FARM PLANNING AND ORGANIC AGRICULTURE MANAGEMENT PRACTICES

A Training Manual

Jamesly T. Andres

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MESSAGE

Benguet State University continues to pursue its commitment of providing extension services that are research results aligned with quality education and sustainable development practices. This year's University Foundation theme, "Creating Milestones toward Global Engagements: BSU @102," makes this knowledge product (KP) timely and relevant. It concretizes important steps to bring to fruition our vision of delivering quality education and client satisfaction that promotes sustainable development.

Through this module, BSU has upscaled research-based initiatives and technologies thru handy materials for use by varied audiences - from farmers, to homemakers, to fieldworkers and extensionists. By circulating this knowledge product, the development of a critical mass of farmers who adopt and champion BSU technologies will be facilitated effectively and support sustainable development and continuing innovations from the field. It is our fervent hope that in the long run this knowledge will contribute in improving quality of life and increasing income of our communities and clients.

I congratulate the Office of Extension Services' team for producing this knowledge product which is a testimony of BSU's prolific knowledge generation and continuing commitment to serve its communities. This should encourage other knowledge holders to work on translating their knowledge to tangible KPs.

Mabuhay tayong lahat!

FELICIANO G. CALORA JR.
University President
Benguet State University
27 September 2018

MESSAGE

The Research and Extension (R&E) sector's goal explicitly states highlights the generation of "relevant and gender sensitive research and extension programs for institutional development, sustainable communities, climate resilience, industry innovation and partnerships." To do this, there is a need to share research results in different platforms for BSU- R&E outputs to reach the widest audience possible. The knowledge products produced by the Office of the Extension Services is a step towards addressing the different client needs in this increasingly competitive and changing world. With many years of extension work, there is also an increasing recognition to capacitate Extension Service Providers aside from directly working with clients, and one way is to produce knowledge products (KPs) tailored to answer this emerging need of the sector. Many of the knowledge products developed therefore are for these extension service providers. Specifically, this training manual on organic farming and management practices which puts together long research work outputs as well as actual experiences, aims to facilitate the work of the university research and extension.

It is hoped that this KP will be utilized and will serve its purpose which is a handy guide for extension workers, and also the bigger public such as the farmers in the region and in the neighboring provinces with similar environmental condition. The training manual is a concrete manifestation of technologies generated in the academe and translated into a language that can be used by the popular sector.

I congratulate the Extension sector for coming up with various knowledge products which is a timely response to the very fast changing and challenging prospects of the times. Being the lead University in the region, it is but proper that we also lead in this kind of engagements,while working for excellence and innovation for client satisfaction.

CARLITO P. LAUREAN
Vice President for Research and Extension
Benguet State University
27 September 2018

MESSAGE

In the journey of extension work, we gain knowledge through our exposure to different fieldwork experiences and interaction with our development partners. In the process, we generate knowledge and build on it – thereby making each one of us "knowledge holders" and is magnified in the collective knowledge of our University. One way of retaining and ensuring intergenerational transfer of knowledge is through knowledge products. Knowledge Products or KPs, in the context of knowledge management, aim at transferring knowledges to identified users. What makes a KP unique is that it is a "call to action" by its intended users, enabling application of the knowledge easy and handy. This is the purpose of the training manual developed by the College of Agriculture.

What comes with this exercise is the "communication and pursuasion" package, a task taken by the Office of Extension Services (OES). In the process of doing these tasks, admittedly, the OES had several realizations: the urgency of tapping knowledge holders (who are retiring), the need to maximize resources which required a multidisciplinary lens and in the process, the need to refine some "extension processes" necessary for extension operation to adapt to the "changing times." It was a difficult task, but in this way, we have innovated the generation of knowledge for our intended specific audiences.

In this age where knowledge-based economy is increasingly becoming important, we believe that knowledge generation, transmission and application is facilitated through the culture of sharing. Through this training manual, we hope to contribute to the circulation of technology and innovation menu while innovating further on knowledge and technologies.

RUTH S. BATANI
Director
Office of Extension Services
Benguet State University
27 September 2018

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- the Office of Vice President for Research and Extension headed by Dr. Carlito A. Laurean for the support and encouragement in developing knowledge products; and

- the Benguet State University headed by Dr. Feliciano Calora Jr.

PREFACE

A lot of effort has been done by Benguet State University (BSU) when it comes to organic agriculture. Thus, this material on the topic is one of the breakthroughs in our effort to espouse organic farming to BSU stakeholders and beyond.

This training manual talks about organic farming in a holistic manner. Specifically, it shares about farm planning and organic agriculture technologies; crop programming; plant maintenance and care; food processing; and farm record keeping. The manual highlights the practical experiences of the pool of experts at the College of Agriculture and organic practitioner collaborators.

This training manual is aimed to be used by agriculture extension workers in delivering organic agriculture technologies to farmers. The need from Local Government Units, Non-Government Organizations, and People's Organizations can now be responded through this material. As they are in one with BSU in its effort to advocate for safer food to the public and concern to environment. It is hoped that more farmers will venture into responsible farming.

Further, programs in SUCs offering organic farming in their curriculum can also use in this material to teach their students about organic farming.

JANET P. PABLO
Dean
College of Agriculture
27 September 2018

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Module I

Farm Planning

The goal of this module is to highlight the significant aspects to be considered in farm planning to effectively manage resources in organic farming.

Module Delivery Plan

Title: Farm Planning
Number of Lesson: 1 lesson
Number of Session: 3 Sesisons
Total Duration: 8 Hours

Lesson Number	Lesson Title	Learning Objectives	Delivery Mechanism	Duration	Resources Needed
1	Farm Planning, Organic Agriculture Technologies	At the end of the lesson the learner should be able to: a. Describe the importance of farm planning; and b. Discuss the important considerations in proposing a farm plan design.	a. Lecture	2 hours	• LCD Projector • training manual • whiteboard and marker • computer
			b. Field Visit	4 hours	• transportation • food (snacks) • prior arrangement • training kits
			c. Workshop	2 hours	• manila paper • pentel pen • scotch tape • food

LESSON 1: Farm Planning, Organic Agriculture Technologies

I. LEARNING OBJECTIVES

At the end of the lesson, the learner should be able to:

1. describe the importance of farm plan and design; and
2. discuss the important considerations in proposing farm plan and design.

II. ACTIVITY

ACTIVITY	MECHANICS	DURATION	RESOURCES NEEDED
Session 1: Lecture	1. Discuss key topics based on the discussion guide.	2 hours	• LCD projector • training manual • white board • computer
Session 2: Field visit	1. Visit an organic farm with the following characteristics: • with an established farm plan and design, which has been implemented for at least five years (with composting area, nursery, growing area, packaging area/post-harvest facility, biodiversity area); and • with organically-grown crops in rainy season or dry season. 2. Visit an actual In-progress organic farm and note the following: ▪ the farm plan which has just been implemented usually less than three years (with growing area, composting, nursery area); and ▪ the modifications done to improve the plan (i.e. biodiversity	4 hours	• transportation • food (Snacks) • prior arrangement • training kits

	area, source of biomass for composting).		
Session 3: Workshop	The participants will be grouped into two: • Group 1 will visit the area for conversion (high susceptible to pollution and contamination); ▪ pollution control (neighboring farms using chemicals);and ▪ pollution on farm transport due to fumes and dust. 5-15 minutes interval= High 15-30 minutes interval= Medium 30-45 minutes interval= Low ▪ Windbreaks/ Buffer zones: these established trees or shrubs, bamboos, Napier grass source as pollution control); ▪ Irrigation source: the possibility of contamination of irrigation. ▪ Check use of pesticide Spray every 3-5 days= High 7-14 days interval= Medium 30-45 days interval= Low	2 hours	• manila paper • pentel pen • scotch tape • food

	▪ Group 2 will visit an area not needing conversion (less likely susceptible to pollution and contamination) and consider these aspects of the farm plan: ▪ pollution control, what are the possible wind breaks that can be easily established; ▪ nursery; ▪ growing area; ▪ composting area; ▪ biomass, identify biomass sources; and ▪ irrigation source (level of chlorine content, e-coli especially water coming from river) and consider some bioremediation measure to control irrigation pollutants in the plan. • Both groups will come up with a farm plan considering the different parameters needed for organic farm conversion. Outputs will be present it for critiquing.		

III. DISCUSSION GUIDE

A. DEFINITIONS OF FARM PLANNING

According to AgriInfo.In, farm planning has been defined by different farm economists as follows:

- farm planning is a process to allocate scarce resources of the farm. This is also to organize farm production to increase the efficiency of resource use and the income of the farmer.

- It is also deciding what to do in the future specifically the best combination of crops and livestock to be raised.
- Farm planning is mainly a process of choice making or choosing from among competitive alternatives. It is concerned with various adjustments the farmer makes in the existing organizations, with the purpose of making the most profitable use of scarce resources.

B. IMPORTANT CONSIDERATIONS IN PROPOSING FARM PLAN AND DESIGN

Planning the design is the most important thing we do at the start. The tips below can help the farmer in the planning process.

1. **Identify the available resources, observe, and ask the local people**
   a. Identify the source of biomass for composting within the farm.
   b. Locate areas for planting leguminous trees since these are one of the sources of raw materials for composts.
   c. Designate areas in the farm where animal integration can be done in order to have source of farm manure.

2. **Topography or slope of the farm**
   a. Slope of the farm should be considered in identifying and selection of crops to be planted. Slope of the farm determine what crop can be planted, steep slope are for forest trees, sloppy areas are reconverted for fruit trees and level areas are for crops. For example, fruit trees are suitable for hilly areas.
   b. Riprapping recommended for steep slopes as soil conservation method especially in the Cordillera. The farmer can also integrate riprapping method.
   c. Soil conservation practices for soil erosion control are important considerations for improving sloppy areas. Technologies such as Slopping Agricultural land Technology (SALT) and stonewall riprap is possible.
   d. Plans on proper soil and water conservation practices should be considered.
      - mulching
      - rain protection mechanism to avoid soil erosion
      - rain water harvesting
      - construction of canals for drainage

3. **Climate and Micro-climate**
   - Rainfall pattern in the farm should be observed in setting up structures for rain shelters like greenhouses.
      - Check rainfall amount and rainfall distribution in the area that the rain shelter or green houses can withstand rain load.
      - Tunneling and rain shelter can be options to reduce the negative effects of rain on crops such as rotting and soil erosion on plots.
   - Temperature and humidity determine the crops that can tolerate heavy rainfall and the possible ways to mitigate heavy rain that damage crops that are sensitive to rain.

4. **Structures**
   a. Determine the best area for establishing greenhouses, nursery, packing shade, pathways and irrigation facilities, and drainage.

b. Planning and designing possibilities to control incidence of pests and diseases must be done to reduce negative effects to crops such as repellants.

5. Soil and Fertility

a. Determine the soil properties in developing the plans including soil conservation methods for sustainable soil health management.
b. Planting of biodiversity area as source of biomass for composting.
c. Consider mulching and soil protection to prevent erosion.
d. Proper drainage to reduce plant stress and water logging.
e. Consider soil sampling and soil testing so that you can propose plans to improve pH, nutrient status, and structure of farm soil.

6. Water

a. Consider the source of irrigation for the farm is accounted and water contamination from pesticides coming from other farms, pollution, and toxic wastes or effluent.
b. Include water harvesting such as establishing rain barrels or dug out for water impounding.
c. Include water conservation methods like mulching, water efficient irrigation techniques and organic matter application.

7. Sunlight orientation

a. Proper row orientation of plots is necessary to provide equal sunlight distribution in the production areas.
b. Sunlight distribution is needed to enhance photo synthesis and reduce incidence of fungal and bacterial diseases.
    - Sun loving plants like solanaceous crops prefer light exposure to support flowering and fruiting.

C. BENEFITS OF A GOOD FARM DESIGN

1. Better productivity and product quality

a. A very good farm plan is a good guide to determine the cropping scheme and pattern for a sustainable farm production and to maximize farm resources.

2. Holistic management of cropping and pest problems

a. Within the whole farm duration, the inventory of available resources and utilization is documented.
b. In estimating a composting area, the plan helps in identifying the proper location and how wide the spaces should be.
c. Cropping pattern and pest management – there is an arrangement in such a way that the cropping pattern (rotation, programming, pest management practices, harvest and post-harvesting practices) will start in the growing area. Cropping pattern also includes the consideration of the maturity period of the crops integrated for continuous harvest and income of the farmer. Cropping pattern and rotation are strategies to manage pest by not integrating crops of the same family.

3. Less overall input costs

a. All should be planned and programmed in order to maximize the resources, and minimize input costs. This is also in relation to having a good inventory of the resources present and assessment of the biotic and abiotic factors.
    - In pest management, if not planned, time can be wasted. However, if it is sequenced, time is maximized.

4. Less use of natural resources

a. The primary natural resource used is water, which is scarce especially during the dry season. There should be a plan for water usage in order to maximize its use. Water is also distributed easily when its management is planned.
b. This is in relation to use of residual water and fertilizer not used by the present crop.
c. Facilitates soil conservation practices and fertilizer management.
d. Biodiversity area and possible sources of biomass for compost is maintained.

5. Profitability

a. If there is lesser input cost, the profit becomes higher.
b. Develop a planning strategy that crop programming is a tool that produce crops that are off season and crops with high value and high market demand.

6. Accessibility

a. The composting area should be near the road for easier transfer of materials.
b. Consider farm-to-market access for both input and output.
c. Post-harvest facilities should be in a convenient place where harvest is gathered and prepared for packaging and transplanting.
d. Plan the best possible ways that farm operations should be managed with easy access to different service facilities in the farm.

7. Aesthetic value

a. This considers the arrangement and beauty of the farm, ambiance, and enhancement of the natural condition for additional income.
b. If the area is small and if it is aesthetically pleasing to the eye, it can become a potential spot for agri-tourism.
c. Arrangement of crops where sun loving plants are placed in places where sunlight areas are exposed. Shade plants are placed under partial shaded place.
d. Landscaping skills should be considered in planning to improve the aesthetic value of the farm.

8. Maximizing limited space

a. Integrating several agricultural venture and technologies in the farm and maximizes space by introducing technologies like the vertical garden and/or hanging plants.
b. Succession and relay cropping are another technologies that maximize limited space.
c. Space utilization considers your knowledge in plant characteristics in identifying shade loving plant and light loving plants. These plants should be arranged in a

way that shade plants are placed under the light exposed plants. Example is the hanging strawberries with ginger on the ground.

9. Environmental care

a. Proper waste disposal such as the composting of biodegradable residuals.
b. Equipment and tool rooms are properly in order.
c. Toilet is also considered for sanitation and health purpose.
d. Farm waste management should be planned as well for its utilization.

10. Improved product quality

a. Harvesting time, physiological maturity, postharvest handling and practices, cleaning, washing, trimming and packaging.
b. Include cold storage to prolong shelf life of farm products in post-harvest practices.

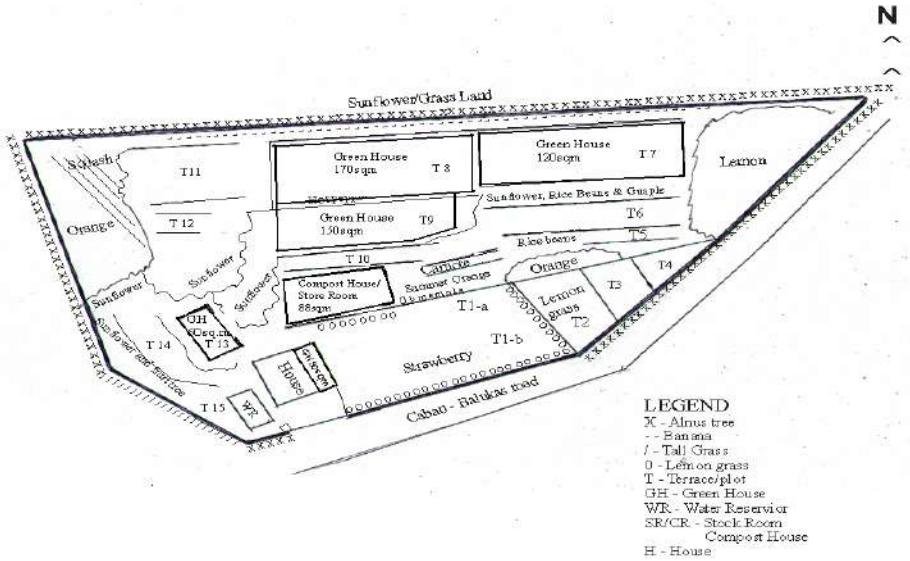

Figure 1. An example of a 5,000 sq.m farm plan (Cosmic Farm owned by Rogel Marzan in Caban, Beckel, La Trinidad, Benguet

D. STRUCTURES TO BE CONSIDERED IN FARM PLANNING

1. Compost/ Fermentation Area

This is an area designated in an organic farm for the preparation of stock compost for fertilizer. It is also a place where concoctions are prepared for foliar spray and enhancement of the compost fertilizer (see Figure 2-5).

Composting area should accommodate available organic fertilizer needed by the crops. It should be a continuous preparation activity area to provide available materials for nursery and farm operations.

Figure 2. *Composting area where the organic fertilizers are produced*

Figure 3. *Shredded grasses*

Figure 4. *Covered compost to enhanced decomposition and prevent moisture loss*

Figure 5. *Mixing of composed help to enhance faster decomposition of substrate*

Figure 6. *Processed compost ready for storage and application*

2. Nursery

In crop programming, nurseries are needed as area for preparing seedlings. Scheduling of planting seedlings is needed for proper assignment of crops in every plot. Not all crops are directly-seeded and most vegetable crops like leafy vegetables are small-seeded. Thus, these are needed to be sown before these are planted on-field.

Seedlings are prepared in this place for proper and tender care because seedlings at early stage are susceptible to various pests and diseases and climate hazards. They are vulnerable to mechanical damage, thus they need to be protected before they are planted to the field. Environmental hazards such as heavy rain, strong wind and direct heat from the sun causes damage to the tender growing seedlings (see Figure 7).

Make sure that water is always available to support the seedlings. Irrigate at the right time with the right amount to ensure the faster growth of seedlings and to avoid stress. Concoctions for foliar spray should be available anytime to support seedlings for faster and vigorous growth.

Figure 7. *Nursery area where seedlings are raised with tender care*

3. Production/Growing Area

In the production area, ease of operation must be considered thus allocating pathways for walking is needed. Pathways are significant in the organic farm operation such as in planting, fertilizer application, irrigation, pest management and harvesting (see Figures 8-9.)

The area should be planned in such a way that crops have proper planting schedule. Companion cropping, multiple cropping and harvesting schedules should be included for proper crop schedule and management.

Production area should be the center of the farm where access to composting area and postharvest facilities are accessible. It is a place where farm produce is taken care and harvested. Farm operations, from planting to harvesting activities were done. Proper planning is needed in the area to improve ease of operation, minimize labor cost and ensure safety of laborers.

Cleanliness and order should be included in the plan for the production area to show that products being produced are in high quality standard.

Figure 8. *Production area showing enough pathways between plots*

Figure 9. *Production area where various crops are being produced*

4. Post-harvest Facilities/ Packaging Area

Postharvest facilities and the packaging area should be considered in organic farm. It should be located in a place that is accessible for harvest storage and for post-harvest

processing. The shade will serve as protection from the rain and sunlight such as cleaning after harvesting the crops.

Washing facilities should be included. Clean water, wash tubs, and sink must be placed in order to improve comfort of operation in post-harvest handling of farm products.

5. Water Impounding/Irrigation Source

Water impounding can be in the form of water tank made of cement or metal. It can be dug out covered with polyethylene plastic. The structure should be made in accordance with the standard that it should not be damaged by cracks or crevices that causes water seepage. Prevent water loss as it should be another waste of resources in irrigation operation.

It should be accessible for immediate use. Water irrigation must be free from contamination as it is important in producing healthy food. Water contamination can be treated by proper filtration in farm before irrigating. Heavy metals, pesticides, microbial contaminants and salts must be eliminated in the irrigation water for organic farm. Impounding is another method in eliminating chlorine in the case of using chlorinated water from the water district (see Figures 10-11.)

Figure 10. *Overhead irrigation using sprinklers through water gravitational pressure*

Figure 11. A cement tank where water is being stored

6. Foraging and Biodiversity Area

Foraging area is a place where biomass is harvested for composting. It is designated in farm where it is not recommended for production. It is a place where different weeds and shrubs grow. Partly, it is a biodiversity area since it can be a hiding place for micro/macro-organisms and different plants.

It is recommended that an organic farm should have an adjacent area for maintaining biomass as place for foraging crop residues in compost production. The farmer should at least know where to source out raw materials.

The foraging area should be free from pollution and disease contamination to prevent problems in compost preparations. Foraging area should be sustained as biodiversity area for the farm. It serves as a place for beneficial organisms to grow, making the farm ecologically alive (see Figure 12).

Figure 12. *Foraging and biodiversity area*

7. Buffer Zones

Buffer zone is commonly defined as an area lying between two or more farms. It is planted with trees and shrubs or tall grasses like bamboo. It also reduces the possibility of damaging interactions between farms. Buffer zones are also helpful in wind and pollution control in the organic farm. It serves as a barrier from other farm to prevent migration of pests and wind-dispersed diseases and pesticide contamination from other farms.

Buffering zone is in the form of wind breaks or diversion ditch to prevent contaminants from adjacent areas that are using pesticides. Buffer zones are required by organic farm inspectors for farms near to conventional farms that are using pesticides. These are defined as boundaries to prevent contamination from aerial pesticide or waterborne contaminants carried by rain (See Figure 13).

Figure 13. *Plants and trees being used as buffer zone*

Module II

Crop Programming

The goal of this module is to elaborate the techniques on crop selection, plant bed preparation and planting techniques.

Module Delivery Plan

Title: Crop Programming
Number of Lesson: 3 Lessons
Number of Session: 8 Sessions
Total Duration: 16 Hours

Lesson Number	Title	Learning Objectives	Delivery Mechanism	Duration	Resources Needed
1	Crop Programming	At the end of the lesson, the learners should be able to: a. Understand the value of continuous cropping programming; b. develop a program for continuous harvest; and c. Understand the characteristics (agro-botanical) and maturity of the crops.	1. Lecture	3 hours	• LCD Projector • training manual • whiteboard and marker • food
			2. Workshop	2 hours	• manila paper • pentel pen • scotch tape • food
2	Plant Bed Preparation	At the end of the lesson, the learners should be able to: a. Discuss plant bed preparation; b. discuss the procedure in organic farming that enhances soil in plant beds; and c. Prepare beds	1. Lecture	1 hour	• LCD Projector • training manual • whiteboard and marker • snacks
			2. Field visit	1 hour	• vermi compost • carbonized rice hull • coco choir dust • mountain sand • compost (*alnus,* if available) • Seedling tray • Seedling box • Transportation
			2. Workshop	3 hours	• vermi compost • carbonized rice hull • coco choir dust

					• mountain sand • compost (can be *alnus* if available) • soil • organic matter • water • food • seedling tray • seedling box • transportation
3	Propagation and Planting Techniques	At the end of the lesson, the learners should be able to: a. Understand crop planning and crop rotation; and b. practice the different steps in seedling production and transplanting.	1. Lecture	1 hour	• LCD Projector • training manual • whiteboard and marker • snacks • computer
			2. Field visit	1 hour	• potting media mix materials (substrate in Lesson 2) • seedling trays • seeds and seedling of any leafy vegetable or fruits • snacks • transportation • prior coordination
			3. Workshop (on-farm activity)	4 hours	• Potting media mix materials mix materials(substrate in Lesson 2) • Seedling Trays • Seedling of any leafy vegetables or Fruits • food • transportation • prior coordination

LESSON 1. Crop Programming

I. LEARNING OBJECTIVES

At the end of this lessons, the learner should be able to;

1. understand the value of crop programming; and
2. develop a systematic cropping and harvesting.

II. ACTIVITY

ACTIVITY	MECHANICS	DURATION	MATERIALS NEEDED
1. Lecture	1. Discuss based on the discussion guide	3 hours	• LCD projector • training manual • white board • snacks
2. Workshop	1. Form groups for crops grown during: • rainy season (May-October) • dry season (November-April) 2. Instruct participants to develop a crop programming plan of vegetables by considering these aspects: • crop rotation • maturity • companion planting • fallow period • Let learners present their outputs for comments.	2 hours	• manila paper • pentel pen • scotch tape • snacks

III. DISCUSSION GUIDE

In crop programming, the farmer should consider the different cropping patterns and cropping methods that are appropriate to the organic farm. It has been discussed in Module

I that climate, slope, and market forces are some of the important factors to consider in crop planning and programming.

A. CROPPING SYSTEMS

1. Seasonal Cropping

Cropping program should be based on crops that can tolerate heavy rain fall and crops that can survive during dry season. Crops can also be programmed for off season cropping for higher prices. Rainy season and dry season crops will be considered here.

2. Regular Cropping

It will be based on the programmed regular crops, not based on the season. Some crops are continuous crops, which are usually contracted.

3. Crop Rotation

These are the rotating crops. For instance, legumes can be planted on one side, Chinese cabbage on another side, and carrots on another area. At the end of the season, their areas will rotate. In crop rotation, plant characteristics must be considered based on fertilizer use.

Giver crops: legumes
User crops: cabbage
Heavy user crops: corn

4. Perennial Cropping

These are the steady crops. Examples are rootcrops, lemon, *goose berries*, and rosemary.

5. Animal Integration

Examples are caged goats, chicken and swine.

6. Seed Production Programming

If you are producing seeds, then you have to program it.

7. Mono-Cropping

Only one crop is planted.

8. Intercropping

Examples are strawberry, onions and legumes planted in one plot.

9. Companion Planting

a. Allelopathic reaction: consider planting crops that are compatible with one another (Refer to Table 5).
b. Beneficial insects have lesser resistance to chemicals sprayed—thus, they are the first ones to die when sprayed with pesticide.
c. Therefore, biological control is best (diadegma and Diamond Back Moth).

Crop planning considers what, where, when, and which plants to grow in relation to their requirements for space, sunlight, water, length of maturation, season of planting and tolerance for other crops.

B. WHAT CROPS CAN BE PLANTED

One should plant vegetables that are nutritious and easy to grow. Indigenous varieties that are productive and tolerant to common insect pests and diseases are recommended in

the organic farm. Raise more vegetables that will allow you to harvest over a long range of time instead of vegetables that have to be harvested all at one time.

Mix short and long maturing crops to ensure a well-distributed supply of nutritious vegetables. Place a special emphasis on crops that have more than one edible part (roots and leaves, flowers, leaves, etc.).

Your family food garden should include vegetables that are rich in protein, carbohydrates, minerals, and vitamins.

Table 1. Example of vegetables with their vitamin and energy sources

Carbohydrates/Energy sources	• cassava • sweet potato • taro (*gabi*) • rice bean (*talipan*)	• dried lima beans (*patani*) • dried pigeon pea (*kadyos*) • dried talk beans (*habas*) • mung bean
Vitamin A sources	• amaranth (*kulitis*) • hot pepper leaves • horseradish leaves • bittergourd (*ampalaya*)	• spinach • *kangkong* • sweet potato leaves • squash
High protein sources	• winged bean • lima bean • rice bean	• pigeon peas • string beans (*sitao*) • jack beans
High vitamin C sources	• horseradish • bittergourd leaves • amaranth leaves • mustard	• *pechay* • bittergourd fruit • *kangkong* • spinach
Iron-rich crops	• amaranth leaves • pigeon peas • lima beans • sweet potato leaves • pepper leaves	• winged beans • *mungo* • *pechay* • spinach • *kangkong*

Plant four categories of vegetables in your bed: leafy, root, legume and fruit. Crop rotation requires that each category or type should be planted in a different subdivision of the bed every season.

Note that each plant has varying root depths and so they extract nutrients from different regions of the soil profile. The cultivation of different plants in the same part of the bed from season to season does not over-burn the soil. However, within each of these four categories, you can interplant other vegetables.

Table 2. Examples of the four categories

Leafy vegetables	Amaranth, lettuce, cabbage, *kangkong,* etc.
Fruit-bearing vegetables	Tomatoes, peppers, *okra*, bittergourd, eggplant, etc.

Rootcrops	Radish, ginger, *gabi*, cassava, sweet potato, etc.
Legumes	Winged beans, lima beans, cow pea, rice beans, etc.

Table 3. Cycle of stages of each bed

Season 1 Crops	**Season 2 Crops**	**Season 3 Crops**	**Season 4 Crops**
leafy vegetables	rootcrop	legume	fruit
rootcrop	leafy vegetables	fruit	legume
legume	fruit	rootcrop	leafy vegetables
fruit	legume	leaf	Rootcrop

C. THE BEST TIME TO PLANT

The best advice on the appropriate season to raise a crop is from local farmers. By raising the seedlings in advance, transplanting can be undertaken upon harvest of an early-maturing crop without keeping a portion of the bed vacant.

Table 4. Maturation guide of vegetables

Vegetables	Maturation (Number of days)	Vegetables	Maturation (Number of days)
Chinese cabbage	48-62	mustard	30-40
lima bean	50-65	leaf lettuce	30-40
cabbage	58-68	cucumber	35-45
garden pea	65-70	string beans	40-70
tomato	70-100	*okra*	50-60
kundol	80-100	cowpea	55-75
head lettuce	55-75	radish	60-70
bulb onion	90-150	sweet corn	68-70
upo	100-120	*ampalaya*	70-72
garlic	100-140	*patola*	75-80
batao	60-80	squash	75-100
winged bean	65-75	green onion	80-90
kadios	90-150	sweet pepper	90-110
petchay	30-40	sweet potato	90-120

Note:

Crop planning can provide a family food and other essentials during staple crop shortages, plus a variety of quality nutrients to lessen or eliminate deficiencies in the diet.

Companion crops

Planting two or more crops which have mutual beneficial effect on each other is called companion planting (see Figure 8).

Figure 8. *Sample of companion planting, onion leeks planted beside the plot of cabbage*

Table 5. Companion plant guide

Vegetables	**Likes (companion)**	**Dislikes (enemies)**
beets	onions, garlic	pole beans
snap bean	corn	onions, garlic
bush *sitao*	corn, *mungo*, sorghum	sweet potato
crucifers family (cabbage, cauliflower, broccoli)	garlic, onion	pole beans
garlic	carrots	none
corn	beans, squash, potato, cucumber	none
cucumber	radish	potato
tomato	onion, lettuce	potato
eggplant	pepper, beans, lettuce	none
onion	lettuce	none
mungo	corn, sorghum	none
sweet potato	corn, *mungo*	none
radish	bush *sitao*, beans, cucumber	none

LESSON 2: Plant Bed Preparation

I. LEARNING OBJECTIVES

At the end of the lesson, the learners should be able to:

1. discuss plant bed preparation;
2. discuss the procedures in organic farming that enhance soil in plant beds; and
3. prepare beds.

II. ACTIVITY

ACTIVITY	MECHANICS	DURATION	MATERIALS NEEDED
1. Lecture	1. Discuss based on the training manual	1 hour	• LCD projector • training manual • white board • snack
2. Field visit	2. The trainer will demonstrate how to prepare substrates (substrate ratio combination is 1:1:1)	1 hour	• vermi compost • carbonized rice hull • coco choir dust • mountain sand • compost (can be *alnus* compost if available) • seedling tray • seedling box • transportation
3. Workshop	1. Each participant will prepare plant bed by applying the techniques discussed during the lecture. 2. Present results for comments.	3 hours	• vermi compost • carbonized rice hull • coco choir dust • mountain sand • compost (if available) • soil • organic matter

			• water • snack • seedling tray • seedling box

III. DISCUSSION GUIDE

A. PLANT BED PREPARATION

In building the ideal soil type, the organic farmer should aim for minimum of:

5% organic matter
45% mineral content
50% air and water

B. SOIL PREPARATION ACTIVITIES

These are the activities that farmers should not do during land preparation:

- Burning
- Chemical application
- Removal of plants

C. PROCEDURES IN ORGANIC FARMING THAT ENHANCE SOIL IN PLANT BEDS FOR PLANTING

1. Fallowing- To plow and leave a growing area unseeded for a period of time to let the soil rest, and break weeds and disease cycles.

2. Cover cropping- To sow a crop into plant bed between main crop plantings. This provides soil protection, weed and pest control and improve soil quality. These are then plowed into the bed a few weeks before planting to increase organic matter. Example of cover crops are spinach and camote.

3. Straw mulching- This is the process of spreading straw over plant beds to protect soil, manage moisture and weeds and protect newly planted crops. This also adds to the organic matter in the soil as mulch breaks down.

4. Green manuring- This is the process of planting of nitrogen-fixing plants within crops that are slashed throughout the cropping period to increase nitrogen in the soil and create mulch on the surface. This is a wonderful way of rejuvenating the soil.

5. Inoculation- This is providing beneficial microorganisms such as Indigenous Micro-organisms.

6. **Animal Integration-** This is using animals to control plants and clean planting areas of standing weeds between crops. Examples are goats as herbicide and chicken as chicken tractor.

D. PROPER ESTABLISHMENT OF PLANT BEDS THAT SHOULD BE CONSIDERED

1. Pathways must be in placed to provide easy farm management operations.
2. Plant beds should contain high organic matters and soil nutrient to support plant growth.
3. Erosion control and rain protection must be in placed to prevent organic matter loss due to flushing during heavy rain and improper irrigation.
4. Plant bed barriers should be place as hollow blocks or bamboo to prevent scattering of organic matters in the pathways.

LESSON 3: Propagation and Planting Techniques

I. LEARNING OBJECTIVES

At the end of the lesson, the learners should be able to;

1. understand crop planning and crop rotation; and
2. practice the different steps in seedling production and transplanting.

II. ACTIVITY

ACTIVITY	MECHANICS	DURATION	MATERIALS NEEDED
1. Lecture	1. Discuss based on they training manual.	1 hour	• LCD projector • training manual • white board • snack • computer
2. Field visit	2. The trainer will demonstrate proper sowing and preparing seedling trays	1 hour	• potting media mix materials (substrate in Lesson 2) • seedling trays • seeds and seedlings of any leafy vegetables or fruits • lunch • transportation • prior coordination
3. Workshop (On-farm activity)	• Each participant will apply proper sowing on plant beds prepared in Lesson 3 • They will prepare seedling trays by following the	4 hours	• potting media mix materials (substrate in Lesson 2) • seedling trays • seeds and seedlings of any

	composition of potting media mix and steps in preparing seedling trays • Present results for comments.		leafy vegetables or fruits • snack • transportation • prior coordination

III. DISCUSSION GUIDE

A. CROP ROTATION AND PLANNING

Consider the following questions:

1. What does the market require? What can you sell?
2. What are the growing seasons of each crop?
3. Nutrient consumption and disease tolerance of each crop?
4. How can the crop rotations be used to prevent and minimize pest and disease outbreak?

Planned rotation that must be followed	Benefits from this crop rotation
1. cereal crop 2. root crop 3. leaf crop 4. fruit crop 5. legume crop	a. prevention of pest and disease cycle b. preventing nutrient deficiencies c. nitrogen fixation

Disease tolerance (strong to weak)	Nutrient consumption (highest to lowest)
1. cereal crop 2. root crop 3. legume Crop 4. leaf Crop 5. fruit Crop	a. legume crop b. root crop c. leaf crop d. fruit crop e. cereal crop

Biodiversity

Biodiversity is the stability of plant species that will not compete with each other for light, nutrients and water. Reducing root competition by providing physical shelter, providing nutrients and assisting in pest control such as the insectary plant, sacrificial plant, predator or pollinator attractor plant, and all-season host and trap crops.

B. SEEDLING PRODUCTION AND TRANSPLANTING

For leafy and fruit vegetables like brassicas, lettuce, celery, pepper and tomatoes, seeds are sworn first in seedling trays.

Potting Media Mix (materials needed)

- one-part garden soil
- one-part compost
- one-part decomposed rice hulls or sand

Steps:

1. Mix properly the soil, compost and the hulls or sand.
2. Sterilize on galvanized iron for 30 minutes.
3. Allow to cool then put in seedling trays.

Note: Transplanting of seedlings takes place in 3-4 weeks old.

Table 6. Desired spacing and number of rows of the vegetables that will be planted

Vegetable	Spacing	Number of Rows
cabbage	30 cm x 30 cm	double rows per lot
chinese cabbage	30 cm x 30 cm	double rows per lot
broccoli	35 cm x 35 cm	double rows per lot
cauliflower	30 cm x 30 cm	double rows per lot
iceberg lettuce	30 cm x 30 cm	double rows per lot
romaine lettuce	15 cm x 15 cm	four rows per lot
celery	15 cm x 15 cm	four rows per lot
pepper	40 cm x 40 cm	double rows per lot

C. DIRECT PLANTING OF VEGETABLES

If you are planting directly into beds, the soil may need to be sterilized through plant-bed sterilization.

Steps:

1. Dig plot and level.
2. Collect dry grasses, twigs and sticks and place on top of bed.
3. The following day, mix the ashes into the soil and then plant the seeds.
4. Broadcast organic fertilizer (2-4 kg per sq. m) and mix thoroughly into the soil.

Table 7. Desired spacing and number of rows of the vegetables that will be planted

Vegetables	Spacing	Number of rows
Snap beans and peas	20 cm x 20 cm	2 seeds are planted per hill at a depth of 2.5 cm, double rows per lot
cucumber	30 cm x 30 cm	2 seeds are planted per hill at a depth of 2.5 cm, double rows per lot
sugar beet	20 cm x 20 cm	1 seed is planted per hill at a depth of 2.5 cm, double rows per lot
radish	25 cm x 25 cm	2 seeds are planted per hill at a depth of 1.5 cm, double rows per lot
carrot	10 cm x 10 cm	2-3 seeds are planted per hill at a depth of 1.5 cm, 7 rows per lot
spinach	11 cm x 11 cm	1 seed is planted per hill at a depth of 2.5 cm, 6 rows per lot

Module III

Plant Maintenance, Care and Seed Saving

The goal of this module is to discuss the techniques and principles of plant maintenance and seed saving.

Module Delivery Plan

Title: Plant Maintenance, Care, Seed Sowing, Seed Saving
Number of Lesson: 2 Lessons
Number of Session: 3 Sessions
Total Duration: 8 Hours

Lesson Number	Session Title	Session Objectives	Delivery	Duration	Resources Needed
1	Plant Maintenance and Care	At the end of the lesson, the learners should be able to: 1. enumerate and explain the different techniques on plant maintenance; and 2. apply the techniques for plant maintenance and care.	1. Lecture	1 hour	• LCD Projector • training manual • whiteboard and Marker • computer
			2. Field Visit	4 hours	• transportation • prior coordination • snack
2	Seed Saving and Storage	At the end of the lesson, the learners should be able to: 1. explain the importance of seed saving; 2. differentiate the hybrid seeds from open-pollinated seed; and 3. Follow the different steps on seed collecting and seed saving.	1. Lecture	3 hours	• LCD Projector • training manual • whiteboard and marker

LESSON 1: Plant Maintenance and Care

I. LEARNING OBJECTIVES

At the end of the lesson, the learners should be able to:

1. enumerate and explain the different techniques on plant maintenance; and
2. apply the techniques for plant management and care.

II. ACTIVITY

ACTIVITY	MECHANICS	DURATION	MATERIALS NEEDED
1. Lecture	1. Discuss based on the training manual	1 hour	• LCD projector • training manual • white board • computer
2. Field visit	1. Visit an organic farm with the following characteristics: • Established as an organic farm for at least 3-5 years • With proper irrigation, and proper shade/ multi-storied plant canopy, repellants 2. Trainer should be able to share the proper techniques in thinning, hilling-up, trailing, fertilizer application, trellising, mulching, spacing, and appropriate companion crops 3. Trainer should be able to demonstrate crop protection and harvesting techniques	4 hours	• transportation • prior coordination • snack

III. DISCUSSION GUIDE

A. TECHNIQUES ON PLANT MAINTENANCE AND SPECIAL PRODUCTION PRACTICES

1. Irrigation

Fruit vegetables such as pepper, cucumber, snap bean and garden pea require adequate water supply during flower initiation to fruit development (see Figure 9.) Critical period for irrigation of fruit bearing vegetables is during flowering. Water is needed for fruit development and maturity. Thus, leafy vegetables should be irrigated during the vegetative stage or growing stage. Irrigation can be used to control insect pest and mites during dry season.

2. Thinning

This is done by removing the other plants and leaving only one plant per hill. Thinning may be done 2- 3 weeks after emergence; the weak and abnormal seedlings are removed. This is also done for plants with very close spacing to provide aeration and space for root growth and sunlight distribution in plots.

3. Hilling-up

This practice is necessary in carrot, radish, sugar beet to cover the roots with soil to prevent discoloration due to sunlight exposure. It is an effective weed control, and a way of fixing the plot to minimize water run-off during watering and to anchor the plants.

4. Training

Immediately after hilling-up, the tomato, garden pea, cucumber and other twinning or trailing crops will be provided with trellises by putting sticks at the middle of each plot interwoven diagonally (fence type). This provides support for the plant when it begins to fruit and keeps them out of the soil, which can cause disease and discoloration of the fruit. Garden pea vines should be bound with string to train them to follow the trellis.

5. Pruning

This is done by removing unwanted plant parts that are diseased or branches that compete with nutrient uptake. Removal of unwanted water sprouts for fruiting crops like tomatoes will improve the quality and yield of fruits produced. Leaf pruning is done on beans to provide sunlight exposure for the crops. Old leaves are removed to help strawberries produce new leaves to support growth of new fruits. Removal of diseases and pest-infected leaves is another form of pruning to enhance recovery of disease-infected crops.

Figure 9. *Adequate water is a need to maintain crops*

6. Fertilizer Application

All crops require organic fertilizer application to ensure proper production. The critical period for fertilizer application is during the vegetative growth period (seedling emergence to flower initiation). For poor soils, basal fertilizer application is needed to help growing seedlings develop to a real plant. Stunted growth can be prevented with application of fertilizers.

Frequency of application

- Annual crops- basal application and side-dressing will be sufficient with foliar fertilizer application at key vegetative stages.
- Perennial crops- application starts during rainy season. For fruit trees, fertilizer application is done at the start of dry season.

7. Trellising

A trellis is a structural support for climbing plants. Trellising provides the following benefits:

- maximizes the use of limited space by allowing several crops like legumes and gourds to be grown on a single trellis;
- permits the growing of shade tolerant crops under the trellis;
- makes production feasible over canals and water-logged areas; and
- protects plants from stray animals. Trees and tall crops like papaya and banana can also serve as trellis and 'live' fences.

8. Mulching

This is the placement of any dry material or to plastic sheet on the base of the plant to cover the soil. Mulching reduces soil water evaporation, controls weed growth, minimizes rotting, promotes growth of living microorganisms in the soil and regulates soil temperature.

During the initial stages of crop growth, the space between the plant is covered with dried rice straw or grasses to conserve moisture. Later on, this is removed (if not decomposed),

since the plants themselves serve as living mulch when their leaves cover the soil surface. During hot months, the mulch should always be maintained.

In the rainy season, mulch should be used around young seedlings and crops to avoid splattering the leaves and prevent soil erosion.

Plants should be at least six weeks old before mulch is used as it can promote the growth of fungi-causing seedlings to rot.

9. Shade/Multi-Storied Plant Canopy

Plant shade-tolerant vegetables (*gabi*, ginger, pepper, mustard, and sweet potato) underneath tall crops such as cassava, kadios and trellis vines (gourd, squash and winged beans). This will form a multi-storied shade canopy that can efficiently use sunshine. Various crops can be grown on limited space with little competition. Weed growth is also controlled through shading the upper canopy level and by trailing vine vegetables. Since weed growth is controlled, the vegetable crops get better opportunity for growth.

If the bed is located in east-west direction, the tall crops should only be planted at either end of the bed.

10. Companion crops (Refer to Module 1, Lesson 1)

Consider crops that has no allelopathic effect with crops planted side by side. Companion cropping could be used as deterrent of common pest to discourage them to attack the main crop. Like in the case of flea beetle as a common pest for crucifers. If aragula is planted side by side of crucifer, flea beetle will not attack the crucifer due to the bad odor of aragula.

11. Maturation

Consider the growth of short-duration vegetables (*pechay* and mustard); and slow-growing, long-duration crops (tomato and sweet pepper). Long-duration vine vegetables (cucumber, *upo*, *patola*, winged bean, squash and *alugbati*) could be rooted at the ground and/or allowed to trail on a trellis constructed beside the plot.

12. Spacing

There should be a proper spacing for crops so that they would not be planted too close or too far from each other.

Space plants closely seeing to it that each plants have enough sunshine and space to grow. They are properly spaced when leaves of the fully-grown plants barely overlap with the adjacent ones. Crop spacing can be done in many ways using square, rectangular, triangular and single line spacing. This practice allows more plants to be grown within a small area than the usual method of square or row planting. It also prevents the growth of weeds and moisture evaporation as the plant canopy serves as living mulch.

13. Repellants

Every bed must have a few spice plants and medicinal herbs with strong odor to repel insects from the garden. Some of these are listed below.

- mint
- onion

- oregano
- basil
- garlic
- rosemary
- sweet basil
- mint
- marygold

In addition, each bed should have 6 to 8 marigolds which secrete a chemical that kills nematodes. The strong odor of marigolds also repels insects.

Potential Output

For perennial fence crop (90 feet long), you can gather a variety crop of 1.2- 2.5 kilograms per day.

For two hundred square feet of growing bed area, you can gather a variety crop of 1-3 kgs per day.

Fruit Bagging

This is a method to cover the growing fruit with net or paper to prevent fruit fly infestation. It protects fruit from harsh environment to produce good quality skin by protecting fruits from bruises and scars.

Fruit Thinning

This is a method to remove malformed fruits to support growing fruits to grow longer. It is also a method to remove diseased fruits to prevent infection of other fruits from spreading pest and diseases. Fruit thinning is also a method to improve the growth of growing fruits by improving quality and preventing heavy competition of nutrient intake.

Pest Management

There are many options available to minimize pest such as crop rotation, biological control, trapping, field sanitation, cultivar selection, etc. The different techniques in organic farm management practices are pest management procedures to prevent pest and disease infestation.

B. HARVESTING TECHNIQUES

The different vegetables differ in their maturity periods. The premium quality is attained when the vegetables are harvested at the right stage of maturity.

1. Head-forming vegetables are harvested when their heads become firm. Heads are cut with clean sharp knife.
2. Carrots are harvested 3.5 to 4 months after planting.
3. Snap bean and pea pods are harvested green mature (16-17 days from pod set) then
   3-4 days thereafter.
4. Romaine, pak choi and polonsai are harvested 30-35 days from planting.
5. Bell pepper are harvested when fruits become firm and blue green in color.
6. Harvest vegetables early in the morning when plant is under least stress and cool.

7. Harvested vegetables should be handled carefully to prevent damage and kept out of
   the sun.
8. Always ensure that all tools and equipment used in harvest are clean and will not
   damage the vegetables in any way.
9. The quality of vegetables at harvest can only be maintained by proper post-harvest
   handling: washing, trimming and packaging.

LESSON 2: Seed Saving and Storage

Based on the handouts of ***Dr. Silvestre L. Kudan***

I. LEARNING OBJECTIVES

At the end of the lesson, the learners should be able to:

1. explain the importance of seed saving;
2. differentiate the hybrid seeds from open-pollinated seeds; and
3. follow the different steps on seed collecting and seed storage.

II. ACTIVITY

ACTIVITY	MECHANICS	DURATION	MATERIALS NEEDED
1. Lecture	Discuss based on Training Manual	3 hours	• LCD projector • training Manual • white board and marker

III. DISCUSSION GUIDE

In the Cordillera, planting crops for seed production must be done towards the end of October and early November. This will not only produce higher yield but also enough sun-drying period in March. Dry seeds (7% moisture content) are kept in air-tight containers such as jars, plastic containers and tin cans then stored in a cool dry room.

Due to the difficulty of producing seeds of temperate vegetable seeds under local conditions, organically-produced seeds may be obtained from other sources following organic production practices.

A. IMPORTANCE OF SEED SAVING

This is the practice of collecting the seeds of your plants and storing them for planting in the next growing season. This allows the selection of seeds from the strongest and most productive plants and reproduce them.

In modern agriculture, there has been wide-spread use of hybrid seed, which is partly responsible for the increase of yields. While this makes it easier to grow food for an increasing population world-wide, it also results in the loss of genetic variety and species of food plants. If this continues, the field of agriculture can be possibly left with only vulnerable and poorly performing genetic stocks. Saving seeds contributes to preserving the unique plants that are found in the area as well as having healthier and stronger plants. Specifically, below are the benefits.

1. To preserve the rich diversity of food crops for ourselves and future generations.

2. To increase in production of hybrid seeds over open-pollinated seeds.
3. Dependence on corporate controlled hybrid vegetable seeds is reduced.
4. Monopolizing of the seed market by multinational seed companies reduces availability of diversity of seeds.
5. Genetic engineered and hybrid seeds are not suited for seed saving.
6. Increased problems with pests and diseases due to monoculture can happen.
7. There are hybrid and genetic engineered seeds not bred for taste and backyard growing, but for market interests.

B. HYBRID SEEDS VERSUS OPEN-POLLINATED SEEDS

Hybrid seeds	Open-pollinated seeds
1. Hybrid seeds are produced by artificial cross-pollinating two plants of the same species but with different traits. This cross results in hybrid vigor and highly productive seed with desirable traits. This is very popular in large-scale farming systems because it allows a farmer to grow better performing, uniform crops that are usually high-yielding. 2. Seeds from hybrid plants cannot be saved because they will not reproduce true-to-type, they will favor one parent plant or will be sterile. This means that each year, new seeds must be bought to be planted. 3. Hybrid seeds do not have genetic resistance to disease and pests that an open-pollinated plant has, and will require chemical inputs to manage them.	1. Open-pollinated seeds are produced through natural reproduction and will display the same traits of its parent plant. This process allows the plants natural resistance and strength to be reproduced with each generation. Through careful selection, the plants that carry the best traits can be continued and improved upon with each generation. Because of this process, they are reliable. 2. Harvesting open-pollinated seeds allows breeding plants that are ideally suited to local environment.

C. COLLECTING SEEDS

Collect seeds from vigorous, healthy plants that exhibit the best characteristics.

Seeds must be correctly dried and may require treatment to control pest and disease infestation prior to long term storage.

Be sure to record as many details as possible when collecting seeds. If identification is not certain include specimen of the parent plant for identification later.

D. STEPS IN SEED SAVING

1. Plant selection

When growing a plant to harvest seeds, allow it to reach full maturity so that it is able to flower and produce seeds. Consider the following:

- plant size;
- growth ;

- edibility;
- flavor;
- texture (especially leaf vegetables);
- color (leaves, fruit, pods, roots, bulbs, stem);
- ripening (does fruit ripen evenly?);
- disease resistance;
- tolerance of extreme weather conditions; and
- level of inputs the individual plant require (water, fertilizer).

Proper plant selection takes place over many generations.

2. Genetic purity

It is important to ensure that outside genetics (pollen from other plants) do not contaminate your own plants.

A. Cross-pollination: plants that need for their survival to have their flowers pollinated from other plants, mostly in the same species. Pollen is exchanged between different flowers on the same or different plants. Insects, wind and animals will help cross pollination.

Three common vegetable families

1. **Cucurbitaceae:** long vine, short vine
   Example: cucumber, pumpkin, melon, squash, luffa and chayote.
2. **Crucifix flower**: seeds in silique
   Example: cabbage *bokchoy*, turnip, mustard and kale.
3. **Apiaceae:** flowers and seeds on umbrella
   Example: fennel, carrot, dill, parsnip, parsley and coriander.

Methods of preventing cross-pollination

1. Distance/isolation (wind and insect pollination)
2. Caging (insect and animal pollination)
3. Cage on alternate days
4. Isolate by time
5. Bag them
6. Rouging

It is also important to prevent inbreeding, which causes loss of vigor in the plant.

Self-pollination: a term used to describe plants that have their flowers pollinated from flowers on the same plant or in a single flower.

Three common vegetable families

1. **Solanaceae:** five-petal flower, fruit
   Example: tomato, potato, eggplant, chili and, tamarillo.
2. **Leguminosae/Fabaceae:** seeds in a pod, pea flower
   Example: peas, beans, pigeon pea and, patani.
3. **Asteraceae:** daisy like flowers, seeds
   Example: lettuce, endive, dandelion and yacon.

3. Maturation and harvest

Maturity of seeds should be based on physiological maturity. This refers to the attainment of final stage of biological function of a plant like the seed. This is the stage that the plant organ is reserved in maximum size and growth. Senescence is one indication that the plant is matured.

4. Seed treatment and storage

- Certain percentage, 13% moisture content
- Charcoal to maintain moisture content
- Cool, dry place (tin cans), sealed with candle wax
- Storage temperature (to maintain the viability of seeds)

Module IV

Food Packaging and Processing

The goal of this module is to highlight the importance of food packaging and processing.

Module Delivery Plan

Title: Food Packaging and Processing
Number of Lesson: 1 Lesson
Number of Session: 1 Session
Total Duration: 3 Hours

Session Number	Session Title	Session Objectives	Delivery	Duration	Resources Needed
1	Importance of Food Processing	At the end of the lesson, the learners should be able to: 1. Discuss the importance of food processing	1. Lecture	3 hours	▪ LCD Projector ▪ training manual ▪ whiteboard and marker ▪ computer

LESSON 1: Importance of Food Processing

*By **Jane K. Avila***

I. LEARNING OBJECTIVE

At the end of the lesson, the learners should be able to;

1. discuss the importance of food processing in organic farming.

II. ACTIVITY

ACTIVITY	MECHANICS	DURATION	MATERIALS NEEDED
1. Lecture	1. Discuss based on training manual	3 hours	• LCD projector • training manual • white board and marker • computer

III. DISCUSSION GUIDE

Food processing pertains any process done to food from the farm to the table.

IMPORTANCE OF FOOD PROCESSING

1. Prevents spoilage and reduces food waste
   - Processed food products have prolonged shelf life
   - Processed products make a palatable appeal to consumers
   - Provide opportunity that the product will be processed in many farms to create more from the main product

2. Reduces transportation cost
   - Processing of products reduces its bulk size when peeled and other food parts are removed
   - Processed products may be reduced in size but its price can be increased due to value-addition

3. Levels out seasonality

   - Processed products can be eaten out of season because they can be stored for longer time
   - Processed products can be consumed when special occasion is celebrated

4. Makes products available in places where they are not grown

- Processed products in the form of candies, jams and dried fruits canned or bottled can be transported to different places.

5. Adds value to farm produce
    - Value is added through improved quality
    - Value added can change the product and can be used for other important uses
    - Value added can provide product uses at the right place and time

6. Processed jams and jellies can be available in places where they are not produced
    - Processed fruits like durian can be sold in other places where durian is not produced. It can be sold in form of candies and jams.
    - Dried fruits produced from other countries can be sold in countries where these fruits are not produced.
    - Juices and wines are example of processed products that are produced in other countries but sold in places where natural form is not available.

PROPER PACKAGING AND LABELING

Miki noodles properly packed in plastic with label

Pineapple Jam with label and seal

Vegetables with proper label and covered with cling wrap

Module V

Farm Record Keeping

The goal of this module is to highlight the importance of farm record keeping.

Module Delivery Plan

Title: Farm Record Keeping
Number of Lesson: 1 Lesson
Number of Session: 1 Session
Total Duration: 10 Hours

Lesson Number	Session Title	Session Objectives	Delivery Mechanism	Duration (Hours)	Resources Needed
1	Farm Record Keeping	1. Identify the importance of farm record keeping and classification 2. Appreciate the importance of farm-record keeping as they go along their farm activities	1. Lecture	2 hours	▪ LCD Projector ▪ Training manual ▪ Whiteboard and Marker
			2. Field Visit	4 hours	▪ Transportation ▪ Food (snacks) ▪ Prior Arrangement
			3. Workshop	4 hours	▪ Computer ▪ LCD Projector ▪ Manila Paper ▪ Pentel pen ▪ Food

LESSON 1: Farm Record Keeping

I. LEARNING OBJECTIVES

At the end of the lesson, the learners should be able to:

1. understand the importance of farm record keeping and classification;
2. appreciate the importance of farm record keeping as they go along with farm activities;
3. apply proper recording and posting of all expenses and income in the farm; and
4. accomplish record keeping as a requirement for organic certification.

II. ACTIVITY

ACTIVITY	MECHANICS	DURATION	MATERIALS NEEDED
1. Lecture	1. Discuss based on training manual.	2 hours	• LCD projector • training manual • white board and marker
2. Field visit	1. Visit an organic farm with the following characteristics: • Established as an organic farm for at least 3-5 years; and • With complete and proper documentation of their farm activities from nursery establishment, planting and marketing 2. During the visit, let the learners record the farm activities that the trainer presented	4 hours	• transportation • food (Snacks) • prior arrangement
3. Workshop	1. The learners will be grouped homogenously based on the	4 hours	• computer • LCD projector

	crops they are planting 2. Let learners prepare specific farm records, specifically: • farm record on production cost for labor; • farm record on farm inputs; • farm record on Fixed costs; • farm record on daily farm activities; • harvest record; and • farm record on daily farm expenses 3. Let learners present their outputs for comments.		• manila paper • pentel pen • food

III. DISCUSSION GUIDE

The strict recording of all farm activities such as labor, farm input like seeds and fertilizer and all expenses used in farm operations is mandatory.

Keeping record in organic farming is a requirement for certification process. Record is one of the first questions to be asked by the certification team. The organic farm inspector will see to it that all activities done in the farm are recorded. All organic inputs, pest management practices, organic fertilizer and other inputs used in organic farm should be recorded in the record of organic farming.

Strict inspection of all recorded activities and inputs are the basis for organic farm inspector to check in the process of organic farm inspection. The inspector should see to it that there are no activities or inputs used in the farm that are not approved by the Philippine National Standard (PNS).

Keeping record is also very important for all farmers so that one could understand that the labor and input costs are properly accounted for and to make sure that all expenses in the farm are repaid after the end of the harvest.

Records of everyday harvest should be reflected under record keeping. This is to identify which of the harvested products have higher demand good sales. Harvest record should show the picture on how the organic farm is gaining profit or if there are losses during the farm operation.

In record keeping, there are advantages that the organic farmers can benefit from it.

1. Provide a historical perspective of farm operations that can provide inputs from planning year to year activities.
2. Records provide information to keep track of farm inputs used during the field operation.
3. Records will tell you when to plant and when to plan for a better strategy and decision making.
4. Cropping pattern, crop rotation and crop programming application in the organic farm operations can be useful information to improve successful farming.
5. Farm records provide information for the organic farm inspector if you are doing the acceptable activities approved by PNS and the Organic Certification Body.
6. Keeping records is an important tool as safety net for planning in the organic farm.
7. Field records will serve as an evidence to show that you are using the required operations for organic farms if ever there are problems or complaints against your farm contamination from outside pesticide pollution.
8. Farm records is an evidence document for loan application.
9. Farm records will serve as a basis for crop evidence claim.
10. Organic farm records is a requirement for the yearly renewal of Organic Farm Certification. It is a basis for check and balance by the organic farm inspector.

VEGETABLE FARM RECORD THAT MEET PNS REQUIREMENTS FOR CERTIFICATION

1. Farm and field maps
2. Field history sheets
3. Input records such as foliar sprays, pest control products and compost production record
4. Harvest records

GENERAL TIPS FOR RECORD KEEPING

1. Keep all receipts and other document relevant for record keeping in the organic farm.
2. Make an applicable, easy and simple record keeping. These are useful records for farm management decision making.
3. Be sure that records are placed in an accessible area for easy recording purposes.
4. Be sure to update records everyday. It is very hard to recall activities done in the past if information is recorded later.
5. By year end season, collect all records from clipboard and fill them in one database.
6. Check all past record for the year operation as a basis for making plans for the coming year.
7. Improve your records as time pass by. Remove useless records and include new information that are relevant for next year operation.

FARM RECORD KEEPING

A. Rent	PhP xxxx
B. Labor	PhP xxxx
C. Inputs (e.g. seeds, fertilizers, etc.)	PhP xxxx
D. Transportation Expense	PhP xxxx
E. Packaging	PhP xxxx

F. Miscellaneous	PhP xxxx
Total Expenses	PhP xxxx

PRODUCTION COST FOR LABOR

	1000 SQ. METER	**Organic Input outside farm**
	Commodity	
	Cabbage	
LABOR FORCE	**M-D**	**Value (P)**
Land preparation		
Cleaning and weeding	**4**	**1,200.00**
Digging/plot preparation	**5**	**1,500.00**
Hole making and basal fertilizer application	**3**	**900.00**
Seedbed preparation and seedling production	**1**	**300.00**
Compost preparation		
Transplanting	**5**	**1,500.00**
Planting		
Irrigation	**4**	**1,200.00**
Thinning and weeding	**3**	**900.00**
Hilling-up and side dressing	**5**	**1,500.00**
Pest & disease control management	**4**	**1,200.00**
Harvesting (picking, sorting, packing, hauling)	**5**	**1,500.00**
TOTAL	**39**	**11,700.00**

***all values are examples only**

RECORDS OF FARM INPUTS

Activity	**1000 SQ. METER**	**Organic Input outside farm**
	Commodity	
	Cabbage	
		Value (PhP)
Seeds (kgs)	**50g**	**776.00**
Organic Fertilizers		
PCM	**20**	**3,800.00**
Foliar (seaweed)	**7**	**1,400.00**
Biological/botanical pesticides		

Seaweeds	**3**	**600.00**
Detergent soap (environclean)	**1.5**	**420.00**
TOTAL	**31.5**	**6,996.00**

***all values are examples only**

RECORDS FOR FIXED COST

Activity	**1000 sq.m.**	**Organic Input outside farm**
	Commodity	
	Cabbage	
		Value (PhP)
FIXED COST		
Land Rental (per square meter)	**2**	**2,000.00**
Depreciation cost on tools and equipment		
2pcs. Sickles 2 years	**900**	**112.50**
2pcs. Grubhoes 3 years	**400**	**33.35**
2pcs. Japanese hoe 3 years	**500**	**41.70**
2pcs.Watering cans 2 years	**900**	**112.50**
1pc. Knapsack sprayer 5 years	**1,600**	**80.00**
additional cost (certification fee) 1 year	**20,000**	**5,000.00**
TOTAL		**7,380.05**

***all values are examples only**

COST OF PRODUCTION		
Total Cost of Production		**21,076.05 (26,076.05)**
Average Yield per 1,000sq.m.	**1,000 kg**	
Cost of Production / kilogram		**21.10 (26.10)**

***all values are examples only**

DAILY FARM ACTIVITIES

Farm Activities for the Month	**Date**			
	1	**2**	**3**	**31**
Land Preparation				
Cleaning and weeding				
Digging/plot preparation				
Hole making and basal compost application				
Seed preparation and seedling production				

Sowing				
Potting				
Planting				
Transplanting				
Preparation of compost/compost tea				
Weed Gathering				
Shredding/chopping				
Mixing/stirring				
Maintenance				
Watering				
Thinning and weeding				
Hilling-up and side dressing				
Sticking				
Application of compost tea/compost				
Tying				
Mulching				
Trimming				
Visiting/observing				
Pest and disease control management				
Spraying				
Insect picking				
Harvesting				
Picking				
Sorting				
Packing				
Labelling				
Marketing				

***all values are examples only**

HARVEST RECORDS

Harvest Area	Volume (kg)	Reject (kg)	Sales (kg)	Returns (kg)

DAILY FARM EXPENSES

Date	Particulars	Amount (PhP)

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Jamesly T. Andres was born on August 26, 1966 in Acupan, Virac, Itogon, Benguet, Philippines. He is the eldest among the four children of Mr. and Mrs. Eusebio Andres. He finished his elementary education at Acupan Elementary School in Itogon, Benguet in 1978. He continued his secondary education at the Mountain State Agricultural College Vocational Agricultural Science High School now, Benguet State University (BSU) in 1983. In the same year he, enrolled to Bachelor of Science in Agriculture major in Horticulture in the same school where he graduated in 1987. He immediately worked at the Department of Agriculture Provincial Nursery located in Otucan, Bauko, Mountain Province from 1988 to 1989. Then, he transferred to the Bureau of Plant Industry in Baguio City and served as an extension worker based in Sabangan and Bauko, Mt. Province under the special project of the Philippine German Fruit Tree Project from 1990 to 1997. In 1998, he transferred to the Department of Agriculture Research Outreach Station based in Sagada, Mountain Province.

He also applied for a scholarship and was granted the privilege to enroll in Master of Science in Horticulture Economics at the Hannover University, Herrenhauser Strasse, Hannover, Germany from 1999 to 2000.

After finishing his masters degree, he worked with the Highland Agriculture and Research and Development Consortium and International Center for Research in Agroforestry, a research collaboration for the promotion of agroforestry in Bocloc, Abra and Bakun, Benguet from 2004 to 2005. He transferred to BSU in 2008 to work as training officer and facilitator under the Office of Extension Services of BSU.

He joined the faculty of College of Agriculture, Department of Extension Education from 2009 to 2013. After a year, the university approved his scholarship to enroll at the Central Luzon State University, Science City of Moñuz, Nueva Ecija, Philippines and pursued his Doctor of Philosophy in Crop Science, major in Horticulture under the Faculty and Staff Development Scholarship Program of the Benguet State University.

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