

SANREM CRSP SEA (Phase III) project entitled “Agroforestry and Sustainable Vegetable Production in SEA Watersheds” seeks to alleviate poverty, food scarcity, and reduce environmental degradation in SEA by combining economically-viable and resource-conserving technologies, and gender friendly socio-economic policies that benefit and reward stakeholders in a watershed, especially small-scale farmers both women and men. The study area is in Barangay Songco, Lantapan, Bukidnon. Barangay Songco is an upland barangay located at the foot of the Mt. Kitanglad Range National Park in the Southern part of the Philippines. In search of a sustainable agro-ecosystem model in the upland areas, the team documented the Binahon Agroforestry Farm. The Binahon Agroforestry Farm showcases sustainable agricultural practices which can be adopted by small farmers. The study of Binahon Agroforestry Farm documents its humble beginning, and focuses on the doable and successful integration of agroforestry, vegetable and livestock production; simple yet effective soil and water conservation and management; and impressive farm technology innovations.

THE BINAHON AGROFORESTRY FARM: A CASE STUDY OF UNITY AND DIVERSITY, BALANCE AND SUSTAINABILITY



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What is the Binahon Agroforestry Farm about?

The Binahon Agroforestry farm is a model upland farm that incorporates sustainable agricultural practices. It is a must see place where one can learn and experience the different application of farming systems for production as well as conservation.

The farm applies the Natural Vegetative Strips (NVS) together with other farm practices for soil conservation. It is currently one of the largest producers of coffee planting materials in Region X as well as the main sources in Bukidnon. The farm uses simple and practical farming methods that can be adopted by small scale farmers. The idea transferring knowledge and technology urged the owner to build a resource center where he can organize extension programs together with the local government units and non-government organizations.

Binahon Agroforestry Farm is a great place for those who like to commune with nature, relax and experience how the farm put nature, agriculture and production into a harmonious balance.



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CD Pocket

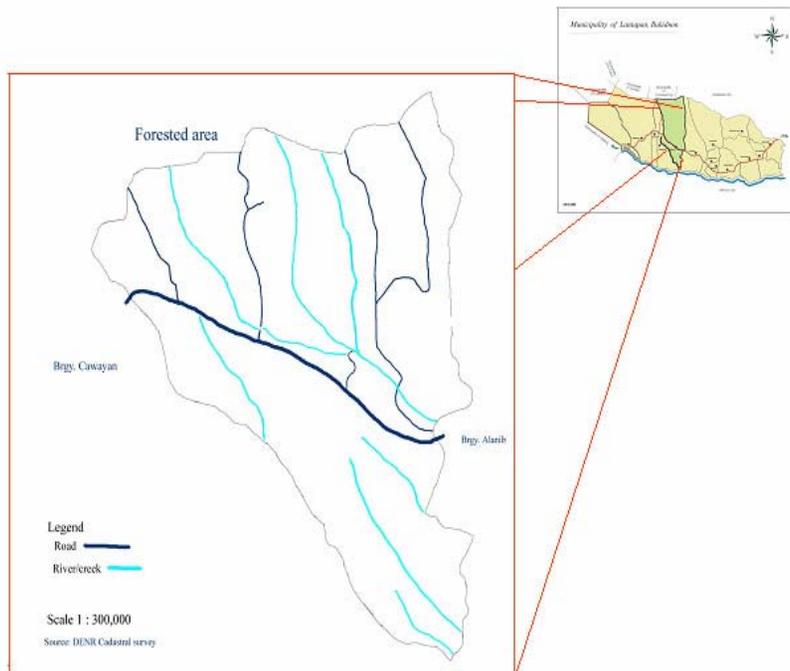
Where is Binahon Agroforestry Farm located?

The Binahon Agroforestry Farm is located in Sitio Bol-ogan, Barangay Songco, Lantapan, Bukidnon. The farm can be reached by riding a public utility jeepney or any vehicle bound to Lantapan along a bumpy and dusty road. Upon reaching Barangay Songco, with the waiting shed as a starting point, a hike of fifteen to twenty minutes up the rocky slope takes you to the farm.

How was this farm established? (A brief history)

In 1986, Mr. Henry Binahon was a farm consultant and the person supervising the project Molita-Manupali Watershed Management Program of the DENR. He was in-charge of the development of a satellite nursery in Sitio Bol-ogan. During this project implementation he met his wife – Perla, a forester of DENR and the head of the Bol-ogan sub-nursery. After two years, they got married and had two children, Henry Mark and Pearlie Jane, who will later help in the expansion of the farm.

The couple acquired 2.75 hectares of land in the sitio of Bol-ogan in 1992. They purchased the land from a local farmer for Php10, 000.00, on installment basis. Started from living in a small hut with a piece of land, Henry and Perla read agricultural books and immersed themselves in studying the different farming practices used by the local farmers. They also participated in trainings and seminars. Using the knowledge and experiences they have gained through years of self-study and participatory learning, they slowly developed the land into a farm, then into an Agroforestry Farm. Some years after, they expanded their property into 8 hectares by purchasing nearby lands sold to them by their neighbors.



Location map of the study area

The Binahon Agroforestry Farm is now known as a model farm that practices sustainable agriculture in the uplands. It is one of the known main sources of planting materials in the locality as well as the biggest producer of coffee planting materials in Region X. Recently, the farm has been as part of many activities conducted by local government units as well as non government organizations. The farm also transformed from just being a simple agroforestry farm into an agroforestry farm with its own resource center, which helps to inform local farmers of the latest innovations in the field of agriculture.

The main purpose of this system is to minimize soil erosion. When the rain erodes the soil, the tendency is that it will be blocked by the contour lines where it can still be utilized by the crops that are grown there.

What are the different types of industries does the farm operates?

Table 4. Example of plants grown in contour lines.

Contour Line	Napier grass, Banana and Bitter gourd / Legumes / Tomato
1 st Strip	Chinese Cabbage / Radish
2 nd Strip	Tomato / Beans
3 rd Strip	Cabbage / Pepper
4 th Strip	Bulb Onion / Carrots
5 th Strip	Carrots / Onions
6 th Strip	Beans / Tomato
7 th Strip	Zucchini
Contour Line	Napier grass, Banana and Bitter gourd / Legumes / Tomato



The Cut Flower Industry

Calla lily

Million flowers

The Binahons' industry and ingenuity have made theirs a model farm in the Philippines, demonstrating the successful application of sustainable agriculture and natural resource management principles. The farm illustrates the Binahons' philosophy: unity and diversity, balance and sustainability.

One of the popular cut flower in the farm is the calla lily. These flowers were planted along the canal system which collects the waste water from the training center, kitchen, and the household. They are planted under the trees, along the canals and creek at the back of the piggery.



Another advantage of intercropping is for pest management. By planting many types of crops in the field, the insect pests are not likely to infest the produce. One way of effectively controlling pest is by

planting crops that are considered as natural insect repellants like bulb onions, which is planted alongside other high value crops.

6. Contour Farming



The farm utilizes natural vegetative strips in preventing soil erosion as well as maximizing the potential use of the land. The farm establishes contours where crops are intercropped in soils that undergone minimal tillage. The crops are grown in strips where they are alongside other high value crops. Contour lines are composed of roughages that are used in feeding the carabao and the goats. Aside from grasses, the contour lines are planted with banana and legumes or tomatoes.

Local markets can purchase a dozen of calla lily flowers at Php75/dozen while individuals can purchase at a very reasonable price of Php60/dozen. Aside from selling calla lily, they also are used for different purposes such as decoration of the training center, catering services, and home.

Million flowers or milflores is another cut flower that the farm cultivates. It is sold at Php75/doz. The packaging of these cut flowers involves placing each stalk to a small plastic bag with water and then 6pcs are pack with newspaper or banana leaves. Finally, they are placed in a box.

Baby's breath is also one of the cut flowers that the Binahon Agroforestry farm produces. Direct buyers purchase it at Php50-75/kg. They can also buy these cut flowers in Malaybalay, Cagayan de Oro or Iligan. Aside from being sold, Baby's breathe is popularly used in their catering services.

During celebrations like the annual Kaamulan festival, they received contracts to provide cut flowers. Last March 10, they sold 40 dozens of calla lily to the provincial capital used to decorate the stage. A generous amount of Ph2,400.00 was given to them for their beautiful cut flowers.

The Produce Industry

One of the unique features of Binahon Agroforestry Farm is the application and modification of the Natural Vegetative Strips (NVS). This method can be observed in the contours of the land area. The plants that were meant for vegetative control can be seen in the lower area while the plants with high economic value, such as vegetables are place at the upper level of the contour. This modification was done to balance economic activity as well as the conservation land.



An example of combination of crops in contour lines (hedgerows) is the cultivation of ampalaya at the upper level, calla lily at the back of NVS which is composed of coffee, banana, durian, lansones and timber trees.

Another NVS hedgerow was modified, banana, durian and eggplant are planted above the hedgerow where the lemon grass was planted and/or the combination of banana, coconut, pomelo, and coffee.

Table 1. Crops and trees grown in Binahon Farm

Crops Grown	Scientific Name
<u>Cutflowers:</u>	
Calla lily	<i>Zantedeschia sp.</i>
Milflores	<i>Hydrangea sp.</i>
Baby's breath	<i>Gypsophila sp.</i>
<u>Vegetables:</u>	
Sayote	<i>Sechium edule</i>
Tomato	<i>Solanum lycopersicum</i>
Cabbage	<i>Brassica oleracea</i>
Lettuce	<i>Lactuca sativa</i>
Romaine lettuce	<i>Lactuca sativa</i>
Celery	<i>Apium graveolens</i>
Ampalaya	<i>Momordica charantia</i>
Sweet pepper	<i>Capsicum sp.</i>

These plants are shade loving and grow under the canopy of the nurse trees. The third and last level is the plant nursery. The nursery contains plants that are shade loving and are still in their developing stage. Some of these plants are sold to the farms visitors, while some are stored for future planting materials.



Table 3. An example of crops used in multistory cropping.

Level	Plant
First	Eucalyptus
Second	White Lauan/Rattan/Abaca
Third	Mango

5. Intercropping

Intercropping is practiced in vegetable production for plant diversification and integrated pest management. In plant diversification, there is a higher return from marketing these crops. Planting diverse crops in the farm ensures better income. There is no need to lower the price of a particular crop when supply is high because there are alternative crop to earn income.

The farm practices crop rotation to minimize insect pest population in the farm. Another advantage of crop rotation is the rejuvenation of the soil from its depleted nutrients. Every crop's nutrient requirement varies so there should be compatibility between the crops that will be interchanged so that the nutrient that was depleted will be returned.

3. Vermi-composting

Instead of using chemical fertilizer, the farm uses organic fertilizer that they produced. The farm practices vermi composting by collecting the organic wastes produced by the farm and the household. These wastes are mixed with other bio-degradable waste and are left in containers that are not sealed, where they can ferment for a couple of days and be used for composting. The humus produced is used as organic fertilizer.



4. Multi-story Cropping

Multistory cropping maximizes the use of land by having different plants grown in the same area. It is applied to the cultivation of trees and other ornamental plants. It can be distinctly observed in the farm. The arrangement and cultivation of plants are in three levels. The first level is commonly composed of tall trees that provide a canopy for the smaller plants or also known as the “nurse trees”. The second level plants are mostly endemic fast-growing dipterocarps.

Crops Grown	Scientific Name
Bell pepper	<i>Capsicum annuum</i>
Chili	<i>Capsicum sp.</i>
String beans	<i>Phaseolus vulgaris</i>
Carrots	<i>Daucus carota</i>
Sitsaro	
<u>Condiments</u>	
Chili	<i>Capsicum sp.</i>
Tanglad	<i>Cymbopogon ambiguus</i>
Ginger	<i>Zingiber officinale</i>
Green onion	<i>Allium sepa</i>
<u>Rootcrops:</u>	
Sweet potato	<i>Ipomoea batatas</i>
Potatoes	<i>Solanum tuberosum</i>
Cassava	<i>Manihot esculenta</i>
<u>Ornamentals</u>	
Creeping juniper	<i>Juniperus horizontalis</i>
Pinus carribea	<i>Pinus carribea</i>
<u>Fruits/Fruit trees</u>	
Durian	<i>Durio sp.</i>
Lanzones	<i>Lansium domesticum</i>
Lemon	<i>Citrus × limon</i>
Pineapple	<i>Ananas comosus</i>
Jackfruit	<i>Artocarpus heterophyllus</i>
Marang	<i>Artocarpus odoratissimus</i>
Mangosteen	<i>Garcinia mangostana</i>
Pomelo	<i>Citrus maxima</i>
Mandarin	<i>Citrus reticulata</i>
Guava	<i>Psidium guajava</i>
Ponkan	<i>Citrus reticulata</i>
Rambutan	<i>Nephelium lappaceum</i>
Avocado	<i>Persea americana</i>
Kalamansi	<i>x Citrofortunella microcarpa</i>
Lemon	<i>Citrus × limon</i>

Crops Grown	Scientific Name
<u>Agroforest trees</u>	
Rainbow Eucalyptus	<i>Eucalyptus deglupta</i>
Sydney Blue Gum	<i>Eucalyptus saligna</i>
E. torriliana	<i>Eucalyptus torriliana</i>
E. europyla	<i>Eucalyptus europyla</i>
E. camaldunensis	<i>Eucalyptus camaldunensis</i>
E. rumpiana	<i>Eucalyptus rumpiana</i>
Narra	<i>Pterocarpus indicus</i>
Mahogany	<i>Swietenia sp.</i>
Banana	<i>Musa sp.</i>
Abaca	<i>Musa textilis</i>
Coffee	<i>Coffea sp.</i>
Rattan	<i>Calameae sp.</i>
Bamboo	<i>Bambuseae sp.</i>
White lauan	<i>Pentacme contorta</i>
Malakauayan	<i>Podocarpus philippinensis</i>
Igem	<i>Podocarpus imbricatus</i>
Julibresin	<i>A. julibresin</i>
Falcataria	<i>A. falcataria</i>
Ilang-ilang	<i>Cananga odorata</i>
Molave	<i>Vitex parviflora</i>
Banaba	<i>Lagerstroemia speciosa</i>
Bagalunga	<i>Melia Dubia</i>
Dao	<i>Dracontomelon dao</i>
Balite	<i>Ficus sp.</i>
Rain tree	<i>Samanae saman</i>
Acacia	<i>Acacia auricoliformis</i>
Cherry blossoms	<i>Prunus jamasakura</i>
Mala-adelfa	<i>Podocarpus neriifolius</i>
<u>Nursery seedlings</u>	
Mangosteen	<i>Garcinia mangostana</i>
Malakauayan	<i>Podocarpus philippinensis</i>
Molave	<i>Vitex parviflora</i>
Tambis	<i>Syzygium aqueum</i>
Rain tree	<i>Samanea saman</i>

2. Integrated Pest Management

The solution of sugar and vinegar is one effective way of controlling pests in the field. The sugar-vinegar solution is placed in bottles which serve as an attractant that feeds and eliminates sucking insects. The bottles are refilled with the solution whenever necessary or when the bottle is almost empty.



Another method of catching and killing pests in the field is the use of bright colored sacks. The sacks brushed with motor oil are placed in the middle of the field. The bright color of the sack attracts the insects while the motor oil traps these harmful insects. The paraphernalia is replaced every fifteen days.

Bio-fumigation is a practice applied before every planting season to eliminate soil borne diseases. The leaves of cabbage, radish and crucifers are chopped and are applied to the soil fifteen days before the planting season begins. These leaves emit gases that kill bacterial wilt that may damage the crops.

Mr. Binahon does not mind the native bees living in some of the buildings in the farm. He said that it is considered good luck based on local belief. He also believes that it should be allowed to live wherever it wants because it is a way of living harmoniously with nature.

The preferred species of trees by bees are observed to be the *kalamagan*, *kadungi-surug* and *Aralia bipinata*. Other feeds of bees include Eucalyptus, sayote, cassava, and most of the fruit trees. Included in the menu of bees are the wild shrubs and grasses that are found in many parts of the 8-ha farm. The expected harvest for the 26 boxes is 120 kg per year. They are expecting to have 100 colonies by Dec 2007-March 2008. The expected harvest is 2 tons/year, at a current market price of Php200/kg.

What are the different technologies and farming systems employed in the farm?

1. Waste Water Management

The water used from the kitchen, bathrooms, and pigpens are used to water the plants in the farm. The water passes through a series of canals where calla lilies are planted, hence, the reason why the owners calls these flowers “canal lily.” Since the recycled water contains some amounts of organic matter, it also provides additional advantage to the system.

There are also several artificial ponds within the farm. These ponds contain fishes which are utilized as mosquito control as well as for aesthetic purposes. The ponds are intended to collect and store rainwater, which is then used to water the plants. The organic matter produced by the fishes in the ponds also serves as a minute source of nutrients for the crops.

Crops Grown	Scientific Name
Bamboo propagules Lemon Calamansi	<i>Bambuseae sp.</i> <i>Citrus × limon</i> <i>x Citrofortunella microcarpa</i>
<u>Pasture</u> Mani-mani Wild napier	<i>Arachis pentoi</i> <i>Pennisetum purpureum</i>

Livestock Industry

>>Swine Production

The farm’s integration of swine started in 1997 when Mr. Binahon and his family started with an initial inventory of 3 piglets. Four months after, they sold the piglets and then purchased the second batch of five piglets. After quite some time, they sold all of their swine and then they bought eight swine. From the batch of eight piglets, four were sold while four became sows. Ten years after, the farm now has 2 breeders and 10 sows. The pigs are sold in the local market in live weight basis.



>>Goat Production

The farm adopted the goat production industry in 2002. The farm started with one goat only. After six months, Mr. Binahon bought two more goats. Some grasses like Napier and other pasture species were grown as feeds to the goats. Currently, the farm has fourteen goats in all. Some of the goats are slaughtered whenever there are guests in the farm, while some are placed in the refrigerator for home consumption and for the lodgers.



>>Carabao and Horse Rearing

There is one carabao in the farm mainly for hauling. A horse, recently bought by Mr. Binahon is observed grazing in some area of the farm. Horse, he believes that it can be an attraction to the farm in the future



Table 2. Livestock raised in Binahon Farm

Livestock/	Number	Scientific Name
Pigs	2 breeders, 10 sows	<i>Sus scrofa</i>
Goats	14	<i>Capra aegagrus hircus</i>
Carabao	1	<i>Bubalus bubalis</i>
Horse	1	<i>Equus caballus</i>

Apiculture



The Binahon Agro-forestry Farm has two colonies of bees since November 2005, which Mr. Binahon bought from a knowledgeable friend in bee keeping. “The real story was that I bought one colony for PhP5400 and the other

colony in exchange for broad frames made in the woodworking shop. I bought 5 queens at PhP500/queen, and split the colonies in January 2006. When one queen died, we merged the colonies. In April 2006, there was a natural emergence of 3 queens, making a total of 9 colonies. In October 2006, there was natural swarming and new queens emerge, to make a total of 14 colonies. During the December 2006 training, we bought 10 queens, which made the 14 colonies to 24. Then I sold 4 colonies for PhP5,400 each. There were two days of basic training, and one day advanced queen rearing. As a result of the training on queen rearing, we gained additional 5 colonies; there are now a total of 25 colonies. I expect that we will have 100 colonies at the end of the year,” Mr. Henry Binahon said.

Twenty six boxes of an exotic species of bee, *Apis melothesa*, can be found in the farm. According to Mr. Binahon, the native species (*A. cerana*) is known to be aggressive and swift to swarm, and hence management is difficult. The imported species is more manageable and has a higher production rate. Aside from the aggressiveness of the native bees, its production (25%) is lower than the imported species, that’s why the farm cultures imported bees.