

NATURAL & ORGANIC FARMING
By: Rex A. Rivera, Agronomist

INTRUODOCTION TO:
NATURAL FARMING

With
ORGANIC & BIOLOGICAL
TECHNOLOGY

**(AN ATTEMPT TO GO BACK
TO MOTHER NATURE)**

Prepared and compiled by:
REX A. RIVERA
Agricultural Consultant
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INTRODUCTION

We can grow healthful food without depending too much on toxic chemicals and chemical fertilizers with NATURAL

ORGANIC AND BIOLOGICAL FARMING systems. The knowledge and simple but practical technology in this manuscript can save your crops and help you earn more from your garden and farm. Let's return to the "Natural" ways. The growing market demand is for safe organically grown fruits and vegetables.

It is not the intention of this paper to entirely eliminate the use of beneficial agricultural chemicals and fertilizers that help to suppress and control destructive pest and diseases and provide food nutrients to the plants. We also encourage the adoption of the latest improved technology and farming systems that are environmentally and ecologically friendly. We encourage farmers to adopt practical Integrated Pest Management (IPM)

This paper will attempt to help and teach interested farmers adopt natural and practical farming systems that will reduce the use of costly and toxic agricultural chemicals and replace them with organic preparations the farmers themselves can produce and use. This can result to producing healthful organic food at lower cost with higher productivity as the soil and environment improves. This may be debatable, but possible and attainable.

There is a worldwide shift for safe, chemical free food and a demand for organically grown food crops. The alarming increase in the use of toxic chemicals to control pests and diseases on both farm animals and plants has endangered the environment and reduce bio diversity as well as the health of consumers. We become too dependent like addicted people as the soil becomes poorer and insect pest become resistant to chemicals used.

The world that we have created is dominated by a disregard for Nature and a greed that destroys for profit the environment, the ecosystem and the capacity of the land to produce without artificial human interventions.

Useful insects and predators of pests are killed together with the insect pests with the wide and intensive use of toxic agricultural chemicals. The surviving pest finds no natural enemies, thus they

increase rapidly resulting in more destructive infestation with more resistant pest to chemical control. We have to recognize the natural laws, governing and balance of nature, its biodiversity and life itself.

These simplified guides can help farmers reduce their production cost and become self reliant with renewable crop protection products they can grow and formulate in their own farms, together with their commercial crops and livestock. They can also make their own fertilizers and soil amendments that will turn their land into productive farms. This can make farmers self reliant and self sustaining

Through Natural Farming, we can feed the increasing population of the world with healthful food free from toxic chemical residue.

NATURAL FARMING

To understand natural farming we need to know the cycle of life and matter. Natural farming as we envision is learning nature's laws, and using them with care. Take note: **Natural Laws are the laws of God who created Nature.**

Natural farming is a culture where plants are grown in 100% natural environment with the least human interference and no harmful chemicals or synthetic products used. It is practically leaving the crops grow and produce in their natural environment, and man comes enhances the natural conditions to improve productivity. Then, harvest or gather its products for man's use. However, in the context of our discussion, we will be introducing farming systems that will employ and apply more and more organic and biological farm practices.

Dr. Saturnina Halos, an agricultural scientist says: "Strictly speaking, farming interferes with nature. There are a lot of human interventions in farming." This is very true, and if we are not careful enough, we may totally lost natures' resources and capacity to produce the food that our growing population needs. We seek to

learn natural organic and biological farming to safeguard the environment and sustain its productive capability.

While there is a growing demand for organically grown fruits and vegetables, it is difficult and almost impossible not to use chemical products to increase the production per unit area in a shorter period of time to meet the growing food demand of the increasing population. Besides plant roots and leaves can only absorb nutrients in their chemical form. Organic materials have first to be broken down into its basic chemical component to be utilized by plants. Synthetic chemical products being used in Agriculture were processed and synthesized from organic and/or mineral materials.

Before life was created, matter first existed. In the beginning we have water, rocks, gases, light, solar energy, the earth and atmosphere. There was yet no life. (Read the Holy Scriptures 'The Holy Bible' Genesis on Creation). When the environment became ready, life began to appear in many forms from single cell to the complex form of plants and animals. We learn that evolution is God's continuing process of creation.

Matter on the other hand is never lost, it just change in form and substance from solid to liquid and gas and back to solid. From its mineral chemical form to organic compound and back to mineral and chemical. (*Remember man that thou art dust and unto dust thou shall return.*). Roots absorb nutrient in simple chemical form decomposed organic compounds have to be converted to chemical form and are absorbed by plants.

Evolution as science discovers, life started in the waters in single cell microorganisms in animal and plant form. In ages and millennium the seed of life developed into higher forms as we see them today. Together with life or biological progression, weathering of the environment prepared the development of ecological diversity. So even at our time, we witness the continuing process of creation and evolution of new varieties and forms of life.

Man with his God given intellect is an instrument in the development through the science of breeding and lately genetic engineering and cloning. Man's technological advances are still following natural laws, which without that, it will be impossible.

If we observe the growth and vegetation of natural forests, we will notice the healthy growth of trees, shrubs, grass and other forest vegetation. The soil is fertile, rich in organic humus and there is very limited pest and disease damage. Animal life, also abound from microorganisms like bacteria, fungus to worms, reptiles, birds and mammals.

The plants and animals have grown in their natural environment without interference of man. They may not be as productive as we wish them to be, but we can learn from their growth, survival and production in their natural habitat. Ecological and biological diversity can be observed existing and living in harmony.

- The soil is kept fertile with the leaves, branches and other plant parts that mature and drop to the soil surface are decomposed with the aid of bacteria, fungi and other minute organisms that eat and digest them up with moisture (water). This results to the buildup of humus and organic fertilizer, which break down into simple chemical form rich in readily available plant nutrients for roots to absorb.
- Beneficial microorganisms abound in the fertile organic rich soil that help both in the decomposition of organic materials and suppress or control the spread and multiplication of pests and diseases. Probiotics or beneficial microorganisms help suppress and control the growth of disease causing microbes (bacteria, fungus and virus) and even soil born pests like nematodes and insects.
- Insect pests are kept down as both destructive and friendly insects are balancing their population in their natural habitat. This control the buildup of insect infestation is a

continued process when left to their natural estate. Example of these are: the use of *Trichogramma ostrinae* against corn corer and *Braconidae* or Braconid Wasps which parasitize other arthropods. Braconid wasps can be endo- or ecto-parasite, solitary or living in groups as primary or secondary parasites. Different species may attack every stage of an insect development; there are braconids that are egg parasites, larval parasites, and parasites of pupae and adult insects. Many parasites are valuable as biological control of pests.

- Big and tall trees protect the soil and other living organisms beneath from too much heat and inclement weather conditions. Soil erosion and depletion is minimized or totally prevented. Trees serve as umbrella in forest and natural habitat. Tree planting in certain sections of the farm is advisable and encouraged. Keep and grow spots of mini forest in your farm to preserve and protect the environment and eco system for the habitation of bio diversity.
- The environment is preserved as bio-diversity is protected in natural forest vegetation where man has not set its foot on. All of creation and living things have a purpose and role. Herbal and medicinal plants have been destroyed and eliminated with the past century of clearing and cultivating lands for agriculture and crop production.
- Zero tillage is propagating plants without the artificial means of cultivation. Plants and seeds are spread by growth of rhizomes, vines, carried by wind, water and birds. Modern natural farming systems can learn much from nature's way of propagating and preserving its species even without the usual land clearing and land preparation involving digging, plowing and harrowing.
- Following is a farming practice by ancient farmers up to the 50s where the land is made to rest for a year or two to allow nature to rejuvenate it and enrich the soil fertility and productive capacity. Resting the soil for one year after six

years of crop production. Today, this is less practiced due to the limited farming areas. Farmlands are chopped down by CARP into small lots 3 hectares and smaller. Farmers need to make them produce continually without resting, so artificial methods are done to keep it producing using chemical and organic fertilizers.

To adopt natural farming system, we have to understand how the ecosystem responds to man's interventions. The moment we clear the land, remove the protective trees and cultivate the soil, we have destroyed the natural environment and the existing ecosystem and bio-diversity. The lesser we destroy or remove the natural environment; the closer we get into natural farming.

However, we can gradually return to natural ways by learning the natural laws governing plant and animal propagation, growth and production.

Some practices now being done and promoted as natural farming practices:

1. Zero cultivation and following, allowing the soil to rest and rejuvenate.
2. Integrated Pest Management (IPM).
3. Insect traps, lure and attractants.
4. Use of Biological pest control (natural enemies of pest)
5. Use of Organic Compost fertilizer and bio micro inoculant.
6. Use of Organic Pest and Disease control materials.
7. Use of indigenous resistant plant varieties and strain.
8. Practice crop rotation and following (resting the soil for some time).
9. Growing and inter-cropping of pest repellent and herbal plants.
10. Integrated cropping pattern to prevent growth of toxic weeds.
11. Growing the right crop on the right soil, climate and at the right time.

While the above practices are good and desirable, they have to be done in combination with modern agricultural technology to increase productivity per unit area at shorter possible time. This is because the farming and food production areas do not

increase, while population continues to increase. Feeding the growing world population needs the ingenuity of man, his talent and ability to invent and innovate as his Creator endowed in him

1. Zero cultivation, following and allowing the soil to rest and rejuvenate.

Zero cultivation has been a long and original practice of man in its first attempt to grow crops. Even today, kaingineros, those who clear the forest or trees to grow seasonal crops do not cultivate the soil, since it is soft, friable and very fertile.

They just make small holes with pointed stick and drop seeds of rice, corn, vegetable or any crop they wish to grow. After one or two seasons, the soil hardens and hard to work on because of exposure to sunlight, necessitating soil cultivation, as the humus and organic content of the soil lessens. Then the farmer starts depending on commercial chemical fertilizers to replace nutrient loss. Unless organic compost materials are augmented to the soil, it will continue deteriorating.

To remedy the situation, following, or resting the field for one year, allowing all vegetation including weeds to grow, to bring back the natural fertility and bioorganic life into the soil. The use of organic fertilizer in combination to commercial chemical fertilizer will help preserve and sustain the productivity of the land. This has been the practice of ancient farming in Egypt, Babylon and Israel.

Tilling on the other hand promotes healthy soil in cultivated agricultural lands. It exposes the pest and soil born diseases, increases soil aeration and oxygen supply to microorganisms and promotes root growth and penetrates better as the soil is loose. This is done after destroying the natural soil environment through tillage.

In orchard farms (fruit tree plantations) where permanent trees are growing, zero tillage can be done, by growing low

creeping leguminous cover crops like Arakis pintoy or Australian peanut weed (mani-mani) around and in between tree rows.

2. Practice clean culture.

Keeping the field clean will help in preventing the growth and multiplication of pest and diseases. All plant waste and droppings should be gathered in one place to be composted and converted into organic fertilizer. Before using the composted organic materials for fertilizer, sanitize them first by exposing them to direct sunlight and dried to eliminate any diseases and eggs of insect pests. Defoliate over mature and diseased and infested leaves. Allow sunlight and aeration to penetrate between plants and within the foliage of trees. It will promote the growth of normal and healthy branches and eliminate abnormalities.

Cultivation and weed control will also help not only in soil aeration and softening of soil mass but will also reduce or disturb the breeding place of insect pests and fungal diseases. To bring back the natural organic matter, these materials have to be incorporated with the soil as organic fertilizer and manure.

3. Integrated Pest Management (IPM).

Integrated Pest Management (IPM) is a pest control program using combination of all practices to reduce or eliminate pest damage. This includes natural, biological and mechanical practices as well as bio and chemical pesticide application.

Among these practices include the following:

- a. Planting resistant or tolerant plant varieties. Growing indigenous crop varieties with reasonably high productivity should be encouraged. New breeds and genetically modified plants are being developed like Bt Corn which are resistant to corn borer infestation. New pest and disease resistant with high nutrient food value

- varieties are being bred and produced through genetic engineering (GM) and natural cross breeding.
- b. Timing planting so as the growing and fruiting stages does not coincide with inclement weather conditions and high incidence of pest population.
 - c. Growing boarder or inter-crops that are repellant to insect pests.
 - d. Practice clean culture, proper pruning and removal of diseases or infested plant parts especially with fruit trees. Remove all breeding places of insect pests and infected debris rotting near plants and field.
 - e. Use organic fertilizer in combination with chemical fertilizer and supplement the field with compost and probiotic (bacteria, yeast & fungus). Sanitize compost and organic materials by exposing them to direct sunlight before applying it as fertilizer.
 - f. Learn to prepare and use bioorganic pesticides and fungicides as substitute for toxic chemicals.

IPM may also include the following:

- a. Keep the garden small and the plants varied to prevent insect pests infestation. Solo or mono cropping tends to encourage the multiplication and outbreak of insect pest that feed on the particular plant grown. Multiple cropping or maintaining a green belt in the farm where vegetation is allowed to grow naturally will be a shelter and home to beneficial organisms, plants and animals including variety of insects that will check and control any outbreak of pests. This will be a natural check and balance.
- b. A basic principle in pest management: Plant the right crop on the right soil at the right time. Plant crops at a time when its particular pest is inactive.
- c.
- d. Plant indigenous cultivars or plant varieties native to the place. They are resistant to the pests and adapt very well to the local environment. The introduction of hi-

breeds and high yielding commercial seeds have the tendency of eliminating indigenous varieties that are adopted to the environment as they have survive decades and century of adjustments.

- e. Healthy organic soil, grow healthy plants that resist pests and diseases. In soils applied with organic matter or humus, animal manure and compost, the soil host a wide variety of micro organisms that are harmful to nematodes and cause diseases to some insect pests thereby allowing the increase in population of beneficial organisms and insects.
- f. Crop rotation dissociates microorganism buildup around the plant roots as each crop has a characteristic microbial association. (Example is pro biotic and nitrogen fixing bacteria for legumes). New microbes are being developed to inoculate the seeds just before planting to introduce them into the soil and help in nitrogen fixation that enriches the soil.
- g. Aromatic herbs like mint, garlic, marigold, oregano, onion, control nematodes and repel insects, and should thus be grown as companion crop to your garden or farm.
- h. Tilling promotes healthy soil as it allows aeration bringing supply of oxygen promoting root growth and permit better root penetration breaking soil compaction. It exposes pest and soil born diseases to sunlight and disturbs their growth and multiplication. Sunlight is a very good and free sanitizer.
- i. Crop combination such as legumes and potatoes, control nematodes. Learn and find out the best crop partners and combinations. Planting tomatoes in between rows of eggplant will reduce fruit fly infestation on eggplant fruits. Growing marigold at the border of vegetable plots will also help repel some insect pests.

4. Insect traps, lure and attractants.

There are many practical and inexpensive ways of controlling and managing the population of insects pests in your garden and fields. Here are some of them that you may adopt:

- a. **Light Traps** - This practice have been found effective in unlighted areas. Light is provided with a basin of water. As the nocturnal insects are attracted to the light, they fly and dip into the water, or their wings are singed by the flame of the fire light.
- b. **Lure with attractants** – The lures derived from molasses and flower scent (odor), tantalize both male and female moths (the caterpillar adult stage) with the promise of nectar. The insects fly into the opening of a lure-dispensing trap, never to return.
- c. **Chemical sex attractant** – The use of **PHEROMONE** a chemical with female insect odor that confuses the male and attracts them to a bait treated with toxic insecticide or they fail to mate with the female insects.
- d. **Blue electric lamp** surrounded with electrically charged mess wire that electrocutes insects upon contact.
- e. **Yellow pads** – Most insect pests are attracted to bright yellow color. Yellow pad with grease or paste, attract insects during the day and sticks to the pad as they come in contact. The pad may also be treated with molasses and pesticide to give added attractant and killing potential.

5. Use of Biological Pest and Disease Control.

The use of living plant and animals or living organisms to control pest and diseases are called Biological Control. They may be microorganisms such as bacteria, fungi, virus or

bigger life forms like insects, worms, reptiles, mammal and birds. You can learn to increase the beneficial insects, microorganisms and other animal and plant life in your farms to counter pests and diseases harming your crops. Let us protect and increase these beneficial enemies of pests.

6. Use of Organic Fertilizer

Fertilizers coming from fermented and decomposed organic materials are very nutritious safe fertilizer materials. They both enrich the soil plant food nutrients, improves the texture for easier root growth and preserve the soil life such as beneficial bacteria and fungi. We have several recommended formula in preparing organic fertilizer both liquid and solid form in this handbook.

7. Used of Organic Pest and Disease Control

Herbal preparations to control pest and diseases can easily be made by farmers themselves since we have abundant plants in the Philippines that are suitable ingredient.

We offer you several formulations and methods of preparing Botanical or Herbal pest and diseases concoctions in this handbook to guide you make your own.

8. Use of indigenous resistant plant varieties and strain.

There are several plant varieties and species that are found resistant or tolerant to certain prevalent pest and diseases. It will be wise for farmers to know them and grow these type of plants specially during months or season that certain pest and diseases are abundant.

9. Practice crop rotation and following (resting the soil for some time).

Crop rotation or changing crops grown in certain areas to avoid the buildup of certain pest or disease affecting certain crops. Example, rotating onions with pepper or cassava.

Resting the soil for one to two years to allow natural vegetation and the growth of natural enemies to introduce balance of nature, while enriching your soil environment for future crop production.

10. Growing and inter-cropping of pest repellent and herbal plants.

There are crops that repel certain insect pests. Intercropping tomato with cabbages and cauliflower will help reduce the diamondback moth attacking cabbages. Learn what these crop combinations. You will not only reduce your cost of pest and disease control but may even increase your income per unit area with the crop combination.

11. Integrated cropping pattern to prevent growth of toxic weeds.

Certain weeds are difficult to remove or control, like grasses. Planting vines and crawling crops like sweet potato and cover crops will help suppress weeds. Replacing the weeds with other beneficial creeping plants like Arakis pintoy (mani-mani) that covers the spaces between fruit trees and help supply nitrogen to the soil.

12. Growing the right crop on the right soil, climate and at the right time.

There are suitable crops that are ideal for certain season of the year and suitable soils for their healthy and productive growth. Learn the nature of the plants and their preferences before deciding what to grow in your farm. The Philippines is located in the tropical zone, so ideal for tropical crops and not much for temperate crops. Let us learn the advantages we have by growing the right crops best suited to our land with good market demand.

COMMON INSECT PESTS AND THEIR CONTROL

1. **Whit Flies** are aphid-like small insects that look like tiny moth. The nymphs are found in the underside of the leaves or covered parts of the plant as they try to avoid direct sunlight. Repeat treatment several times

Control measures:

- Spray with soap and nicotine solution.
- Use tobacco dust.
- In every serious case, use kerosene emulsion with soap and water.
- Spraying or drenching plants with HOC-4n1 (Herbal Organic Concentrate) including the soil at the base of plants will reduce and eventually eliminate infestation.

2. **Borers** hatch inside the stem of plants, eat and grow inside as caterpillars. The branch or stem infested wilts and die.

Control by cutting off the infested stem and burn killing the pest. Periodic spraying plants with organic insecticide will help repel pests. Introduction of **TRICHOGRAMMA & BRACONIDS** are very effective and self sustaining borer control. When established in the community, borers no longer can multiply and increase into pest population.

Spraying of HOC-3n1 (Herbal Organic Concentrate at weekly interval during flushing, flowering and fruit development stage will greatly reduce infestation until totally eliminated.

3. **Coffee Berry Borers (CBB)** The 1.5 mm bark beetle spends its entire larval life inside the coffee berry, encases the coffee bean. Male mates inside the berry with females, but never emerge. Only the mated female emerge to fly to

a new berry and bore into it to lay eggs and start the cycle anew. Only when the female fly out is it vulnerable to predators or chemical control.

Control is difficult with traditional and biological means. A Fungus, *Beauveria bassiana*, attacks a wide range of insects, including CBB. The technique is to get the fungus in contact with the insect pest. The fungus can become **ENDOPHYTIC** – meaning, once introduced to the plant, it integrates with plant tissues. Four methods are employed. 1. Injecting it into the stem, 2. Spraying it on the leaves and other parts of the plant, 3. Soaking the seeds in it and 4. Drenching soil with it. The purpose is to make the fungus thrive in the plant so that the coffee berry borer can become exposed to it and be infected and die.

Spraying the coffee trees with HOC-3n1 (Herbal Organic Concentrate) once in 15 days will help reduce and eventually eliminate infestation.

4. **Caterpillars** feed on leaves and tender parts of the plant. Butterfly and moth underneath the leaves usually lay eggs.

Control measures:

- Spray kerosene emulsion and wet the egg clusters to destroy them.
- Handpick the caterpillar and destroy them.
- Pick leaves with cluster of eggs and burn them.
- Introduce natural enemies in the environment like **Braconids** and other beneficial insects and predators.
- Spray and drench the plant with HOC-4n1 (Herbal Organic Concentrate) when pest are observed.

5. **Cutworms** attack newly transplanted vegetable seedlings or chew leaves and tender parts.

Control measures:

- Check at night with flashlight and gather pest and mechanically destroy them.
- Cultivate and expose the soil of seedlings attacked by cutworm, locate them and destroy.
- Placing a stick or toothpick/matchstick at the side of the seedling stem buried will prevent cutworms from encircling cutting the stem.
- Spray or drench the plant with HOC-4n1 (Herbal Organic Concentrate) including the soil at the base of the plant.

6. **Leaf miners** are grub inside the leaf. It develops into pupa and drops into the ground. It causes minor damage to leaves

Control measures:

- Herbs with strong smell repel adult's flies and other insect pest. Intercropping or planting strong smelling herbs in your garden will lessen infestation.
- Chickens and birds feed on pupa in the ground. Making your garden and farm a haven for birds will help reduce insect infestation.
- If possible, plant trees bearing fruits and berries edible to birds in your farm. Maintain a watershed or mini forest for haven of wild life.
- Dusting wood ash and HOP-3n1 (Herbal Organic Powder) on leaves will repel leaf miner fly.

7. **Mealy bugs** are scale insects covering stems and branches of plants, sucking its sap. This pest if not controlled early can destroy entire orchard.

Control measures:

- Spray alcohol on the mealy bugs. It penetrates the waxy shell like protective cover, killing the insect.
- Spraying kerosene with tobacco and soap plus Malathion is effective for field control of orchard fruit trees like mango.

- Repeat spraying every week until the pest is totally under control.
- Weekly spray of HOC-3n1 (Herbal Organic Concentrate) for insect pests.

8. **Fruit Flies** are common and serious pest on fruits like mango, guava, jack fruit and other fruits and vegetables. The fly lays eggs into the fruit and hatch into maggot that burrow inside fruits. They eat up portion of the fruit and open it to secondary rot infection.

Control measures:

- Gather all infested fruits and bury or burn them to destroy the pest.
- Use bait like methyl eugenol or hydrolicate with insecticide.
- Dip ripe fruits like aromatic guava, jack fruit in Malathion or other insecticides, and place them on branches of trees every 20 meters apart.
- Mix two teaspoon of household ammonia and $\frac{1}{4}$ teaspoon soap powder in a quart of water. Fill a jar with mixture and put the jar right next to the sunny side of the plant. Change the bait once a week or if it is diluted by rainwater.
- Plant strong smelling herbal plants within your garden and farm.

9. **Squash bugs** lay eggs on squash. They develop into gray nymphs with fat bodies and black legs. They suck the sap of squash and other plants with tender shoots and flowers like mango.

Control measures:

- Sprinkle the plant with hydrated lime or wood ash.
- Find the eggs and crush them.
- Trap them with a thin flat board place slightly tilted in the garden. The bugs assemble beneath the board where they can be gathered and destroyed.

- Spraying kerosene with tobacco and soap plus Malathion is effective for field control of orchard fruit trees like mango.
- Repeat spraying every week until the pest is totally under control.
- Spray HOC-3n1 on weekly interval.

10. Root maggot of flies laid its eggs near roots of plants like corn, vegetables. The hatched maggots feed on the roots, and weaken the plant. When in heavy population, they wilt and kill the plants.

Control measures:

- Sprinkle wood ash around the stem of newly transplanted seedlings.
- Incorporate chopped marigold into the soil.
- Use organic fertilizers.
- Sprinkle HOP-3n1 (Herbal Organic Powder) for insect pests.

11. Aphids / Green / Black fly makes your plant looks spindly and pale. They attack the leaves and stem. Aphids can change color to match plant color. It Metamorphose from nymphs to adult, with or without wings. When they are over crowded, they develop wings and fly to neighboring plants of the same family. They have 12 days cycle to maturity.

Control measures:

- Makabuhay (*Tinospora rumphi*) – Roots, stem and leaves liquid extract mix with water and soap is a good spray against flies, aphids, moth, worm and other insects.
- Atis (*Anona squamos*) seeds are grind into powder and mixed with water and soap. Use as spray on aphids.
- Spray HOC-3n1 on weekly interval until pest are controled.

USE OF ORGANIC PEST AND DISEASE CONTROL MATERIALS

We have a long list of biological pest and disease control and prevention materials at the later part of this paper for your guide, in case you decide to make your own botanical organic pesticides and fungicides.

Research found Marigold to repel or eliminate nematodes within a meter radius from the plant. The roots give off chemical diffusate that is toxic to nematodes. Many other plants and herbs have been found to have insecticide and fungicidal properties. You may follow these simple steps in preparing organic pest and disease extracts for your garden use:

PREPARING YOUR OWN PESTICIDE

While so many farmers are complaining of the high and even increasing cost of commercial agricultural chemicals, they can make and prepare their own with cheaper and available materials they can secure in their community or even grow in their own farm. Among these are the following:

1. Lime sulfur powder as natural fungicide

- b. Secure 1-kilo very fine lime and 1-kilo sulfur powder.
- c. Mix at 1:1 ratio.
- d. Add 1-gallon water.
- e. Bottle and seal tightly.
- f. Spray to plants for the control of fungal diseases of both garden and farm crops.

2. **Water** is a universal solvent and cleaning agent. Home gardens with good water supply, while watering their plants

can wash them with pressure hose to remove insect pests, fungus and bacterial infections. This practice is even done to big trees with power sprayers. Spraying clean water can wash off mites, ants, spidermites, and even fungal infections and other insect pests. With this practice many home gardens never use toxic chemicals to spray their plants against pests and diseases.

3. **Sea Water** is one source of good fungicide and insect repellent as well as providing the plant with added trace mineral elements. However it may need dilution with fresh water to reduce its toxicity to plants specially those with thin leaves and sensitive tissues.

4. Soap or Detergent and water

- Dissolve two (2) ounces soap flake to three (3) gallons of water.
- Bottle the stock solution, ready for spraying. Soap washings may be used.
- Dissolve three- (3) tbs. of soap flake/powder in one (1) gallon of water. Soap washing may also be used.
- Spray the plants with the stock solution against insect pest attacking your garden plants. The soap solution is effective control against mites, aphids, ants and other garden insect pest. It can also control fungal infection.

5. Soap and Kerosene

- a. Buy soap and kerosene from your local store.
 - b. Mix $\frac{1}{4}$ cup soap water + $\frac{1}{4}$ tbs. of kerosene + one liter water. Stir the mixture to form stock solution.
- Place stock solution in bottle ready for use. Use this solution when infestation is serious. Adding Malathion insecticide will help increase killing potency.
 - Spray plants for the control of garden pests such as aphids, ants, mealy bugs, mites and spider mites, etc.

6. Soap and Aromatic Herbs

- a. Collect / gather / wash and clean 1 Onion, 1 Garlic, 1 tbs. Hot Pepper.
- b. Chop / cut materials into small pieces. Use grinder.
- c. Pound / grind the different materials to extract juice.
- d. Filter the different materials separately.
- e. To the filtered juice of different materials, add 1-quart water. Let it stand for one hour and add 1-tbs. liquid soap detergent. Place the mixture in tightly covered jars and store in a cool dark place for a week as stock solution.
- f. Bottle stock solution ready for botanical pesticide. Spraying garden plants with botanical pesticide. This spray makes use of the repellent quality of onion, garlic and pepper. The soap serves as sticker and spreader.

7. Vinegar

- a. Buy vinegar from your local dealer. Bottle the vinegar as stock solution.
- b. Spray plants with vinegar (stock solution) for the control of powdery mildew and other fungal diseases. Vinegar and other acids is good material for fungus eradication.

8. Vinegar + Fermented Sugar

- a. Buy vinegar and sugar (brown or moscovado) from your local dealer
- b. Mix the fermented sugar and vinegar at 1:1 ratio and place in bottle as stock solution.
- c. Spray to plants stock solution for control of pest and fungal diseases.
- d. Adding water and soap can help spread the stock solution but could dilute the material to be less effective.

9. Vegetable oil

- a. Buy vegetable oil from your local dealer. This serves as stock solution.
- b. Add water and soap (1 part oil + 5 parts water + ½ part soap) and spray to plant to control spider mites and scale insects.

10. Crude oil

- a. Buy crude oil from your local gas station dealer.
- b. Mix soap and water to form your stock solution. (100 grams powder soap + 1 liter crud oil + 1 liter water).
- c. Mix to stock solution to 16 liters of water and spray to plants against scale insects, mite, aphids and other insect pest and fungus.

11. Wood Ash

- a. We can control root maggots in radish, cabbage, onion and other brassicas by spreading fresh wood ash around the plant roots. Ashes are then covered lightly with soil.
- b. Wood ash can also control snails, slugs and cutworms by encircling plants with 3-4 inches wide trench, 1-2 inches deep and fill the trench with ash.
- c. Spraying cucumber beetle with a mixture of equal parts of wood ash, powdered lime and soap is an effective control.
- d. Spray wood ash with water and soap can control flea beetle of tomatoes.

12. Vinegar and vinegar with fermented oil

a. Vinegar

- 1) Buy vinegar from your local dealer. Bottle the vinegar as stock solution.
- 2) Spray plants with vinegar (stock solution) for the control of powdery mildew and other fungal diseases. Vinegar and other acids are good material for fungus eradication.

b. Vinegar + Fermented Sugar

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2. Mix the fermented sugar and vinegar at 1:1 ratio and place in bottle as stock solution.
3. Adding water and soap can help spread the stock solution but could dilute the material to be less effective.
4. Spray to plants stock solution for control of pest and fungal diseases.



KNOW ABOUT HERBAL PLANTS

Aloe – [M.E.<Gr.*aloe*, dried juice of aloe leaves] Any plant of the liliaceous genus *Aloe*, chiefly African, various species of which yield a purgative drug, aloin, and fiber; also, the century plant, American aloe.

Aloe vera, one of the species contain **manapol** which contain vitamin, amino acid, macro and micronutrients and polysaccharides. It has an immunostimulant property. It contain a rich source of **saponins** which is toxic on herbivores, detergent, and destroy pathogen membranes. It has insect repellent, anti fungal, anti viral and anti bacterial property. The new compounds were found in the sterol fraction of the leaf. The presence of these agents in Aloe are very important. Campesterol, cholesterol, and B-sitosterol are plant sterols which possess chemical structures which are anti-inflammatory. Lupeol, a hydrochloride, is also an antiseptic and analgesic agent.

In 1982, a University of Chicago Burn Center Report which will be examined in more detail later in this text recommended the presence of Salicylic Acid but adds that this aspirin-like compound is a breakdown product from aloin (barbaloin) found in the sap. Other researchers have identified the presence of small amount of Urea Nitrogen, another anti-microbial agent, in the sap.

From the evidence obtain from research, one can postulate that Aloe vera works without toxic or allergic effects because of its nutrient and water content acts as a buffers. The nutrients also are essential to tissue growth and function. The plant controls (or eliminates) infection because of natural antiseptic agents – Sulfur, Phenols, Lupeol, Salicylic Acid, Cinnamonic Acid, and Urea Nitrogen. It controls inflammation due to its anti-inflammatory fatty acids, Cholesterol, Campesterol and B-sitosterol, and it limits or stop pain because of its content of Lupeol, Salicylic Acid and Magnesium. Acting together, these agents and the leaves, other agents constitute the synergistic relationship. Thus, we see a rational explanation for the numerous reports that Aloe Vera eliminates many internal and external infections, limit or eliminates inflammation, and is highly effective pain killer.

Chemistry explains Aloe's ability to work as an effective treatment for burns, cuts, scrapes, and abrasions as well as for the treatment of many inflammatory conditions such as rheumatic fever, arthritis of all kinds, disorder of the skin, mouth, esophagus, stomach, small intestine, colon, and other internal organs such as the kidney, spleen, pancreas, and liver.

It is important to remember that an anti-inflammatory and anti-bacterial agents are found in the sap and the rind of the plant, not in gel. At the same time one must not forget that the basic nutrient and other agents are widely dispersed throughout the plant – meaning the sap, the gel, and the rind. – and about 98% of the water is confined to the gel. This knowledge should help put pseudo-scientific fallacies to rest, especially the wide held myth that the gel of the plant is totally responsible for the healing ability of Aloe Vera. At the same time, we need not avoid an overreaction, which dismisses the gel as worthless. The gel is important as a buffering agent. Therefore, the theory of a synergistic relationship is the one, which is supportable with both history and science.

At this point in our research for the truth, we have a chemical explanation of Aloe vera's ability to heal through its capability to

control or kill a number of disease causing microbes, to alleviate (or eliminate) pain, and to counteract inflammation.

We know that it has been repeatedly stated that the plant has all these abilities, and more. As yet we have not even mention Aloe vera's reported ability to eliminate excessive water from tissue, to aid digestion, to balance body acidity, to eliminate or greatly reduce scarring. To regenerate hair follicles, to return injured or damaged skin to its normal health color, or any other benefits that will be explored as we move from the theoretical back to the practical.

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Neem Tree (Azadiracta indica)

Neem originated in the regions of Asia, India, Burma and Thailand. Now the tree grows in the tropical and arid regions in other parts of the globe. It is a fast growing tree adapts to semi-arid areas with 250 – 2000 mm rainfall per year. It can grow in poor soils but will not tolerate in high moisture soils and constant humidity.

Neem tree flowers are small and white. Fruit is oblong small in size about 2 cm long grows in bundles. Light green and turns yellow when ripe. Many parts of the tree, from roots to fruits contain natural organic insecticide properties, which can be extracted and used by farmers and gardeners.

Preparing neem spray. Pound the leaves, bark or seeds at 1:2 ratio. Soak in water overnight and use extract as spray for lepidopterous pests, bacterial wilt, nematodes, fruit flies, beetles, aphids and leaf hoppers. Cake can be used as mulch or mixed with soil to control bacteria, fungi and nematodes.

Uses of Neem:

- a. As an insecticide, neem extracts from roots, bark, leaves and seeds have strong anti-feeding insecticide properties. Insects affected and sensitive to neem extracts are the following:
- 1- Coleoptera beetles about 20 species.
 - 2- Diptera flies – 5 species.
 - 3- Hemiptera bugs – 14 species.
 - 4- Isoptera termites – 2 species.
 - 5- Lepidoptera butterflies and moth – 25 species.
 - 6- Orthoptera locust and grasshoppers – 5 species.

Insects that show resistance to neem extracts are scale insects, mealy bugs, bark eating caterpillars, and some pests infesting stored grains and seeds.

Neem extracts from leaves, fruits and bark have a strong repellent, anti-feedant and insecticide property. The Neem seed oil extract is a repellent to termites and nematodes. Extracts affect the food intake of insects, its digestion and physiological control mechanism (hormones) of insect growth that results in abnormalities in its molting process. Insect fertility is also affected, reducing greatly its fertile eggs.

- b. The wood can be used for lumber – construction. It is resistant to termites and woodworms. Wood chips can be used as paperboard, and excellent mulching material.
- c. Use for greening urban communities, along roadsides and parks, provide shade, clean the air pollution, acting as wind breaker, serves as water shed and prevents soil erosion, green barrier against spread of forest fires.
- d. Use as fodder for goats and sheep. It contains 15% protein and low in cellulose content.
- e. It is also very good soil conditioner and organic fertilizer. Neem cake or fruit pulp mixed with urea or other commercial chemical fertilizers will help restrict the growth of denitrifying bacteria. This reduces the breakdown of nitrogen in fertilizers

and optimizes the efficiency of fertilizers applied to the soil. Blending urea with Neem cake saves 20% of nitrogen fertilizer and increases yield by up to 15% in India. Neem cake significantly increases growth of azola and reduces insect (*Pyralis* sp.) infestation also in India.

- f. The extracted juice is used as medicine. Effective treatment for septic wounds, ulcer, skin diseases, stomach worms and malaria. Pharmaceutical preparations as nimbidin, based ointment, soap, toothpaste, cosmetics, denaturant and edible fats.
- g. The crude oil from seeds is used as lubricant. Neem seed oil mixed with soap and water is very effective spray against a wide range of insect pests. It is safe for bathing pets like dogs, cats and birds to dispel lice.

TOBACCO (BAR Chronicle July 2003)

Tobacco has been used by man for various reasons. Today it is used more for smoking because of its addicting pleasure. It is also used as food and feed, insect pest and disease medication for animals, pets and poultry.

“This is an herb of marvelous virtue against wounds, ulcers, herpes and all other things” says Jean Nicot in the 15th century, French ambassador to Portugal who introduced the tobacco plant to France. Today, our scientist continue research on tobacco. They confirmed that it has medicinal properties as antibacterial, antifungal, and topical analgesics. National Tobacco Administration (NTA) are formulating tobacco seed oil and leaf extract for medication.

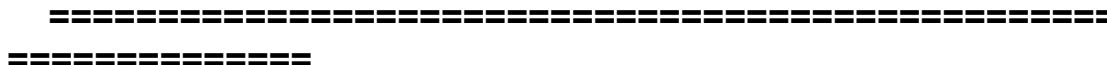
It has been reported in the DA-BAR Chronicle, that tobacco dust, if sprayed in liquid form, can be used in vegetable crops to kill insect pests such as golden snails, corn weevils, rain moths, and red flour beetle. Staunch advocates of organic farming are delighted with the beneficial uses of tobacco to control plant pests and diseases.

Other herbal plants

The Philippine is very rich in different herbal plants that are suitable for pest and disease control. Some of them are discussed in this handbook.

ORGANIC FARMING

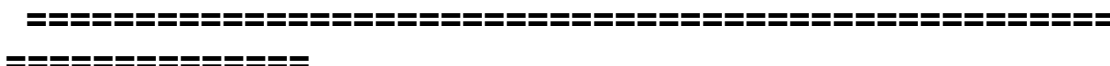
Many of the above discussions on Natural Farming practices including most items on Integrated Pest Management are part of Organic Farming practices. In these following discussions, we will be introducing farming practices that will be focused on the use of organic materials instead of synthetic chemical products.



HOW TO PREPARE OWN ORGANIC PESTICIDE AND FUNGICIDE

- b. **Gather plants with strong repelling odor and taste, like pungent (hot) pepper, black pepper, tobacco, onion, ginger, garlic, marigold, oregano, bitter vine, derris, neem, aloe vera, marigold, kamantigui, guava leaves, curry leaves, ipil-ipil leaves and seeds, madre de cacao leaves, castor bean seed, tuba-tuba leaves and seeds, adelfa and other plants that repel or kill insects and have fungicidal property.**
- c. **Chop and place them in a blender with equal amount of water and blend or Pound and extract the juice or sap (fluid/liquid). For brew, boil the material, cool and separate the liquid tea.**

- d. **Strain the liquid and mix one (1) teaspoon powdered detergent per litter and place in bottle as stock solution.**
- e. **Upon spraying mix one (1) tablespoon of stock solution for every litter of water. (1 tbsp. per 10 ml. water) Dosage may be increased or decreased as you find its effectiveness to your crop.**



HERBAL TEA PREPARATIONS FOR PLANT PROTECTION

Prepared by: **REX A. RIVERA, Agronomist**

HERBAL TEA preparation for plant protection can be made by the farmers right in their own farm without depending too much on commercial chemical pesticides and fungicides. The following procedure are simple and low cost that can be done by the farmers themselves.

MATERIALS NEEDED:

200 liters capacity plastic drum.

Grinder / chopper and mortar & pestle (*lusong pambayo*)

Strainer/screen/cloth (*salaan*)

Dipper (*tabo*).

Wooden ladle / paddle (*Kahoy na panghalo*)

Fresh clean water (*tubig na malinis*)

Herbal materials (*Halamang panghalo*)

10 kilos Ginger (*Luya*)

5 kilos Garlic (*Bawang*)

5 kilos Aloe vera (*Sabila*)

10 kilos Hot pepper (*Siling labuyo*)

30 kilos Neem tree leaves (*Dahon ng Neem Tree*)

30 kilos Madre de Cacao leaves (*Dahon ng Kakawati*)

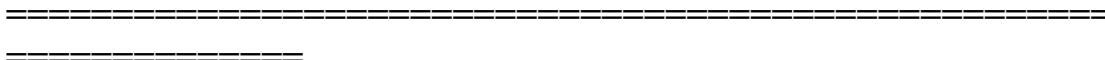
5 kilos Derris (*Tubli*)

5 kilos Bitter vine (*Panyawan//Makabuhay*)

Other herbs with insecticide, fungicide and pest repellent properties.

PROCEDURE:

1. Prepare the above materials.
I-handa and mga gamit.
2. Grind or pond the herbs separately.
Durugin at bayuhin and mga halaman na magkakahiwalay.
3. Place all ground and pounded herbs in the plastic drum.
Ilagay ang lahat ng dinurog at binayong halaman sa dram na plastik.
4. Fill the drum with fresh clean water.
Punuin ng malinis na tubig ang dram.
5. Mix the materials with a wooden ladle
Haluin ang tubig at dinurog na halaman gamit ang kahoy na panghalo.
6. Stay overnight or one day to allow the herb juice to mix with water. Herbal tea..
Pabayaang magdamag o maghapon upang ang katas ng mga halaman ay mahalo sa tubig na magiging tsaa.
7. Get herbal tea from drum pass through screen strainer
Kunin ang tubig o tsaa sa dram paraanin sa screen na salaan.
8. Add equal amount of fresh clean water to the herbal tea.
Dagdagan ng preskong tubig ang tsaa na kasing dami.
9. Place in sprayer or sprinkler.
Ilagay sa sprayer o sa rigadera.
10. Spray on plants, drench from base, trunk, branches and leaves.
Spray o diligin ang halama, basain mula lupa, puno, sanga at dahon.
11. Repeat spraying 3 or 7 days interval as the need arises.
Ulitin ang pag spray o pagbibisbis tuwing ikatlo o isang lingo ayon sa pangangailangan.



**HERBAL ORGANIC CONCENTRATE
PREPARATION**

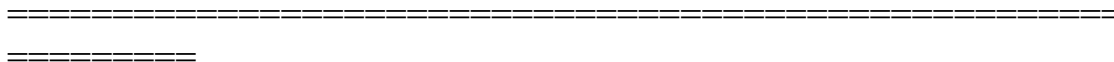
Herbal Organic Concentrate (HOC) preparation is done in a strict laboratory procedure by chemist to insure its standard quality and stability for a long self-life and efficacy upon application on plants.

Materials:

1. Grinding and pounding equipment.
2. Blender
3. Juice extractor, presser with strainer.
4. Fresh herbs.
5. Stainless, plastic or bottled containers.

Procedure:

1. Gather fresh herbs and cut into small pieces.
2. Grind, pound and extract juice.
3. Dehydrate to reduce moisture.
4. Add preservative
5. Bottle or place in dark colored containers.
6. Label or stick marker with appropriate instruction of use.
7. Store in clean, cool, dry, dry and dark place.
8. Check cover from time to time, and loosen to release gas buildup.
9. Seal tightly when transporting.
10. Follow instruction on label when using.



**PREPARING
FOLIAR ORGANIC FERTILIZER**

Materials:

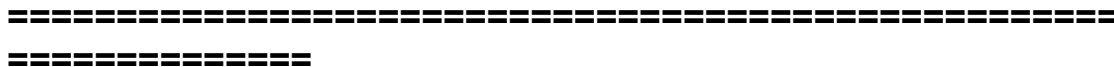
1. Chopper and grinder
2. Plastic, earthen, glass or enameled container.
3. Wooden paddle mixer.
4. Organic and herbal materials.
5. Brown sugar (moscovado / kinugay) or molasses.

Procedure:

1. Gather organic materials (Fish, meat, sea weeds, fruits, herbs)
2. Chop and grind.
3. Place in non-metal container (glass, plastic, enamel or earthen jar..

4. Add equal amount of brown sugar or molasses and effective microorganism.
5. Cover with cloth and ferment for 2 to 4 weeks.
6. Get juice and place in dark colored container (Plastic or glass) and cover.

Label the organic foliar fertilizer with instruction of storage and use.



BOTANICAL PEST CONTROL

The Philippines is rich in various varieties and species of plants that can be used to regulate and control pests and diseases. These plant species are endangered because they are not known, or the local farmers do not know their uses. Farmers by clearing and burning continually destroy them, as they are considered weeds and a hindrance to their crop production.

Here is a short list of plants that can be effective against a wide range of insect pest including those attacking the mango.

1. **GOAT WEED (*Aegaratum conisoides*) Leaves-** Extract juice and spray against diamond black moth and cotton Steiner.
2. **DAMONG MARIA (*Artemesia vulgaris*) Leaves –** Pound, extract juice and spray at the rate of 2 to 4 tbs. per 16 liters of water with detergent or AZ41 and spray against cotton borer and mango tip borer.
3. **LANTANA (*Lantana camara*) Flowers –** Pound and store around the grains to serve as repellent against weevils.
4. **DITA (*Derris philippinensis*) Roots –** Pound and extract juice. Spray at the rate of 1 cup per gallon of water or powder, mix with detergent or AZ41 and spray at the rate of 120 grams powder + 250 to 300 grams detergent per 4

gallons of water against diamond black moth and other insect pests.

5. **WILD SUNFLOWER (*Tethornia diversifolia*) Leaves** – Pound and extract juice and use as spray at the rate of 1 to 2 kg. Fruit per litter of water against cotton Steiner, black armyworm and diamond black moth.
6. **MARIGOLD (*Tagetes erecta*) Roots** – A mixture from the pounded leaves, flowers and roots soaked in water at a proportion of 500 grams/liter of water has been found to be effective against lipidopterous pests, leafhoppers, beetles and house flies. The remaining cake can be used as a mulch or mixed with the soil to control nematodes and other soil pests. Marigold inter-cropped with vegetables like eggplants are said to repel insects from the plantation. Extract juice and spray at the rate of 2 to 4 teaspoon juice per litter of water mix detergent or FAA (Fish Amino Acid) against green leafhopper, brown plant hopper, diamond black moth and aphids.
7. **FRENCH MARIGOLD (*Tagetes patula*) Roots** – Pound and extract juice at one-kilogram roots mix with one litter of water and detergent or AZ41 then spray directly into the soil against green aphids and grain borer.
8. **BLACK PEPPER (*Piper nigrum*) Fruits** – Pulverize seeds and mix with water and spray. Spread powder around stored grains against cotton Steiner, diamond black moth, common cutworms and corn weevil.
9. **MAKABUHAY (*Tinospora rumpii*) Vines** – Pound leaves and stem to extract juice. Mix the juice with water and stir thoroughly. The mixture can be used as spray for black bugs, steam borer, diamond back moth and leafhoppers. Extract juice and spray at the rate of 15 to 20 tbsp. juice per 5 gallons water against diamond black moth and green leafhoppers.

10. **HOT PEPPER** (*Capscium frutesens*) Fruit – This can be effective for the controlling of lepidopterous persts, other chewing insects and pest for stored products. Mash mature fruits, add water, strain and use the mixture as spray. For stored product pests, pulverize the fruits and spread in storage area. Pound and extract juice and spray at the rate of 2 to 3 cups fruit per litter of water against rice moth. **HOT PEPPER** - Researches from the University of the Philippines at Los Banos, Laguna have found that **Siling Labuyo (Hot Pepper)** fruit, skin and seeds are all effective against ants, aphids, caterpillars, Colorado beetle, cabbage worms, warehouse and storage pests, cucumber mosaic, ring spot virus, tobacco virus and other crop diseases. Briefly, siling labuyo serves as an insecticide, repellent, anti-feedant, fumigant and anti-viroid.
11. **CUSTARD (*Annona aquamosa*) Seeds** – Powder and disperse in water, then strain and use as spray against rice pest.
12. **NEEM (*Azadiracta indica*) Seeds** – Remove husk of two to three handful of mature seeds, winnow or put in water to float away the husk, Grind seeds into fine particles. Soak ground seeds in 3 to 5 litters of water for at least 12 hours. Filter the solution, add detergent or AZ41, then use the spray against rice pest, diamond black moth and mango leafhoppers.
13. **TOBACCO** – Chop or grind tobacco leaves, stalk and root. Soak in water for 13 to 36 hours. Strain tea solution; mix detergent, AZ41 or Aloe vera extract and spray against a wide species of insects including hoppers and worms.
14. **MADRE DE CACAO.** Pound the roots, leaves and bark and soak in water at a proportion of 500g/liter of water. Let it stand overnight. Use the concoction as spray for lepidopterous pests and fleas. Example of lepidopterous pests are the larvae of moths, and butterflies that are

usually seen as worms eating the leaves and fruits of many vegetables.

In a particular research, entomologists at UPLB have found that wild (labuyo) pepper is effective as protectant for storing corn and rice grains against weevils and red flour beetles. To protect the grains from the insects, the researchers soaked the sacks for 24 hours in the fresh (siling labuyo) extract. Later they noted that the rice and corn were undamaged for over a month. Similarly they also found out that mixing the air-dried hot pepper powder with rice effectively protected the grains for over 2 months without affecting the flavor. Hot pepper extract mixed with paint, caulks, glue and rubber coating materials have been found effective repellent against a wide range of pests.

Antidote for accidental contamination or contact with hot pepper preparation includes cold sweet, salty, and sour foods. Fatty foods seem to cool down burn due to the solubility of capsaicin to oil. The better cool downs include fruity ice cream (cold, sweet, sour and fatty) or best frozen yogurt. In case of skin contamination, wash or take a bath with soap and cold water.

The following plants with their simple preparations can substitute or replace the chemical fungicides. This is ideal for growing organic fruit free from toxic chemicals. Organically grown fruits and vegetables have a fast growing market demand with the quickly spreading belief about hazards of toxic chemicals in food crops.

1. **GARLIC (*Allium sativum*) Cloves** – Chop finely, soak in two teaspoon of oil for one day. Mix with half liter of soapy water and filter. Mix one part solution with 20 parts water, then spray.

Disease organisms controlled: Alternaria, Cercospora, Colletotrichum, Curvularia, Diplodia, Fusarium, Helmitosporium, and Pestalotia (fruit rot, early blight, purple blotch, leaf spot, leaf mold, frog eye, anthracnose, fruit rot, smudge, leaf blight, and fruit and stem rot, damping off, stem and root rot, wilt, and curly top.)

2. **ACAPULCO (*Cassia alata*) Leaves** – Extract juice and spray at the rate of 1-cup juice per liter of water. Spray on plants infected with *Altenaria*, *Cercospora*, *Colletotrichum*, *Diplodia*, *Fusarium*, *Helminthosporium* and *Pestalotia*.
3. **AMARANTH (*Amaranthus gracilis*) Leaves** – Extract juice of one-kilogram leaves, then mix in three liters of water and spray against *Altenaria*, *Cercospora*, *Colletotrichum*, *Curvularia*, *Helminthosporium*, and *Pestalotia*.
4. **PAPAYA (*Carica papaya*) Leaves** – Pound, soak in water and use infusion as spray. This is effective against *Cercospora* and *Diplodia*.
5. **SENSITIVE PLANT / MAKABIYA (*Mimosa pudica*) Whole plant** – Pound and soak in water and use infusion as spray against *Diplodia* and *Pestalotia* (fruit and leaf spot.)
6. **DAMONG MARIA (*Artemisia vulgaris*) Leaves** – Extract juice and use as spray at the rate of two to five table spoon full juice per liter of water against *Altenaria*, fruit rot, early blight, purple blotch and leaf spot.
7. **GINGER (*Zingiber officinale*) Rhizome** – Extract juice and use as spray against *Cercospora* leaf mold, leaf spot, early blight and frog-eye disease.
8. **KAKAWATI / MADRE DE CACAO (*Gliricida sepium*) Leaves** – Extract juice of one kilo leaves, then mix juice with three liters of water and use as spray against *Cercospora* leaf mold, leaf spot, early leaf blight and frog-eye disease.
9. **MAYANA (*Coleus scutellarioides*) Leaves** – Extract juice of one-kilogram leaves, mix with three liters of water and use as spray against *Cercospora*.

10. **LAGUNDI (*Vitex negundo*) Leaves** – Extract juice of one kilogram leaves and mixes with three liters of water and spray against *Cercospora*.
11. **SAMBONG (*Blumea balsamifera*) Leaves** – Extract juice and mix with water at 1:1 ratio and spray against *Cercospora*.
12. **IPIL-IPIL (*Leucaena leucocephala*) Leaves** – Pound and soak in small amount of water. Use the infusion as spray against *Sclerotinia* (fruit rot, early blight, purple blotch, leaf spot); *Cercospora* (leaf mold, leaf spot, early blight, frog-eye disease); *Colletotrichum* (leaf blight, Anthracnose, fruit rot); *Curvularia* (leaf blight); *Helminthosporium* (leaf spot, leaf blight); *Pestalotia* (leaf spot).
13. **RED ONION (*Allium sepa*) Bulb** – Chop finely and soak in two teaspoons of oil for one day. Mix with half liter of soapy water and filter. Mix one part of the solution to 20 parts of water then spray to control: *Cercospora* (leaf mold, leaf spot, early blight, frog-eye disease); *Colletotrichum* (leaf spot, anthracnose, fruit rot); *Curvularia* *Fusarium* (leaf spot, leaf blight); *Helminthosporium* (leaf spot, leaf blight); *Pestalotia* (wilt, curly top, leaf blight and leaf spot).
14. **DRUMSTICK / HORSEHEAD DISH (*Moringa oleifera*) Leaves** – Extract juice of one kilo and mix with three liters of water and use as spray against *Alternaria*, *Colletotrichum*, *Diplodia* and *Pestalotia*.
15. **KAMANTIGUI (*Impatiens balsamina*) Leaves** – Extract juice of one kilogram leaves and mix with three liters of water then use as spray against *Fusarium* (damping off, stem root rot, blight); *Helminthosporium* (wilt, curly top leaf blight).
16. **MANA (*Jatropha multifida*) Leaves** – Extract juice of one kilogram leaves and mix in three liters of water and use as spray against *Diplodia* (fruit and stem rot) and *Fusarium* (damping off, stem and root rot, early blight, wilt and curly top).

There are many more herbal plants that are effective in controlling fungus and bacterial infections. Every farmer mango grower should have processing equipment such as grinder, hammer mill and juicers to extract substances from plants and use as spray solution.

Another way of extracting plant substances is soaking the plant material in drums of water for several days until water turns yellow brown as tea, mix with detergent and spray water on plants. For faster way, organic plant materials are boiled, and the resulting tea is cooled ready for use.

Plants found to be effective tea control for pest and diseases are Wild tea, tobacco, neem tree, legumes and beans, guava leaves and many others).

PREPARATIONS AND USE ORGANIC PESTICIDES

Adelfa bark and leaves:

- a. Collect / gather / wash and clean adelfa bark and leaves.
- b. Chop / cut the materials into small pieces. (Use mechanical chopper or hammer mill if dealing in big volume.)
- c. Pound and extract juice. (Use grinder if dealing in big volume.)
- d. Soak in water (1kilo pounded material + 1 liter water).
- e. Filter through No. D screen.
- f. Filter through No. E screen
- g. Place the juice in bottles and seal tightly as stock solution.
- h. Spray plants for the control of ants, flies, bugs and other insect pests.

Atis seeds

- a. Collect / gather and clean atis seeds.

- b. Chop / cut into small pieces atis seeds.
- c. Pound seeds or grind.
- d. Mix pounded atis seeds with coconut oil (1/2 kilo pounded seeds + 100 ml coconut oil).
- e. Filter / screen mixture.
- f. Bottle the stock solution ready as botanical (organic) pesticide.
- g. Spray plants for the control of garden and vegetable pests such as ants, mites, and other insects attacking the plants.

Citronella + Neem leaves + Galangal

- a. Collect / gather / wash and clean leaves.
- b. Chop / cut the materials. Use hammer mill for big volume.
- c. Pound the different materials making it fine. Use grinder for big volume.
- d. Mix materials with 40 liters water.
- e. Soak the mixture for 1 day.
- f. Filter / screen the solution.
- g. Diluter the solution with water at the ratio 1:60.
- h. Place the stock solution in bottles and seal tightly. (Ready for spray).
- i. Spray plants with prepared botanical pesticide for control of garden pests such as cabbageworms, mites, and leaf miners. Effective against worms attacking leafy vegetables.

Coconut oil + Nicotine extract (tobacco leaves).

- a. Collect / gather / wash and clean tobacco leaves (10 leaves)
- b. Chop into small pieces.
- c. Pound leaves to extract nicotine (juice). Use grinder if available.
- d. Mix pounded leaves with 1 liter water.
- e. Filter / screen stock solution. Press the material during filtering.
- f. Mix coconut oil 250 ml to 1-liter nicotine extract.
- g. Place in bottle and seal tightly.

- h. Spray plants to control garden pests and farm crops.

Derris tubers and roots

- a. Collect / gather and clean derris tubers and roots.
- b. Chop into small pieces and pound to extract liquid or juice. Use grinder and presser if available.
- c. Filter to separate liquid or juice.
- d. Bottle the pure juice, close tightly and store in cold dark place.
- e. Mix 1 tbs. liquid derris to 1 gallon water. Solution is ready for use.
- f. Bottle the mixture of botanical pesticide ready for use.
- g. Spray plants for the control of aphids, leafhopper, spittlebug, beetles, thrips, white flies, leaf miners and caterpillars.

Derris roots + powdered soap

- a. Collect / gather and clean derris roots.
- b. Chop into small pieces and dry derris under direct sunlight.
- c. Pound the roots into powder form. Preferably use grinder.
- d. Boil about 120 grams of derris powder in 5 cups of rainwater or distilled water.
- e. Add 300 grams of powdered detergent soap and dissolve thoroughly.
- f. Add 4 gallons of water.
- g. Filter / screen solution then bottle the stock solution for ready use.
- h. Spray plants to control rind borer of citrus, oranges, pomelo and grapefruits. Spray also grasses and weeds around the trunk of fruit trees as they serve as shelter and breeding place of insects during the daytime.

Garlic

- a. Collect / gather / wash and clean garlic cloves.

- b. Chop / cut / pound garlic cloves to extract liquid or juice. Use grinder and presser if available.
- c. Filter the juice and mix water. For mild preparation: 1 part garlic juice to 100 parts water (1:100) this is the stock solution.
- d. Store in bottles and seal tightly.
- e. Spray to plants. It is effective fungicide to control blight, mildew and rot of a wide variety of plants. It is effective spray against mildew of solanaceous plants and other fungal diseases.

Green – Shallot onions

- a. Collect / gather / wash and clean green shallot onions.
- b. Chop and cut materials into small pieces and pound material to extract juice or liquid. Use grinder and presser for big volume.
- c. Mix water at one part juice to one part water (1:1)
- d. Filter / screen the juice (stock solution)
- e. Add one teaspoon powdered soap to make the stuff adhesive.
- f. Mix 1 tbs. to 1 liter water and spray to plants against fungus and repellent to insect pests.

Hot Pepper (sili)

- a. Collect / gather / wash and clean hot pepper fruits.
- b. Cut into small pieces then pound fruits to extract liquid or juice. Use grinder and presser for big volume.
- c. Mix at the rate of 2 tbs. pounded sili with 1-gallon water.
- d. Filter / screen and place stock solution in bottles for storage or ready use.
- e. Spray to plants to control mites, aphids and other insect pests.

Hot Pepper + Soap

- a. Follow the previous Hot Pepper preparation.

- b. Add soap to solution. Good for control of rice bugs, budworms, ants, mites, cabbage worms and maggots.

HOT Pepper + Soap + Tobacco leaves

- a. Collect / gather / wash and clean sili fruits and tobacco leaves.
- b. Chop / cut and pound sili fruit and tobacco leaves separately
- c. Mix tobacco leaves and sili fruits with water. (To 1 kilo chopped and pounded tobacco leaves, add 5 liters water. To 1 tbs. pounded sili add 1 gallon water)
- d. Soak separately overnight.
- e. Filter / screen both solutions separately.
- f. Mix the two materials
- g. Mix 2 ounces powder soap. Stir to dissolve the soap. This mixture becomes the stock solution.
- h. Bottle for storage and ready use. Store in cool dark place.
- i. Spray plants at 3 days interval against eggplant fruit fly and other insect pests.

Kamarya twigs as repellent for mosquitoes and other flying insects.

- a. Collect / gather kamarya twigs.
- b. Dry kamarya twigs under direct sunlight.
- c. Burn dried kamarya to drive mosquitoes and other flying insects.

Lanson (Lanzones fruit peelings as repellent for mosquitoes & flying insects).

- a. Gather / collect lanzones fruit peelings and dry it under direct sunlight.
- b. Burn dried lanzones peelings to drive mosquitoes and other flying insects.

- c. Note: same procedures with other leaves like neem tree, madre de cacao, ipil-ipil, etc.

Lime sulfur powder as natural fungicide

- g. Buy 1-kilo very fine lime and 1-kilo sulfur powder.
- h. Mix at 1:1 ratio.
- i. Add 1-gallon water.
- j. Bottle and seal tightly.
- k. Spray to plants for the control of fungal diseases of both garden and farm crops.

Linga (sesame) plants

- a. Collect / gather / wash and clean linga plants.
- b. Chop / cut into small pieces then pound to extract liquid or juice. Use hammer mill and grinder for big volume.
- c. Filter the juice as stock solution. Place in bottles. Use mechanical presser for juice extraction for big volume.
- d. Before spraying, mix 6 tbs stock solution to 1 liter of water. Add soap.
- e. Spray to control aphids, ants, flies, mites and other insect pests.

Luya-luya-an root brew (Ginger ail)

- a. Collect / gather / wash and clean ginger roots.
- b. Chop / cut into small pieces 1 kilo of ginger then pound to extract the juice. Use grinder and presser for big volume.
- c. Dilute the extract in 1-gallon water.
- d. Filter / screen pounded ginger and bottle the stock solution for storage and ready for use.
- e. Add soap and spray on insects attacking plants. Good for rice, vegetable and fruit trees.

Madre de Cacao or Kakawate

- a. Collect leaves of Madre de cacao. Chop cut and pound to produce extract liquid juice. Use hammer mill and presser for big volume.

- b. Dilute with water 1 part pounded materials with 5 parts water (1:5).
- c. Keep it soaked and stay overnight.
- d. Filter the stock material and place in plastic container or drum.
- e. Add soap to the stock solution and use as spray to plants to control mites, aphids, ants, etc.

Mannungal + coconut oil

- a. Collect / gather / wash and clean mannungal plant.
- b. Chop / cut plant into small pieces and pound plant to extract juice.
- c. Filter / screen liquid juice.
- d. Mix oil to the extract at 1:1 ratio and bottle the stock solution.
- e. Add soap and water then spray to control farm and garden pests.

Makabuhay plant

- a. Collect / gather / wash and clean makabuhay plant.
- b. Chop / cut plant into small pieces and pound plants to extract liquid and juice. Use grinder and presser for more efficient juice extraction.
- c. Add 126 milliliters water to 5 grams pounded makabuhay.
- d. Filter / screen the liquid stock solution and place in bottles.
- e. Add soap, dilute with water and spray to plants to control leafhoppers, aphids, mites' ants and other insect pests.

Makabuhay + Sili (Hot Pepper)

- a. Collect / gather / wash and clean makabuhay and sili fruits.
- b. Chop / cut separately makabuhay and sili fruits into small pieces.
- c. Pound materials separately to extract juice. Use grinder and presser.

- d. Mix: 50 grams pounded makabuhay to 126 milliliters water.
1 cup pounded sili to 18.9 liters water
- e. Filter and mix the two materials and bottle as stock solution.
- f. Add soap and dilute with water before spraying to plants to control hoppers.
- g. Bottles of prepared stock solution ready as organic pesticide.
- h. Spraying plants for the control of garden pests and other farm crops such as rice green leafhoppers, etc.

Marigold plant

- a. Collect / gather / wash and clean marigold plant.
- b. Pound marigold plant to extract liquid or juice. Use grinder and presser for big volume and more efficient juice extraction.
- c. Filter / screen the liquid portion.
- d. Add equal amount of water to the marigold juice.
- e. Dilute the stock solution (1Tbs stock solution to 1-pint water.
- f. Bottle solution for ready use.
- g. Add soap and spray to control mites, aphids, ants and worms.

Neem seeds

- a. Collect Neem seeds.
- b. Wash and remove the fleshy pulp and skin of the seeds.
- c. Dry the seeds under the sun for two to three days.
- d. Store the seed in airy containers (jute sacks or basket. Do not use plastic bags or containers with no aeration).
- e. Remove rotten kernels and pound slightly to remove covering shell.
- f. Pound or grind neem seeds to extract oil Use grinder.

- g. Soak the grounded kernels (20 – 50 gm per litter of water) and Filter the stock solution.
- h. Kneading of pounded kernel wet in little water to extract oil.

Red Pepper + Lemon grass leaves (tanglad) + Agdao Leaves

- a. Collect / gather / wash and clean red pepper and lemongrass leaves.
- b. Chop / cut to small pieces separately then pound to extract juice. Use hammer mill and grinder for big volume.
- c. Filter / screen the materials separately.
- d. Mix solution 1:1:1 ratio, 5 cc each and add 4 liters water for every 15 cc of stock solution.
- e. Add soap and spray to plants. According to farmers experience it is 87% effective.

Pepper + Mannungal + Langkawas or Kalawag

Materials:

Hot pepper, Mannungal, Hagunoy, Langkawas or Kalawag, mortar and pestle

Water, containers for liquid, sharp knife, screen wire or filter clothe.

- a. Collect / gather / wash and clean the different materials.
- b. Cut the materials into small pieces then pound the materials separately. Use hammer mill and grinder.
- c. Add and mix water as follows:
 - 1 part pepper + 5 parts water
 - 1 part mannungal + 1 part water
 - 1 part kalawag + 1 part water
- d. Filter or screen the materials, mix them together as stock solution.
- e. Spray 1 liter stock solution to 16 liters spray load.
- f. Use to control whorl maggots, caseworm, etc.

Sili (hot pepper) fruits as repellent

- a. Collect / gather / wash and clean sili fruits.

- b. Dry sili fruits under direct sunlight.
- c. Grind dried sili fruits into powder.
- d. Mix dried sili fruits powder with the seeds or grain before storing.

Sili (Hot Pepper) + insecticides (chemical insecticide)

- a. Collect / gather / wash and clean sili fruits (hot pepper).
- b. Chop/ cut sili fruits into small pieces.
- c. Pound the fruits to produce liquid or juice. Use grinder.
- d. Mix with water. 1 cup pounded sili to $\frac{1}{2}$ cup water.
- e. Filter / screen the material.
- f. Add 6 tbs. insecticide and place stock solution in bottle.
- g. For spraying, mix 3 tbs. of stock solution to 1 spray load (16 liters)

Sili (Hot Pepper) + Makabuhay + Yellow Ginger + Onion

- a. Collect / gather / wash and clean sili fruits, makabuhay, yellow ginger and onion.
- b. Chop / cut the different materials into small pieces.
- c. Pound to extract juice separately. Use grinder.
- d. Mix the materials separately:
50 grams makabuhay + 126 milliliter water
1 cup ginger + 1 liter water
1 cup onion + 1 liter water
1 handful sili + 18.9 liters water
- e. Mix all materials together, add 100 grams powdered soap and store.
- f. Spray solution to control plant pests.

Tobacco leaves extract

- a. Collect / gather / wash and clean 5 pieces tobacco leaves.

- b. Chop / cut tobacco leaves into small pieces.
- c. Pound the leaves. Use grinder.
- d. Soak tobacco leaves in 5 liters water overnight.
- e. Filter / screen the stock solution.
- f. Bottle the stock solution ready for use.
- g. Spray plants to control pests attacking vegetables such as eggplant, tomatoes, sweet pepper and others.

Tobacco water brew from tobacco stems

- a. Collect / gather / wash and clean tobacco stems.
- b. Chop / cut tobacco stems into small pieces.
- c. Place the chopped tobacco stems in boiling water. Submerge the stems.
- d. Let it stand for several hours to cool.
- e. Mix 1 part tobacco brew to 4 parts plain water.
- f. Filter / screen the mixture and bottle.
- g. Spray to plants to control various insect pest and fungus.

Tubli roots

- a. Collect / gather / wash and clean tubli roots.
- b. Twist tubli roots until arm size and foot long. Bury the roots in moist soil for a week.
- c. Get tubli roots and pound. For every 1 part pounded roots add 3 parts water. Use grinder.
- d. Filter / screen the material. The liquid forms the stock solution.
- e. Place the stock solution in bottles as ready botanical pesticide.
- f. Spray the botanical pesticide against aphids, mites, ants and other insect pests.

Tubli Roots + Sili (Hot Pepper) Fruits, + Tobacco Leaves

- a. Collect / gather the different materials, wash and clean.

- b. Twist tubli roots until arm size and a foot long. Bury in moist soil for a week.
- c. Chop and cut the materials and pound them separately. Use grinder.
- d. Add water to the materials separately as follows:
 - 10 tobacco leaves + 1 liter water
 - 1 part tubli roots + 3 parts water
 - 1 handful sili fruits + 18.9 liters water
- e. Filter and mix the three materials in one container.
- f. Bottle the stock solution ready for use as botanical pesticide.
- g. Spray to plants to control a wide range of insect pests.

Use same preparation as above. It is recommended to add soap as sticker and spreading agent.

Chrysanthemum

- a. Collect / gather Chrysanthemum flowers.
- b. Dry the flowers under direct sunlight.
- c. Grind / pound the dried material. Use grinder and presser.
- d. Mix the grinded Chrysanthemum flower with fine clay loam soil. (9 parts Chrysanthemum + 1 part soil)
- e. Mix 7 tbs. stock material with one-gallon water. Stock solution is now ready for spraying against wide range of insect pests.

Lantana Camara

- a. Collect / gather / wash and clean lantana camara branches.
- b. Chop / cut materials into small pieces.
- c. Dry lantana camara and burn the chopped branches.
- d. Apply lantana camara ashes on the leaves of garden plants to control various beetles and leaf miners.

Mint, Oregano and other aromatic herbs

Plant these herbs all around the garden or farm perimeter fences. The strong odor, repel insects. They are also use as medicine and spices. For every 100 square meters bed, plant 10 marigolds in the border and intercrop 25 garlic or onion bulbs.

Onion Brew

- a. Collect / gather / wash and clean onion roots, stem and leaves with other aromatic herbs such as garlic, horseradish, red hot pepper, ginger, mustard and mint.
- b. Chop / cut the different materials into small pieces
- c. Pound or grind the different materials to extract the juice. Mix 50 parts juice of different materials with 50 parts water.
- d. Filter / screen the solution. Let it stay and allow it to ferment.
- e. Drench the plants with the stock solution to repel insects.

Tomato stems and leaves.

- a. Collect / gather / wash and clean tomato stem and leaves.
- b. Chop/cut material into small pieces. Pound or grind materials.
- c. Boil the material then cool. Mix 50 parts material 50 parts water.
- d. Filter / screen the stock solution and bottle.
- e. Spray the plants against caterpillar and black or green flies. This will serve as insect repellent.

USE OF INDIGENOUS RESISTANT OR TOLERANT PLANT VARIETIES AND STRAIN

Native or indigenous plants have adopted resistance to prevailing pests and diseases existing in the local environment. They have survived decades if not century of adjustments.

The introduction of hi-breeds and high yielding commercial seeds, have the tendency of eliminating indigenous varieties because of farmers' preference for the higher yielding potentials

Seed breeding institutions like IRRI, IPB-UPLB and PHILRICE are keeping and maintaining SEED BANKS to preserve the genes of indigenous crops or native varieties and strains. The Holy Father, Pope John Paul II during the visit of Philippine President Gloria Macapagal Aroyo September 29, 2003 at the Vatican, said the Church approves the use of GMO (Genetically Modified Organism) for Agriculture food production but not for human breeding which should be left to the natural laws of reproduction.

PRACTICE CROP ROTATION AND FOLLOWING (Resting the soil for some time)

Resting the soil by following or keeping the land uncultivated for one season or one year to bring back life and rejuvenate to restore the natural fertility and nutrients.

Rotating crops is also one way of keeping the soil healthy as different crops have different root systems and level of absorption. Legumes like beans when inoculated with nitrogen fixing bacteria makes the soil more fertile when followed by grain crops like rice and corn.

Crop rotation dissociates microorganism buildup around the plant roots as each crop has a characteristic microbial association. (Example is pro biotic and nitrogen fixing bacteria for legumes). New microbes are being developed to inoculate the seeds just before planting to introduce them into the soil and help in nitrogen fixation that enriches the soil in a natural process.

INTERCROPPING OF PEST REPELLANT HERBS

There are a wide variety of plants that repel pests. Most of them have strong odor like marigold, mint, onion, tobacco, tomato, and others. Planting them on farm borders or intercropping them with row crops can greatly reduce insect infestation.

INTEGRATED CROPPING PATTERN TO CONTROL UNDESIRABLE WEEDS

Toxic weeds can kill or reduce productivity of your crops. Weeding is very expensive especially in large farms. Growing low creeping grass like carabao grass and *Arakis pinto* in orchard can save the farmer from expensive weeding and cultivation. Growing low creeping cover crops like kudzu and centrocema puvisence will both increase soil fertility being legumes and protect the soil from erosion and compaction due to rain and sun backing.

Crop combination such as legumes and potatoes, control nematodes. Learn and find out the best crop partners and combinations. Marigold is repellent to nematodes

Growing the right crop on the right soil, climate and at the right time.

Farmers have learned that seasonal crops have seasonal infestation. Planting earlier or later than the period the pest appear will both save the crop and avoid costly spraying and control measures.

Planting during full moon was observed to be good for the crop as the magnetic force of the moon induces humidity even during dry months as it pulls up the soil surface underground water. The same force has an effect on the growing tissue of the plant.

BIOLOGICAL FARMING

The objectives of Biological Farming as part of Natural Farming is to produce food crops without the use and traces of toxic synthetic chemical product. In this case, we will be using living organisms from the microscopic beneficial fungus and bacteria to insects and animals and other life forms.

BIOLOGICAL PEST CONTROL (The use of natural enemies of pest)

There are many beneficial insects, birds; animals that help suppress the population of insect pest. Providing them home and habitat within your farm will greatly lessen incidents of serious infestation. Bacteria, yeast and fungus (BYM) Pro-biotic that fight bad bacteria and fungus; and damage the egg as well as adult insect pests can be very helpful at low cost while renewable as they live and grow. We encourage green belting and preserving a natural forest within your farm to host and preserve wild animals, birds, insects and beneficial microorganisms.

There are some insects that fight and eat other insects. Example is *Trichogramma wasp*, which is an effective predator against most *lepidopterous* insects parasitize and feed on the eggs of corn borer, fruits and sugarcane. It can help control durian and other fruit borer, tip and twig borer, eggplant and other vegetable borers that infest seasonal and permanent crops. Except incomplete insects cycle like fruit fly, aphids, leafhoppers, white fly and trips.

The Department of Agriculture have trained farmers nationwide to prepare and use *Trichogramma*, but few are still actively using the technology. One of them is Boy Bacus of Gen. Santos City who supplies orders through RARE, 11 Magsaysay Avenue, Gen. Santos City, Tel. (083) 301-0117 or contact Cell No. 0917-746-2029.

To preserve these beneficial insects and birds, maintain a green forest belt within your farm or garden. Provide drinking water and birdbath. Keep the green belt from bird hunters and avoid disturbing them. Attract wild life by planting shrubs, trees that bear berries and fruits. Encourage frogs and toads to stay in the farm as they are very good predators of insect pests.

Raise domestic fowls like chicken and ducks and allow them to feed on the range, or field where they will not destroy young plants. Goose and Muscovy ducks can also help in weeding your field. The fowls are early morning and late afternoon feeders, so you can release them to the field during these times.

HOW BIOCONTROL WORKS

The method of biological control or biocontrol makes use of natural agents such as friendly beneficial insects in controlling pests. The natural agents control the pest through:

*** PREDATION *PARASITIZATION *INFECTION**

The biological agents may be grouped as follows:

- **Predators** such as ladybird beetle, spiders, dragonflies and mites.
- **Parasites** such as Trichogramma, Braconids
- **Pathogens** such as bacteria and fungi which cause diseases.

Advantages of biological, particularly the Trichogramma method:

- Safe to man, animals, fishes and birds.
- Safe to the environment with very high level (88-94%) of control
- Require less labor than the chemical control.
- Requires minimal expenses. Cheap compared to chemicals.

Disadvantages:

- Very hard to rear commercially. It will need laboratory facilities secure, sanitized and away from other biological rearing facility.

- It will need constant attention and monitoring by expert workers.
- Due to complex parasites that will attack the host and feed competitors during rearing and field placement.
- Will need correct timing in rearing and field release that farmers should well understand and follow right application procedures.

TRICHOGRAMMA CONTROL METHOD

The Trichogramma as a biological control of insect pest like Asian corn borer and other borers is now the focus of interest of farmers avoiding the too much use of poisonous synthetic chemicals that endangers the environment and health.

Borers that infest rice, corn, fruits and vegetables and are among the most destructive pests that reduces the yield and income of the farmers. To control insect borers, many farmers use toxic chemical insecticides. An alternative control is the use of biological control method using the PARASITOID WASP TROCHOGRAMMA.

Trichogramma species are tiny wasps less than 1 mm in size which parasitize the egg of over 200 variety of insect pests, among which is the corn borer, rice borer and fruit borers, bollworms, diamond back moth and other insects with soft and hairless eggs.

Trichogramma are produced in laboratories, following mass rearing techniques. About 1,500 – 2000 Trichogramma are glued onto cards about 2"x2" in size. These Trichogramma carrying cards are the Trichocards, which are placed in the cornfield following a distribution, patterning about 10 meters apart. The Trichocards are hung on corn plants.

Trichogramma completes its life cycle from egg to egg in 7-8 days following the stages:

EGG → LARVA → PUPA → Wasp → EGG

The Trichogramma wasp lays eggs on the host, the corn borer eggs. After a day the Trichogramma egg develop into a larva which feed on the content of the corn borer egg. The corn borer eggs are destroyed and no corn borer, later develop. This is why the Trichogramma is called a parasite.

Some 3-5 days after, the Trichogramma larva have developed, they change into pupae. At this stage the whitish corn borer eggs turn black in color indicating that Trichogramma has parasitized them.

The adult Trichogramma wasp emerges from the parasitized egg of the borer 7-8 days after the Trichogramma oviposition. Newly hatched Trichogramma Wasp mate and then reach for fresh corn borer eggs to parasitize.

CONTROLLING CORN BORER

A CORN BORER EGG MASS CONTAINS ABOUT 30-40 EGGS. A Trichogramma wasp is capable of parasitizing 60-70 corn borer eggs. One Trichogramma generation succeeds another as long as Trichogramma find borer eggs to feed on. Many of the Trichogramma dies after the corn cropping season due to the absence of corn and corn borer. Some survive by feeding on borer eggs found on grasses and other crops such as sugarcane, sorghum, and palay and fruit trees.

In transporting Trichocards, be sure they are not exposed to heat as they easily die in high temperature. Keep them dry. Place them on plants with the side of the card with eggs facing the plant. It needs 70-100 Trichocards per hectare.

Frequency of application:

Corn. Rice Sorghum	2-3	times at 7 days interval.
Fruit trees (Durian, etc.)	7-11	times at 2 days and 7 day's interval.

Other crops (Cacao, etc.) 2-7 times at 2 days and 7 days interval.

Day of application: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
18 19 20 21

The proper instruction in applying Trichogramma shall be made by the Entomologist providing Trichocards or strips.

For corn, Trichocards are placed on the third or fourth leaf from the ground. Place at the fourth and fifth week after planting. Distance of placement is 12 meter or 17 steps apart.

BRACONID

Brac-o-nid (brakanid) Plural: braconids, Family: Braconidae

Parasitic fly: A fly whose larvae lives as parasite on other insects.

Braconid Wasp is a larvae parasites that will attack on larvae of any insect pests that will undergo larval stages and later the larvae will die and many braconids will emerge on a single dead larvae. It also attacks flies, beetles and aphids. It can be either endo or ecto parasites in living hosts.

How to set up a Braconid field rearing station.

Unlike trichogramma, were egg cards are placed on plants at interval of 10 meters, Braconids are set in the field in shaded boxes where feeds, host larvae and braconids are reared and released.

1. Construct a field shed to house the boxes containers, protected with screen from predators and water or oil barriers from ants.
2. Rear initial set of braconids in the laboratory for field placement.
3. Place the braconids infested larvae in containers with ready feeds (rice or corn grits and brand) at the field shed stations.

4. When population of braconids reaches to the desired level, stop feeding to make the braconids fly out and look for insect pest larvae to parasitize.
5. To increase population again, introduce more braconid infested larvae and feeds into the rearing containers at the field stations.

BIO - IPM

IPM is a kind of management using different strategies and techniques such as cultural, biological and chemical in controlling insect pests and diseases in agricultural crops.

Three (3) kinds of insect control:

1. **Cultural control:** Land preparation, cultivation, cropping pattern, irrigation and drainage, pruning and thinning, etc.
2. **Biological :** Using predators, parasites and pathogens.
3. **Chemical:** The use of chemical or organic biological preparations as insecticides or insect repellent.

Basic biological control procedure:

1. Introduction of potential natural enemies.
2. Augmentation through periodic release of natural enemies.
3. Conservation by maintaining an alternate food for the natural enemies while the pest population is low.

Biological control agents:

1. **Predators** such as ants, ladybird beetle, lace wings, spider, preying mantis, hover flies, birds, frogs, etc.
2. **Pathogens** such as Bacteria and fungus like mf, bt, npv, etc.
3. **Parasites** like Trichogramma and Braconids.

Different kinds of chemical pesticides:

1. **Insecticides** for insect pests.
2. **Fungicide** for fungus or mold.
3. **Bactericide** for bacteria.
4. **Nematocide** for nematodes.
5. **Herbicide** for weeds or herbs.
6. **Rodenticide** for rodents or rats.
7. **Acaricide** for trips and mites.

The above information can help farmers lower their cost of production, protect the environment from degradation, preserve the ecosystem and bio-diversity as well as producing healthful food crops that are safe and free from toxic chemical residues causing ailments.

MICRO-BIOLOGICAL FARMING

Bacteria, yeast and molds are now being introduced in Agriculture to help farmers grow crops with lesser or no dependence on toxic synthetic chemicals. Some of the products now available in the market for mango culture are:

- a. **MYCOMET (*Metharizium anisopliae*)** M.a. is a pure culture of beneficial soil inhabiting fungus that is used for the biological control of more than 300 species of insects and athropods. It is used in controlling aphids, beetles, leaf miner, fruit borers, earworm, crickets, diamond back moth, worms, hoppers, locust, nematodes, black bug, housefly, spittle bug, white grub weevil, wireworm, thrips, ticks, termites, cockroaches, whiteflies and other insect pests.
- b. **MYCOBO (*Beuvaria bassiana*)** discovered by Balsamo Vuillemin, is a pure culture of beneficial fungus that is used as a biological control agent to parasitize insects. This is used in controlling more than 200 species of insects. Among them are anta, aphids, diamond back

moth, cockroaches, mealybugs, psyllids, thrips, whitefly, and termites.

These two products are cultures by Gracia Corporation, 25 Agripino Neri Sr. St. (S of NFA) Baloy, Cagayan de Oro City, Philippines. Tel. No. (088)-855-2627, cell no. 0920-288-1045 Contact person: Mr. Sandy Emperio, brother of Dr. Enrico Emperio who introduced this beneficial fungus from Hawaii.

KOREAN TECHNOLOGY ON ORGANIC FARMING

1. IMO – Indigenous Microbial Organism

(For composting inoculant)

- a. Mix 1 kilo cooked rice with 1 kilo muscovado sugar.
- b. Place in earthen jar or plastic pail.
- c. Cover with clean Manila paper and fasten with rubber strip.
- d. Allow to ferment for 7 to 14 days.
- e. Separate the juice in clean container and seal, ready for use.
- f. Dosage and usage: Mix 4 tbsp | 1 liter of water or 1 litter IMO to 100 liters water and spray on plants and

soil root zone. Spray on hog feeds and animal manure to eliminate malodor. Use IMO as inoculants in composting degradable organic matter.

2. OC – Organic Compost formulation and making (For composting inoculant)

- a. Materials to be used:
 1. 100 kilos or 2 bags of rice or corn brand.
 2. 100 kilos or 2 bags of top soil.
 3. 0.5 kilo IMO (Indigenous Microbial Organism).
 4. 0.5 kilo FFAA (Fermented Fish Amino Acid).
- b. Mix thoroughly the above materials and cover with plastic sheet.
- c. Ferment the materials for 7 to 14 days.
- d. IMO and FFAA can also be used as inoculants in making compost with the use of sawdust or hammer-milled corncobs with chicken dung or other animal manure.

3. FFAA – Fermented Fish Amino Acid formulation (For foliar fertilizer and growth activator)

- a. Mix 1 kilo unwashed fresh trash fish with 1 kilo muscovado sugar or molasses.
- b. Place in earthen jar or plastic pail.
- c. Cover with clean Manila paper and fasten with rubber strip.
- d. Allow the materials to ferment for 7 to 14 days
- e. Squeeze out the juice and place in a clean container and seal.
- f. Collect the solid fishbone to be used for making calcium nutrient spray formula for plants.
- g. Juice is used as foliar fertilizer to induce vegetative growth.
- h. Dosage: 1 liter FFAA to 1 drum (200 liters) of water or 1 ml FFAA to 1 liter of water.

4. CPN – Calcium for Plant Nutrient formulation (For Foliar Fertilizer)

- a. Crush 1 kilo egg shell and burn.

- b. Mix with 10 liters of pure coconut vinegar.
- c. Place in a jar and cover with clean Manila paper. Fasten with rubber strip.
- d. Let it stay in the jar for 3 weeks, and add 2 kilos fishbone. (Fishbone from making FFAA can be used.)
- e. After 4 weeks, the liquid can be used as Calcium Nutrient spray on plants.
- f. Dosage: 1 ml to 1 liter of water or 1 liter to 1 drum (200 liters) water

**5. FFJ – Fermented Fruit Juice formulation
(For foliar Fertilizer and drench fertilizer for seedlings)**

- a. Mix 1 kilo chopped banana or other fruits (except citrus), and mix with 1 kilo muscovado or molasses.
- b. Place in an earthen jar or plastic pail.
- c. Cover with clean Manila paper and tie with rubber strip.
- d. Allow to ferment for 7 to 14 days and separate the juice in clean container and seal.
- e. Usage: Animal drink nutrient enhancement.
- f. Dosage: Mix 1 liter FFJ to 1 drum (200 liters) of water or 1 ml FFJ to 1 liter of water

**6. FPJ – Fermented Fruit Juice formulation
(For Foliar Fertilizer or drench fertilizer for seedlings)**

- a. Mix 1 kilo chopped banana pseudo stem) 2 feet long on the upper most section to be taken at 5 a.m.
- b. Mix with 1 kilo muscovado or molasses and place in a jar or plastic pail.
- c. Cover the mouth of the jar with clean Manila paper and fasten with rubber strip.
- d. Allow to ferment for 7 to 14 days and squeeze out the juice.
- e. Usage: Hog and livestock drink.
- f. Dosage: 1 liter of FPJ to 1 drum (200 liters) of water or 1ml FPJ to 1 liter water.

**7. LABS – Lactic Acid Bacterial Serum formulation
(For Foliar Fertilizer or seedling drench)**

- a. Mix 1 kilo uncooked brown rice and or fresh milk with 1.5 liters water inside a jar.
- b. Cover the jar with clean Manila paper and tie with rubber strip.
- c. Allow to ferment for 7 to 14 days.
- d. Usage: The juice can be used as soil conditioner or fertilizer.
- e. Dosage: Mix 2 ml juice with 1 liter of water. (1 tbs. per gallon water).

**8. OHN – Oriental Herbal Nutrient formulation using
GARLIC**

(For Foliar insect repellent and fungicide)

- a. Mix 1 kilo clean ginger, crushed by stone of wood (no metal implement should be used), with 1 kilo muscovado sugar or molasses and place in a jar.
- b. Pour in a bottle of gin, Ginebra San Miguel 40% proof.
- c. Cover the mouth of the jar with a clean Manila paper and tie it with a rubber strip.
- d. Allow to ferment for 7 to 14 days.
- e. Usage: **OHN** is used as spray against insects and fungi.
- f. Dosage: 3 ml **OHN** (garlic) mix with 1 liter of water. (1.5 tbs per gallon)

**9. OHN – Oriental Herbal Nutrient formulation using
GINGER**

(For foliar insect repellent and fungicide)

- a. Mix 1 kilo clean ginger, crushed by stone of wood (no metal implement should be used), with 1 kilo muscovado sugar or molasses and place in a jar.
- b. Pour in a bottle of gin, Ginebra San Miguel 40% proof.
- c. Cover the mouth of the jar with a clean Manila paper and tie it with a rubber strip.
- d. Allow to ferment for 7 to 14 days.

- e. Usage: **OHN** is used as spray against insects and fungi.
- f. Dosage: 3 ml **OHN** (ginger) mix with 1 liter of water.(1.5 tbs. per gallon)

10.ST – Seed Treatment for germination

Dosage and treatment of liquid formulations

0.2 % **FPJ**

0.2 % **BRV** (Brown Rice Vinegar) or Coconut vinegar.

0.2 % **OHN** (0.1 % OHN Garlic + 0.1 % OHN Ginger)

Mix the above formulations together with water.

How to use: Soak the seeds to be germinated for 4 to 8 hours. For slow germinating seeds, soak the seeds for a longer time.

11.SW – Sea Water usage as spray for plants against diseases

Get sea water from the blue colored area or deep portion where water is clear and uncontaminated with land pollution. Mix 1 liter of seawater with 30 ml fresh water in a plastic container and let it stay for a duration of 2 days. The mixture can then be used as spray on disease infected plants.

USAGE GUIDE:

IMO – For early vegetative growth.

FFJ – For early vegetative stage.

FPJ – For early vegetative stage.

FFAA – For late growth stage and bearing period.

SW – For late growth stage and bearing period.

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**HOW TO PREPARE FAA
(Fish Amino Acid)**

**FOLIAR FERTIZER
(Growth hormone with insect and disease control
properties)**

Materials:

Trash fish	5 kilos
Moscovado / Kinugay or molasses	5 kilos
Cooked rice or corn grits.	2 kilos
Herbal mix (garlic, ginger, hot pepper)	3 kilos
Aloe vera	1 kilo
Probiotics (beneficial microorganism)	5 ml
Coconut water (tuba) or natural vinegar	2 gallons
Plastic container with cover	5 gallon

capacity

Other herbal plants that may be added:

Hagunoy, Makabyhay or Panyawan. 2 kilos

Procedure:

Chop, grind or pound solid materials like fish and herbal mix.

Place all the above ingredients in the Plastic container and mix.

Cover the container with cheesecloth or Manila paper and tie securely.

Let it ferment for 15 to 30 days

Mix materials from time to time (every 5 days)

Gather the fermented juice and place in bottles or plastic containers.

Cover tightly and store in dry cool and dark place until needed for use.

Use:

This will serve as foliar fertilizer, insect repellent and fungicide

For foliar spray mix 2 tbs. juice (FAA) to 1 gallon water or

1 liter FFA to 100 liters water.

HOW TO MAKE YOUR OWN SUGAR

Materials:

Sugar cane juice or fresh coconut juice (tuba)

Big cooking stainless steel basin

Wooden mixing ladle

Stove and fuel

Procedure:

Press fresh sugarcane to extract juice - 08.0%
sucrose content

Or gather fresh coconut juice (tuba) - 16.8%
sucrose content

Place in the cooking basin
Boil to dehydrate
Mix continuously until totally dry and dehydrated with wooden ladle.

Place the dehydrated brown sugar (moscovado) in clean dry containers.

Ready for storage and use.

Uses:

May be used for food, food preparation and processing

Feed additive for poultry and livestock

For bioorganic preparations and additive.

HOW TO MAKE VIRGINE COCONUT OIL

Processing virgin coconut oil right in your own home and kitchen is

very easy and simple.

Grit the meat of freshly opened mature coconut.

Pour a little water and mush the greeted coconut meat.

Press to extract the coconut milk.

Let the milk stay overnight or for 10 to 12 hours.

The water will settle down the container and the oil will float.

Drain out the water.

Heat the oil in stainless steel kettle in 45 to 70 degrees temperature for 15 to 30 minutes to remove and evaporate remaining water in the oil. Better heat oil in double kettle where the first has water in direct contact with fire and the other with oil inside the casserole with heated water.

Place the virgin coconut oil in bottle and seal.

Store in room temperature away from sunlight.

Another way of preserving virgin oil is by freezing instead of heating.

Virgin coconut oil is used for various purposes. It is used for medication, beauty and body skin ointment, cooking oil, lubricant, fuel, etc. It does not get rancid when the right procedure is done.

TAKING CARE OF YOUR SOIL THE NATURAL WAYS

Several researches have found that declining crop yield is related to the loss of soil quality. Soils are threatened by water and wind erosion, salinisation, and nutrient depletion, chemical interference that kills microbiological soil born organisms and other things.

Soil depletion is causing sever impact on agriculture like what is now happening in the Philippines. We are just now waking up to the growing magnitude of soil depletion in most agricultural lands using conventional farming, heavily dependent on chemical fertilization, herbal, pest and disease control. The Ecological Society of the Philippines headed by its president Antonio M. Claparols is very much concerned on the deteriorating soil condition of the country.

Global warming makes things worse. As the ground heat up, organic matter decompose more rapidly, reducing soil fertility, releasing carbon dioxide which increase the warming effects. High priority for soil restoration through carbon sequestration or storing carbon in the soil securely so that it is not easily re-emitted through soil conservation and incorporation of organic fertilizers.

Composts are natural fertilizers that supply soils with vital plant nutrients helping to retain water and air. It restores soil structure, soil carbon anti-biotic activity. Compost or organic fertilizers improves soil texture, helps to control weeds, pest and diseases.

The prices of commercial chemical fertilizers price are skyrocketing, beyond the purchasing power of the marginal farmers. Attention is now focused on teaching and encouraging farmers and entrepreneurs to invest on the production of organic fertilizers.

Organic fertilizers can easily be made by farmers from readily available materials such as plant leaves and residues, animal waste and other biodegradable substances. They do not have to buy or get credit to make their own fertilizer and soil conditioners. Soil fertility and health can also be restored with resting the soil for a year or two, green manure, incorporating crop residue with soil during land preparation or cultivation, and planting of trees along farm borders and banks of waterways.

The Philippines is among the 17 most bio-diverse countries in the world. Part of the Philippines treasure are the large forest trees which are rapidly vanishing. Trees are contributing to the ecological balance as they help clean the air and conserve water. One hectare of forest is needed to supply the fresh nitrogen needed by 40 persons.

Trees and wild vegetation are not only needed in the countryside and farming areas, but more so in communities and urban areas where population density is high. Urban gardens and soils can be improved by growing trees and using organic compost fertilizers.

USE OF ORGANIC COMPOST FERTILIZER AND BIO MICRO INOCULANTS

Organic compost fertilizer is the closest we can return to natural farming. The emerging farming system is towards the use of organic fertilizer in combination with chemical fertilizer.

There are now available in the market several Pro-biotic like BYM and Tricograma that helps hasten the breakdown and decomposition of organic cellulous materials to convert them into organic fertilizer.

Simple way of preparing organic compost:

The old practice is the sandwich type where different organic materials or waste are piled layer after layer like plant residue + animal waste + soil and repeat the process until reaching a meter high. Keep it moist and insert a bamboo with ventilated holes to aerate until the material decomposes. Then mix the material and keep it moist until totally decomposed. Aerate and expose to sunlight before applying as fertilizer.

The new practice is chopping or hammer-milling the organic materials then spraying pro-biotic to the mass, keep it moist and cover with plastic sheet to avoid dehydration. Mix the mass at least once a week. With sufficient digester (microorganism or pro-biotic) it will take less than a month to convert organic materials into ready to use fertilizer.

Mixing a combination of different organic materials both plant and animal source will insure a more complete nutrient content of the organic fertilizer. Pro-biotic spray or inoculation of the compost will prevent destructive and undesirable microorganisms to grow. The odor becomes pleasant.

COMPOST

Composting, essentially a rapid self heating process by which organic material is decomposed and stabilized, was practiced by ancient Egyptians, Greeks and Romans and is even mentioned in religious texts. During the past 20 years, this time honored practice has developed into a robust waste-management technology that generates valuable organic soil amendments.

Biological treatment technologies may be either aerobic or anaerobic. Aerobic systems use oxygen, but anaerobic ones don't. Both may use heat to fuel the reactions that break down organic matter in manure. In composting, heat is generated by microbes

that digest organic matter. After decomposition, it will be good to sanitize the organic compound by drying or exposing it to sunlight for a day or two.

“Nutrient stabilization in composted manure allows soil microbes and plants to use the nutrients in a slow-release and beneficial manner. Compost may even help reduce demand for nitrogen in certain crops.” Says Patricia Miller of the Environmental Microbial Safety Laboratory in Beltsville, Maryland

Composting is one of several technologies used to treat animal manure, sewage sludge, and other organic residuals, which may contain pathogens or parasites of public health concern. In any manure slurry system, solid can be composted. Liquids can be further processed to stabilize nitrogen and phosphorus in soluble forms compatible with current nutrient-management requirements.

Soil structure is easy to improve with compost. Organic matter is the most important source of plant nutrients contributing to the fertility of the soil. Compost material sustains healthy plant growth by providing food for both living microorganisms, speeding up their multiplication and absorption of the roots. Organic matter has also a dual role that helps water move through the soil and at the same time improve the soil's water holding capacity. Unlike depleted soils of organic matter, soils rich in humus retain a good surface and do not crust or clod after heavy rains. Aeration is good in humus rich soils and this important factor means root growth is good. Organic matter also acts as storage for nutrients, increases cation exchange capacity and acts as a regulator for nutrients, so they are not all released at one time.

HOW TO PREPARE YOUR OWN LACTO BASILLAI

LACTO BASILLAI is one of the beneficial microorganisms called pro-biotic. It helps in the breaking down of cellulose fibers and converts organic materials into humus and fertilizer. Producing your own stock of lacto bacilli can easily be done using the following procedure:

1. Use rice wash or finely grounded grain preferably brown rice mix in water.

2. Place in a wide plastic basin and cover loosely to allow ventilation.
3. Allow it to ferment for 7 days. Bacteria including lacto bacilli in air will infect solution.
4. Strain liquid and place in bigger plastic container.
5. Add 10 parts milk (skim, powdered, condensed or fresh) Milk is best feed for lacto bacilli will multiply rapidly and overgrow other bacteria in solution. .
6. Cover loosely to allow ventilation and ferment for another one week.
7. The flotsam consisting of fats, carbohydrate and protein contain lacto bacilli.
8. Scoop the flotsam and mix with food or feed materials. A yellow colored liquid will form containing a great concentration of lacto bacilli.
9. Store in refrigeration or room temperature.
10. Mix liquid in equal quantity of rough brown sugar, moscovado or molasses.
11. Mix stock solution in 20 parts water. Use to is with compost materials.
12. Dosage: Use 2-4 tbs. per gallon water and spray to plants.

HOW TO MAKE COMPOST

The sandwich method:

- a. Organic materials such as animal waste, plant waste and topsoil are placed in layers one on top of the other until they reach a high of 3 feet.
- b. The material is watered moist and covered with coconut leaves or plastic sheet in order that moisture will be retained.
- c. Mix the compost pill after two weeks, moist and cover again.
- d. Repeat mixing once a week, until the compost materials are totally decompose with the appearance of soil.

- e. Dry in direct sunlight to kill or eliminate unwanted microorganisms such as fungus and bacteria.
- f. The material is now ready for use or placed in sacks for storage or shipment.

Biological fast composting:

- a. Gather the organic material, chop or hammer mill and mix thoroughly.
- b. Water them moist with pro-biotic microorganism (lactobacilli or trichoderma) mixed in the water.
- c. Cover the compost pile with plastic sheet.
- d. Mix the material every week.
- e. It will usually take only 4 weeks to totally decompose the material with the aid of the microorganisms that help digest the cellulose materials.
- f. Sundry the decomposed organic material (fertilizer) to kill unwanted microorganisms.
- g. The material is now ready for use or bagging for storage or shipment.

Field composting:

- a. After harvest and just before plowing and land preparation, gather the organic materials, chop or hammer mill.
- b. Spread the materials evenly in the field. In case the plant waste residues are in the field, then step a. will not be necessary.
- c. Spray the organic material in the field with pro-biotic microorganism.
- d. Plow and disk-harrow the field to mix the organic material with the soil.
- e. If possible do the above operation just before an expected rain or irrigate the field after the plowing of cultivation. This will allow the microorganism to work fast, and multiply. In the process, digesting the organic material into organic fertilizer or soil amendment.

Note that the pro-biotic organisms will continue working in the soil, as long as favorable conditions like adequate soil moisture and presence of organic materials.

Steps in composting with wild sunflower:

1. Look for a suitable area, partly or fully shaded.
2. Gather compost materials such as rice straw, animal manure, and other farm waste.
3. Collect wild sunflower and chop the young stem and leaves into small pieces.
4. Stick a bamboo with holes to serve as ventilator of the compost pile.
5. Pile crops residue and farm waste in the following sequence: rice straw, sunflower, manure, soil and repeat the layering. Proportion: 2-3 parts fresh sunflower, 1 part rice straw, 2 parts manure and 1 part soil.
6. Water the pile until thoroughly wet.
7. Cover pile with leaves, sack or plastic sheet to minimize evaporation.
8. Check the moisture every 2 days, and wet in case compost dry up.
9. Check also the temperature. If it is warm, then decomposition is taking place.
10. After 3 to 4 weeks, check the compost pile and if it has turned into soil humus physical form it is most likely ripe.
11. In case the compost will not immediately be used, air dry before placing into sacks or in a shady dry place.

Farmers are encouraged to implement simple and inexpensive ways of producing organic fertilizers through the use of indigenous technology. They may adopt other methods of composting by using other materials and plant waste available in their respective farms.

VEMICOMPOSTING

VERMICOMPOSTING is composting plant materials with worms. The advantage of vermi-composting to that of the usual conventional compost pile is that the process is faster and the resulting organic soil is richer in certain nutrients provided by the earthworms themselves. It is rich in **Humic acid, which** is a growth promoting.

African Night Crawler (*Eudrilis eugeniae*) earthworm are incredible eaters and will eat and expel their own weight every day when conditions are right. It takes 60 days or less for fresh organic waste to be converted into compost fertilizer. Our native earthworm may also be employed.

Steps in Vermi-composting:

- f. Have a shed for the composting site to protect the worms from direct sunlight and from torrential rains to be able to do their work undisturbed. The worms need a good living condition, dimly lit area to live in with enough moisture.
- g. Construct a storage area for digested compost before it is screened and bagged.
- h. Construct the compost bed for worms to digest with concrete hollow blocks three blocks high with a depth of 30-45 cm., 1 meter wide by 2 meters long or longer. Be sure that the soil bed is well drained under the composting bed. The worms will not escape into the soil if there is available food to digest.
- i. Use a shredder or hammer mill to crush the organic materials into small particles easy to decompose and eaten by the earthworms. Good food: They need 25% nitrogen from legumes like madre de cacao and ipil-ipil leaves, chicken droppings and cattle dung, etc. and 75% carbon source like grasses, rice and corn stalks, cogon and sugarcane tops.
- j. Mixing old animal manure and chicken droppings (2 months old) with shredded vegetable waste will improve the nutrient content of the finish product. Do not use fresh manure for the ammonia produced will give discomfort to the worms.
- k. Water the bed from time to time to keep them moist but not flooded so as not to drown the worms.

- l. Fence off or screen in the beds to keep out chickens, birds, rodents and other pest that will eat or bother the worms in the wormery.
- m. Mix a little ordinary soil to the fresh shredded vegetable materials before introducing the worms.
- n. Place one kilogram of worms per square meter for fast composting. 10-20 pieces may do to start with but it will take longer time to compost while the worms breed to increase their number. A kilo of worms are sold for P500 and they breed fast in two months.
- o. Inoculating and spraying the compost materials with pro-biotic bacteria will help fast tract decomposition and the worms to digest the compost in much shorter time.
- p. When the compost is digested, the worms become less active. It is time to herd them to another compartment with fresh food materials. As they leave, the digested compost is ready for harvest and transferred to the stocking or holding area for screening, drying and packing.
- q. Harvesting will be easier by allowing the bed with completely digested compost material to dry up so the worms will move to the next compartment with moisture and fresh shredded vegetable food materials.
- r. Screen the material with $\frac{1}{4}$ inch mesh before weighing and bagging for sale. A 50 kilo bag humus is sold for P150 to P300 to gardeners. If you use it in your own farm, there is no need of screening. (Note: Commercial imported chemical fertilizer today prices have gone over P600 per 50 kilo bag)

The worm's feces are called **vermin-casting** or **humus**. Compost takes 2-3 months to decompose, while shredded materials fed to worms takes only 15-21 days.

Advantages of Vermicomposting:

1. **Environment friendly.** The use of organic fertilizer, vermin-casting of humus is one, revives the soil fertility level and brings back life to soil environment, improves soil texture and improves water holding capacity.

2. **Economical.** Investment on vermicomposting is only about P2.00 per kilo while commercial chemical fertilizer cost P8-15 per kilo.
3. **Higher Crop Yield.** Humus have shown its potency in inducing higher crop yield for a longer period. Vermi-casting humus is found to be more effective compared to ordinary compost and chemical fertilizers.
4. **Market Potential is Very Big.** Organically grown food crops are increasing in market demand. Organic fertilizer has likewise increase in use as imported commercial fertilizer have been increasing its prices.
5. **No imported inputs required.** Farmers can make their own organic fertilizer from farm waste materials. This means no dependence on imports and oil price fluctuations.
6. **Healthful.** Organic farming is considered as healthful way of growing food crops.
7. **Lesser risk.** Producing your own fertilizer will make you unaffected by exchange rates and fluctuation changes in the prices of other commodities. There is less or no risk at all producing your own fertilizer and even selling excess requirement of your own farm.
8. **Undemanding laborers.** The worms themselves them selves are the workers converting farm waste materials into organic plant food nutrients.
9. **Big savings.** Producing your own fertilizer is a big savings and cost cutting for the farmers.
10. **Income-earner.** This technology can help farmers earn more from their farm waste

MAGGOT COMPOSTING

Instead of using earthworm, a simple natural process has been discovered in fast composting. A mixture of sawdust and chicken or quail droppings are placed in a compost pile covered with shed. The maggots eat up the cellulose in a few weeks instead of several months. To prevent the maggots to complete its cycle to adult flies, chickens are allowed to scratch and peak the growing maggots, a source of animal protein. Spraying or drenching the compost pile with pro-biotic

microorganisms (beneficial bacteria and fungi) will help hasten decomposition and prevent foul odor.

SLUDGE FERTILIZER

Liquid sewage sludge being disposed as communal waste contain essential elements needed by crops, making it a potential organic fertilizer and soil conditioner for sugarcane farms, corn fields, rice lands and even fruit orchards and vegetable gardens.

In a research conducted by Luzon Agricultural Research and Extension Center (LAREC) of the Sugar Regulatory Administration (SRA) in cooperation with Manila Water Company, Inc., the use of liquid sewage sludge for agricultural purposes was assessed to determine its effects on the growth and yield of sugarcane. The study was conducted at LAREC R&D Farm at Floridablanca, Pampanga.

It was confirmed the application of liquid sewage sludge in the barren sandy lahar deposits of Floridablanca, Pampanga the soil became richer and sustain healthy and productive sugar cane, compared with untreated field.

COMPOSTING CROP RESIDUE IN THE FIELD

Rice and corn are among the traditional crops grown by Filipino farmers. As the usual practice is removing the debris and burn them to clear the land and cultivate for next planting. Tones of organic materials are wasted and lost.

Organic farmers spread rice straw and corn cobs back to the field immediately after harvest. They are sprayed with beneficial microorganisms or pro-biotic or bacteria and plowed under. In 4 weeks, they are decomposed and the field is ready for land preparation for new planting.

This practice is also being started with big pineapple and banana plantations in Mindanao. Some sugarcane planters found the benefit of composting cane residue in the field instead of the usual practice of burning after harvest then cultivating and fertilizing. Field composting of crop residue help retain and improve soil fertility, at the start reduces the use of chemical fertilizer to the time that no more synthetic fertilizer is needed.

Coconut trees and other fruit trees have lots of leaves, bracts, twigs, flowers and fruits that fall to the ground. When these materials are allowed to decompose beneath the trees, they turn into humus and fertilizer to the trees. Unfortunately, because of clean culture, they are removed and burned. Teaching the farmers to return the crop residue to the soil from where they came from will both enrich the soil and sustain productivity of the trees without relying solely on chemical or synthetic fertilizers.

GREEN MANURING

Green manuring is the is the planting of seasonal crops usually legumes like beans and plowing them under at their tender age during flowering and early fruiting when they are rich in nutrients. Plowing under weeds and grasses, allowing them to decompose is also green manuring. Spraying them with pro-biotic will hasten their decomposition. These practices have long been done by farmers' century back, until commercial chemical fertilizers have been introduced to the market.

COVER CROPPING

Cover cropping is the growing of low crawling plants usually leguminous vines like centrocema pubisence and kudsu to protect the soil surface from water erosion, prevent the growth of noxious weeds and help increase soil fertility. These are grown beneath fruit trees and taller crops.

INDIGENOUS POTTING MATERIALS

Garden soils have been the usual potting materials for gardeners. However there are different Potting mix and indigenous materials that gardeners and nursery operators may use. Here are some of the suggestions offered to readers by Anthony Gaw of Aim Trading Corporation, Calihan, San Pedro City, Laguna with Telex (049) 800-1572:

- A mixture of fertile garden or topsoil decomposed organic materials and fine river sand at 1:1:1 ratio.
- **Rice hull charcoal** is half burned rice hull. It contains a high level of carbon needed by plants for normal growth. It makes the mixed medium looses and easier for root development. It helps retain fertilizer and releases to plants in a longer time. Rice hull charcoal is mixed in 1:4 ratios with other potting materials. It is good for seedling trays, potted plants, vegetable pots and herbs in pots.
- **Washed coco peat** comes from the husk of coconut. The coconut hush is shredded and soaked in water for several days and washed with fresh clean water. It has a good water holding capacity. It is mixed with other materials at 1:1 ratio. Very good for seedling trays, vegetable plots, potted plants and fruit bearing trees.
- **Fermented Bagasse** and garden soil at 1:4 ratios Bagasse is sugarcane pulp. Decomposed bagasse is rich in humates providing plants with essential trace elements. It is suitable for fast growing vegetables like peachy, mustard and lettuce.

- **Pumice Stones** are small volcanic rocks with other materials at 1:5 ratios. Pumice stones prevent panning or the compacting of the medium due to strong watering. They are good for seedling trays, potted flowering plants, and orchid community pots.
- **Granulated charcoal** comes from coconut shell. It is a good material for drainage that prevents excessive moisture that damaged the roots. It is a source of carbon a plant nutrient needed in maturing. A layer or two is placed at the bottom of the pot before potting materials are place into the pot.
- **Powdered charcoal.** The coconut shell or wooden charcoal is pulverized into powder. It helps absorb foul odor of decomposing organic materials. It helps beneficial bacteria hasten decomposing process. Spread at leas an inch thick on compost pills or decomposing materials.
- **Short coconut fiber** from coconut husk is separated through decortications. It is a good mulching material for sensitive plants. 1 to 2 layers is place on top of soil or partly mixed with soil to prevent erosion.
- **Granulated Zeolite** are chipped from boulders and used as absorbent material. Fertilizers and plant nutrients absorbed by seolite are released to the plant roots slowly and continually for a longer period of time. It controls the growth of molds and fungus, especially in nitrogen rich medium.
- **Cubed coconut husk** The husks are sterilized and then chopped to produce uniform sized cubes, It has a good water holding capacity and ideal for aerial plants tike anthuriums, bromeliads, dendrobiums, and other high value aerial plants.

SOIL CONDITIONERS

There are many kinds of soil conditioners, depending on the different soil conditions and deficiencies. Progressive farmers should know them and how to use them properly to make their soil rich and highly productive as the years go by. Among them are:

- **Agricultural lime**, to correct very acid soils and brings the pH level to near pH-7, which is neutral and suitable to most plant growth and availability of plant nutrients for root absorption.
- **Organic fertilizers**, to both improve the soil texture and increase its fertility.
- **Chemical fertilizers**, to supply the nutrient deficiency of the soil and meet the nutrient requirement of the crops grown.
- **Organic composts** are decomposed or partly decompose or plain organic materials place or incorporated into the soil to improve its texture and later through the action of microorganisms are fully digested and converted into soil nutrients that are readily absorbed by the plant roots.
- **Probiotics or Microbes** are beneficial bacteria and microorganisms that helps digest and decompose organic materials and convert them into soil nutrients made available to root absorption. There are now a lot of available preparations of these microorganisms sold in the market. They are usually mixed in water and sprayed into the soil or organic compost to help hasten decomposition and fight the bad or undesirable microorganisms in the soil. Probiotics can help reduce the use of chemical fertilizer and help improve the texture of the soil.

MICROORGANISMS ENHANCES CROP PRODUCTIVITY

(As reported by Bengie P. Gibe, S&T Media Service)

Microorganisms, also known as microbes, are microscopic organisms like bacteria, protozoa, algae, fungus and virus. They are found in soil, water and atmosphere, and inextricably intermingled in the environment. There are bad and good organisms. Some of them can enhance crop productivity.

The National Institute of Molecular Biology and Biotechnology (BIOTECH) of the University of the Philippines Los Banos (UPLB)

produced two, Biological Nitrogen Fixers (BNF): Bio-N and Nitro Plus.

Bio-N is solid inoculants in powdered form that contains any of the two important strains of bacteria isolated from the roots of talahib grass that can convert the nitrogen from the air into ammonia. It can substitute 30-50% of the nitrogen requirement of rice and corn.

Bio-N increases the yield of rice and corn by as much as 35% compared with unfertilized treatments, maintains the natural soil properties and fertility, and makes plants healthy and green even in drought and in the presence of pests.

Nitro Plus is legume inoculants, which can substitute for nitrogen chemical fertilizer at a much cheaper cost. This is a bacterium called *rhizobia*, which are specific for legumes such as soybeans, peanut, mungbeans, cowpea and pole sitao.

The bacteria reside inside the nodules of leguminous plants where they can fix nitrogen directly from the air. Nitro Plus can replace 30-50% of the nitrogen requirement of the crop.

Mycorrhiza is a symbiotic association between the roots of plant and fungus. The association provides many benefits to plants. It increases the absorption of nutrients like phosphorous and water, serves as a biological control agent against infection, improves soil properties, increase the tolerance of the crop to environmental stresses (drought, diseases, mineral imbalances).

BIOTECH has come up with two Mycorrhiza products: Micogroe and Mycovam.

Mycogroe is a soil based bio-fertilizers tablet form that promotes survival and growth of forest species like eucalyptus, pines, agoho and dipterocarps. The tablet is inoculated into tree seedlings during their nursery stage. Some 60-80% of the fertilizer requirements of the trees in the fields are replaced by using this microb inoculant.

Mycovam on the other hand, is in powdered form, soil inoculant effective for agricultural crops like rice, corn potatoes, eggplant, fruit trees and forest trees.

It is also added during the nursery phase of seedling or inoculating seeds just immediately before planting. It can replace fertilizer requirement by as much as 60 to 80% nitrogen.

Bioorganic microorganisms can decompose agricultural residues and convert into bioorganic fertilizer, which enhances the growth of plants.

BIOTECH has likewise produced an organic fertilizer technology that uses two microorganisms:

Trichoderma harzianum or compost fungus activator (CFA), brand BIO-QUICK.

The other is *Azotobacter sp.*, free-living nitrogen fixing bacteria, brand BIO-FIX.

BIO-QUICK enhances the process of decomposition by reducing the composting period from 5-6 months to only 3-4 weeks, after which the resulting compost is inoculated with **BIO-FIX**. Inoculation of one week produces nitrogen-enriched compost that can be applied to field crops, vegetables and fruit trees.

These materials are available at BIOTECH, UP, Los Banos, Laguna at very reasonable price. Reservations and orders have to be made at least one month before pickup or need.

MULCHING

Mulching is the covering of the soil surface to slow down soil moisture evaporation or conserve soil moisture, prevent growth of weeds and keep the soil soft and friable. In the process, beneficial

microorganisms digesting cellulose are protected from the sun and continue their work of converting organic materials in the soil into organic fertilizer.

There are different methods of mulching:

- Covering soil with cut grasses, weeds, straw, sawdust, rice hull or other vegetative materials that eventually decomposes and mix with the soil to add to its humus or organic content.
- Covering soil surface with plastic sheet, usually black with silver surface.
- Cultivating or breaking soil surface before summer to break moisture evaporation.
- New technology of mulching is the use of greenhouses or covering the plants with nets to both reduce sunlight intensity and break the force of raindrops. This is coupled with the use of ultra violet ray plastic transparent roofing. These practices are the emerging conventional technologies that help farmers grow high value commercial crops in compact and limited areas.

The higher the organic content of the soil particles, the more moisture holding capacity it has. There are jells from seaweed when incorporated with the soil improves its water holding capacity and releases moisture slowly to the roots. This is one advantage in using humus and decomposed organic fertilizers.

ISSUES AND FACTS ON ORGANIC FERTILIZERS

ISSUES	FACTS
Organic materials after undergoing decomposition, especially when applied in large quantities, could cause groundwater pollution.	Inorganic chemical fertilizers are more pollutants to groundwater even in smaller quantity than organic materials.

NATURAL & ORGANIC FARMING

By: Rex A. Rivera, Agronomist

Plant do not use directly the nutrient found in organic materials since this has to first undergo mineralization.	This is true to all types of fertilizers and plant food nutrients. Plants absorb them in the simplest mineral ion forms.
The amount of essential plant nutrients in organic materials are very low compared with synthetic chemical fertilizers.	This is true, that is why bigger volume of organic materials is applied to the soil. However organic fertilizers carrying the 17 nutrients needed by plants while chemical fertilizer may only carry 2 to 5 nutrient elements.
Organic fertilizer releases the plant food nutrients within a few days slowly and last at a longer stretch of time that takes years	Chemical fertilizers on the other hand may have immediate and fast release of nutrients and is dissipated in only 3to 4 months.
Organic materials are claimed to improve physical properties of soil but this could only be true in aerobic soil condition,	This claim is not entirely true as irrigated lands where organic fertilizers have been incorporated during land preparation show outstandingly better crop growth and yield.
Soil organic matter will not increase significantly in just one or two years of applying organic materials.	This may be true if the quantity of organic fertilizer applied is minimal, however, periodic application will be improving soil capacity of sustaining increasing crop productivity as the years go by.
Organic fertilizer is not the sole factor in improving the quality of the food product such as increased anti-oxidant content.	Yes there are mineral soil conditioners that will help enhance your soil with organic fertilizer to improve food crop quality.
Using purely organic fertilizers/materials will not make your crop productive as when chemical fertilizers are used solely.	This is not true. Organically grown fruits and vegetables without chemical fertilizers have been producing commercially well.
Organic fertilizers/materials	This is one big benefit in using

incorporated in the soil improves the soil texture, nutrient content and feeds microorganisms and keep the soil alive.

organic materials. The heavy use of chemical fertilizer have the tendency to make the soil acidic and kills microorganisms and life forms in the soil making it barren.

FARMERS'S EXPERIENCES, OBSERVATIONS AND PRACTICES WORTH SHARING AND EMULATING

In the September 2003 issue of Agriculture Magazine, we read the experience of a mango grower who turned to natural organic farming after experiencing big losses due to the high cost of chemical pesticides. He is Col. Virgilio Ecarma of Batangas with 5,000 bearing trees.

Here is what Col. Ecarma did. On his 2000 trees he stopped using chemical pesticides and replaced them with his own concoction of organic preparations. His organic concoction did not only control pest and diseases, but also invigorated the trees. The materials he used are neem tree leaves, garlic, vinegar, coconut water, gin (alcohol), molasses, trash fish, rice brand and effective microorganism (Pro-biotic).

He prepared his concoction in three 100 liters plastic drums. In the **first drum** he filled it 1/3 with neem leaves, added 5 kilos of molasses, 10 kilos of crushed garlic, 24 bottles of gin (alcohol), 1 gallon of vinegar and filled the drum with water, then covered. Allowed it to ferment for 15 days, opening the cover to relish methane gas accumulating.

The **second drum** was filled half with trash fish, 20 kilos of molasses and filled the drum with water. Cover and allowed to ferment for 15 days.

The **third drum** was filled wit 20 kilos of molasses and 2 liters of pro-biotic (Effective Microorganism), 5 kilos of rice brand and coconut water to fill the drum. Cover and allowed to stay for 15 days.

After 15 days, ½ litter of liquid was taken from each drum and mixed to 100 litters of water and sprayed on the mango trees on a weekly interval.

The result, fruit flies and mango hoppers were driven away. The 2000 trees sprayed with the organic preparation had a very striking contrast with the 3000 trees not treated. The sprayed trees were very fruitful, and the fruits were unblemished by fruit fly or anthracnose; while the 3000 trees untreated were attacked by hoppers and fruit flies and were unproductive. Col. Ecarma also observed the treated trees were much healthier. He surmised that the fish emulsion with Probiotics supplied nitrogen amino acid essential for plant growth.

The organic preparations can also be used to other plants like ampalaya, patola, guava, macopa, papaya, caimito, banana, balimbing, siniguelas, pechay and other fruit bearing plants and vegetables.

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Organic vegetable growers, Jef and Lydia van Haute bought a 2000 sq. m. land in Balubad Dos, Silang Cavite where they built a greenhouse and grew organic vegetables, free from toxic chemical pesticides. They use organic fertilizer.

When insect pest come into the greenhouse, they spray the plants with concoction of pepper. Overall, they grow disease free and insect free healthy vegetables.

They follow a system of crop rotation. They have classified their vegetables into the Cabbage group, Foliage group, Fruit Vegetable group, Root Crop group and the Legumes group.

The different groups have their own peculiar pests and diseases, explains Jet. To avoid pest and disease problems, they rotate the different groups. For instance, legumes are planted where

tomato and eggplants were planted previously. Pechay and lettuce on the other hand may be grown where carrots were planted before, and so on.

Another technique in avoiding pest and diseases is to intercrop plants that repel insect pests such as marigold. Besides repelling insects, its roots also secrete a substance that kills nematodes in the soil.

In cases where the vegetables are still infested, the couple, spray them with organic pesticide like *Bacillus thuringiensis* (Bt) commercially prepared in powdered form and mixed with water for application to plants.

ORGANIC MANGO

There is now a growing market demand for organically grown fruits and food crops especially in Europe, and slowly influencing the world markets. PREDA (Peoples recovery, Empowerment and Development Assistance Foundation, Inc.) is working on the commercial production of Certified Organic dried mango. PREDA agriculturists are working with mango farmers all over Central Luzon on the first phase of “going organic” training. We have to take note however, with the chemical pollution of the soil, air and water worldwide, we cannot say that crops are grown 100% organic. What we can do is produce fruits and food crops without toxic chemical residue when harvested or consumed.

BOTANICAL PESTICIDES for MANGO

Studies on botanical plants with, pesticidal properties against mango leafhoppers were done by Dr. Hernani Golez and Nenita F. Zamora of Guimaras Island’s National Mango Research Center (NMRC). Field test of different crude extracts showed that

tobacco plus detergent and combined extracts of *kakawati*, *tubli* and ripe *sili plus detergent (KTRD)* were effective against mango hoppers. Furthermore, KTRD as bio-spray was also effective in the control of mealybugs attacking the flowers of mango. Incidence of borer damage was also minimized by spray application of different extracts (*tubli*, *tobacco*, *lagundi*, *atis* and *makabuhay*).

A comparative study is conducted by mango growers assisted by the Agricultural Training Institute (ATI), at Tukawal, Alabel, Sarangani Province. The study consist of comparing practices of

1. Mango Grower Contractor practice
2. Chemical Company Recommendations
3. Integrated Pest Management (IPM)
4. Natural Organic and Biological practice
5. With Control trees

Initial observation shows the Chemical Company recommendations and the Natural Organic and Biological practices are competing in excellence. The study shows that growing chemical free organic mango is commercially attainable.

POST HARVEST TREATMENT

There are several post harvest treatment being employed:

1. **Plain warm water washing** with 1% salt solution or detergent and chlorine. Dry fruits after washing as re-infection occur when fruits are moist.
2. **Hot Water Treatment (HWT)** where fruits are dipped in 52-55 degrees water for 10 minutes. A new innovation dip in 59 to 60 degrees water for 30 seconds to one minute. The temperature range should be strictly maintained and monitored to avoid scalding if it rises, and if it drops, may not control the pest and diseases of the fruits. Air-dry immediately after dipping. Adding chlorine to the water helps control diseases

The author designed and fabricated a simple HWT tank made out of one sheet stainless steel plate heated by LPG. Dimension is 20 x 30 inches and 18 inches high. It has a capacity of 2 crates of 20 kilos per crate per loading. The unit can easily be transported to the site of harvest. It cost P8,000 to P10,000 per complete unit with stand, gas stove burner, LPG tank with hose, regulator and thermometer. A bigger stainless steel tank with 6 crates capacity cost P20,000.00 fabricated by a machine shop in Gen. Santos City.

3. **Extended Hot Water Treatment (EHWT)** – Dipping the fruit in 46 - 48 degrees Centigrade for 90 minutes. This treatment is practiced in Mexico for mango exported to the USA.
4. **Vapor Heat Treatment (VHT)** where fruits are subjected to heated vapor until the inner flesh of the fruit reaches 46 degrees for 10 minutes. This treatment is required for mangoes exported to Japan, and Korea. It is non toxic and non chemical disinfectant.
5. **Chemical Treatment** – Using fungicide to control fruit rot. Fungicides are dissolved in water where the fruits are dipped. Benomyl (500-1000 ppm) and other suitable fungicides are used.
6. Fumigation with Ethylene dibromide (EDB) at the rate of 16 grams per cubic meter for 2 hours at 25°C is done for mangoes exported to Australia and New Zealand. This will control and destroy the insect eggs in the fruit. The Australian government has now banned the use of EDB. The Philippine government is negotiating to replace it with VHT to control fruit fly. Irradiation seems to be more favored by Australia.
7. **Irradiation** – This is a new introduction to access fruits and food preparation to USA and other countries requiring such quarantine procedure.

These treatments tend to control fruit born diseases like Anthracnose and Stem End Rot as well as kill insect eggs like Fruit Fly. Be sure to fully dry the fruits after treatment, before packing

because wet and moist fruits are easily re-infected by fungal rot diseases.

STEPS IN HOT WATER TREATMENT

1. Heat water up to 55°C and main the temperature range at 52-55°C during operations. A 59-60 degrees for fast treatment.
2. Place mango in perforated plastic crate or basket that fits into the hot water tank to maximize the number of fruits that can be treated in one dipping. In the absence of plastic crate, any other suitable containers that will not cause bruises on the fruits may be used. This will avoid direct contact of the fruits with the hot metal bottom of the tank that can cause heat injuries or scalding.
3. Dip the mango into the hot water submerged for 5 to 10 minutes, checking the temperature is between 52-55°C. A faster procedure is 30 to 60 seconds dipping in 59 to 60 degrees water. It is advisable to move the crates now and then to equalize the heat and help remove the dirt from the fruits.
4. Use electric fan to hasten drying. When fully dried, sort them and pack carefully in fruit boxes or crates for storage or shipment to the market.
5. Some buyers do not want chemically treated fruits, so HWT or VHT are done without using fungicide of chemicals.

The above operations should be done within 4 to 8 hours after harvest. It is even preferable for small quantity harvest to do the whole operation right in the field or farm. Treat fruits within 4 hour of picking while latex are still wet.

Harvested mangoes should never be exposed to direct sunlight, wind, rain and other contaminants, either in the farm or during transport to the processing plant and packaging site. If this cannot be avoided, thorough washing and hot water treatment should be done and completely dried and packed avoiding re-contamination.

AGRO CHEMICAL PRICES

Dr. Pablito P. Pamplona and Marisa Garcia, professors of the University of Southern Mindanao made a study tour with fruit growers in Mindanao to Thailand, Indonesia and Malaysia. They found that cost of producing one-kilo mango in Thailand is only P3.00 per kilo while in Mindanao averages P6.00 to P7.00 a kilo.

The comparative prices of agri-chemicals in the Philippines and Thailand:

AGROCHEMICALS	Philippine Prices (Davao)	Thailand Prices (Chantaburi)
1. Cultar (Growth regulator)	P5, 300 (25%) per litter	P250 (15%) per litter
2. Confidor (Insecticide)	6,440 per litter	800 per litter
3. Decis 2.5 EC (Insecticide)	750 per litter	300 per litter
4. Karate 2.5 EC (Insecticide)	850 per litter	350 per litter
5. Aliette (Fungicide)	1,600 per litter	490 per litter
6. Round Up (Herbicide)	1,500 per gallon	480 per gallon

The solutions to correct the disparity are,

- a. Adopt Free Trade by removing barriers for Filipino farmers to access to cheap agri-chemicals
- b. Government through the DTI and DA import directly agri-chemicals from cheap sources and sell to Filipino farmers by bypassing layers of trades increasing the prices.
- c. Go Natural farming with organic and biological technology.

ORGANIC FARMERS

Mr. Jose (Batchoy) and his life partner **Mrs. Pamela (Pam) Henares** of Sitio Balugo, Bry. Alangilan, Bacolod City are practicing organic farming. They grow black pepper and lettuce organically. They do not want to contaminate the drinking water of the city which comes from their farm area.

Besides the vegetables and flowers, raise 50,000 heads of broiler from where they source their organic fertilizer, chicken droppings, 3,000 sq. meters rice field, calamansi, pineapple, fruit trees and different variety of vegetables.

Mr. Ramon Uy, owner of RU Foundry & Machine Shop Corp. in Bacolod City is a new convert of organic farming. He was requested by Mr. Jose "Bachoy" Henares to repaid his imported shredder. Because of the encounter, RU Foundry is now manufacturing his own version of shredders for groups of farmers and local government units converting their organic waste in public markets into organic fertilizers. Mr. Uy realized that agriculture and industry have to progress together to support one another. He himself is now engage in vermi-composting and organic gardening. He also set up a model organic farm at Bago City with a partner to showcase how integrated organic gardening. It can be adopted by small farmers and earn more. Mr. Ramon Uy is willing to teach farmers and LGU sponsored groups and learn how they can produce their own fertilizer without relying so much on imported chemical fertilizers whose price is going up beyond the purchasing power of most Filipino farmers.

Mr. Uy observed that using chemical fertilizers may be cost effective at first, in the long run the cost increases because the soil gets depleted (as friendly microorganisms are eliminated) so more and more fertilizer will be needed. On the other hand, the application of organic fertilizer may progress slowly, but the cost of production will decrease and soil productivity increases as the years go by.

Lina Adoracion, a retired teacher at Malungon, Sarangani Province grow organic rice, banana and other crops. She produces superior quality rice seeds. Their organic rice sell more than rice grown conventionally with chemical fertilizer and pesticide spray. She finds the farm environment healthy as she makes more money selling organic crops.

Rue R. Ramas, Manager and proprietress of SEED WORLD in Gen. Santos City grows organic vegetable in here demo vegetable garden. She introduces the use of compost fertilizer and pro-biotic to counter pathogens. Rue have been conducting trainings and seminars on organic farming in cooperation with LGUs, NGOs and interested farmer groups.

Mr. Pat Acosta, a Horticulturist and Businessman has been growing strawberry for the last 12 years. He now grow different variety of lettuce in his 3,000 sq. meter greenhouse farm at Lamtang, La Trinidad, Benguet. Pat is one of the pioneering organic farming practitioners. He has a shredder and compost pile, designed to turn shredded plant residue into organic humus. He uses this material in growing his vegetables. He uses probiotics and enzymes to speed up raw materials. Pat says, he work his land the natural way as his Master, the Lord God wishes.

ORGANIC BANANA GROWING

Carlos Impang, a Latundan Banana farmer at Talaytay, Poblacion Malungon, Sarangani Provice has this to share. His farm is 3 hectares planted to Latundan Banana at a distance of 3 x 6 meters. He practices clean culture, with the weeds and banana leaves left to decompose in

between hills. He uses organic mulch and organic waste as his fertilizer. He does not spray chemicals or bagging of bunches as done with Lacatan and Cavendish banana growing. He prunes off diseased leaves and brack to prevent spread of fungal diseases.

It takes 10 to 12 months from planting to flowering. Fruit emergence takes 14 to 16 days, and 2.5 months from flower emergence to fruit maturity and harvest.

He maintains 2 to 3 suckers per hill at different stages of growth. Excess suckers are removed to concentrate nutrient to fruit development. Provide good drainage and aeration to keep the plants dry with maximum sunlight exposure. Soil moisture is maintained with the mulching. He does not plow to avoid damaging roots that will serve as entry point of diseases.

The average production is 10 to 35 kilos per bunch. He markets at the local Public Market of Malungon at P10.00 per kilo whole sale to retailers. He has a weekly harvest of 100 to 130 kilos from $\frac{3}{4}$ hectare. He is expanding his area to 6 hectares. He observed that his yield increases during the rainy season and drops during summer months.

Replant after 3 to 5 years with 1 year rest or planted to legume crops. It is a good practice to rest the land for one year and allow the growth of natural vegetation and microorganisms that help decompose and turn plant residue and convert them to organic fertilizer and readily available plant nutrients.

ORGANIC FISH CULTURE

Inland fish culture has been originally practiced in lakes and ponds the natural way. They just building the pond and allow fish to live, tribe and grow. As new technology are introduced, many fishpond operators were feeding the fish with ready mixed and milled commercial fish feeds. They also use chemical fertilizers to induce growth of algae fish food. Aerators are used to help introduce oxygen into the waters as heavy pollution depletes the air in water.

Loven Vilches of Sibunag, Guimaras started using 1 ton organic fertilizer per hectare of fishpond instead of chemical fertilizer. They decompose the organic fertilizer (chicken droppings) with pro-biotic or beneficial microorganism. It takes 3 weeks from treatment of bacteria before the organic fertilizer is applied on the pond. After a few days the pond is filled with water and side dressed with liquid algal booster. His harvest increased by 25%. He uses fingerlings caught from the wild and limits fry population so as not to over stock the pond. The biological fish culture technology was introduced by Aidine Galvan of Growbio Farming System of Bacolod City.

Bangus is harvested in 2.5 months instead of the usual 3 months. The fish size are 4 pieces to a kilo. After harvest, there is rich algae supply in the pond, that there was no need to add fish feed. There is no need for another month pond preparation for the next cropping. 15 days is enough. They add more pro-biotic bacteria for enzymes to continue the production of fish food. The dead algae, fish litter and other organic waste in the pond are converted into nutrients by the enzymes and become fish food again. It is recycling waste.

HERBAL PLANTS

Plants were created for animals. While we also use them for plant nutrition and protection, they are more used as food and medication to keep man and animals healthy productive and have a long life. Here is one. (A bonus to our readers)

HYDROCELLA ASISTICA or CENTELLA

Common name – Gotu Kola, Payong-payong, Takip-kuhol
It is referred to as Indian Ginseng. Another variety is Koto Kola.

“Two leaves a day keeps sickness and old age away”
Herbalist calls Gotu Kola as the finest herbal tonic.

The leaves appear to act as brain food. 2-3 leaves a day eaten raw strengthen worn out body tissues and the brain to a remarkable degree.

1. It prevents Brain fatigue and nervous breakdown. Two to three leaves a day will keep old age away provided that the body is exposed to the sun for a time being for each day.
2. It cures the nervous and mental problems, heart problems, age spots, and thyroid stimulant.
3. It improves skin and relieves skin problems, leprosy, tuberculosis, and venereal diseases.
4. It assists in healing depressions, impotence, and menopausal problems.
5. It also serves as an aphrodisiac.

The Indians use the plant as a diuretic to remove excess fluid from the body and stimulate stimulants to the kidney and bladder as a blood purifier.

Gotu kola has also been used as cancer treatment, and herb used by Jason Winters as told in his story in his inspiring book "KILLING CANCER" that is usually available in health and food shop.

Because Gotu Kola (*Hydrocella asistica*) is an Asian herb, it is not mentioned in European herbals, as they do not grow naturally there.

It was renowned Chinese herbalist PROF. LI CHANG YUN, who lived to the age of 256 years as a user of that herb that awoke the Western World as to its value. He was born on 1677 and in 1933 the New York Times announced the death of the remarkable oriental whose life span had reach over two and a half-century. The Chinese government officially recorded his age. At 260 years of age Prof. Yun still gave

courses of lectures (Its lecture lasting 3 hours) on longevity at the Chinese University. Those who saw him declared that he did not appear older than a man of 72 did. He stood erect and strong and had his own natural hair and teeth.

After Li Chung's death, the French government has done extensive studies. They found out that there is unknown vitamin that they called Vitamin Y for the youth vitamin because it was found to have a beneficial effect on the brain and endocrine glands.

Another French Bio-Chemist Jules Lepino who undertook extensive researches of the plant and found out that it had a rare tonic properties that had marked energizing effect on the nerves and brain cells to keep them functioning well.

Many people who took Gotu Kola daily tell how they no longer feel brain fatigue. Their memory is strengthened and a feeling of mental and physical well being and energy had been experienced. It is considered as brain food.

The lady who took the herbal for six weeks said that she did not feel fatigue despite heavy schedule and she was more relax and her arthritic pain gone. For years she had not been able to take the ring off her finger because of arthritis. But after taking the herb for several weeks, she was able to remove her ring again.

Recently a lady from Brisbane came to pick up her friend who has been sick and also troubled with high blood pressure. She started taking the herb. In her next checkup, the doctor took her pressure three times as he could not believe that her blood pressure for ten years normalized due to her taking Gotu Kola daily with in two weeks.

Goto kola (*Hydrocella asistica*) can be eaten straight from the plant or added to salad or chopped as a last minute garnish or meal like parsley. It has a slight bitter flavor. The

leaves can be used as fresh or died for iced fruit juice sweetened with honey.

But do not over eat. It may result to headache, dizziness, or too much energy and sleeplessness at bedtime.

Gotu kola is a rich source of chlorophyll, Vitamins A, B, C, D, K and particularly minerals and magnesium. The plant is easy to grow and adapts in most soils.

A 95 years old lady in wheel chair at the General Santos City Home for the Aged has now left her wheel chair after eating *Hydrocella asistica* for two months. She was suffering from sever Arthritis with high blood and diabetes. Now she can walk and move around with a cane. Soon she says, even the cane may no longer be needed as she feels progressively getting stronger and active. Other old folks in the home for the aged also say their health and strength are improving as they daily eat fresh *Hydrocella asistica* leaves. They claim that three (3) leaves a day is enough. Too many intakes cause headaches to some. It tastes pleasantly bitter when chewed fine and juicy.

The plant is a soft tender crawling vine with roots and a leaf at every node. *Hydrocella asistica* leaves are shaped like umbrella with al long pistil. They grow well on moist soil partly shaded areas. It is fast growing, ideal to replace noxious weeds between fruit trees in orchard farms. It appears to help enrich the soil as green manure plant.

Planting materials are now available in tray pot.

Contact Marietta H. Rivera at 30 Lapu Lapu St., General Santos City.

Tel (083) 301-0117

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There are more Natural and Organic and Biological Farming systems that have not yet been included in this manuscript. This technology we have just presented are sufficient for beginners, farmers and enthusiasts to start on the road on natural farming and producing safe and healthful food crops. We suggest that our readers embark on your own research, study, trials and readings to learn more and be a part of a new movement of environmental and ecology friendly farming.

The new movement hopes to bring back the birds of the air, frogs and reptiles on the land, and fishes of the waters and streams that disappear because of the unrestricted use of toxic chemicals in agriculture. The lost bio ecological balance and diversity of nature will be back with the rich fertile soils that can sustain crop production and renew the face of the earth nearer to its primal origin.

Let us study and learn natural laws for they are God's laws that will help us farm the natural ways. In the process, we will be producing safe, healthful food while protecting the environment, sustaining balance ecosystem and preserving bio-diversity in our farms. Good luck and happy productive Natural Farming.

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The lifetime works, research, and studies of Pedro D. Sangatanan, BSA, MSc. And Ronel L. Sangatanan, BSA, MAgr. They have been an inspiration in promoting organic farming to the Filipino farmers, and help produce safe and healthful organically grown food at lower cost and self-sustaining natural farming system.

Mr. Zac B. Sarian, Editor of *Agriculture Monthly Magazine*, who has a wide source of information on agricultural technology, and has been unselfish in sharing them to help fast

tract the development of several Philippine agricultural industries and ventures.

Miss Lina Adoracion a retired teacher now a full time farmers adopting the Masikap way of natural and organic farming at her Malungon farms. She produces organically grown rice and fruits.

Ms. Rue R. Ramas, proprietor of Seed World and currently busy educating and conducting training's on organic farming with the use of pro-biotic. Her demo-vegetable crops are organically grown. SEED WORLD, V.G. Rivera Farm, Nat. Hwy. Lagao. General Santos City. Telex. 083-302-0444, Tel. 083-302-0456 Cell: 0917-951-5364)

Mr. Antonio "Toto" Marin III, Pathologist and practicing farmer. He is an advocate of organic and biotechnology who makes his own researches and studies which he shares with farmers in seminars and training. Cell No. 0918-329-2033.

To the farmers who encourage this writer to continue improving and promoting this manuscript to help and guide them in returning to natural farming.

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For more information and consultation please contact:

REX A. RIVERA
Agronomist, Agricultural Consultant

NATURAL & ORGANIC FARMING

By: Rex A. Rivera, Agronomist

30 Lapu Lapu Street, General Santos City

E-mail: rarivera8@yahoo.com

Telex: 083-301-0117

Cell Phone: 0917-746-2029