TRAINING OF TRAINERS OF FARMERS FIELD SCHOOL ON COFFEE PRODUCTION

REPORT

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SUMÁRIO

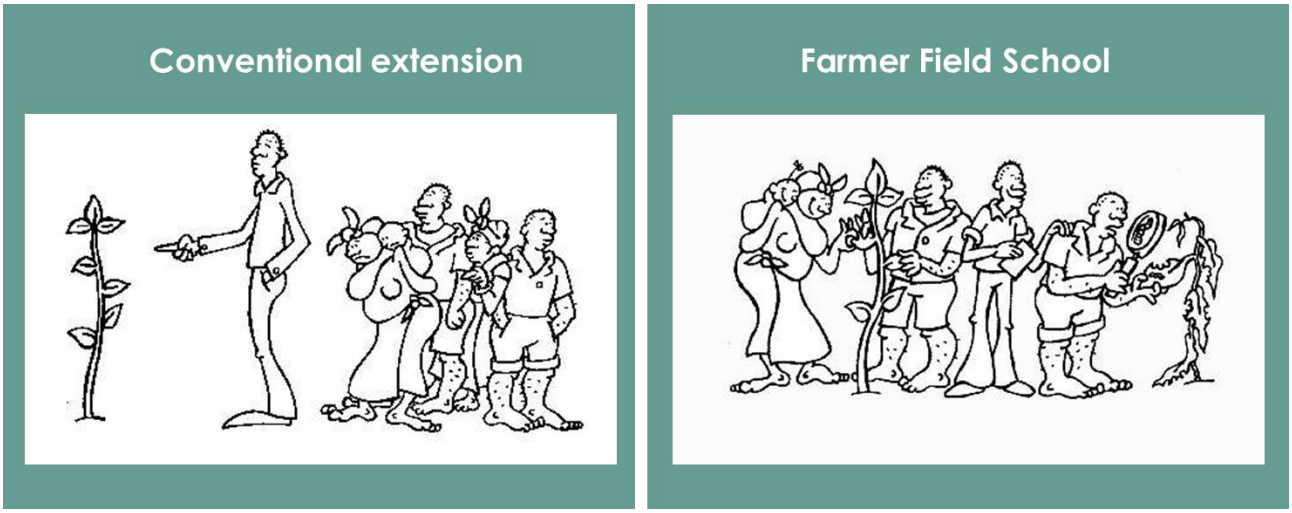
I. OBJECTIVE

- Review the FFS approach used by HRNS and design strategies to improve our interventions;
- Share experiences, tools, approaches used by HRNS in the regions;
- Incorporate key approaches, like climate change, gender, youth, diversification, financing and marketing in the FFS executed by HRNS;
- Improve the documentation, systematization and learning process between the regional offices.

II. CONCEPT

For many years, the technology transfer was used as a main mean to promote technologies developed in the research centers for the agriculture. However, in several cases the approach of transfer was not effective in the dissemination and adoption of these technologies in large scale, especially in the segment of smallholders, the most part of farmers in the world. One of the cause for this result if the conception issue, which in general it is unidirectional from the inception of the problem definition to be faced, the design of technologies to solve these problems and in the way how the messages are communicated. In this way, it is possible find good technologies not adopted or misapplied due to not consider the local context, the cultural preferences, the ecosystems, the resources to the investment and the profile of the technicians who were focused in the technology (object) and not in the people (subject).

FIGURE 1: SCHEME OF TWO EXTENSION MODELS: TECHNOLOGY TRANSFER AND FARMER FIELD SCHOOL



As an alternative, during the last three decades, specialist on development from the various fields, such as the education, the health and the agriculture had demonstrated that community development can be dynamited in a most effective way through the facilitation of learning processes among participants who have built their knowledge collectively. According with this thought, the objective of the interventions is not just the technologies adoption, but the awakening of the farmer capacities to the management of challenges increasingly complex. The result of the learning is linked to concrete actions that help to the farmers and their groups to solve the problems in an independent manner, by themselves. In this context, the learning on ecosystem management and the technological

innovation for a more productive agriculture and sustainable is a main axis in the methodology of Farmer Field School (FFS).

The FFS is not an extension modality completely new, it is just an idea more effective built on the base of knowledges and motivations of farmers. The methodology consists in a group of 20 to 30 farmers, members of a community that share the same problems and challenges in the production of crop/livestock. The group, with the support of one facilitator, identify the common problems and test solutions through the experimentation process, the base of the learning by discover. The FFS use the field as classroom where all the ecosystem interaction take place. Also, farmers create a space to discuss and interchange knowledges, due the level of experience of each farmer, member of the FFS. The facilitator promotes the use of participative tools to discover and understand the physiological and ecological principles. All these activities are developed in regular session once per week, biweekly or monthly, during a crop/livestock cycle. In this way, can be described to the objective of the FFS as process to improve the farmer capacities to solve their problems and empower the decision making.

FIGURE 2: SCHEME OF THE CONCEPT OF FARMER FIELD SCHOOL METHODOLOGY.

III. PRINCIPLES OF THE FFFS

Each FFS is different because the methodology is designed on the base of problems and challenges of each group/community, however all the FFS keep the same principles that characterize them. These are:

Non-formal adult education: The school assumes that participants have previous knowledge and skills on agriculture, for that reason the training uses different methods of adult education to give the opportunity to generate new experiences and experiment with the purpose of relearning their produce way. In addition, it is a good space for the interchange of experiences to share existing feats and in other cases, to seek practical solutions in a collective way. It is an interactive way of learning, in which facilitators and participants contribute to the generation of knowledge and discovery.

Based on the phenological stages of the crop/livestock and with a limited time: The FFS has a design based on the phenological stages of the crop or the animal breeding. Thus, problems of sowing are studied from the seed to the planting, soil fertility issues are discussed when crop has a greater

need for nutrients, pests and diseases are treated when the crop is more susceptible to the problem and is attacked by them, and so with the other themes. The basis of this method implies that the vegetative growth of the crops determines the sequence of technical contents and their development. This modality ensures the relevance of the study by the participants, who use the knowledge acquired immediately in their fields.

The field is the place of study: The FFS is organized in the communities where farmers live. In this way, they can easily attend the weekly, biweekly or monthly sessions (in the case of coffee) and give continuous follow-up to the study activities. FFS has a small field of study of approximately 400 m2 to 600 m2 (100 coffee trees), which serves as a learning field. This is a living laboratory that gives producers the opportunity to experiment and test new techniques before applying them to their own fields of production. The field of study must be maintained and conducted by the group.

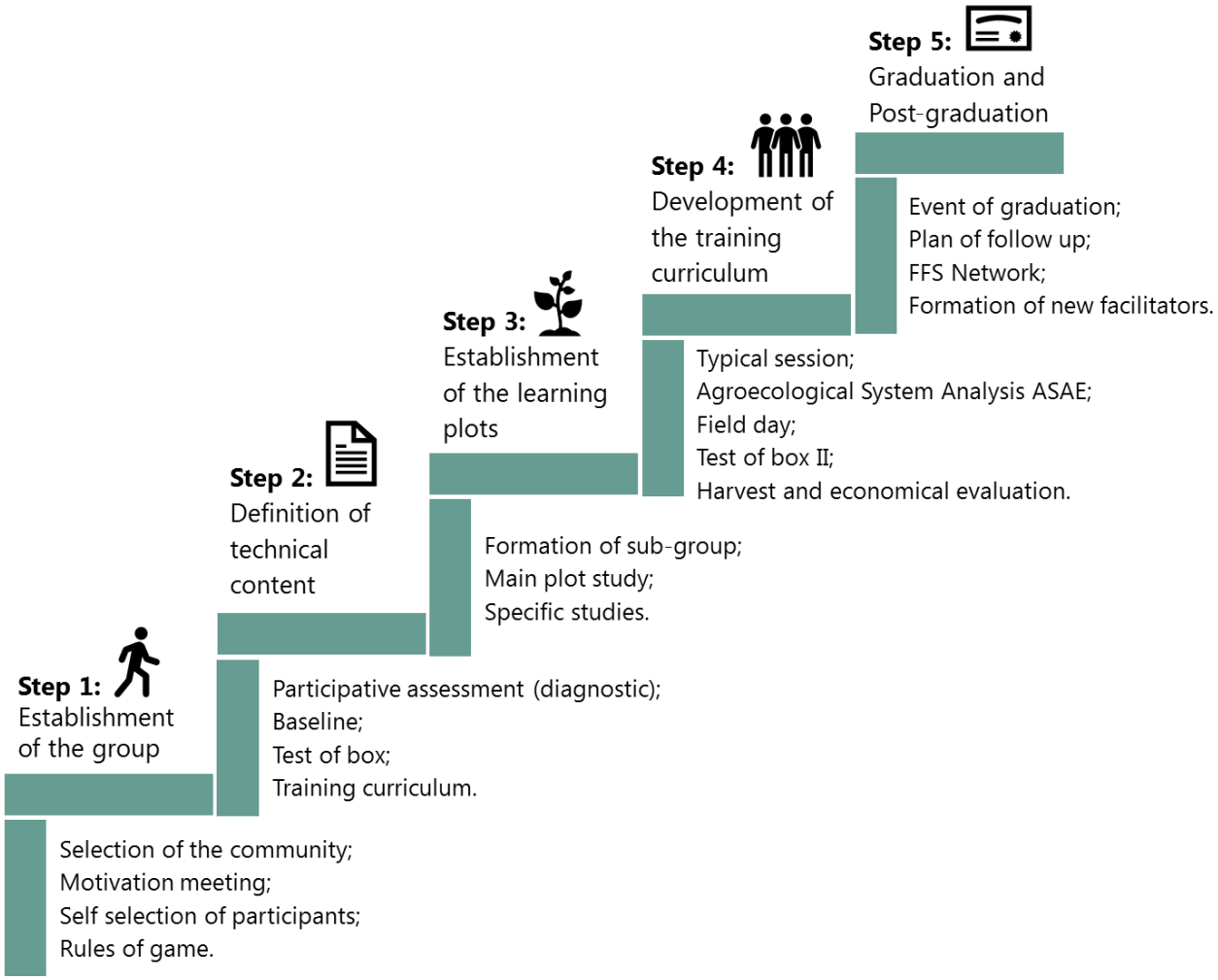
Basic science: The FFS emphasizes the understanding of basic physiological and ecological processes and principles through observations of the production system and experiments. It has been found that when farmers have mastery of these principles, they can understand the cause and effect relationship of situations in their crop and implement practices that balance relationships and build more sustainable systems for themselves.

Based on local interest: Farmers, not technicians, are who decide what is relevant and most urgent to study in the FFS. In this way, the interest of the group is assured, because the theme responds to a priority determined by the group itself. Therefore, each FFS is different, has its own needs and opportunities and its own content. Although each FFS applies universal methodological principles, each FFS is unique.

IV. METODOLOGICAL CHAIN

To develop a FFS there are activities that facilitator must do to prepare the group, design the content, develop the learning activities and follow-up the collective action once the FFS have finished. These activities are grouped in 5 steps into of the methodological chain. Each step has a logical sequence and the application of all the activities can guarantee the success of the learning process.

FIGURE 3: METHODOLOGICAL STAIR OF FARMER FIELD SCHOOL



4.1. STEP 1 ESTABLISHMENT OF THE GROUP

The establishment of the group is a very important step because the success of the work often depends on the group that participates in the training. This group should be composed of men and women of any age, who are farmers and who have the profile of innovative producer, since they must be willing to experiment in their farming. In the FFS, experimenter farmers, whose work example motivates the rest of the community, are often involved in implementing the new technologies that can help solve local problems. We start from the innovators to change the critical mass and / or other members of the community.

The Step 1 is composed by 4 activities: the selection of the community, the motivation meeting, the self-selection of participants and the rules of game.

4.1.1. SELECTION OF THE COMMUNITY

The first activity to establish a group of FF is community selection. Although all communities have the potential to participate, it is important to start with a community where results can be built that

motivate the implementation of FFS in neighboring communities. In the training of trainers in Uganda, the participants identified characteristic of a group where FFS is working well.

FIGURE 4: CHARACTERISTICS OF GROUPS WHERE FARMER FIELD SCHOOL IS WORKING WELL OR BADLY.

Tics of a group which is doing well	Tics of a group which is not doing well
○ FFS meet at least once per month; ○ Group has a good leadership structure/good; leadership and guidelines; ○ Common goal and interest; ○ Inclusiveness (gender and youth); ○ Have a good facilitator; ○ Learning take place at garden; ○ Farmers adhere and comply to the governing rules and principles; ○ Define their own curriculum based on crop and community challenges/democratic selection of topics; ○ They are united and share a common objective; ○ Active participation of the members; ○ Willing to learn and adopting; ○ Must ready to share experiences; ○ Well documentation/record keeping.	○ Passive participation of members; ○ Irregular meetings; ○ Topics not respond to the interest of the members; ○ Have different interest; ○ Gender discrimination; ○ Poor leadership; ○ Irresponsible facilitator; ○ Poor communication; ○ High level of absenteeism in meetings; ○ Lack of rules and regulations; ○ But understanding of the FFS concept; ○ Backbiting and rum or mongering amongst members; ○ Lack of follow up on members and activities; ○ Don´t adopt/implement they agree on; ○ Poor documentation and systematization of the results.

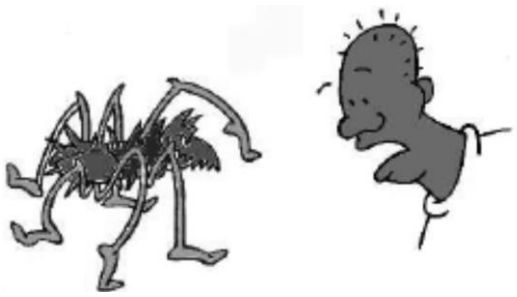
4.1.2. MOTIVATION MEETING

Once the community where the facilitator thinks about establishing an ECA is identified, an approach is usually made to their leaders or leaders, who collaborate to convene more community / association members for an information meeting. Community members are the possible participants in the ECA, so it is necessary to have the largest number of participants. To do so, it is desirable to promote and schedule the meeting for an accessible day and time for the men and women of the community.

The introduction of the methodology constitutes the preliminary meeting and aims to inform, motivate, arouse interest and clarify doubts. Sometimes we use problem analysis exercises to identify the need for training in the community; also show examples of other similar processes using videos or invite to farmers participating in some neighboring FFS to receive its testimony. It is very important that during the promotion meeting the facilitating does not create false expectations among community members about the scope of FFS, so that in the future there will be no loss of members because it was not fulfilled with the promised one. In addition, it is necessary to clarify from the outset what things members will encounter and what things will not develop during the training process.

Learning tool: The fly

Objective	Explain to community members what is a FFS and what they can expect from their participation
Time	45 minutes
Materials	Flipchart, markets, common insects of the place, magnifying glass
Procedure	○ We asked community members to draw an insect on giant paper. They can be done individually or in groups; ○ We collect the drawings and put them in a place where everyone can see them, and we ask the participants to count the legs and parts of the insect structure in the different drawings; ○ Normally in each drawing, the insect has a different number of legs and parts, so we draw attention to the different ideas of the people and ask why; ○ We bring the real insect for members to observe and ask them How many legs and parts does the insect have; ○ We explained that through observation and discussion, the group was able to determine the number of legs and parts of the insect (something they did not know or had not noticed). We took the opportunity to explain that it was not necessary to bring in a specialist for this, and that this is the basis of FFS; ○ In conclusion, we explain better what an FFS is, how it works, what activities are carried out, and what are the advantages of participating in it.
Key questions	○ Was it necessary the presence of a specialist to teach us about the insect? ○ What were the actions that members do to learn about the insects?
Conclusion	Using the observation and discussion farmers can learn for themselves. Usually, farmers need basic orientation to discover the ecological and phenological principles existent in the field.



4.1.3. SELF-SELECTION OF PARTICIPANTS

The motivation meeting can be used to identify the members who will form the FFS. However, the community or association is the one who selects the 20-30 participants based on certain criteria that will determine the characteristics of the members needed to form the group. It is important to reiterate that the selection must be made by the members themselves, without the participation of the facilitator. If necessary, the facilitator can come back another day to see the results of the selection. Some criteria to be proposed are:

- Be interested in participating in the training;
- Be willing to apply the most important experiences to your own case in your field;
- Be a producer of an important culture for the community (in our case, be a coffee grower);
- Like to innovate and try new things;
- Be willing to participate in all ECA sessions;
- Commit to exchanging ideas and sharing experiences;

- Be willing to invest time and resources to improve your knowledge;
- It is not necessary to know how to read or write;
- Accept men and women with various levels of experience.

4.1.4. RULES OF GAME

Once the definitive group is established, a meeting is held to ensure the organization and the well development of the FFS. For this, the facilitator promotes the election of a simple board with a president, a secretary and a treasurer, who will represent the group. Its basic functions can be defined by the participants themselves, but based on our experience, some of the duties that board members have are:

President: He/she is the representative of the group, serves as link and communicator between the members and the facilitation, motivates the participation of the members to become active, enforces the internal regulations of the FFS.

Treasurer: He is the administrator of FFS resources and materials, such as fertilizer, pesticides, tools, measurement materials, training materials (flipchart, markers, tape, scale, etc.). In addition, in case the school receives the money directly from the donor, the treasurer is responsible for managing the resources and ensuring its effective use.

Secretary: It is the person who records the events during the ECA sessions, including key information from the learning portion. The secretary stores the information and handles the ECA records. On the other hand, the rules of the game also discuss ideas about the functioning of the ECA, that is, define the following aspects with the group:

- Frequency of sessions (weekly in short cycle crop or biweekly and monthly in perennial crops such as coffee);
- Days and time of session;
- Program of activities for the season;
- Rental of learning plots;
- Role and responsibilities of the participants and the sponsoring organization; Distribution of investment and commitment to carry out field activities.

One of the crucial issues in this discussion is the selection of the FFS field. At first, the group should identify a member who is willing to lend an area to carry out FFS studies. This land should preferably have the same characteristics as most of the community land. In case there are more than one option, the group must decide which is best for achieving the objectives to be pursued in the FFS. Some criteria for this choice may be: the proximity of the land to the community, access so that it is in sight of all, that does not have many hills or inclination. In some cases, water for irrigation, among other aspects, may be decision criteria for the group.

Once the land has been identified, the group together with the land owner should establish the parameters for the land use, such as area, time of use, length of service. Our experience indicates that it is important for the group and the landowner to sign a document that details the use of this crop to avoid future problems.

4.2. STEP 2 DEFINITION OF THE TECHNICAL CONTENT

In the FFS the training content is a basic requirement for its development. It must be based on local reality and be constructed in a participatory manner. The technical content defines the themes of training and it is the result of a set of activities that help to define the critical and unfamiliar themes in the community, keys to developing sustainable agriculture in resilient ecosystems.

The Step 2 follow four activities for design the technical content: the participative assessment, the baseline, the box test and the training curriculum.

4.2.1. PARTICIPATIVE ASSESSMENT (DIAGNOSTIC)

This activity aims to diagnose the agricultural situation in the community and the participation of the family members in the control and access of the resources, identify the problems and prioritize them. It helps us to establish the main thematic approaches of the FFS and proposes the following instrument.

Learning tool: Identification of the main crop in the community

Objective Identify the main crop or breed production, the participation of the family members in activity, analyze its importance and identify its problems / challenges.

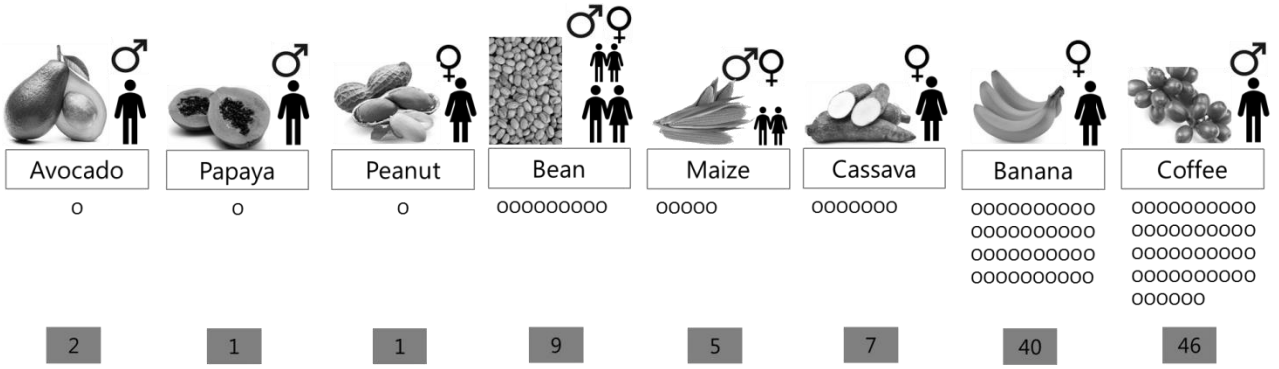
Time 1 hour

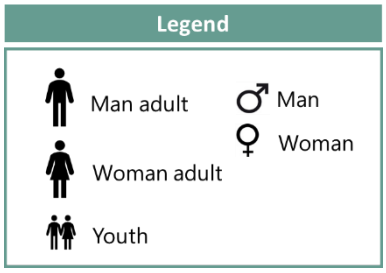
Materials Samples of crops and breed production in the community; beans for voting, paper, markets, tape.

Procedure

- Participants group in a circle in an open space / outdoors;
- Participants are asked to collect samples (leaves, flowers, fruits, seeds) from the most important crops in the community. In the case of a community where livestock activities are practiced, feathers, skins, products such as milk, eggs, etc. can be collected;
- Once the samples are collected, the facilitator places them on the floor in a row;
- To determine the main crop, the selected options will be voted on. For this, each participant receives a total of 6 beans. Participants will use 3 beans for the most important crop for them, 2 beans and 1 beans for other options according to the importance level. To ensure that there is no influence of leadership, voting can be done individually with confidentiality;
- Once the vote is over, the bens are counted and the most important culture is determined (more voted), which becomes the FFS study culture;
- Another analysis can be done, for example, on which family member takes control and accesses the resources generated by each crop, having as category of man, woman, young. This information is very important for the definition of the main culture according to the family group that participates in the FFS.

FIGURE 5: RESULT OF THE "IDENTIFICATION OF THE MAIN CROP" DURING THE TRAINING OF TRAINERS ON TRAINERS OF FARMER FIELD SCHOOL IN UGANDA





In this case, coffee was the crop most voted, followed of banana. Coffee is a crop managed by men and banana by women. This result is important in the moment to choose the crop of first and second cycle according with the target group participating in the FFS.

Learning tool: Spider web

Objective Analyze the importance of the selected crop and identify the main problems.

Time 1 hour

Materials Markers, cardboards, toothpicks or tape.

Procedure

- The sample of the main culture (coffee) is placed in the middle of the circle of the participants;
- Participants are asked to collect sticks to join their cards. Write or make a living representation or drawings on the cards about the reasons why culture is the most important in the community;
- Subsequently, producers are asked to analyze the causes that limit the achievement of the important benefits to that crop;
- In this way, the organogram called spider web is created.

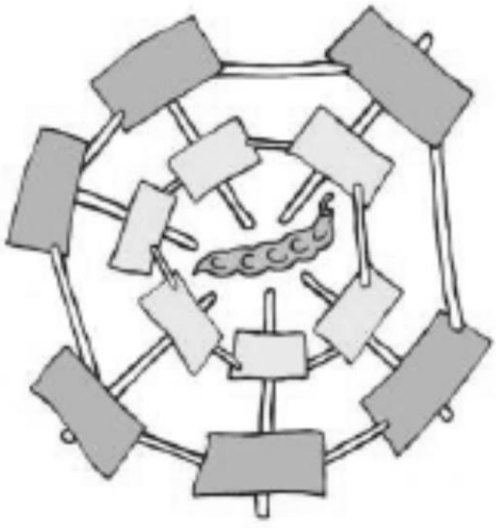
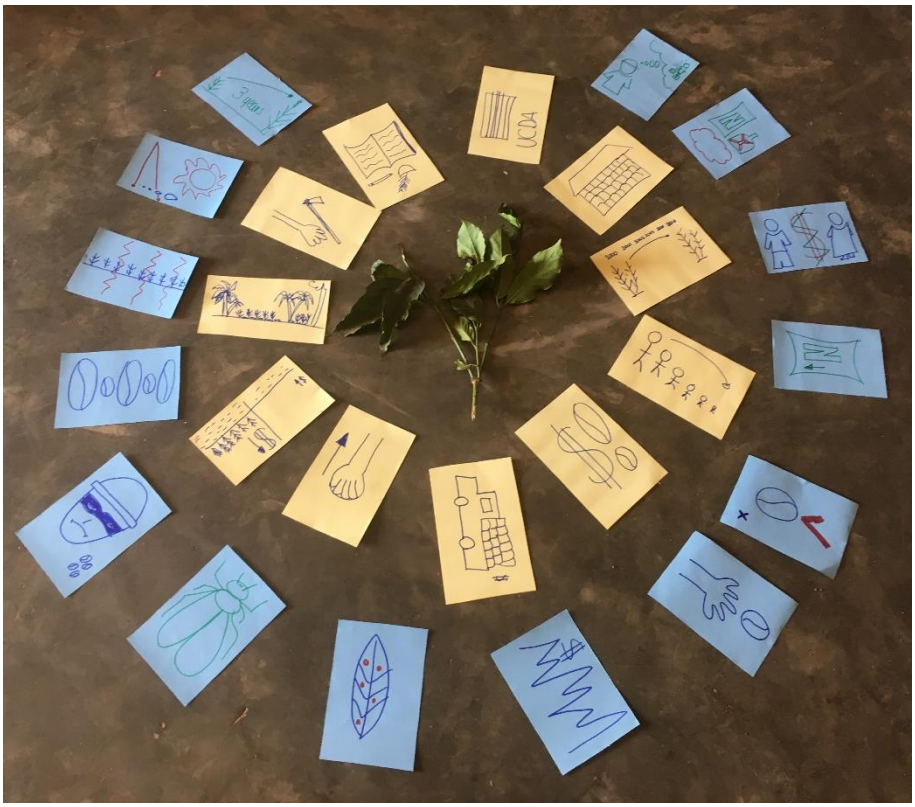


Figure 6: Result of the "Spider Web" during the training of trainers on farmer field school in Uganda



Justification: Source of work, permit the intercropping, valorization of the land, low need of labor, easy of sale, generator of income, crop transmitted from generation to generation, perennial crop, storage to sale according with the need, generation of revenues for the country.

Problems: lack of strategies for the income generation until start the production, lack of water, bi-annual effect of the production (high and low crop), Insecurity and coffee theft, pests, diseases, price variability, lack of labor, lack of seeds, low access to inputs, low quality of inputs, migration of the youth, lack of integration of men and women in the decision taken in the farm.

Learning tool: Problem periodization

Objective

Determine the main problem, the secondary problems and the problems that we could not solve through experimentation, but through training or new practices.

Time

30 minutes

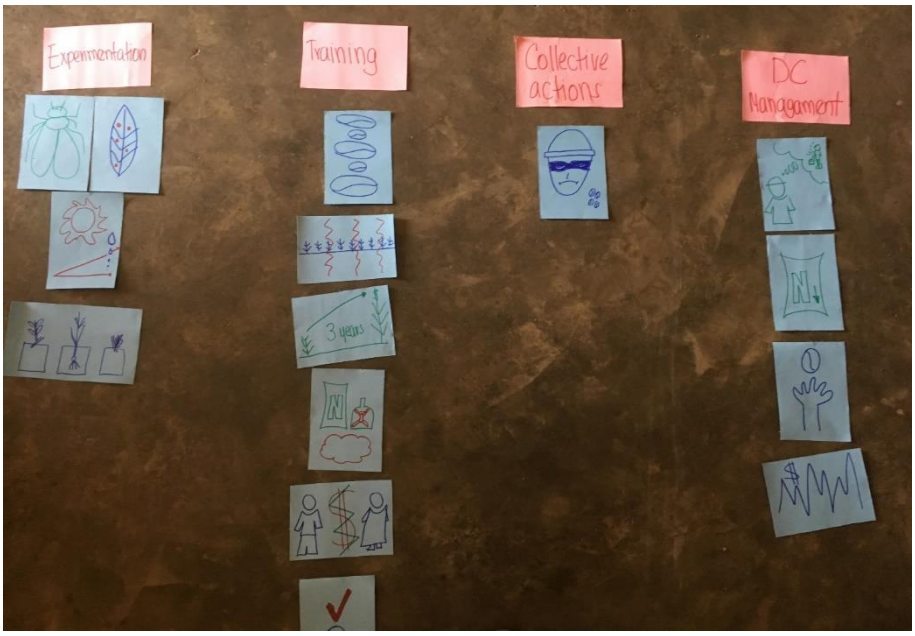
Materials

Cards of the problems identified in the previous exercises, the spider web

Procedure

- Separate from the spider web the cards that contain the problems;
- Analyze each problem with the participants, whether we could seek solutions through experimentation or whether it is better to treat them through training;
  Separate the problems we can solve through experimentation and put on the ground in row;
- We relate each of the problems to the others, trying to establish whether a problem is cause or effect, putting up if they are effects or down if they are causes, as if it were a problem tree;
- The priority problem will be the one that lies below (root problem), and if we solve it, we focus on the solution of the other problems that originated by it. The main problem is the central theme of the ECA and, thus, experiments will be set up with one or several alternatives in the main field. The effects-problems are considered as secondary problems, with the relative experiments established in the plot / terrain of specific studies.

FIGURE 7: RESULT OF THE "PROBLEM PRIORITIZATION" DURING THE TRAINING OF TRAINERS ON FARMER FIELD SCHOOL IN UGANDA



There were four problems to be solved through experimentation: pests and diseases, drought and quality of the seedling. Of these problems, the quality of the seedling and the drought were the main problems due those can cause pests and diseases.

4.2.2. BASELINE

During the second step facilitator can identify the current situation of the community related with the main crop established in the participative assessment. The previous activity provided of problems in the coffee production that will be transformed in training themes to be developed in the FFS. Some of these themes become indicator to be measured in the baseline. The baseline is a tool used by the facilitator to conclude if any change had happened through the implementation of the learning process.

The questionnaire is a table where facilitator insert the names of the participants and collect the information from then about different topic related to the performance of the production, the use of practices and technics that can help to face the problems identified in the participative assessment. Ideally, the facilitator should apply the same questionnaire one or two years before the FFS have finished to compere the result of both applications.

In the figure below is presented the result of the example built during the Training of trainers on Farmer Field School in Uganda.

FIGURE 8: RESULT OF THE "BASELINE" APPLIED TO THE PARTICIPANTS OF THE TRAINING OF TRAINERS ON FARMER FIELD SCHOOL IN UGANDA.

Name	Production (kg)	No. Trees	Clone resistant	Clone non-resistant	Elite	Wild	Mulching	Fertilizer	Pesticide	Decision	No crops
Farmer 1	0		Yes	Not	Not	Not	Not	Yes	Yes	Man	3
Farmer 2	75		Not	Yes	Not	Not	Not	Yes	Yes	Woman	5
Farmer 3	2300		Not	Not	Yes	Not	Yes	Yes	Yes	Man	3
Farmer 4	800		Not	Yes	Not	Not	Not	Yes	Yes	Man	3
Farmer 5	900		Not	Yes	Not	Not	Not	Yes	Yes	Man	4
Farmer 6	1200		Not	Yes	Not	Not	Not	Yes	Yes	Man	5
Farmer 7	400		Not	Yes	Yes	Not	Yes	Yes	Yes	Man	3
Farmer 8	550		Yes	Not	Not	Not	Not	Not	Yes	Woman	6
Farmer 9	450		Yes	Yes	Not	Not	Not	Not	Yes	Man	2
Farmer 10	300		Not	Yes	Not	Not	Not	Yes	Yes	Woman	3
Farmer 11	600		Yes	Not	Yes	Not	Yes	Yes	Yes	Woman	4
Farmer 12	300		Not	Yes	Not	Not	Not	Yes	Yes	Man	5
Farmer 13	500		Yes	Not	Not	Not	Not	Yes	Not	Man	4
Farmer 14	600		Yes	Yes	Not	Not	Not	Yes	Not	Man	5
Farmer 15	480		Not	Not	Yes	Not	Yes	Yes	Yes	Man	5
Farmer 16	530		Not	Not	Not	Yes	Not	Yes	Yes	Man	3
Farmer 17	700		Not	Yes	Yes	Not	Yes	Yes	Yes	Man	3

Conclusion

- The yield per garden is 629 Kg;
- 35% of participants are using resistant clones, 59% are using non-resistant clones, 29% are using elite, and 6% are using wild variety;
- 29% of the gardens adopt mulching;
- 88% of farmers are using fertilizer and the same number, 88% are using pesticides to the pest and diseases control;
- Men are responsible for the decision taken in 76% and women in 24%;
- The average crop per garden is 4 crops.

4.2.3. RESULT OF BOX TEST

The box test is a diagnosis and evaluation tool that's used to determine participants' knowledge extent. The experience is highly practical and takes place in the field, which makes it very existential. The box test is performed twice: once at the beginning of the FFS, which is the diagnosis and will serve to adjust the content focusing on the least known subjects; and once again at end, which serves as an evaluation to prove the advancement of knowledge obtained during participation in the FFS. Box testing includes questions

related to soil management, fertility, crop management, sanitation (pests and diseases), climate impacts, amongst others identified at the baseline.

Learning tool: The Box Test

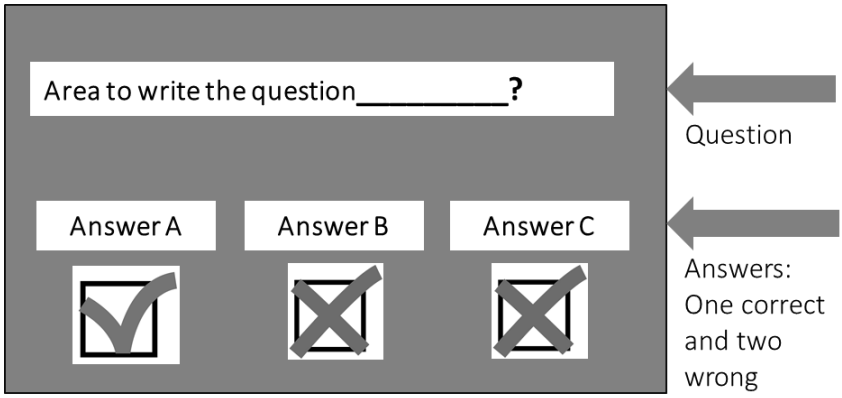
Objective To identify the level of individual and collective knowledge and gaps of knowledge in the FFS group.

Time 1 hour

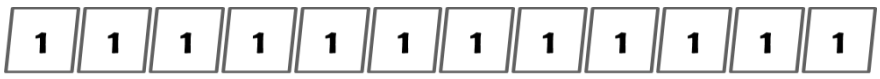
Materials Cardboard for boxes and envelopes, paper to make the report cards, craft paper and pens / markers for evaluation.

Procedure

- Elaborate the boxes containing one question and three answer options: One answer correct and two wrong. Materials such as paper, cardboard, recycled materials, etc. can be used.



- Prepare a number of report cards equal to the number of FFS members. The report card will be numbered equal to the number of prepared boxes. For example, if there are 20 members in the FFS, facilitator could prepare 20 boxes and report cards from 1 to 20, similar to the follow example.



- Report cards are given to each FFS member, registering members' numbers and names.
- The box test is applied to participants.
- A joint evaluation is made to learn the form of qualification.

FIGURE 9: APPLICATION OF THE BOX TEST ON THE COFFEE FIELD

FIGURE 10: RESULT OF THE "BOX TEST" APPLIED TO THE PARTICIPANTS OF THE TRAINING OF TRAINERS ON FARMERS FIELD SCHOOL IN UGANDA.

Question	Q1- Fertility	Q2- Gender	Q3	Q4	Q5	Q6	Q7- Youth	Q8	Total	%
Farmer 1	0	1	1	1	1	1	1	1	7	87,50
Farmer 2	1	1	1	1	1	1	1	1	8	100,00
Farmer 3	1	1	1	1	1	1	0	1	7	87,50
Farmer 4	1	1	1	1	1	1	0	1	7	87,50
Farmer 5	0	1	1	0	1	1	0	1	5	62,50
Farmer 6	1	1	1	0	1	1	0	1	6	75,00
Farmer 7	0	1	1	0	1	0	0	1	4	50,00
Farmer 8	0	1	1	0	1	0	1	1	5	62,50
Farmer 9	0	1	1	1	0	0	0	1	4	50,00
Farmer 10	1	1	1	1	1	1	0	1	7	87,50
Farmer 11	1	1	0	1	1	1	1	1	7	87,50
Farmer 12	1	1	1	1	1	1	1	1	8	100,00
Farmer 13	1	1	1	0	1	1	0	1	6	75,00
Farmer 14	0	1	1	0	1	1	0	1	5	62,50
Farmer 15	1	1	1	1	1	0	0	0	5	62,50
Farmer 16	1	1	0	1	1	1	1	1	7	87,50
Farmer 17	1	1	1	0	1	0	0	1	5	62,50
Total	11	17	15	10	16	12	6	16		
%	64,71	100,00	88,24	58,82	94,12	70,59	35,29	94,12		**75,74**

Conclusion:

- The percentage of knowledge on the subject evaluated was 76%;
- Farmer 7 had the lowest performance in the group and should have more facilitator´s support;
- The group has a good perception about gender (high score in question 2), but not good perception about youth (low score in question 7). This must be considered by the facilitator to increase the attention of youth topics.

4.2.4. TRAINING CURRICULUM

The training curriculum is the main tool for planning the FFS training campaign, which consists of identifying the key themes for each of the phenological steps, to take place along with the producers and facilitators. It's based on the results of the participatory diagnosis, the baseline and the box test. The procedure is as follows:

Learning tool: The Box Test

Objective	To determine the technical content to be developed during FFS.
Time	2 hours
Materials	Craft paper, pens, masking tape, participative assessment results, baseline and box test.
Procedure	The phenological stages of the main culture in the participatory diagnosis are identified. For each stage, we identify the field activities (cultural dealings) that must be performed. For each field activity the technical topics (physiological and ecological principles), the practices and technologies that farmers must master in order to apply them efficiently are discussed. Identify the complementary themes of social, economic, environmental and climatic character that emerge as participants' subjects of interest. This way the participants emphasize the topics they wish to learn, relating the main problems resulting from the prioritization in participative assessment, the baseline indicators and the knowledge gaps identified in the box test. The figure below shows the proposed design for the training curriculum.

FIGURE 11: RESULT OF THE "TRAINING CURRICULUM IN COFFEE CROP" REALIZED DURING THE TRAINING OF TRAINERS OF FARMER FIELD SCHOOL IN UGANDA.

Stages	February	March to April	May to June	July to September	October to December
Field activities	Pruning; Mulching; Desuckering;	Mulching; Fertilization; Trenches; Cover crop planting; Desuckering; Shade management;	Weeding; Pest control; Desuckering;	Staking; Desuckering; Fertilization; Pest control;	Desuckering; Weeding; Picking; Drying; Storage; Marketing;
Knowledge	Importance, types, methods, tools and application of pruning; Advantages, materials, application of mulching; Reasons, methods and application of desuckering; Cost analysis and record keeping of the GAPs.	Nutritional deficiencies and function of the nutrients; Types, method and quantity fertilizer application; Elaboration of organic fertilizer; Advantage, types, methods of trenches; Advantage, types, plantation and management of cover crops; Advantage of shade, selection of shade species; estimation of percentage; and shade regulation; Cost analysis and record keeping of the GAPs.	Importance and method of weed control; Identification of pest/diseases and damages in coffee; Monitoring and integrated pest and diseases management; Risks on human health and adequate management of pesticide; Evaluation and control effectiveness; Cost analysis and record keeping of the GAPs.	Method of stacking and prevention of need for staking; Cost analysis and record keeping of the GAPs.	Maturity stages; Method of picking; Types, methods and infrastructure for drying; Determination of % of coffee humidity; Necessary condition of the storage place, materials, security for storing; Market players, places, prices and marketing options; Cost analysis and record keeping of the GAPs.
Additional topics	Access to financing; Social skills.	Climate change and adaptation practices; Social skills.	Gender relationship; Diversification and food security; Social skills.	Land distribution and family succession; Social skills.	Access to planting materials (seedlings); Business plan; Social skills.

FIGURE 12: RESULT OF THE "TRAINING CURRICULUM IN BEAN CROP" REALIZED DURING THE TRAINING OF TRAINERS ON FARMER FIELD SCHOOL IN UGANDA.

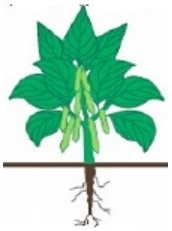
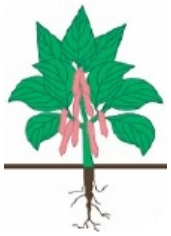
Stage	 Seed	 Germination	 Growth	 Flowering	 Fruiting	 Harvesting
Field activity	Seed selection; Site selection; Land preparation;	Planting; Fertility;	Weeding; Pest and diseases control;	Fertilization;	Pests and diseases control;	Harvesting; Drying; Threshing; Storage; Pests control; Marketing;
Knowledge	Varieties and quality evaluation; Technics of land preparation; Cost analysis and record keeping of the GAPs.	Technics of planting and spacing; Types, method and quantity fertilizer application; Cost analysis and record keeping of the GAPs.	Importance and method of weed control; Identification of pest/ diseases and damages in coffee; Monitoring and integrated pest and diseases management; Risks on human health and adequate management of pesticide; Cost analysis and record keeping of the GAPs.	Nutritional deficiencies and function of the nutrients; Cost analysis and record keeping of the GAPs.	Cost analysis and record keeping of the GAPs.	Maturity stages; Methods of harvesting and drying; Threshing technics; Necessary condition of the storage place, materials, security for storing; Monitoring and control of bean weevils; Bulk marketing; Cost analysis and record keeping of the GAPs.
Additional topics	Gender relations.			Safe use and handling of agrochemicals .	Gender and nutrition.	Food security.

FIGURE 13: RESULT OF THE "TRAINING CURRICULUM IN BANANA CROP" REALIZED DURING THE TRAINING OF TRAINERS ON FARMER FIELD SCHOOL IN UGANDA.

Stage				
Field activities	Desuckering; Fertilization; Weeding; Mulching; Pests and diseases control; Pruning; Tranches;	Pruning; Desuckering; Pests and diseases control; Mulching;	Stacking; Removal of male bud; Pruning; Desuckering; Pests and diseases control; Mulching;	Harvesting; Mulching; Marketing;
Knowledge	Reasons, methods and application of desuckering; Nutritional deficiencies and function of the nutrients; Types, method and quantity fertilizer application; Importance and method of weed control; Advantages, materials, application of mulching; Importance, types, methods, tools and application of pruning; Advantage, types, methods of trenches; Cost analysis and record keeping of the GAPs.	Identification of pests/diseases and damages in banana; Monitoring and integrated pest and diseases management; Risks on human health and adequate management of pesticide; Evaluation and control effectiveness; Cost analysis and record keeping of the GAPs.	Methods, materials and application of stacking; Importance, method and application of removal of male bud; Cost analysis and record keeping of the GAPs.	Maturity stages; Methods of harvesting; Handling the pseudas stems and commercialization; Market players, places, prices and marketing options; Cost analysis and record keeping of the GAPs.
Additional topics	Gender issues	Climate change	Diversification	Business plan

FIGURE 14: RESULT OF THE "TRAINING CURRICULUM ON MAIZE CROP" REALIZED DURING THE TRAINERS OF TRAINERS ON FARMER FIELD SCHOOL IN UGANDA.

Stages						
Field activities	Land identification; Land preparation; Seed selection; Fertilization; Planting;	Weed control; Pest control;	Top dressing; Pest and diseases control; Weeding; Desuckling;	Pest and diseases control;	Pest and diseases control;	Picking; Drying; Storage; Marketing;
Knowledge	Technics of land preparation; Type source of seed and quality evaluation; Types, method and quantity fertilizer application; Spacing and hole size; Cost analysis and record keeping of the GAPs.	Weed identification, type of control and herbicides; Identification of pest/diseases and damages in maize; Monitoring and integrated pest and diseases management; Cost analysis and record keeping of the GAPs.	Nutritional deficiencies and function of the nutrients; Types, method and quantity fertilizer application; Criterial to remove/retain plants; Cost analysis and record keeping of the GAPs.	Risks on human health and adequate management of pesticide;		Maturity stages; Methods of harvesting, drying, de-husking and threshing; Hulling; Necessary condition of the storage place, materials for storing; Market options and prices; Cost analysis and record keeping of the GAPs.
Additional topics	Social issues; Diversification.	Social issues; Safe use and handling of pesticides/ Herbicides.	Social issues; Gender.	Social issues Family nutrition	Social issues	Social issues

FIGURE 15: RESULTS OF THE "TRAINING CURRICULUM OF PIG BREEDING" REALIZED DURING THE TRAINING OF TRAINERS ON FARMER FIELD SCHOOL IN UGANDA.

Stage				
Activities	Construction of sty; Feeding; Treatment; Marketing; Breed selection; Cutting the tips of the milk teeth;	Feeding; Treatment; Castration; Culling; Marketing;	Feeding; Breeding; Culling/selling; Marketing;	Mating; Feeding; Breeding; Treatment;
Knowledge	Construction of the local, materials, design; Nutritional requirement, components of feeding, frequency and quantity; Evaluation of weight conversion; Identification of internal and external diseases/symptoms and treatment; Characteristics of breed and selection; Technics, materials and operation of teeth cutting; Cost of the activities and record keeping.	Nutritional requirement, components of feeding, frequency and quantity; Advantage of castration, materials, operations and other considerations; Identification of animals for culling and technics; Cost of the activities and record keeping.	Nutritional requirement, components of feeding, frequency and quantity; Breeding, management and requirements; Selection of pigs to reproduction and fattening; Cost of the activities and record keeping.	Nutritional requirement, components of feeding, frequency and quantity; Mating, determination, attendance and follow up, registration; Cost of the activities and record keeping.
Additional topics	Social issues	Social issues	Social issues	Social issues

4.3. STEP 3 ESTABLISHMENT OF THE LEARNING PLOT

The FFS proposes an experiential and practical work, in which a field is established where the participants carry out experimentation, validation and adaptation of the technologies to their conditions.

The activities of this stage of the FFS are the formation of the learning plot, the establishment of the main learning plot study, and the specific studies.

4.3.1. FORMATION OF SUB-GROUPS

Most FFS activities are conducted in subgroups, with five to eight participants each, an ideal number for effective work, that generates learning through all members' participation. The distribution of farmers in groups can be done using a group dynamic conducted in the first meetings of the FFS. It's important to integrate and balance men and women in each group.

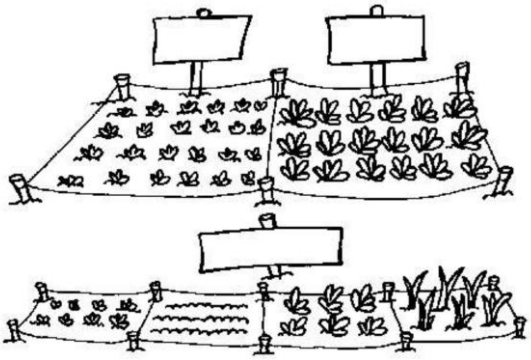
Each subgroup chooses a name that identifies it and a coordinator. In order for the participants to familiarize with the facilitation skills, we recommend that they be given responsibilities in the execution of training activities. These responsibilities can be:

- Support and coordinate the facilitation process.
- Participate in the planning of training sessions.
- Coordinate session schedules.
- Prepare training facilities.
- Support the preparation of field materials.
- Realizar atividades como o registro de assistência.
- Perform activities such as service log.
- Feedback on previous activities, group dynamics, conduct tests and plan activities for the next session.

Finally, each subgroup will be responsible for the conduction of a specific study, where an experiment will be set up, testing several technologies aiming to solve the secondary problems identified in the participatory diagnosis.

4.3.2. MAIN LEARNING PLOT DESIGN

The field in the FFS is considered a "learning field". This concept is different to the "demonstrative field" that usually hope a predetermined result. In the learning field, FFS´s members have the opportunity to test innovative technics (they aren´t necessary new one from the experimentation stations) comparing with the traditional practices used in the local context.



Although members and facilitator hope that the innovations result fine in the study, the result usually is unpredictable, due that the new technology should be adapted to the local condition. Also, it is considered a learning field because the members are who

conduct the field and take the decision, different to the demonstrative field where the technician usually conduct the field and manage all the decision.

Learning tool: Design of the main Learning Plot

Objective	Design the study to solve the main problem of the selected community through experimentation.
Time	1 hour
Materials	Craft paper, colorful markers and masking tape
Procedure	○ Once the main problem in the participative assessment has been identified, members establish the goal they want to achieve through experimentation ○ Then members brainstorm to identify technological alternatives and select the most viable for the community. The facilitator can present alternatives that are available from research centers, universities, etc. ○ The main study will always have: a field that represents the traditional management of the community facing the problem; and another one, where one or a set of technologies oriented to solve the problem will be applied. ○ Then, the facilitator makes a scheme where farmers identify the variable to be studied, as a way of clearing the management plan needed for each plot / field (traditional and alternative technology). ○ Integrated culture management strategies can also be identified, identifying a group of variables to be used, depending on group´s interest and the type of main problem identified in the participatory diagnosis. ○ Finally, we discuss the variables and indicators that will be monitored during the learning sessions and the evaluation of the harvest.

FIGURE 16: RESULT OF THE "DESIGN OF THE MAIN LEARNING PLOT" DURING THE TRAINING OF TRAINER ON FARMER FIELD SCHOOL IN UGANDA.

PROBLEM: Long period the drought is affecting in the incidence of pest and diseases and reducing the yield and incomes.

OBJECTIVE: Increase the soil capacity of moisture conservation.

TECHNICAL OPTIONS: The most suitable practice is the integration of shade management and cover crops to reduce the exposition of soil, increase the organic matter and the capacity to water retention.

Practices	Mulching	Irrigation	Shade	Cover crops	Trenches	Water harvesting
Suitability *from 1 to the less and 5 to the best*	3	1	5	5	3,5	1
Comments	Material not available	Expensive	Seedling available	Farmers engaged	High labor effort	Expensive

ACTIVITIES IN THE FIELD:

	Traditional/control	Modern/innovative
Area	100 trees	100 trees
Pruning	Structure, rejuvenation and health	Structure, rejuvenation and health
Fertilization	400 grams per tree	400 grams per tree
Weed control	Slashing	Mulching created from cover crop
Pest and diseases management	Spraying pesticide	Spraying pesticide
Shade	Not managed	Shade regulation
Soil management	Natural with weed residual	Cover crops

4.3.3. SPECIFIC STUDIES

As an option, small plots with technics different to the considered in the main learning plot can be incorporated to the FFS. On this, facilitator and members can experiment alternatives to solve secondary problems of participative assessment or practices of especial topics considered in the training curriculum. Other technics, according with the interest of the participant can be tested in small areas, or sometime in a small quantity of trees.

Learning tool: Identification and design of special topics more practices

Objective Design additional studies to solve secondary problems or test practices in the "special topics" of the training curriculum through experimentation.

Time 1 hour

Materials Craft paper, pens/marks and masking tape.

Procedure

- Review the problems identified in the "participative assessment" and did not considered in the main learning plot.
- Then members brainstorm to identify technological alternatives, selecting the most viable for the community to solve these problems. The facilitator can present alternatives that are available from research centers, universities, etc.
- These always have a witness (local practice) to stablish the comparison.
- Those studies occupied a small area, usually 3 to 5 trees for treatment to establish compression during the FFS.
- In addition, the special topics related with the crop stage, could become a specific study, for example, test different method of pruning, weeding, types/dose of fertilizers, etc.
- Then, the facilitator makes a scheme where farmers identify the variable to be studied to clear the management plan required for each plot.
- Discuss the variables and indicators that will be monitored during learning sessions and harvest evaluation.

4.4. STEP 4 DEVELOPMENT OF THE TECHNICAL CURRICULUM

This stage consists of the implementation of the training curriculum designed in step II, through a series of typical sessions, as the weekly FFS farmers' meeting is called. It's the main period of training, where studies are carried out and the methodology's tools and dynamics are developed.

In the step 4 the FFS must develop the training in the Typical session, follow up the learning plot with the Agroecological System Analysis, elaborate a field day, apply the second box test and finally evaluate the learning plot to get conclusion about the technics proved.

4.4.1. TYPICAL SESSION

The typical session is the periodic meeting where contents of the training curriculum are developed. A typical session in the community should not fill much of the farmers' day so that they don't become discouraged. A scheduled session should last about 4 hours.

During the session, farmers develop five main activities: field observation, agroecological system analysis, plenary presentation, group dynamics and a special theme. However, most groups add other relevant activities as the example shown below:

A typical session contains the following routine activities:

5 minutes	Registration of Participants
10 minutes	Feedback on the former FFS session
45 minutes	Observations in the field
45 minutes	Agro Ecological System Analysis (AESA)
30 minutes	Plenary presentation of the AESA
30 minutes	Register of information and production cost
30 minutes	Group Dynamics
60 minutes	Special Topic
15 minutes	Plan for the next meeting

4.4.2. AGROECOLOGICAL SYSTEM ANALYSIS

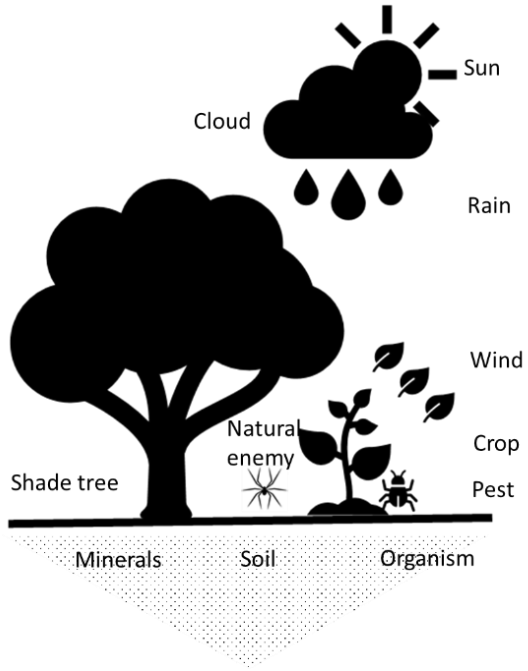
The agroecological system analysis, commonly known as AESA, is a tool created by the methodology and constitutes the heart of FFS. The AESA is a set of three key actions for developing producers' innovation and adaptation capacities: field observation, system analysis and plenary presentation for decision making. The tool takes place at the beginning of each session during the learning portion. This activity is very important since through this process the producers follow the effect of technologies in the development of the culture, and their impact on the production, while understanding the value of maintaining balance in the interrelationships between biotic elements (plant, trees, natural enemies, pests, diseases, weeds, soil microorganisms), abiotic elements (soil

structure, rain and humidity, wind, temperature and other climatic factors) and ecological principles that are generated between them.

To develop the AESA it is necessary to follow the following steps:

Group formation. Performed at the beginning of the FFS; Preferably two groups make the AESA of each traditional plot and adaptation. From session to session, the groups rotate so that each one knows what is happening in the plots well.
Field Observation. The field is visited to establish the number of trees to be observed, usually 10, in which environmental observations are carried out, under the state of the crop, the incidence of pests and diseases, presence of natural enemies, soil status, water, etc.
Data Log. Based on the observations, the data presented in the scheme is recorded and field results reported.
Information Analysis. The subgroup analyzes observation results, analyzing the causes and effects of the phenomena found in the field. They draw their observations for a broader group view.
Group Decision Making. The subgroup makes decisions that will then be taken to the plenary for broad discussion.
Plenary. In order to enrich decisions, the results of subgroup observations are presented to the rest of the members, who debate and come to joint decisions on what to do in the field. This momentum helps strengthen decision-making capacities for sustainable production.
Decision Implementation. Each group implements the decisions taken at the core of the analysis, the results of which are monitored in the following AESAs.

What is an Agroecosystem?



The agroecosystem is a spatially and functionally coherent unit of agricultural activity, and includes the living (biotic) and nonliving (abiotic) components involved in that unit as well as their interactions.

In the coffee agroecosystem, the living components are the coffee tree, the shade trees, the weed, the insects, the natural enemies, the diseases, the decomposer organism, and the soil micro-organism.

The nonliving components are the sun, the water, the wind, the soil structure, and the soil minerals.

FIGURE 17: SCHEME OF THE AGROECOLOGICAL SYSTEM ANALYSIS

AESA No._____

Date:_____ Group/Plot:_____ Hour:_____

_

GENERAL INFORMATION
Weather_____
Crop age_____
Stage_____
Fertilization_____
Status_____

PEST:

DISEASES:

WEED:

Weather drawing

Crop drawing

SOIL
Moisture_____
Compaction_____
Erosion_____
Cover_____

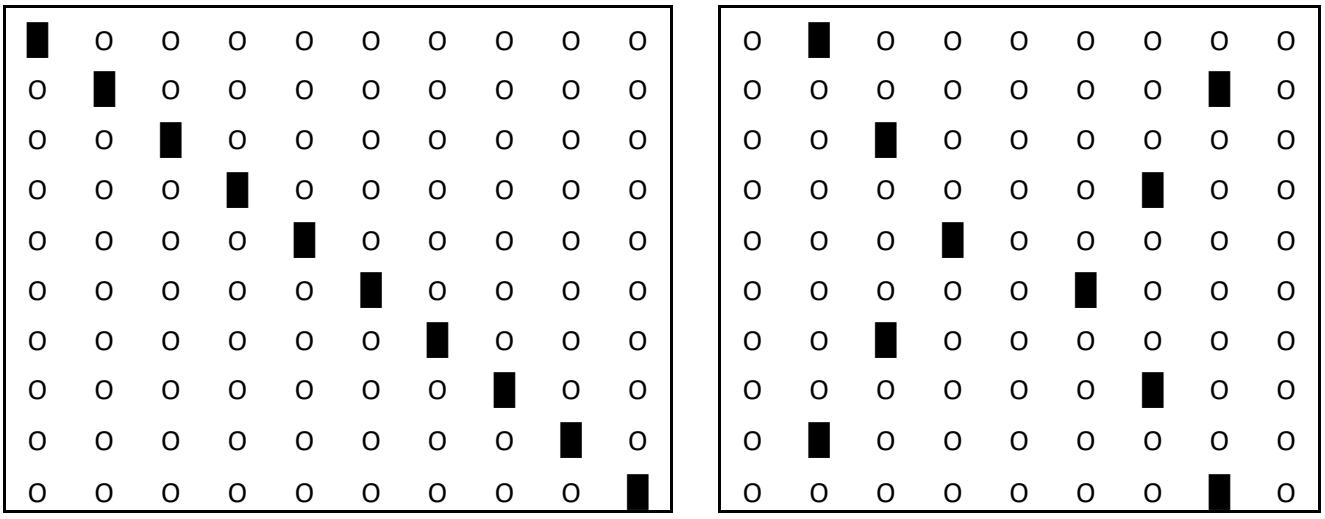
CROP
No. stems_____
No. productive branches_____
No. unproductive branches__
No. nods per branch_____

SHADE
No. species_____
Quantity (%)_____

NATURAL ENEMIES:

Observation / Problems	Analysis/Cause	Decision Taken

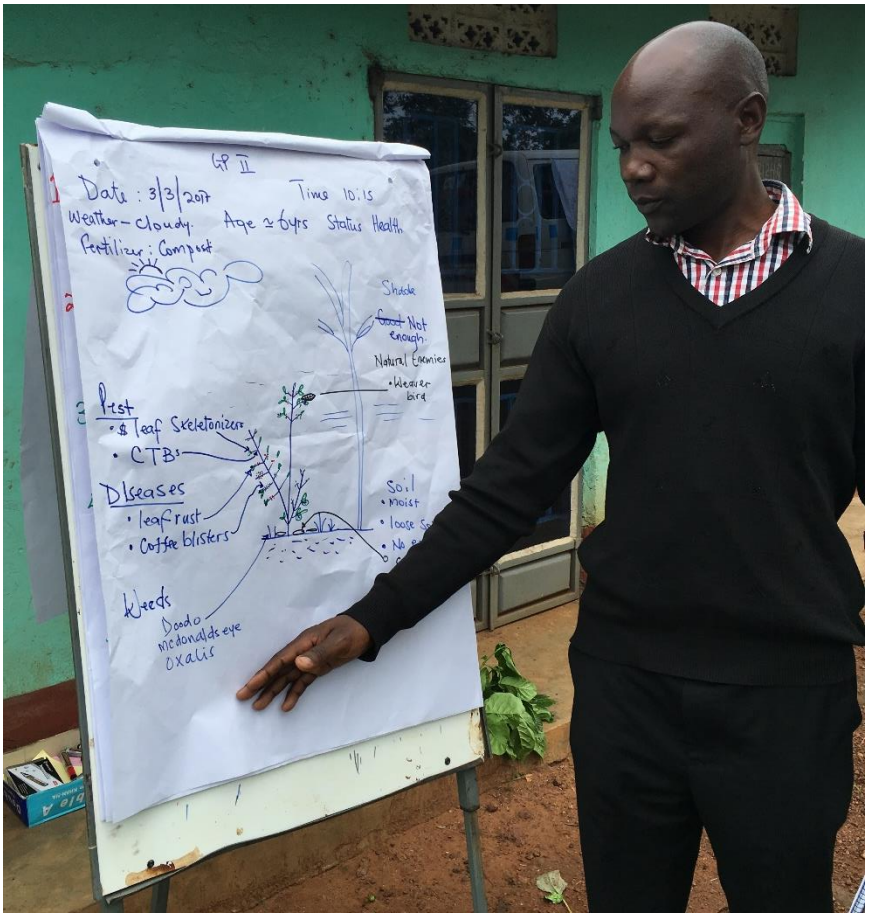
Distribution of trees to be observed



Legend

O	Coffee tree
▮	Coffee tree observed

FIGURE 18: PARTICIPANT OF THE TRAINING OF TRAINERS ON FARMER FIELD SCHOOL PRESENTING THE AGROECOLOGICAL SYSTEM ANALYSIS IN UGANDA.



4.4.3. FIELD DAY

Field day is an event aimed at producers, students, extension workers, researchers, political leaders and other interested parties, in which the preliminary results of the experimental work developed in the FFS are presented. In it, experiences and ideas are shared, and new groups of farmers are motivated to empower themselves using the methodology.

The best time to perform the field day is when the crop is in full production, preferably near the harvest period, so that the guests can experience the results obtained in the field. In addition, field day can be an opportunity for policymakers and other organizations to gain interest and want to support the multiplication of experience in places where there is still no such support.

Field day is an open house where the participants practically expose a set of selected subjects presented in several seasons, contextualizing the problem they are facing, the solution alternatives and the results obtained with the practice used.

The procedure during field day is as follows:

- **Invitation preparation:** In advance, members list the names of key individuals and institutions to attend the field day. As it is a broadcast event, we expect a large number of people, but we suggest keeping the limit of up to 100 guests.
- **Selection of subjects:** Participants brainstorm the subjects they wish to present and select from 5 to 8 subjects. The selection must include the subjects faced in the experimental portion. Other important issues addressed during training can also be considered.
- **Station preparation:** The station should be very practical; We suggest not using written material, but rather the field itself to support the explanation. The content of the station should contextualize the local problematic identified in participatory diagnosis, how it affects the production and sustainability of production, the practices or technologies available to solve them, and the experience of using the one that was selected by the group and which is being proved in the field.
- **Guest log:** In field day, the first activity is the registration of guests, held in a table placed at the entrance of where the event will be held. One person notes the name and origin of visitors. Each person must receive a ticket with a random number equal to the number of stations prepared by the participants. Example: if there are 8 stations, each participant receives a ticket with numbers from 1 to 8.
- **Welcome and Inauguration:** Once participants are registered, a person, usually the community president or another host, addresses the audience and welcomes them.
- **Introduction**: The facilitator or an FFS representative intervenes explaining what the FFSs are, their concepts and principles and explanations regarding the approaches used in training (in this case, climate change and challenges for the sector).
- **Explanation of methodology and group organization:** The facilitator selects people who will act as guides, equal to the number of stations, and requests their presence in front of the participants. Each guide shows their number and asks each guest to queue in front of the guide that has the number equal to the one ticket awarded at the registration.
- **Field Day development:** Once groups are organized, guides lead guests in front of the station corresponding to their number. The facilitator uses a whistle to signal the start and end of the exhibitions and the station exchange. When giving the start signal, the exhibitors develop their subject in between 7 to 10 minutes; The second signal indicates the end of the exhibition and the beginning of the round of questions lasting between 3 and 5 minutes; The third signal indicates the end of exposure and exchange of station. The process is repeated according to the number of stations, each group running through all stations in an orderly manner.
- **Plenary:** When the visit is over, the guides guide the guests to the place where they start, where they have 20 minutes of plenary session, so that doubts, questions, suggestions or impressions are shown and answered by the organizers. The plenary session is held to improve future field days or FFSs that might take place.
- **Closing:** The conclusion of the event is leaded by one of the organizers, who concludes by thanking everyone.

4.4.4. BOX TEST II

This test is similar to the one performed at the beginning of the FFS (activity 2.3), used to identify the level of individual and collective knowledge of the participants. The facilitator should maintain the same questions asked in the first test in order to make a comparison between the initial and final results. It´s expected to have an increase in the degree of individual and collective knowledge of participants.

4.4.5. HARVEST AND ECONOMIC EVALUATION OF LEARNING PLOTS

When crop complete its productivity cycle, members harvest the plots of the main and specific studies to evaluate the results of the technologies. This activity is very important to consolidate the learning and get conclusion about the use of the innovations to solve the local problems. To evaluate the plots, each sub-group have registered all the activities, the production cost, the yield and the opportunity prices in the market. The procedure is presented in the following learning tool.

Learning tool: The Box Test II

Objective	Evaluate the results of the main and specific studies
Time	4 hours
Materials	Craft paper, pens, calculator, field data on portion profits and production costs.
Procedure	o Each subgroup collects the learning share and the specific studies. A systematic record is important to separate and weigh the production of each parcel, noting in the notebook the field information. o Once the data is obtained the information is analyzed, calculating the productivity and cost of production per unit (hectare, sack, etc.), dividing the total cost of production by productivity. o Next, the gross benefit is calculated by multiplying the total output by the selling price of the product. o Then the net benefit is calculated, subtracted by the costs of production from the gross benefit. o Finally, the group closes each portion.

4.5. STEP V GRADUATION AND POST-GRADUATION

FFS's activity do not end when the crop cycle ends. The group can take advantage of the shared/obtained potential to carry out other collective actions. After graduation, when the group officially finishes its studies, members, along with the facilitator, plan future activities.

4.5.1. GRADUATION EVENT

The graduation event is of immense importance to farmers and facilitators because it´s the opportunity to share and disseminate the knowledge gained throughout training with the guests by presenting results of the learning portion (productivity, production cost, gross and liquid benefit) and the specific studies.

Together with the producers, a list of guests is drawn up and details of the date and location of the event are defined. The graduation is addressed to local authorities, representatives of institutions and community members. The delivery of the invitations must be done with the anticipation, to guarantee the attendance of the invited ones.

The graduation is a social event with a strong technical content, in which participants have the opportunity to present the final results of their work and present their conclusions. The following is an example of such a program.

Graduation Event Schedule:

Activity	Responsible
Schedule presentation	Facilitator
Words of welcome to guests	Official community representative or organization
Presentation of graduates	Facilitator
Explanation about FFS	FFS´s President
Presentation of results obtained in the main plot and in the specific studies	FFS´s Participants
Certificate delivery	Local Authorities or another special guest
Intervention by the authorities present	Authorities
Closing of the program	Group´s Representative

4.5.2. PLANNING OF FOLLOW-UP ACTIVITIES

FSS´s capacity building activities should not end after a season dedicated to experimenting with climate change adaptation practices. FSS can continue to cover complex issues, such as the conservation and enhancement of soil fertility, water conservation and biodiversity. Farmers need easy-to-observe indicators to apply to more complex processes not only at the farm level but also at the community and watershed levels. Thus, the group can continue to deal with production issues (second cycle FFS or diversification of production), organizational issues (association formation or cooperative) or issues of market access (joint purchases and sales). According to experiences in several countries, it is necessary to carry out organizational strengthening processes so that groups can identify their purposes and objectives, improve their management and negotiation capacity and be able to execute their plans and projects.

RECOMMENDATIONS

- The suggested FFS-approach described in this report is slightly different from the current FFS practice in Uganda. It is recommended to implement the new approach in a "pilot phase" in a specific project, like the climate change project, to test and establish a referential to compare the result and impact of the past and new approach.

- There was a discussion about the real objective of the plot used in the FFS to follow up of the technologies. Usually, the FFS applied before did not have a specific place, it means, each session the group rotate to farms of each member. The recommendation is to establish a permanent field where the technologies that the program/community want to be tested to observe monthly, and then the facilitator and FFS members can do a schedule where the "special topic" can be developed in different farms from members.

- Experiment/test the adaptation practices to the climate change identified in the c&c approach in the FFS. It could allow to the facilitators put in practice the new approach of FFS where there are identified the problems, the innovative options, and the practices (treatments) to be compared with the local practices. Practices of shade management, cover crops, use of organic matter and the identification of pests and diseases can be incorporate in the training curriculum.

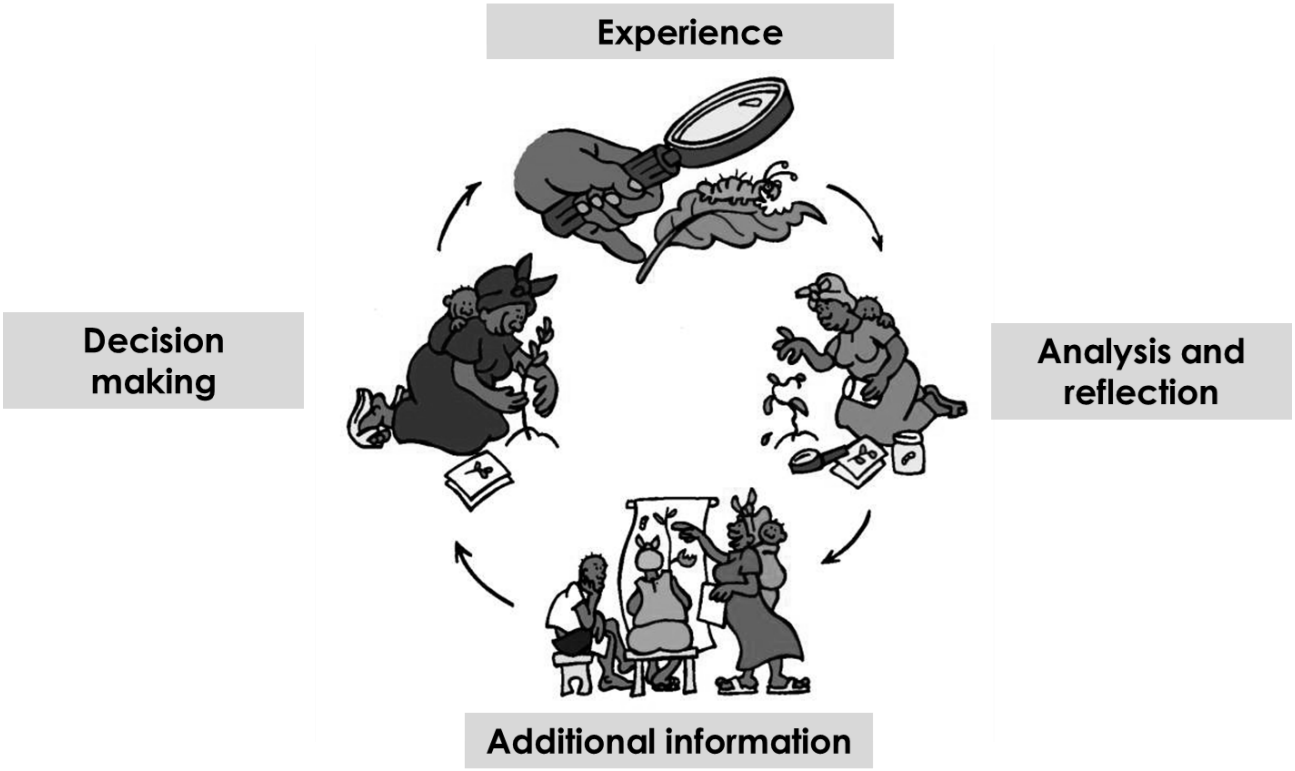
- It is recommended schedule the FFS session by session, trying to develop the typical activities and one or two special topics, about the phenological stages, ecological principles, climate issues or social skills. The session should to last 4 to 5 hours. The FFS cycle on coffee will last one crop season (one year) with biweekly or monthly sessions. The FFS program can be continuous in the community, but attending the various aspects of the production. For example, FFS on coffee, as main crop, should be studied in one or two cycles, monitoring the advances of the knowledge level through the box test and the results of the learning plot to graduate the FFS. Following, other stages of the coffee production can be studied, like coffee seedling production in nurseries, renovation of coffee plantation, coffee processing, etc. Then, the facilitator can promote FFS on the other crops produced in the community, maybe incorporating other social groups, like women and young.

- As a strategy to diversification, improve the food security and increase the family income, other crops could be promoted through the FFS approach. For that, it is important to guarantee the group was graduated in the FFS on coffee, and that there is the need to learn and the interest to try other activities with the methodology. Also, projects focused in youth or gender could promote the crop under control and access of these family groups.

APPENDIXES

As mentioned in some parts of the FFS content, the aim of this methodology is that farmers understand, through the experiences and the experimentation, the ecological and phenological principles of the coffee agroecosystem. It applies to the management practices of the coffee, of which producers must be fully aware of their importance. For that, facilitator can use "learning tools", different exercises/practices that apply the principle of "learning by discover" described in the adult education.

FIGURE 19: SCHEME OF THE LEARNING BY DISCOVER IN ADULT EDUCATION



Following some exercises are presented which were used during the Training of Trainers to show the application of the 'learning by discovery' to develop special topics related to the coffee management and also to develop social skills.

APPENDIX 1: SHADE

Learning tool: Shade analysis in the coffee crop

Objective

Establish the percentage of shade in the coffee crop

Time

30 minutes

Materials

Copybook, pencil, flipchart, markets

Process

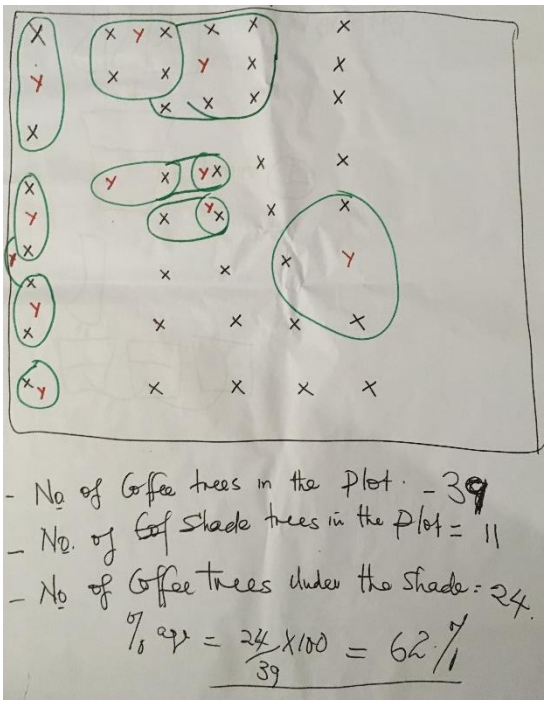
- Walk into the plot and draw a sketch of the distribution of the coffee trees and the shade trees;
- Represent the coffee trees with a "x" and a shade trees with "y";
- Return to the initial point and circle in the sketch the coffee trees that are under shade according with the field observation;
- Respond the key questions and take the decisions.

Key questions

- How many coffee trees are in the plot?
- How many shade trees are in the plot?
- How many coffee trees are under shade?
- How is the percentage of shade in the plot?
- This shade percentage is low, suitable or high?

Conclusion

It is important to take in account the following principle: Low and warm regions need a higher percentage of shade between 40 to 60% according to the latitude (higher when closer to the equator); High and cold regions need lower percentage of shade between 20 to 40% according to the latitude (higher when closer to the equator).



Like Uganda is located in the low and warm region, the percentage of shade should be among 40 to 60%. In case of the exercice, there was established a percentage of shade of 62%, it means higher of the ideal level. As decision, farmer must to regulate the shade to decrease the percentage of shade to benefit the coffee and prevent problems caused by the excesive shade.

APPENDIX 2: ORGANIC MATTER

Learning tool: Determination of the soil moisture

Objective

Determining soil water absorption and retention capacity.

Time

1 hour

Materials

3 samples of soil (poor soil from the road side, soil from the farm and soil with organic matter); 3 socks; 1 scale; 1 water bucket; 3 glasses; 1 stop watch clock.

Process

- Collect three different soil samples. The first should be a poor soil, for example soil from the road. The second should be a common sample for example from the farm. The third should be a sample rich in organic matter, for example compost;
- Fill the socks with 1 kg of each sample and weigh them to take the initial weight
- Immerse the socks in water for 2 minutes;
- Take out the samples and carefully collect the dropping water into to the glasses. Don´t shake the socks and wait until the dripping completely stops from the socks;
- Weigh the socks again and analyze the results (compare initial weight and the second weight. The different is the amount of water retained in the soil sample).

Key questions

- What sample did occupy more space in the sock?
- What was the final weigh of each sample?
- What sample was fuller after the water dripping from the sock?

Conclusion

Organic matter improves the capacity of the soil to absorb and return water in the soil. The biggest and cheapest water reservoir is the soil, when this has organic matter. One way of check it out, is through a small test comparing different soil samples.

In the exercice, the sample with manure was had the highest weight and its glass was fuller than other samples. It means the capacity of this type of soild to absorb (glass water) and the retaintion (higher weight) compare with the other samples in the experiment. Manure has the capacity to absorb and retern more water than other soils.

APPENDIX 3: PRUNING

Learning tool: Shade analysis in the coffee crop

Objective Discuss and define the criterial to choose the stamps and branches to be pruned.

Time 1 hour

Materials Coffee field, rope, handsaw, pruning shears.

Process

- Each sub-group choose a coffee area of approximately 200 m2 for doing the analysis;
- Farmers analyze the structure, the sanity and the current production of the tree and mark with a rope the stamp/branches to be pruned for presenting problems;
- To mark the stamps/branches farmers discuss different criterial, as the conduction, the size the age of the stamp, the vigor and the productivity, the presence of pest and diseases, and any other consideration;
- The results are presented in plenary on the field and the group establish conclusions;
- Then, farmers can implement the decision, if it is the pruning stage, or leave the rope in the trees to apply the decision in the future.

Key questions

- What happen with the but structured, damaged, diseased or old?
- How do they harm the incomes?
- How is the status of the stamps in your garden?

Conclusion

The pruning is a necessary technology to incentive the increase of productivity, quality and efficiency in the garden. Robusta coffee (*Coffea canephora*) demand that pruning should be applied periodically to improve the structure because it is a tree multi-stamp. It conditions cause harms by the infestation of pests and diseases, delay in the cherry maturation, difficult in the harvest producing coffee of low quality. Also, a large number of stamps, harms the crop nutrition and competition among the productive stamp and unproductive stamps, reducing the yields.

During the exercise the participants evaluated the field where there are a large number of stamp for pruning. The main reason was the size and the age of the stamp and the structure that produce shade to the new stamps.

APPENDIX 4: ORGANIC MATTER

Learning tool: Identifying the life in the soil

Objective Compare the soil life in diverse types of soils including the manure.

Time 30 minutes

Materials Four different samples of soil (from the road, from the garden, from a degraded area and manure); three plastic glasses and one peroxide´s bottle of 100 ml.

Process

- Collect some samples of soil from various places or qualities, as example, a poor soil of the road or degraded areas, soil from the coffee garden, soil rich in organic matter like manure or soil of below the shadow trees;
- Place each soil sample in one plastic glass to held the experiment;
- Add three cups of peroxide, observe the soil reaction and compere them and stablish conclusions.

Key questions

- What happen when we put peroxide on a hurt?
- Why the reaction in the soil samples were different?
- What we can conclude from the exercise?
- How can we apply the result of this experiment in our garden?

Conclusion

Organic matter improves soil productivity; plants grow better in soils with high organic content. There are many reasons for this. First, the decomposition of organic materials adds vital nutrients to the soil (organic materials contribute nitrogen, phosphorus, potassium, and many other micro-nutrients). Organic material also improves the soil structure and keeps nutrients from being washed away by rain before the plants can use them. Organic matter also acts like a sponge, helping retain moisture in the soil.

In this experiment, learners compare the amounts of organic matter in different soils on their site. A chemical reaction between soil carbon and hydrogen peroxide makes this possible. Soil is mixed with hydrogen peroxide (H_2O_2). The carbon from the organic matter in the soil bonds with the oxygen (02) in the peroxide to form carbon dioxide (CO_2) bubbles and water. The carbon dioxide (a gas) occurs as bubbles that the learners can observe. Vigorous, long-lasting bubbling indicates a large amount of organic matter. Since the carbon is bonding with the oxygen, scientists say that the organic material has been "oxidized". You will notice that once the bubbling process is complete, the soil has changed color.

APPENDIX 5: PESTS AND DISEASES

Learning tool: Identification and damages of pest and diseases

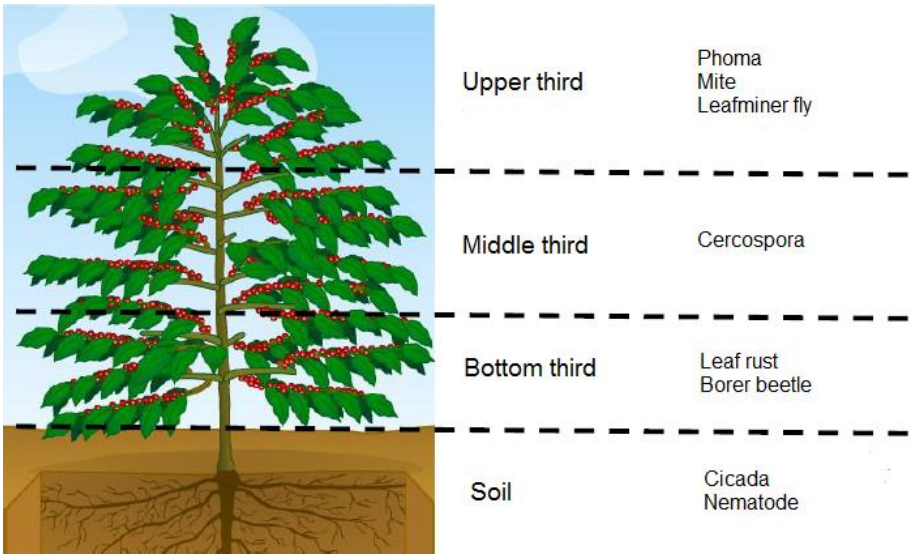
Objective Identify the damage caused by pests and diseases and establish the incident percentage.

Time 2 hours

Materials Coffee field, coffee´s leaf and cherries from different section of the tree.

Process

- Facilitator organize the participants in sub-groups to execute the tool;
- Of preference, each sub-group will be responsible to collect leaf and cherries from different sections of the coffee tree: upper third, middle third and bottom third;
- Each pest and disease monitoring require a specific place to collect the sample (leaf or cherry). Usually, the sample should be the third pair of leaf from a middle branch of the stamp. In the case of phoma the sample must be the first pair in the upper third;
- To facilitate the calculation, farmers can collect 100 leaf of cherries;
- Farmers group similar damage, try to identify its cause and account the number of leaf/cherry to establish the percentage of incidence.



Key questions

- What was the main problem identified in the farm?
- Do you know all the pest and diseases?
- What can do to solve the problems?

Conclusion

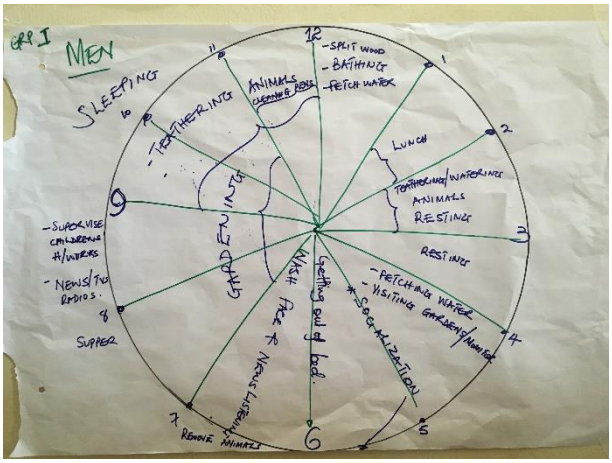
Coffee is a crop vulnerable to attack of pests and diseases. It is important to know them and to understand the type of damage and the effect produced in the crop. Also, it is important to know the condition of the crop (stage) and the climate to allow the development of these organism.

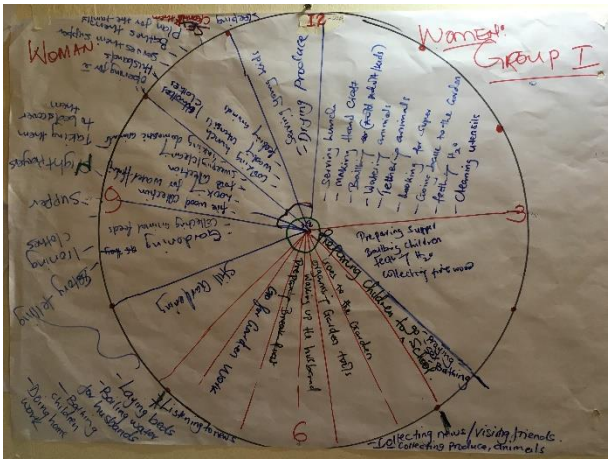
The monitoring to identify the pests and diseases and the level of attack (incidence) is a crucial step to decide if farmer need to apply some control to don´t have economical losses.

APPENDIX 6: GENDER

Learning tool: Clock of activities of gender

Objective	Sensitize on the role of the family members and its contribution on productive and reproductive activities daily.
Time	1 hour
Materials	Craft paper, pens/marks and masking tape.
Process	○ Facilitator organize two sub-group with the members of the FFS. It is important to mix in each group men and woman of different age; ○ They are asked to draw a clock and register all the daily activities held by both, men and women. Facilitator recommended to remember all the activities with details; ○ The final work is presented in plenary for the analysis of all the members and purpose some conclusion about the importance of the role of each family member; ○ The tool could be adapted in case of having young in the group. In this case, one additional group can be formed to ask about the daily activities realized by this family group.
Key questions	○ Are the activities of men and woman similar? ○ What role is the most important for the family? ○ What happen if the contribution of one family member is missed? ○ How men could support to the role of the women and how woman could support the role of the men?
Conclusion	Men and women have different role in the family activities, each one with high importance, consequently, it is impossible to say which role is more essential. Usually the day is more overloaded for women than men, because they combine a productive role, in charge of activities in the farm with self-consumption crops and livestock, and the reproductive role, it is taking care the children, concerned with the education, health and food. While men usually oversee the productive activity, especially in the cash crops or even other source of incomes.





APPENDIX 7: COMMERCIALISATION

Learning tool: Plan of commercialisation according with the cash flow

Objective

To plan the commercialisation of coffee and other cash crop to finance the family and the farm needs during the year.

Time

1 hour

Materials

Craft paper, pens/marks and masking tape.

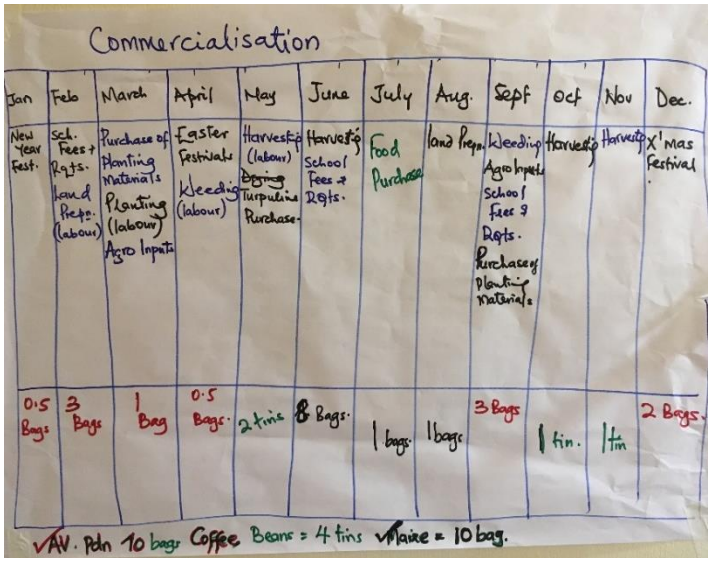
Process

- Facilitator organize two sub-group with the members of the FFS. It is important to mix in each group men and woman of different age;
- They are asked to draw a calendar split monthly;
- The next step is to list the different activities to the farm and family level that need investment;
- Them, they must list the crops and the average yield per crop in a common family in the community;
- Knowing the cash need and the available production per month, farmers distribute the incomes to satisfy the farm and family need in a scheduled way;
- Finally, facilitator ask to apply the tool individually, to each member of the FFS;
- It is suggested to plan the application of this tool with other members of the family. It means invited the husband or the wife that are not participating in the FFS to join to the member and plan the commercialisation in a democratic way.

Key questions

- When is the month with most demand of investment?
- Which are the farm activities with most demand of investment?
- Which is the family need with most demand of investment?
- Is the ongoing family income enough to satisfy the farm and family need?

Conclusion



to satisfy all the family and farm needs it is necessary that family farmers schedule the revenues obtained from the commercialisation of the farm production.

The first step to get this aim is to know the basic demands in the family and farm level. Once farmers and their families analysed the need, they can take the decision about the commercialisation to get the resources to satisfy their needs and decide if the incomes are enough for this aims. In case of not, the farmers, the group of FFS can discuss about the productive alternatives to increase the incomes.

APPENDIX 8: TRAINING EVALUATION

The training was developed in four days where 16 participants from Hanns R. Neumann Stiftung Africa. During 4 days, there were developed theory and practical activities. In the end of the training there was evaluated different aspect of the training with a tool "cup of coffee" to measure the satisfaction level for the understanding and performance of each item.

The score of the training, according with the evaluation was of 4,68/5 with a 72% of full satisfaction of participants. There were registered votes from the middle satisfaction to full, being the low option no voted.

FIGURE 20: RESULT OF THE TRAINING OF TRAINERS IN FARMER FIELD SCHOOL EVALUATION IN UGANDA.

	 5	 4	 3	 2	 1
	Member(%)	Member(%)	Member(%)	Member(%)	Member(%)
Methodologic approach	11 (65%)	6 (35%)			
FFS preparation phase	14 (82%)	3 (18%)			
FFS experimentation design	15 (88%)	2 (12%)			
Field activity (learning tools)	14 (82%)	3 (18%)			
Participation	13 (76%)	2 (12%)	2 (12%)		
Facilitation	14 (82%)	3 (18%)			
Application of the approach	6 (35%)	10 (59%)	1 (6%)		
Time	11 (65%)	4 (24%)	2 (11%)		
Total	72%	24%	4%		