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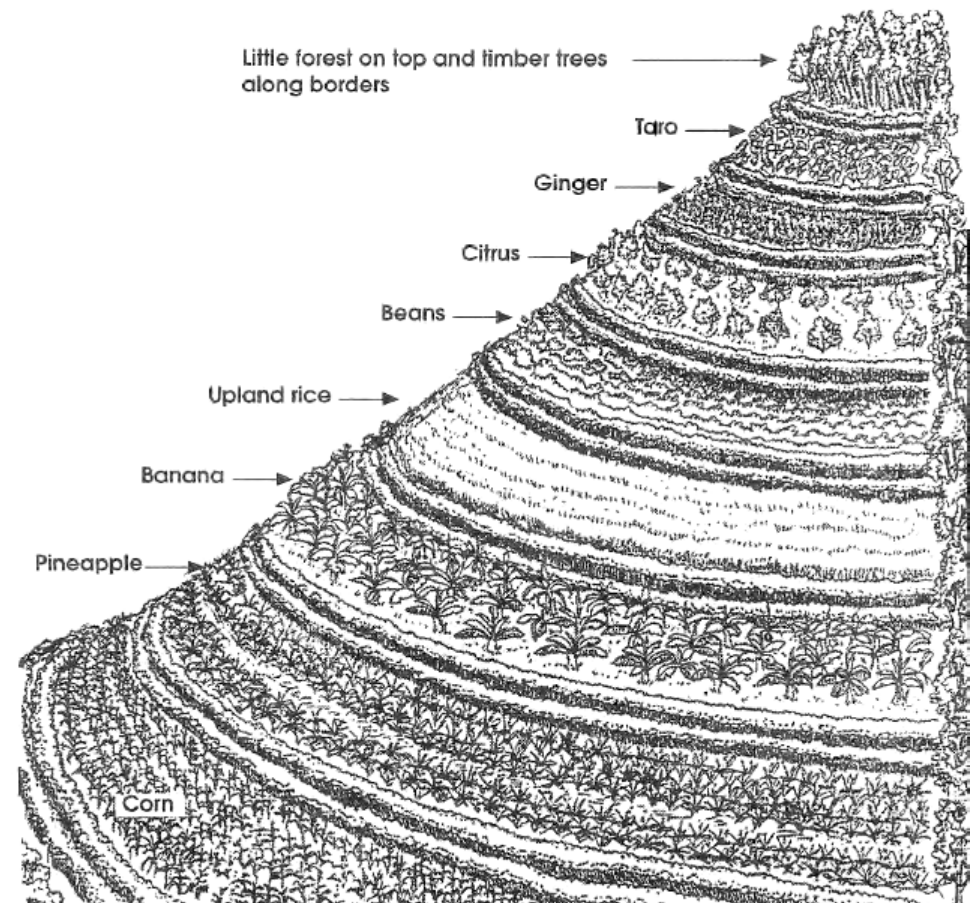
10 Steps to Small Agrofruit Livelihood Technology (SALT-4)

A Guide on How to **Integrate Fruit Trees** into the SALT System

Designed and Printed by:



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Introduction

Agroforestry is a scheme of producing food hand-in-hand with wood in the same piece of land. It is a sustainable management of land which can help in increasing overall production. Possible strategies include intercropping, multiple cropping, monocropping and/or succession cropping in the various sub-units.

In SALT-4, the general objectives are to produce food, increase income and practice soil conservation in a limited sloping land.

Here are the 10 steps which will guide you to established your small agrofruit livelihood technology in the SALT system:

1. Establish a Nursery Area Located at the Center Portion of the Farm

Nursery shed

- Nursery with a dimension of 3 meters by 1.5 meters is sufficient for half-a-hectare farm. You need only four poles and a roof made of locally-available materials.

Materials needed

- Watering cans (with sprinkling head or a can with small holes punched in it), plastic bags for potting, several seed boxes, a spray bottle, and cans for boiling water.

2. Prepare High Quality Planting Materials of Fruit Trees

- Fill the seedboxes with river sand or ordinary soil. Pour boiling water over the seedbox to sterilize the sand. The seedbox and sand should be soaked thoroughly. Wait for 3-4 hours for the sand to cool down before sowing the seeds.

Fruit selection

- It is important to choose fruit species that grow well in your locality. Fruits from other areas can also be used on a trial basis before planting them in large numbers.

- Also build your terraces by putting rocks and stones, twigs and branches, and leaves at the center of your hedgerows. By doing this regularly, you can build strong, permanent, naturally green and beautiful terraces which will hold the topsoil on your farm.

Cultural practices

- Replant fruit trees that have died. Pruning is also needed by some fruit trees. Bagging of young fruits, such as jackfruit and mango, protects them against pests and diseases. Maintain your supply of nursery seedlings. Collect the seeds and grow them in your nursery. Take the scions and cuttings from healthy, high quality fruit trees. You may sell some of the seedlings to interested farmers and individuals.

Pest management

- If fruit production is greatly affected by pests and diseases, spray the fruit trees with recommended chemical. Generally though, by having alternating species, healthy seedlings, proper spacing, and good fertilization, most pests and diseases will not greatly affect your fruit harvests. It is much easier to prevent pests and diseases than to treat them.

Fertilization

- Fruit trees produce fruits even without fertilizer. But for high yields and quality, it is best to fertilize the fruit trees with manure and/or commercial fertilizer. As soil fertility is different in each area, it is not possible to give specific fertilizer needs. In addition, different fruit tree species require different amount of fertilizer. When fertilizing fruit trees, place the fertilizer in a ring around the trunk 20 centimeters away. On older trees, place the fertilizer at the leaf drop.

Table 3. Recommended harvesting time for Philippine fruits.

Fruits	Seeds	Asexual Propagation
Atis	2-4 years	1.5-2 years
Avocado	4-8 years	1-2 years; but should not be allowed to bear fruits until 4-5 years
Balimbing	4-6 years	2-3 years
Caimito	5-6 years	3-4 years
Cashew	3-4 years	*
Chico	6-10 years	3-5 years
Durian	7-8 years	5-6 years
Guava	4-6 years	2-3 years
Guyabano	3-5 years	2-3 years
Lanzones	12-15 years	2-4 years (marcotted); 7-9 years (grafted)
Jackfruit	6-8 years	4-5 years (grafted)
Mango	5-7 years	*
Mangosteen	10-15 years	7-9 years
Marang	4-6 years	*
Pili	5-4 years	2-3 years
Rambutan	5-6 years	3-4 years
Rimas	8-10 years	3-4 years
Santol	5-7 years	*
Siniguelas	*	3-4 years (marcotted)
* Data not available		
Source: Coronel, R.E. Promising Fruits of the Philippines		

10. Maintain Your SALT 4 Farm

- Among the cultural practices that you need to follow in this kind of farming are weeding, pruning of hedgerows, planting hedgerow skips, and controlling of pests and diseases. Only ring weeding is recommended for fruit trees. The weeds may be used as mulching materials. Should there be skips and die-backs in hedgerows, be sure to do replanting.

Seed collection and grafting

- Collect seeds which are very prolific and disease-free. Plant them in your sterilized seedbeds. Water the boxes 2 times a day, keeping the soil moist at all times. When the seedling has 2-true leaves, it is ready for transplanting and bagging. Punch several holes in the bottom of your plastic bags.
- For bagging, use a mixture of equal parts sand, soil and goat manure (other manures can be used but should be dried first before using). Fill the bags with the mixture and transplant the seedlings. Care for the seedlings for 6-8 months.
 - ⇒ The following fruits are highly recommended for grafting: durian, mango, rambutan, and lanzones.
 - ⇒ Cuttings are best for coffee, black pepper, citrus and Barbados cherry.

Hardening and transplanting

- Allow the grafted planting materials to harden for 3 months. Hardening is done by gradually withdrawing water and exposing to the sun. At the end of the 3 months, the grafted materials are ready for planting in the field. Grow as many planting materials as you can. This ensures a steady supply of planting materials.

3. Establish and Develop Your Contour Hedgerows

Locating contour lines

- Contour lines of the farm may be found by using an A-frame. Let the A-frame stand on the ground. Without moving the rear leg, lift the front leg. Then, put the front leg down on the ground that is on the same level with the rear leg. When the air space in the carpenter's level stops in the middle, you have already found a contour line.
- Mark with a stake the spot where the rear leg stands. After doing so, move the A-frame forward by placing the rear leg on the spot where the front leg stood before. The process is repeated again. The recommended distance between

contour lines is 3-4 meters. Be sure to locate the contour lines of the farm accurately. Cultivate the identified contour lines. If laid out haphazardly, you may create a channel on the slope, thus assisting erosion in removing your precious topsoil.

Contour lines preparation

- After finding the contour lines, prepare them by plowing and harrowing until ready for planting. The width of each area to be prepared should be one meter. The stakes will serve as your guide during cultivation. As in other SALT systems, every third step is cultivated at the beginning.

Recommended nitrogen fixing trees and shrubs

- The recommended hedgerow species are nitrogen fixing trees and shrubs like *Flemingia macrophylla* and *Desmodium rensonii*. You need at least 3 kilograms of both species to plant half a hectare. The hedgerows will occupy at least 20% of the farm area. Other species which can be used for hedgerows include *Gliricidia sepium* (locally known as "madre de cacao" or "kakawate"), *Leucaena leucocephala*, *L. diversifolia*, *Calliandra calothyrsus*, *Indigofera tysemani*, and those that are locally grown in the area.

Planting hedgerow species

- On each prepared contour line, make two furrows at a distance of 50 centimeters apart. Plant one seed per centimeter. Planting must be done at the start or during rainy season. To avoid washing out of newly-planted seeds, cover them with mulching materials. Newly-planted hedgerows must be weeded and cultivated at least once a month or more if necessary.

Importance of nitrogen fixing species

- Nitrogen fixing species are important because they manufacture their own nitrogen. Therefore cuttings of the leaves and stems have a lot of nutrients. These cuttings are very useful source of organic fertilizer when placed on the soil.

- Always pile the cut leaves and twigs at the base of the fruit trees or dispersed them evenly over cash crops areas. In intercropping areas, some of the trimmings may be concentrated around the trees while the rest may be distributed over the cash crops.

Green manuring/fertilization

- The prunings serve as fertilizer for both cash and fruit trees. In some instances, particularly during the developing stage of fruit trees and cash crops, you may fertilize them with organic matter. Should there be more than enough prunings for the crops - this happens during the rainy season - they may be used as forage for goats and other livestock raised in the farm. However, if prunings are used for animal feeds, manures should be brought back into the system and placed on the fruit and food crops.

9. Harvest and Market Your Products on Time

- Do not delay in harvesting your food crops. Corn must be harvested from 90-120 days after planting. Papaya are ready for harvest six months after planting. As for pineapple, you may harvest them one year after planting and every month thereafter. Refer to Table 3 for further details about harvesting.

Methods of harvesting

- Fruit trees may be harvested in several ways. You may harvest them using a sharp bolo or pruning shears. Some fruits just drop; harvest them by hand or by using a bamboo pole with a net attached. But before harvesting your fruit crops, plan ahead how and where you will market your products. Planning ahead will enable you to get the best price for your fruits.

7. Practice Crop Rotation and Covercropping

Crop Rotation

- To make sure that you are not depleting your soil of nutrients, rotate your food crops. This means that after planting corn, you can plant legumes (beans, pulses, and peas) in the next cropping season or vice versa. Do not burn anything. Slash the standing stalks and allow them and the remains of the legumes to rot in the field. They serve as mulching materials, suppress the growth of weeds, and add nutrients to the soil. In addition, they hold moisture and reduce raindrop splash erosion.

Covercropping

- When the fruit trees have fully grown and/or are starting to bear fruits, you may plant covercrops like *Desmodium heterophyllum* and *Arachis pentoi* underneath. Aside from helping control erosion, covercrops can also be used as forage for rabbits.

8. Trim Your Hedgerows Regularly for Mulching

- Six months after planting, the hedgerows should be tall enough for their first pruning. The nitrogen-rich hedgerow prunings will become the fertility component of the system. When the young hedges reach a height of about 2-3 meters and have a waist high basal diameter of at least 2.5 centimeters, they are ready for their first trimming.

Pruning hedgerows

- Prune them regularly to a height of one meter (or about waist-high) from the ground. Use a sharp bolo when pruning in order to avoid breaking the remaining twigs and branches which will cause the hedgerows to die. Trimming of hedgerows is done every 30-45 days after the initial pruning.

4. Plant Food Crops at the Lower One-Third Portion of Your Farm

- Plant your preferred short-term crops on the lower 1/3 portion of the farm. Short-term crops (such as corn, upland rice, mungo, beans, and others) should be planted in the strips between the hedgerows. Planting the food crops on the lower portion of the farm allows them to receive the largest amount of sunlight.

5. Plant Fruit Trees at the Upper Two-Thirds Portion of Your Farm

- Plant fruit tree seedlings when they are 9-11 months old and at the start of the rainy season. The fruit trees, which will be the farm's main cash provider in the future, must occupy about 2/3 of the whole farm. Draw a map showing the areas where you intend to plant your fruit trees along with the proper spacing. The map could serve as your guide and record of planting. Provide proper spacing for the fruit trees so as to prevent overlapping and competition for nutrients when full grown (see **Table 1** for proper planting distance). Design your pattern to suit the needs of your farm.
- It is recommended that fruit trees with short production life 1-5 years of fruit production be planted together with fruit tree species that have longer production of life (15-50 years of production), especially during the first year of establishing your SALT 4 farm. By doing this, you can have fruits within 2-3 years (coming from the short-term fruit trees). When production from short-term fruits declines, the long-term fruits will by then be in full production. Examples of short-term fruits are kalamansi (Philippine lime), balimbing, coffee, and bananas. Long-term fruits include mango, durian, lanzones, mangosteen and the like. You may also plant other fruit trees that are very popular and saleable in your area.

Table 1. Planting distance and uses of different fruit trees.

Fruit trees	Scientific name	Purposes/Uses*	Distance (m)
Avocado	Persea americana	Fr, M, Fw	8-10
Balimbing	Averrhoa carambola	Fr, Fw	5-7
Calamansi	Citrus microcarpia	Fr, M	2-3
Cashew	Anacardium occidentale	Fr, Fw, Tm, M	8-9
Chico	Manilkara zapota	Fr	7-9
Durian	Durio zibethinus	Fr, Fw, TM	10-12
Guava	Psidium guajava	Fr, Fw, M	4 x 4
Jackfruit	Artocarpus heterophyllus	Fr, TM, M	8-10
Lanzones	Lansium domesticum	Fr, Fw, M	5-7
Mangosteen	Garciana mangostana	Fr, M	8-10
Papaya	Carica papaya	Fr, M	3 x 3
Pineapple	Ananas comosus	Fr, M	30 x 60 x 90**
Rambutan	Nephelium lappaceum	Fr, Fw	8-12
Siniguelas	Spondia purpurea	Fr	7-9
*Fr - fruit; Fw - fuelwood; TM - timber; M - medicinal			
** in centimeters			
Sources: Coronel, R. E. (1983). Promising Fruits of the Philippines (Laguna, Philippines); Samson, J. A. (1980). Tropical Fruits (New York, U.S.A.)			

Alternate planting

- Plant several and different fruit species in your SALT 4 farm to add diversity; 3-5 species is best. Alternate these species to help prevent disease and insect problems. Doing this will lessen monetary loss if there is a poor fruiting year from one species.

6. Intercrop Your Fruit Trees with Short-Term Crops

- Plant banana, coffee, pineapple, papaya, or root crops around the fruit trees while they are still developing. Some intercrops provide the much-needed shade in the growing stage of trees.
- Continue growing intercrops until the fruit trees are big enough to shade them out. Even then, crops that require less sunlight (like pineapple, ginger and ube) can be grown under the fruit trees. The short-term intercrops will serve as

your primary source of income in the first 3 years. If plowing is employed, it is important not to plow too close to the seedlings. A good rule is not to plow any closer than the leaf drop. This prevents the roots of the fruit tree seedling from being damaged. Examples of intercropping are listed in **Table 2**.

Table 2. Some recommended intercrops for fruits in SALT 4.

Fruit	Fruit intercrops	Cash crop intercrops
Atis	Mango, chico, citrus, pineapple and papaya	Annual field crops and vegetables
Avocado	Papaya, pineapple, and banana	Corn, mung beans, peanut, eggplant or sweet potato
Balimbing		Corn, mung beans, peanut, eggplant or sweet potato
Caimito	Banana, lanzones and coffee	Corn, root crops and other annual crops
Cashew	Banana, papaya and pineapple	Some annual field crops and vegetables
Chico	Banana, papaya, pineapple, calamansi and atis	Peanut and other legumes
Durian	Banana and pineapple	Corn, mung beans or peanut
Guava		Vegetable and short-term crops
Guyabano	Avocado, santol, pineapple and papaya	Cassava, ginger, cowpea and mung beans
Jackfruit	Shade tree for coffee/black pepper	Short-term crops
Lanzones		Corn, mung beans, bush sitao and other short-term crops
Mango	Atis, guava, guyabano	
Mangosteen		Short-term crops
Marang		Short-term crops
Pili	Banana, papaya and pineapple	Field crops and vegetable
Rambutan		Annual crops and coffee/cacao
Rimas	Citrus, chico, atis, guyabano, pineapple, papaya and pineapple	
Santol		Many possible intercrops
Siniguelas	Banana, papaya, and pineapple	Field crops and vegetables
Source: Coronel, R. E. (1983). Promising Fruits of the Philippines.		