea green leafhopper
Damage		
Favorite parts for damage		
Symptoms		
Conditions		
Most severe damage time		
Control options		

Information on the following table can be used as reference for the trainer to back up the compilation of information provided by groups:

Aspect	Tea mosquito bug	Tea green leafhopper
Damage	<ul style="list-style-type: none"> • Lower yield • Impact on the growth of tea plants • Reduce tea quality 	<ul style="list-style-type: none"> • Lower yield • Impact on the growth of tea plants • Reduce tea quality
Favorite parts for damage	<ul style="list-style-type: none"> • Buds and young leaves 	<ul style="list-style-type: none"> • Tea buds, especially on the flush (tender new shoots)
Symptoms	<ul style="list-style-type: none"> • Initially small trace and it turns black to make them folded and dry at leaf rim. 	<ul style="list-style-type: none"> • Brown puncture and they turn black. Bent buds
Conditions	<ul style="list-style-type: none"> • Rain and sun combined, high humidity and high temperature • Bushy plantation, much weed and bushes around plantation 	<ul style="list-style-type: none"> • Sunny, much rain, high humidity • Plantation covered by shadow trees
Most severe damage time	<ul style="list-style-type: none"> • July-Sept 	<ul style="list-style-type: none"> • March-May and August-Sept
Control options	<ul style="list-style-type: none"> • Utilize IPM • Bush clearance and weeding • Plant shadow trees • Chemical that is not prohibited by the SAN: etofenprox (Trebon 10 SC); 	<ul style="list-style-type: none"> • Bush clearance and weeding • Plucking at the right time (Facilitator should explain that the hopper lays eggs in young buds and therefore plucking at the right time is good control measure.) • Balance between organic and inorganic fertilizers • Chemical that is not prohibited by the SAN: abamectin (Aremec 18EC);



Lesson 2: Management of Red Spider Mites and Thrips (*Metatetranychus bioculatus* Wood Mason/ *Physothrips setiventris* Bagn.)

Objectives:

By the end of the lesson, learners will be able to:

- Identify damage symptoms of red spider mites and thrips
- Identify effective control methods that are safe, environmental friendly and ensure the tea quality.

Duration

60 minutes

Teaching materials/tools:

- Lesson plan
- Several specimen of red spider mites and thrips
(if no specimen are present than pictures could be used)
- Samples of tea leaves, tea buds damaged by these pests
- Sheets of A0 paper (one for each small group)

Teaching processes

Step 1: Introduction

- Trainer comes into the class, shows specimens and samples of tea leaves damaged by red spider mite and thrips, and questions the class:
 - Do you know what kinds of pests they are?
 - Why do you know that?
- Trainer collects all answers/opinions.
- He/she directs the class to the lesson subject: in order to have a better understanding of the damage and preventive measures against red spider mite & thrips, we are going to discuss techniques to control and prevent your tea plantation from these pests.

Step 2: Group discussion

- The class will be divided into 4 groups: the groups 1 & 3 discuss Thrips while the groups 2 & 4 talk about Red Spider Mites.
- The samples of damaged tea leaves will be given to the groups.
- The discussion outputs will be recorded on A0 paper.
- Duration of the discussion is 15 minutes.

Discussion questions for Groups 1 & 3

- 1 How does the symptoms caused by thrips look like? What parts of a tea plant are often attacked by this pest?
- 2 When is the outbreak of thrips? What tea plantation is usually damaged severely by thrips?
- 3 How can we prevent thrips and what are effective control measures?

Discussion questions for Groups 2 & 4

- 1 What does the symptoms caused by red spider mite look like? What parts of a tea plant are often attacked by this pest? What do damaged tea leaves look like?
- 2 When is the outbreak of red spider mites? What tea plantation is usually damaged by red spider mite?
- 3 How can we prevent red spider mite and what are the effective preventive measures?

Trainer will observe groups' discussion and provide support to the groups which fail to reach a common agreement.

Step 3: Presentation by groups / plenary discussion

Each groups will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.

Step 4: Conclusion & Lessons Learnt

- All comments/ideas from groups are collected; agree and underline main ideas.
- Trainer then summarizes main damage symptoms, identification and management of red spider mite and thrips: symptoms, tea plantation damaged, appearance time on the tea plantations, and preventive and control measures.
- Trainer checks the understanding of learners with questions:
 - When is the Thrips active strongly, causing severe damage?
 - What will happen to a tea plantation attacked and damaged by red spider mite?
 - What measures can we take to avoid thrips and red spider mite to develop?
 - What can we do to control these pests when their numbers are too high?

Notes for trainers**Thrips (Physothrips setiventris Bagnall)****Identification based on damage symptoms**

Thrips also feed on the youngest open leaves. The sucking marks often are made one after one, forming thin pale lines on the underside of the leaf. These lines are parallel to the main vein.

Leaves that have a lot of this type of damage become dotted with tiny pale (light white) patches. In severe attack, the tiny pale patches turn into light or dark green and the leaves are deformed, shriveled but not curled up. The undersides of leaves have many black dots which are the excrement of the thrips.





Conditions for thrips causing damages

The outbreak of thrips is from April to July in a year. Epidemic could easily happen in dry & hot weather.

Prevention and Control

- **Prevention:** the following farming techniques should be applied to prevent thrips to develop:
 - Keeping tea plantation clean/ hygienic
 - Planting shade trees properly; better tending/ cultivating to kill nymphs
 - Frequent plucking to remove thrips & their eggs
- **Control:** if thrips numbers are too high pesticides could be applied:
 - Need to spray pesticides when the density of thrips is 1-2 thrips/bud
 - Use pesticides containing abamectin, e.g., Nimbus 6.0 EC, Newsodant 5.5 EC, Nafat 3.6 EC. (Follow the usage instructions written on the package).

Red Spider Mite (*Metatetranychus bioculatus* Wood Mason)

Identification based on damage symptoms:

Red spider mite attacks the old leaves and part of mature leaves. Attacked leaves have red. When tea fields are very seriously affected, leave fall off and new and tea plants are slow in shooting new buds.

Green leaves change the color into bronze.

In order to identify red spider mite, press the mite against a white paper. If there are red dots on the paper, which are of red mite's feet (this method also helps to know the density of mite on leave).



Conditions for red spider mite causing damages

- Red spider mites are most abundant from April-June and September-October
- Old & stunted tea plantations are easily attacked when the weather is hot, dry and the tea plantations have no shade trees.

Prevention and Control

- **Prevention:** keeping tea field clean, hygienic; planting shade trees and mulching to increase humidity
- **Control:**
 - Apply chemicals when the density of mite is over 4 mites/ m²
 - Use such pesticides containing *abamectin* (e.g., Voiduc 42 EC) (Follow the usage instructions written on the package).

Lesson 3: Management of Blister Blight (*Exobasidium vexans* Masse)

Objectives:

By the end of the lesson, learners will be able to:

- Identify damage symptoms of blister blight
- Identify effective preventive methods
- Identify effective control methods that are safe, environmental friendly and ensure the tea quality.

Duration

45 minutes

Teaching materials/tools:

- Lesson plan
- Samples of tea leaves with blister blight.
- Sheets of A0 paper (one for each group)

Teaching processes

Step 1: Introduction

- Trainer comes into the class, shows samples of tea leaves with blister blight, and questions the class:
 - Do you know what kind of disease it is?
 - Based on what characteristics do you identify the disease?
- Trainer collects all answers/opinions
- He/she directs the class to the lesson subject: in order to have a better understanding of the damage and prevention of blister blight, we are going to discuss techniques to control and prevent your tea plantation from this disease.

Step 2: Group discussion

- The class will be divided into groups of 5-6 participants for discussing on blister blight
- The samples of infected tea leaves will be given to the groups
- The discussion outputs will be recorded on A0 paper.
- Duration of the discussion is 15 minutes.

Discussion questions on Blister Blight

- 1 What features does blister blight have?
- 2 When is the outbreak of blister blight? What are the weather conditions for the outbreak of blister blight?
- 3 What conditions of tea plantations enable the development of blister blight?
- 4 What should be done to prevent tea fields from blister blight?

Trainer will observe groups' discussion and provide support to groups which fail to reach a common agreement.





Step 3: Presentations and Plenary discussion

Each group will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.

Step 4: Conclusion & Lessons Learnt

- All comments/ideas from groups are collected; agree and underline main ideas.
- Trainer then summarizes key features of blister blight: symptoms, tea plantation damaged, outbreak time, prevention and control measures.
- Trainer checks the understanding of learners with questions:
 - When is the outbreak of blister blight?
 - How can we prevent development of blister blight?

Notes for trainer

➤ Blister blight:

Identification

- On the upper surface of the leaf, the round-shaped blister is sunken with clear border
- On the lower surface of the leaf, the blister is white color and swells. Leaves are shrunk and bent



Conditions for growth/development:

- The disease becomes more serious during Mar-May & Sep-Oct.
- Blister blight grows best in moderate temperature and high humidity.
- Blister blight is usually a bigger problem under heavy shade or in densely planted areas.
- The disease can be more severe in plantations where a lot of nitrogen is applied.

Prevention and Control:

- **Prevention:** use the correct plant density (spacing), if infected tea plants are under shade trees reduce the amount of shade by pruning the branches of the shade tree, weeding, keeping tea field clean, reduce shade in diseased areas, avoid applying too much nitrogen fertilizer, remove severely damage parts of the tea bush, if possible use select tea varieties with the highest resistance.
- **Control:**
 - Plant protection chemicals containing 50% copper (copper oxide, copper oxychloride, copper hydroxide) are normally recommended. (Follow the usage instructions written on the package). *But note that copper is very bad for natural enemies of spider mites and outbreaks of this pest could occur after applying this chemical against blister blight!*

Lesson 4: Management of Brown Blight & Grey Blight (*Colletotrichum camelliae* Masse/*Pestalotzia theae* Sawada.)

Objectives:

By the end of the lesson, learners will be able to:

- Identify damage symptoms of brown blight & grey blight
- Identify effective preventive methods
- Identify effective control methods that are safe, environmental friendly and ensure the quality of tea.

Duration

45 minutes

Teaching materials/tools:

- Lesson plan
- Samples of tea with brown blight and grey blight
- Images of brown blight and grey blight
- Sheets of A0 paper (one for each group)

Teaching processes

Step 1: Introduction

- Trainer comes into the class, shows samples of tea leaves with brown blight and grey blight, and questions the class:
 - Do you know what kinds of diseases are they?
 - Based on what characteristics do you identify the diseases?
- Trainer collects all answers/opinions
- He/she directs the class to the lesson subject: in order to have a better understanding of the damage and prevention of brown & grey blight, we are going to discuss how to control and prevent your tea plantation from these diseases.

Step 2: Group discussion

- The class will be divided into 4 groups: two groups discuss brown blight and two groups grey blight
- The samples of infected tea leaves will be given to the groups
- The discussion outputs will be recorded on A0 paper.
- Duration of the discussion is 15 minutes.

Discussion questions on Brown/Grey Blight

- 1 What features brown blight and grey blight have?
- 2 When is the outbreak of grey/brown blight? What are favorable weather conditions for their outbreak?
- 3 What conditions of tea plantations enable the development of grey/brown blight?
- 4 What should be done to prevent tea fields from grey/brown blight?

Trainer will observe groups' discussion and provide support to the groups which fail to reach a common agreement.





Step 3: Presentations and Plenary discussion

Each group will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.

Step 4: Conclusion & Lessons Learnt

- All comments/ideas from groups are collected; agree and underline main ideas.
- Trainer then summarizes key features of grey/brown blight: symptoms, tea plantation damaged, outbreak time, prevention measures and control methods.
- Trainer checks the understanding of learners with questions:
 - When is the outbreak of grey/brown blight?
 - How can we prevent brown blight and grey blight from developing?

Notes for trainer

➤ Brown blight:

Identification

- Brown blight attacks old leaves, branches, twig and fruits
- The brown symptoms first appear at the edge of leaves
- The symptom is target-like rings. The center is dry & ash-grey color

➤ Grey blight:

Identification

- Grey blight attacks old & mature leaves
- Dark brown trace appears at the edge of leaves
- First, small spots appear back in color and extend inward from the borders of the leaf, causing the leaf fall off

Conditions that make these diseases worse:

- **Outbreak time:** July-August after 10-15 constant rainy days
- High temperature & high humidity make the diseases worse
- These are weak parasites that usually do not reduce yield unless they can enter the plant through a wound (for example, wounds from insect damage, pruning, or sun scorch).

Prevention and Control:

- **Prevention:** avoid serious damage to the bushes, e.g. when using plucking or pruning machines, help plants recover quickly from damage by good tending, apply potassium fertilizer, clean up dry leaves in early Spring or Winter and bury them to reduce pathogens; applying balanced fertilizers weeding;
- **Control:** chemical fungicides such as *propineb* (Antracol 70WP), or copper products could help. Biological fungicides, containing the fungus *Trichoderma* (such as Promot Plus DD), could also be effective. (Follow the usage instructions on the label.)

Prohibited pesticides and WHO Class I and II chemicals

Objectives

By the end of the session, the participants are able to:

- Identify the names of the prohibited pesticides and WHO Class I and II chemicals that they were using
- Understand which chemicals they need to stop using and which chemicals they need to deduce the use

Duration

2 hours

Location for this session

There are two methods of conducting this session. One method is to go to a pesticide shop nearby to identify the names and the active ingredients of the chemicals that are commonly used. The other method is that the participants and the facilitator bring the empty containers and sachets of the chemicals to the class, and identify the names and the active ingredients that are on these empty containers and sachets.

When the first is used, then the location of the session needs to be somewhere close to a pesticide shop where the participants and the facilitator can easily go on foot or by motorcycles. The pesticide shop needs to be contacted in advance and they need to agree to collaborate with the exercise.

Teaching tools

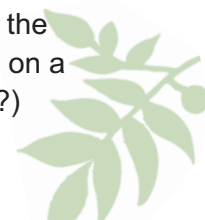
- Flipcharts with list of following pesticides:
 - SAN Prohibited Pesticide List (Version November 2011)
 - WHO Class I and II chemicals (Annex 3 of the Sustainable Agriculture Standard, July 2010)
 - Vietnam list of banned and restricted pesticides (latest version)
- *Markers (different colors), notebooks and pens (Participants should bring the notebooks and pens that have been distributed to them in the first session.)*
- *(If the second method is used) Empty containers and sachets of chemicals (Each participant should put them in a plastic bag, tie it very well to prevent any contamination and bring them to the class.)*
- *(If the second method is used) Plastic gloves for the participants to handle the empty containers during the session*

Teaching processes

Step 1:

(1st method)

Together with the participants, go to a pesticide shop. Take a pesticide and explain to the participants the difference between a “brand name” and an “active ingredient” of a chemical and how to identify these on a bottle/sachet. Discuss what to do if no active ingredient is indicated (ask shopkeeper?, not buy these?)





(2nd method)

Distribute the plastic gloves to all the participants. Ask them to wear the gloves. The facilitator should also wear gloves. Ask the participants to take out the empty containers and sachets they brought. Take a container and explain to the participants the difference between a “brand name” and an “active ingredient” of a chemical and how to identify these on a bottle/sachet.

Step 2:

Ask the participants to write down into their notebook the brand names and the active ingredients of the chemicals they see.

(In the case of the 1st method,) once the participants finish writing down, leave the shop and go back to the class.

Step 3:

Ask the participants to speak out the active ingredients they wrote down. As the participants speak out, write down the active ingredients on the flipchart.

Step 4:

Check whether any of the active ingredients on the flipchart is on the following lists:

- **SAN Prohibited Pesticide List** (Version November 2011)
WHO Class I and II chemicals (Annex 3 of the Sustainable Agriculture Standard, Version July 2010)
- **Vietnam list of banned and restricted pesticides** (latest version)

If you find any that is on the SAN Prohibited Pesticide List, mark those with red. If you find any that is on the Vietnamese list, mark them with red as well and when on the WHO Class I and II chemical list, mark those with a different color.

Step 5:

Explain the following to the participants. Facilitator need to provide info on why the pesticides are banned and should not be used. The guidelines should provide some example of reasons (it harms the environment, it harms the health of people drinking the tea, etc.)

- **SAN Prohibited Pesticides** (They are extremely toxic, and their use needs to be stopped right away.)
- **WHO Class I and II chemicals** (They are highly toxic, so their use need to be reduced gradually.)
- **Vietnamese list of banned and restricted chemicals** (These chemicals are highly toxic and are not allowed to be used in Vietnam, so their use need to be stopped right away. Restricted chemicals can

Step 6:

Ask the participants to write into their notebook the names of all the prohibited pesticides that were found during the exercise today. Tell them that they need to stop using these pesticides from now onwards. Let them know that this is a critical criterion of the SAN standard, which means that the farms that are using prohibited chemicals cannot be certified.

Ask the participants to write into their notebook the names of all the WHO Class I and II chemicals that were found during the exercise. Tell them that they need to start reducing the use of these chemicals and will eventually have to stop their use.

Safe handling of chemicals

Objectives

By the end of the session, the participants are able to:

- Understand the importance of protecting themselves during chemical application
- Have a clear plan of obtaining PPE (by when and how)
- Understand the importance of storing chemicals safely
- Have a clear plan of making a chemical storage (by when and how)

Duration

2 hours

(Steps 1 – 6 and steps 7 – 9 could be done as separate activities as well)

Teaching tools

- Masking tape
- Full set of PPE
- Portable chemical storage made with a plastic tank
- Flipchart and markers
- Notebooks and pens (Participants should bring the ones that have been distributed to them in the first session.)



Teaching processes

Step 1:

Ask one volunteer to come to the front. (Explain that this should be a man because under the SAN standard women are not allowed to spray pesticides.) Stick the papers with different percentages on different parts of his body in the following order:

- 8% Put on his arm
- 10% Put on his hand
- 15% Put on his foot
- 40% Put on his forehead
- 100% Hold the paper and put it over his reproductive organs (by himself)





Step 2:

Ask the participants what these percentages mean. Let the participants make all sorts of interesting guesses about these percentages.

Then explain to them that these percentages mean the level of absorption of chemicals by different parts of our body. For example, when chemicals reach to forehead either through skin or blood, 40% of the chemical is absorbed and will stay in the system. When chemicals reach to male organ through skin or blood, 100% of the chemical is absorbed and will stay in the system, since the part is very sensitive. These absorption rates are based on the research conducted by Ministry of Environment of Mexico.

When the chemicals are absorbed by a male reproductive organ, it will eventually lead to impotence, loss of fertility, decreased production of sperms and deformity of children. Emphasize the word “impotence” very well, as it shocks the participants and make them realize the serious consequence of chemical contamination.

Step 3:

Ask the participants how this volunteer can protect each part of his body from chemicals. When a participant says, “He should wear a hat or a cap,” the facilitator can remove the papers from the forehead and the ear. When a participant mentions “gloves”, remove the paper from the arm. When a participant mentions “boots”, remove the paper from the foot. When a participant mentions “overall”, “shirt with long sleeves and long trousers” or “apron”, remove the paper with 100% written on it.

Step 4:

If the facilitator has other research data or shocking stories about the impacts of chemicals on human body, also share those data and stories with the participants.

Step 5:

Bring out the full set of PPE you brought and show them to the participants. The full set should include the following.

- Hat/cap
- Chemical filter mask (Dust mask is not acceptable. As you show this item to the participants, explain to them the difference between a chemical filter mask and a dust filter mask and that a dust filter mask cannot protect them from chemicals.)
- Goggles
- Overall/ apron /raincoat
- Gloves (Cotton gloves are not acceptable.)
- Boots

Tell the participants that if they already have any of them, they can use what they have. Ask the participants to write down in their notebook any item that they do not have. Most participants are likely to write “chemical filter mask”. Some may also write “goggles”, “overall”, “gloves” or “boots”.

Step 6:

For each item that they wrote in their notebook, they need to develop a plan to get them. The plan needs to include the following:

- **Cost**

The participants need to know how much it costs, so that they can prepare the money. The facilitator should be able to provide the information on the cost of each item.

- **Timeline**

The participants need to decide by when they should get each item.

- **Where/how**

The participants should know where to get them. If it is impossible for the participants to find a shop where they can find the item, the factory should support.

- **Responsible person**

Depending on where/how to get the item, a responsible person needs to be defined (either the farmer or the factory).

See an example of a plan below.

Item	Cost	Timeline	Where/how	Responsible person
Chemical filter mask	Rubber boots	By the end of July 2014	Factory will obtain the mask from Hanoi and will distribute to the farmers on credit.	(Name of the manager of the factory)
Rubber boots	160,000 VND	By the end of July 2014	he farmer buys it from a shop in the town	(Name of the farmer)

Let the participants know that protection during spraying is a critical criterion in the SAN standard. This means that if a farmer is spraying without protection, the farm cannot be certified.

Step 7:

Ask the participants where they normally store the chemicals when they buy them or when there are some leftovers. After hearing their answers, ask them what are the possible negative consequences of storing chemicals carelessly. The following are possible answers:

- A child may think it is a soft drink and may drink it by mistake.
- A thief may steal it.
- Somebody may take it and use it to suicide.
- A spillage or toxic gas that comes out from an opened bottle may contaminate the health of the people living in the house.

Step 8:

Ask the participants how chemicals can be stored in a safe manner. After hearing their answers, confirm the following points:

- A chemical store needs to be locked with a key, and the key needs to be kept by the farmer.
- A chemical store should have a warning sign.
- It should not be in the house.
- Its shelves should be made of non-absorbent materials so that they do not absorb the spillage.
- It should have ventilation.
- It should protect the chemicals from rain and strong heat.
- The chemicals should be in original bottles should not be replaced into a different bottle.





A chemical storage can be made from materials that are locally available. For example, old chicken cage, fridge, cabinet, suitcase, metal drum can all be converted into a chemical storage. See some examples below.



Chicken cage-style chemical storage (The shelves are covered with plastic sheets.)



Storage made with a metal drum



The one on the right is the smallest and cheapest model of a chemical storage, which is adequate for a smallholder who stores just a few bottles. It is made with an empty plastic tank, and has a little door with a lock as well.



Facilitator should prepare this portable storage in advance so that he/she can take it to the FFS session and show the real example to the participants. The participants are most convinced and understand how it is made, once they can see a real example.

Step 9:

Ask the participants which type of chemical storage they feel more comfortable for themselves, out of the different examples explained or shown. Each participant should choose their own option, and write it down in their notebook. Ask them to write a plan similar to that of PPE.

Item	Cost	Timeline	Where/how	Responsible person
Storage made with an empty plastic tank	100,000 VND	By the end of August 2014	The farmer buys the materials and builds it by himself.	(Name of the farmer)

Plant nutrition

Lesson 1 - Roles of N, P and K

Objectives

By the end of the lesson, learners will be able to:

- Understand about the role of the three elements, N,- P and -K

Duration

60 minutes

Teaching tools

- 05 sheets of A0 paper
- 05 felt tip pens
- Lecture designs
- Situation exercises
- Adhesive tape



Teaching processes

Step 1: Warm up activities

- Trainer introduces the crossword game: one person will be standing up at the board and turn back to the class. The trainer will write down words on the board. The other will make hints for this person to guess without using any gesture:
 - Invite one trainee to the board and turn face to class.
 - Stick the word Nitrogen and tell the class to make hints/suggestions. Next is P and K.
 - Applause and release him/her back to seat
- Immediately start the lesson: This is the main topic of our discussion today.

Step 2: Group discussion

- Trainer explains the activity and use of the situation exercise. The class is divided into 4 groups of 5 – 6 participants to discuss the situation exercise. Each group received a copy of the situation analysis. Comments will be recorded on A0 paper in around 20 minutes.
- Trainer will observe group discussion and facilitate the process to harmonize any disagreement that may occur amongst the group members.





Step 3: Presentations and Plenary discussion

- Some groups will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.
- Collection of all comments
 - Trainer and trainees analyze comments and underline those that are correct in terms of the role of N, P and K.
 - Trainer adds more information on these elements if needed.

Step 4: Consolidation

- Trainer checks the understanding of learners with questions:
 - What is the role of N? P? And K?
 - What will happen to the tea bush when there is a lack of any of these elements?

Notes for trainer

Situation analysis exercise

In a recent group discussion in Phu Cuong Tea growers about the role of N-P-K in the production of tea, members failed to reach a mutual agreement. The table below presents two different points of view:

Content	Point of view	Point of view 2
Role of N	<ul style="list-style-type: none"> • Stimulate the development of buds and shoots 	<ul style="list-style-type: none"> • Increase tea productivity • Stimulate the development of buds and shoots
Role of (P)	<ul style="list-style-type: none"> • Stimulate root development • Enhance capacity to withstand cold weather • Increase nutrition absorption 	<ul style="list-style-type: none"> • Increase productivity and final tea products • Enhance capacity to withstand cold weather
Role of (K)	<ul style="list-style-type: none"> • Increase tea productivity • Increase the tannin content 	<ul style="list-style-type: none"> • Strengthen resistance to diseases • Acerbity increased • Drought resistance ability

Plant nutrition

Lesson 2 - Fertilization techniques for tea

Objectives

Up on the completion of the lesson, learners will be able to:

- Know about the processes of fertilization for tea plantation
- Calculate the amount of fertilizer for 1 sao (360 m²) of tea area based on estimated yield.
- Follow technically appropriate procedures when applying fertilizer

Duration

60 minutes

Teaching tools

- Lecture design
- 02 kg of mixed NPK fertilizer
- Fertilization calculation table

Teaching processes

Step 1: Introduction

- Greeting and question:
 - How many kgs of fertilizer do you apply for each sao of tea plantation? What kinds of fertilizer?
 - Do you know how much N, P, and K you apply?
- Trainer collects ideas and comments, and introduces the main content of the lesson of today.



Step 2: Calculation of fertilizer amount

- Trainer divides the participants in groups of 5-6 participants and hangs up the fertilization table based on tea productivity. Each group will make the calculation for one level of productivity based on actual yield of one of the group members.
(Use the rates for NPK mixed fertilizer, with 1 kg fertilizer mix for 21 kg fresh buds/sao/year.)
 - Calculate the amounts of urea, super phosphate and potassium chlorine needed for the yield level selected.
 - Calculate the amount of fertilizer needed for 1 m² for each application during a year.
- Trainer supports and facilitates groups in calculation.
- Groups will then announce the result of calculation and come to a common agreement for each level of yield.





Step 3: Fertilization

- Trainer will let farmers go to the plantation. Select a plantation at convenient geographical location for fertilization and observation. Learners will be requested to stand on both sides to observe.
- Ask participants how they apply fertilizer. Pay attention to the following points: the location of ditches, depth, spreading methods, time for execution, etc.
- Trainer summarizes comments and reviews each step: the depth of ditches, location of ditches, the amount of fertilizer for each meter length, soil back fill, etc.
- Two trainees will be selected to practice under the supervision and support from trainer.
- Trainer summarizes and gives further emphasis/notes when fertilizing the plantation;

Notes for trainer

Yield based fertilizing

NOMAFSI recommends for an estimated yield of 320 kg of fresh tea buds/sao/year to use 15 kg of mixed NPK. This rate is being applied by Phu Ben factory as well.

This means roughly 1 kg fertilizer for each $320/15 = 21$ kg fresh buds/sao/year.

Note: For Van Dien fertilizer (NPK 16:8:4) the recommended amount is 30 kg of fertiliser for 320 kg

Calculation of mixing proportions

When mixing single fertilizers, we should know that:

- Urea fertilizer contains 46-48% of pure nitrogen
- Super phosphate contains 21% of pure phosphorus
- Potassium chlorine contains 60 % of pure potassium

The single fertilizers should be mixed according to a ratio of 4 : 1 : 2.

Name	% purity	Ratio	Results
N	46	4	$= 4 * 100 / 46 = 8.70$
P	19	1	$= 1 * 100 / 19 = 5.26$
K	60	2	$= 2 * 100 / 60 = 3.30$
			17.26

Based on this table, we can calculate, the amounts needed for the different single fertilizers:

Urea (for N) = Total mixed quantity needed * $8.70/17.76$

Super phosphate (for P) = Total mixed quantity needed * $5.26/17.76$

Potassium chorine (for K) = Total mixed quantity needed * $3.30/17.26$

Calculation of fertilizer amount per m² and per m

For example: For tea plantation that has average yield of 320 kg/sao/year, an amount 15 kg NPK is needed for 1 sao.

- For 1 m²: $15\text{kg} / 360\text{ m}^2 = 0,042\text{ kg/m}^2$ or 4,2 gram per m²
- Fertilizer amount calculated for each tea ditches: count the number of ditches in the plantation

For example, one Sao has 40 tea ditches, however, fertilization is conducted between the ditches so we do not need to fertilize for the two rim ditches. It means that only 38 ditches need to be fertilized.

15 kg: 38 ditches = 0,4 kg/ditch

Fertilization methods

1. For NPK

- Twice a year in March- April and July-August
- Dig ditches between the two lines of tea plants to the depth of 6-8 cm
- Scatter fertilizer evenly and fill with soil
- Fertilization time: after rainy days and in the late afternoon. In case of dry soil, it is necessary to spray water

2. Organic fertilizer

- One time for every three years





Recordkeeping

Objectives

By the end of the session, the participants are able to:

- Understand the importance of recordkeeping
- Keep records of their farm activities, hiring of workers and sales of tea

Duration

3.5 hours

Teaching tools

There are two methods of conducting this session. Depending on the teaching method, teaching tools are different.

Method 1)

The Facilitator brings the pre-prepared forms and teaches the participants how to fill in these forms.

Advantages and disadvantages of this option

When there are pre-prepared columns, you can ensure that all the necessary items are recorded. However, the participants become dependent on these forms that are printed and provided by the group/factory. When the given forms are filled up, the participants may not continue the recordkeeping and wait until new forms are provided. The group/factory need to constantly provide new forms so that the participants continue their recordkeeping.

Method 2)

The Participants use their own notebook, and the facilitator teaches the participants how to draw columns in their notebook and keep records.

Advantages and disadvantages of this option

Since the participants use their own notebook, they can always continue to keep their recordkeeping independently. They are not dependent on the group/factory to print and to distribute the forms. However, the facilitator needs to ensure that the participants make all the necessary columns in their notebook; otherwise there could be missing items in their records.

- Recordkeeping forms (in the case of method 1) on the following:
 - ▶ Agrochemical application
(Make sure that the following items are covered in the form.)

Date	Product name	Active ingredients	Plot applied	Size of the plot	Dosage of the product	Total volume of the product	Name of the operator	Authorization (Name of the responsible person)	Application equipment

Note 1: In the case of a smallholder, the name of the operator, the name of the responsible person and the application equipment could always be the same. In that case, it is not necessary to repeat them many times. They can be simplified in the following way.

Name of the responsible person/ operator: _____

Application equipment: _____

Date	Product name	Active ingredients	Plot applied	Size of the plot	Dosage of the product	Total volume of the product

Note 2: It is easier for users to use the form, when the first row is filled in with examples. When you design the forms, make sure that you put an example in the first row of each form.





- Fertilizer application

Date	Product name	Plot applied	Size of the plot	Quantity applied

- Other activities (pruning, weeding, etc.)
- Hiring of workers
- Harvesting and sales
- Flipchart and markers
- Notebooks and pens (*Participants should bring the ones that have been distributed to them in the first session.*)

Teaching processes

Starting questions:

Ask the participants if they are keeping records already. If yes, what information do they keep? Why do they keep that information? If no, why are they not keeping any information? Ask the participants if they know why record keeping is important for certification. (If necessary, the trainer should give additional reasons.)

(For the 1st method)

Step 1:

Distribute the forms to the participants one by one. Using the example in the first row, explain to the participants how each form should be filled.

Step 2:

Ask them to fill in a most recent activity into a form. Go around to check whether the form is filled in correctly. Do the same with all the other forms.

(For the 2nd method)

Step 1:

Ask them to draw vertical lines in their notebook to create columns. Tell them to write the column titles on the top row.

Step 2:

Ask them to fill in a most recent activity into the form. Go around to check whether the form is filled in correctly. Do the same with all the other forms.

Pruning

Objectives

By the end of the session, the participants are able to:

- Understand about the benefits of pruning tea plants
- Analyze the difference between types of pruning
- Prune tea bushes by machine in a correct manner

Duration

90 minutes

Teaching tools

- Situation exercise
- Lecture designs
- 04 sheets of A0 paper
- Fully fuelled pruning machine
- Plantation

Teaching Processes

Theory (45 minutes)

Warm up

- Greetings and topics stated by trainer
- Trainer announces the topic and state expected out put

Group discussion

- The class will be divided into 4 groups and provided with exercises for discussion. Results from groups will be recorded on A0 paper. The duration is 15 minutes.
- Trainer will observe and supports groups that can not reach an agreement during their discussion.

Group presentations and Plenary discussion

- Some groups will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.

Conclusion and consolidation

- Trainer collects all opinions from groups and agrees on correct comments by underlying those to be considered correct.
- Trainer summarizes all the content of pruning techniques: benefits, requirements and types.





Practice (45 minutes)

- The class will go to the plantation and trainer will select two beds of tea plants that are convenient for pruning by machine. The class will be gathered at a large location near there
- Trainer calls for the observation and attention from farmers. He/she will explain about steps necessary for pruning down such as checking cutting blades, machine and operation
- Trainer requires all the class to stand two beds far away and he/she starts pruning on a length of 4m and turns off the machine
- He/she explains about holding techniques and operates. Do and explain at the same time without staring the machine
- Invite 1 learner to repeat steps without actually operating the machine. When seeing farmers more familiar with operation, let start the machine and let him operate on a length of 3 m under the assistance of trainer.
- Evaluate the performance and steps taken by learners and invite two or three learners to start operation.
- Close the practice session

Notes for trainer

Situation analysis exercise

In a recent meeting held by Phu Cuong tea growers with regards to the classification of tea, the two groups have two different points of view as below:

Aspects	Point of view 1	Point of view 2
Benefits of pruning	<ul style="list-style-type: none"> • To create smooth and balanced foliage; convenient for tea picking • Insects and diseases prevention • Lengthen plucking and harvesting period • Maintain productivity 	<ul style="list-style-type: none"> • To fit with picking sheet • Eradicate insects and diseases • Maintain yield
Pruning tools	<ul style="list-style-type: none"> • Sharp scissors and knife 	<ul style="list-style-type: none"> • Cutting knife, pruning scissors and pruning machine
Pruning time	<ul style="list-style-type: none"> • In December annually 	<ul style="list-style-type: none"> • From November to January
Selection of pruning forms	<ul style="list-style-type: none"> • As per the growth of plantation • As per height of tea plant beds • As per the age of tea plants 	<ul style="list-style-type: none"> • As per family conditions • As per the growth of plantation
Light pruning	<ul style="list-style-type: none"> • Means annual pruning; within the first two years, the new pruning is 5 cm higher than the old one, from the third year, the new pruning is 3cm higher than the old one • When pruning height is over 60 cm, new pruning is 1 cm higher than the old one. 	<ul style="list-style-type: none"> • Means annual pruning; within the first two years, the new pruning is 5 cm higher than the old one.

Deep-cutting		<ul style="list-style-type: none"> • Applied when the tree is far from picking reach with many disordered branches, small leaves, small buds and reduced yield. • Pruning location is 60-65 cm from the ground. In the plantation with good growth and yield but far from the picking reach, the pruning location is 70-75 cm from the ground.
Trimming	<ul style="list-style-type: none"> • Applied when tea plants bear lots of weak and reduced yield • Trimming: 1/3 area, 45 cm from the ground, declined along the hill and fix branches with diseases and old branches 	<ul style="list-style-type: none"> • Trees that have gone many years of deep pruning will be trimmed • Trimming 20 cm from the ground, declining along the hill and fix branches with diseases and old branches
Re-aging pruning	<ul style="list-style-type: none"> • Applied when the plantation is old, arid and the exploitation period is over 20 years • Pruning location is 12 cm from the ground. look after tea tree as newly grown 	<ul style="list-style-type: none"> • When the plantation is old, arid • Pruning location is 45 cm from the ground

Suppose that you are attending this meeting, which point of view do you support or do you have your own point of view? Why?





Plucking

Lesson 1 - Tea plucking techniques

Objectives

By the end of the lesson, learners will be able to:

- Distinguish standard buds from below standard buds.
- Analyze the benefit of timely plucking.
- Comply with right picking techniques by hand or by machine

Duration

120 minutes

Teaching tools

- Situation analysis exercise
- Lecture designs
- 4 sheets of A0 paper
- Tea picking machine, containing baskets
- Tea field



Teaching processes

Step 1: Introduction

- Trainer comes into the class, greets farmers and asks one of the participants to draw on the board a picture showing a bud. Ask the farmers to name the different parts on bud.
- Trainer guides farmers to the main content of the lecture: to have a better understanding of the benefit of technically appropriate plucking techniques, timely picking.
The trainer shows the farmers several different buds (make sure to have at least one standard and one below standard bud) and asks the following questions:
 - What is difference between the two buds?
 - What is a standard bud?
 - Do factories pay the same price for each type of bud?
 - Trainer summarizes and describes a standard bud.

Step 2: Group discussion

- The class will be divided in 4 groups and trainer delivers stories for each group for discussion.
- Results of such discussion will be recorded on A0 paper in around 20 minutes.
Trainer observes and support discussion groups who can not reach agreement within group.

Step 3: Group presentations and Plenary discussion

- Some groups will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.

Step 4: Conclusion and consolidation

- Trainer collects ideas and comments from groups and agrees on tea plucking techniques: methods to pluck depending on time and reasons for that.
- Trainer checks learners' understanding by raising the following questions:
- Why should we leave more leaves in summer crop than in spring crop?
- Why should we only pluck standard size buds?
- Should we pick by using knife? Why?

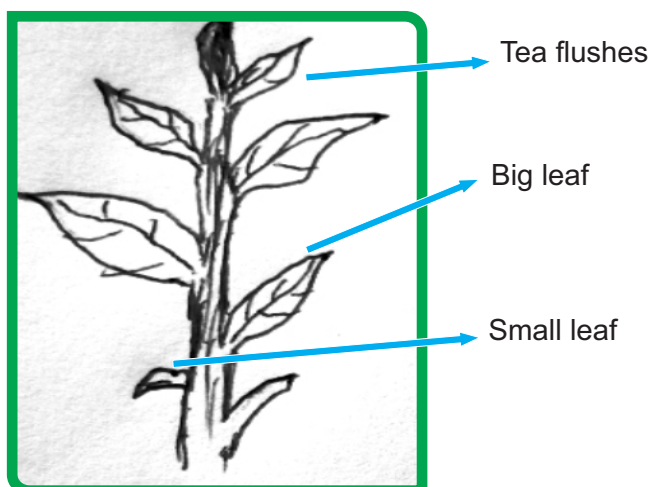
Practice

- 1 The class will be guided out to the plantation and two beds of tea plants that are convenient for picking by using machines will be selected. The class is required to gather at a big space location.
- 2 Trainer guides preparatory steps for picking by means of machine: checking machine, tighten screw at cutting blades, hanging bags and operating machine
- 3 The class stands 2 ditches from the practice location and trainer operates machines on a distance of 4m after that turns off the machine.
- 4 Trainer explains about how to manually control the machine, conditions required for the plantation for farmers to apply machine picking and other notes when operating machine, etc.
- 5 One learner will be invited to operate the picking machine under the assistance of other farmers.
- 6 Trainer evaluates the operation of that farmer, and next two or three other learners will be invited to conduct the trial operation.
- 7 Trainer closes this practice.

Notes for trainer

Tea bud drawing

In a recent meeting held by Phu Cuong tea growers with regards to the classification of tea, the two groups have two different points of view as below:



Normal shoot



Open foliage shoot





Story

Story about Madam Minh

When I passed Tea processing factory, I saw Mrs. Minh, Mr. Thuc and Ms. Van (who weigh tea) were arguing very noisily. After that, Mrs. Minh went out with anger with her red face. Seeing me at that time, she immediately said “You know, my tea always belongs to Type B but today...bud is long and a little bit broken. Why so difficult. What an annoyance!”

I questioned about reasons, she said “Last week, my family was busy harvesting several Saos of peanut and sweet potatoes. We can just only pluck tea today. You know I have my husband and grandson. We use a knife to pluck. And we have been using knives to pluck for a long time. But Ms. Van assessed my tea to be old, broken and lowered to Type D. The same hamlet person, how can she...”

Suddenly, Mr. Thuc just passed with joyful face. No need to ask, he said “I told you, you did not follow me. Plucking must be timely to be fresh and of good quality. It also ensures the yield for next time. Techniques must be followed; for example, it is now in summer harvest, so we need to pick buds with 2-3 young leaves, leave untouched big leaves and small leaves. I am not joking. In spring harvest, the similar is applied as in summer but leave untouched 2 big leaves”

Mrs. Minh then refused “How complicated! You are a trouble” and then she left. One month later, when I was visiting Mr. Thuc, Ms. Minh rushed in and cried “Poor me. My plantation has very few buds. Long and short buds. It is like lack of nutrition. If only...” Incompletely said, she left.

Questions:

- 1 What is the ending of the story? Why?
- 2 In order not to come with that ending, what should Mrs. Minh do?

Lesson 2 - Storage and transportation of green buds

Objectives

By the end of the lesson, learners will be able to:

- Identify the methods to correctly store and transport green buds
- Find out reasons causing the quality reduction of tea
- Apply methods to maintain and transport tea at family scale.

Duration

45 minutes

Teaching tools

- Story
- Lecture design
- 04 sheets of A0 paper

Teaching processes

Step 1: Warm up activity

- Greetings by trainer to farmers
- Trainer guides farmers to the lesson: In order to understand more about the benefit of storage and transportation of fresh buds after harvesting, we will exchange information about ...

Step 2: Group discussion

- The class will be grouped into 4. Each will be provided with a story and must follow the requirements given in each exercise. Results of discussion will be recorded in A0 paper and the duration is 20 minutes.
- Trainer observes group work and supports to deal with any disagreement occurring in the group.

Step 3: Story Analysis

- Some groups will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.





Step 4: Conclusion and consolidation

- Trainer collects all ideas and comments from groups and then comes to a common agreement on the storage and transportation of harvested tea
- Trainer checks/tests the understanding of farmers for the lecture:
 - What reason causes the quality reduction of tea?
 - What happens when we push too much tea in the bag used for transportation?
 - In rainy season, why is there a difference between the weight at home and at sale/collection port?
 - What is the correct way of transporting the tea?

Notes for trainer

Story about Mr. Hoa

Yesterday afternoon, when crossing the factory, I heard a loud row. I came in and saw Hoa couple, close friends of my family were carrying two big bags of tea outward.

Mr. Hoa turned his frustrating face back and said loudly "I will bring back. What a frustration" I witnessed and called his name "Mr. Hoa, something wrong?", With an annoying voice, he replied "Waste of time to bring these two bags. They do not accept. How come?"

I told him "What did the collection staff say'. He said "They said my tea is wet, broken, strong smell!!!!I did pick them up this morning. "More frustrating as they said I cheated in weighing. I weighed 100 kgs to bring here but they weighed again at 95.5 kg"

I then opened the bag. It is true that those two bags are rotten, broken, wet and hot when touching. I asked him "After picking, what you do next?"

He replied "After plucking, I put into bags to be ready. I just finished, my older brother just came and reminded us to attend the engagement ceremony of his oldest son. I thought no problem when leaving tea in shadow and it does not matter to sell them in the afternoon. To make it fresh, I watered them and left them there until 2 pm when we both finish the business. You see two bags weigh almost 100 kg. It cost several hundred. I have to throwaway. What a waste!"

I thought for a while "It makes sense. You did like this. They are right when they did not accept your tea". Mr Hoa kept silence there.

Questions:

- 1 Why did Mr. Hoa have to bring tea back home?
- 2 To avoid the incidence as Mr. Hoa's case, what needs to do to conserve after reaping and in transporting to the factory?



Lesson 3 - Plucking experiment

Background

The main purpose of plucking is to harvest the tea and thereby to get an income for the farmer. Good plucking is having the right balance between quality and quantity. Only the bud and the two (or at most three) youngest leaves are tender and green enough for high-quality tea. Harvesting older leaves (bud + 3 leaves) will reduce quality. The third leaf has substantially less tannin and less soluble contents than the second leaf. But at the same time, harvesting the third leaf will increase the weight of the harvest. The higher quality leaves plucked will have higher price at the factory than the lower quality ones.

One goal of our training programme is to increase the quality of tea coming from the farmers. Increasing quality would mean plucking more often and not letting the tea shoots become too big. However, the best plucking interval will depend on the location and the labour available to each farmer. We will therefore carry out an experiment comparing different plucking intervals and measure yield, income and labour requirements. In addition, plucking can affect the long-term health of the tea plant and can help with insect and disease management. We will therefore also measure plant health and pest damage during the experiment.

Objectives

After completing this activity the participants will understand:

- The influence of different plucking intervals on tea quality and farmer income
- The effect of different plucking intervals on plant health and pest and disease damage

Materials

- Tea field
- Bamboo sticks
- Baskets (to collect plucked tea)
- Scale (at harvest)
- Newsprint paper and felt-tip markers.

Experiment design

This experiment is carried out in a part of the FFS field. For each treatment two rows of tea are selected. All rows should be of similar quality, with no big gaps between the tea bushes. In each row a distance of 15 – 20 meters is measured (choose the same length for all rows!) and a bamboo stick is put at each side of the row. The following plucking intervals will be selected:

1. The current Farmer Practice (= what most farmers in the FFS are doing) (It would be easiest to choose 42 days so that it matches the other plucking intervals.)
2. An interval of 28 days
3. An interval of 14 days

Activity steps

1. Before the start of the experiment all rows included in the experiment are made to have a similar plucking table. At each harvesting day farmers should have a quick assessment of the health of the tea bushes and any pest or disease damage. Write down the observations for each treatment in the notebook.





- 3 At the required day, the rows of the relevant treatments are harvested. The following is an example of the plucking schedule to follow:

Treatment	Start	14	28	42	56	70	84	98	Etc.
14 days	Make plucking tables equal	x	x	x	x	x	x	x	
28 days			x		x		x		
FP (42 days)				x			x		

- 4 Register the time it takes to harvest each treatment. Note it down in the notebook.
 5 Leaves for each treatment are kept in separate baskets. Participants should take the weight of each basket and note it down in their notebook.
 6 Assess the quality of the plucked leaves and note down the percentage of each grade. Make sure the total of the percentages is 100. (Before assessing the tea, farmers should check with the factory on the grades and the price for each grade.)
 7 Make a calculation of the price value of each treatment, as follows:

	Treatment 1			Treatment 2			Treatment 2		
Grade A	5 kg	2400 VND	12,000 VND	... kg	2400 VND	... VND	... kg	2400 VND	... VND
Grade B	4 kg	2200 VND	8,800 VND	... kg	2200 VND	... VND	... kg	2200 VND	... VND
Grade C	6 kg	2200 VND	12,000 VND	... kg	2200 VND	... VND	... kg	2200 VND	... VND
Grade D	2 kg	1800 VND	3,600 VND	... kg	1800 VND	... VND	... kg	1800 VND	... VND
	Total 17		Total 36,400 VND	Total ... kg		Total ... VND	Total ... kg		Total ... VND

- 8 At the end of the season, calculate the totals for each treatment. Make a calculation of the total labour required over a year for each treatment. Calculate the total cost for labour based on the costs to hire a person.
 9 Make a simple cost benefit analysis by comparing the income and cost (= labour) of each treatment.
 10 Analyse the information in the notebooks on tea health and pest and disease damage and make a summary for each treatment.
 11 Make a final comparison between the different treatments.
 12 **Communication:** Share experience from the plucking experiment practices with the other members in the group, discuss and come to a recommendation for the whole group.

Lesson 4 - Classification of tea

Objectives

By the end of the lesson, learners will be able to:

- Realize the need of classifying tea
- Analyze the ways to classify tea by means of pressing and breaking
- Identify different types of tea by pressing and breaking

Duration

60 minutes

Teaching tools

- 4 sheets of A0 paper
- Situation exercises
- 5 kg of green buds
- Five kg scale

Teaching processes

Step 1: Warm up activity

- Trainer greets to farmers and give them 4 tea samples for learners' observation and questions.
 - *If you buy any green buds tea, which one would you choose amongst the four given?*
 - *Which samples has the highest price?*
 - *What is the method to distinguish the different grades of tea?*
- Trainer will guide farmers in to the main content of the lecture: in order to have ground for price, i would like to discuss with you about....

Step 2: Group discussion

- The class will be divided into groups of 5 - 6 participants to do the exercise. This activity will last 20 minutes and recorded on A0 paper.
- Trainer observes group discussion and support groups that fail to come up with final common agreement within the group.

Step 3: Group presentation and Plenary discussion

- Some groups will present the results of their discussion in a plenary meeting. Members of the other groups will ask clarification questions.





Step 4: Conclusion and consolidation

- Trainer collects all comments and ideas and underlines correct comments
- Main content of tea classification will be concluded: sampling, pressing and breaking methods, classification methods
 - What needs to do to harvest as much Type A and B Tea as possible?

Notes for trainer

Situation analysis exercise

In a discussion held by Phu Cuong tea growers related to the classification of tea, participants have the following points of view:

Aspects	Point of view 1	Point of view 2
Benefits of tea classification	<ul style="list-style-type: none"> • Arrange the same type together • Identify selling price 	<ul style="list-style-type: none"> • Ensure product quality • High unit cost
Basis for classification	<ul style="list-style-type: none"> • Maturity of buds • No of standard buds in samples 	<ul style="list-style-type: none"> • Based on the tea fibre ratio in tea samples
How to measure the tea fibre ratio in tea samples	<ul style="list-style-type: none"> • By folding tea buds 	<ul style="list-style-type: none"> • By drying tea, viewing and weigh the stems in the samples
How to take tea samples	<ul style="list-style-type: none"> • By mixing tea sample thoroughly & take samples from 5 points in diagonals; take 200g at each point 	<ul style="list-style-type: none"> • Mix tea buds and take 5 samples randomly, 200g each
Tea bud folding	<ul style="list-style-type: none"> • Break tea stem 1 cm from the cut point, accepted if no fibre. • Put the stem with fibre aside 	<ul style="list-style-type: none"> • Break the tea stem from the bud. • Put the stem with fibre aside
Calculation	<ul style="list-style-type: none"> • Fibre ratio = Weight of tea fibre in folded tea samples/ weight of tea samples taken * 100% 	<ul style="list-style-type: none"> • Fibre ratio = weight of tea samples taken/ weight of tea fibre in folded tea samples * 100%
Tea grades	<ul style="list-style-type: none"> • Type A: Ratio of tea fibre & hard leave is less than 10% • Type B: Ratio of tea fibre & hard leave is from 10,1 to 20% • Type C: Ratio of tea fibre & hard leave is from 20,1 to 30% 	<ul style="list-style-type: none"> • Type A: Fibre ratio is less than 10% • Type B: Fibre ratio from 10 to 20% • Type C: Fibre ratio from 20 to 30% • Type D: Fibre ratio from 30 to 40 % • Type E: Fibre ratio is
	<ul style="list-style-type: none"> • Type D: Ratio of tea fibre & hard leaveis in the range of 30,1->45% 	More than 45%



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