

FARMERS IN BENGUET PRACTICE SAVERS TECHNOLOGY



**SAFE VEGETABLE PROMOTION PROJECT
IN BENGUET**

**FARMERS IN BENGUET
PRACTICE
SAVERS TECHNOLOGY**

December 2011

**Safe Vegetable Promotion Project
in Benguet**

TABLE OF CONTENTS

PREFACE

BASIC INFORMATION

- I. WHAT IS MOKUSAKU?
- II. HOW TO COLLECT MOKUSAKU
- III. SEDIMENTATION OF MOKUSAKU
- IV. COMPOSTING
- V. SOIL SUPPLIMENT
- VI. FERTIGATION
- VII. FOLIAR SPRAY
- VIII. EXTRACTION

REPORT ON THE RESULTS OF MOKUSAKU TRIALS BY FARMERS IN BENGUET

MR. SOTERO CAPSUYAN	BUGUIAS, BENGUET
MR. JOHN DAMPILAG	BUGUIAS, BENGUET
MR. RUDY ATAS	BUGUIAS, BENGUET
MS. SHIRLEY PALAW-AY	TUBA, BENGUET
MS. JUDITH JACINTO	KABAYAN, BENGUET
MR. CLAVIER MENDOZA	KABAYAN, BENGUET
MS. REYNELDE BALONG	KABAYAN, BENGUET
KABAYAN MUNICIPAL AGRICULTURE OFFICE	
MS. LUCY LUCAS	TUBLAY, BENGUET
MR. JEFFREY SOTERO	TUBLAY, BENGUET
MR. RENATO DINGWAS	LA TRINIDAD, BENGUET
MR. WESTMOORE MARTINI	LA TRINIDAD, BENGUET
MR. ISAAC LARUAN	LA TRINIDAD, BENGUET
MR. LEONARD VALDEZ	LA TRINIDAD, BENGUET
MR. STEMBER NGAYAAN	KIBUNGAN, BENGUET
KIBUNGAN MUNICIPAL AGRICULTURE OFFICE	
SAVERS PROJECT DEMO FARM	

MR. SATUR BULAY	BUGUIAS, BENGUET
MS. POLONIA ALOS	TUBLAY, BENGUET
MS. EMILIA ALOS	TUBLAY, BENGUET
MR. RODERICK SUDANGO	BUGUIAS, BENGUET
MR. RENANTE CASENIO	TUBLAY, BENGUET
MR. SORIANO MANU	TUBLAY, BENGUET
MS. GERONIA KIMPA-OY	TUBLAY, BENGUET
MS. DOMINGA TOPE	KABAYAN, BENGUET
MS. RENITA TAPLIN	KABAYAN, BENGUET

PREFACE

Nearly five years have passed since JAEC Project on safe vegetable here in Benguet. This project intended to help Benguet farmers cultivate soil by using organic materials such as compost, charcoal and Mokusaku (wood vinegar) and produce safe and healthy vegetables. The project worked with farmers in La Trinidad during the first 3 years. From 2010 on, the project covered the whole Benguet. A large number of farmers learned the “Safe Vegetables from Rich Soil” technology and practiced it.

These farmers have witnessed beneficial effects of the technology: They demonstrated that, by using these materials and reducing farm chemicals, strong plants resistant to pest and diseases were grown and safe vegetable were produced.

This booklet contains field reports of these farmers. They tell us how Mokusaku and other materials are used for different crops, together with its effects. In order to assist readers having limited experience to understand the technology, this booklet also includes a chapter to explain ways of producing these materials and using them on the field.

Dear readers of this small book, please try using them on your own farms. At first, you may go through errors and trials. But, you will be getting better results by and by. When you get good results, please inform us. We will collect your reports and publish Volume 2, 3, etc. of the booklets.

Hoping that this field report will be of use for your production of vegetables, flowers, strawberries, etc.,

December 2011

MASAKI YOKOMORI

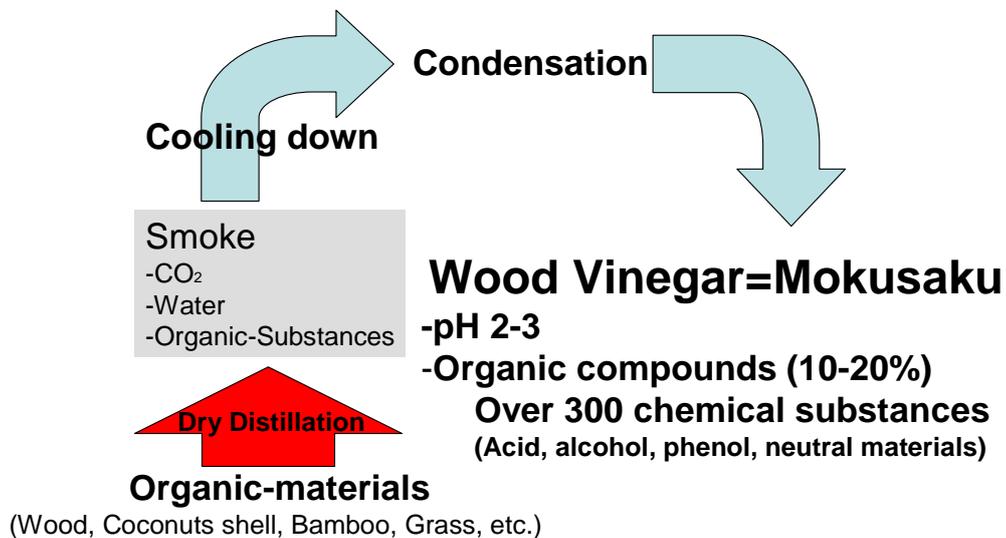
Senior Technical Advisor

Safe Vegetable Promotion Project in Benguet.

I. WHAT IS MOKUSAKU?

Mokusaku is liquid obtained from oil, juices, sap and other liquid contents of organic materials such as wood, coconut shell, bamboo, grass, and other plants after being heated in a chamber. The chamber is heated by burning firewood placed at the base of the chamber. When these organic materials are heated, their liquid contents evaporate as steam (gas, smoke). The steam passes through a tube (cooling chamber) where it will be allowed to cool. When the steam is cooled, the vapor will turn into liquid (condensation processed). The liquid is what is known as Mokusaku. From the tube, this liquid is collected in a container.

WHAT IS MOKUSAKU?



Mokusaku is composed of a lot of organic chemical substances. Studies in Japan have shown that there could be more than 300 chemical substances.

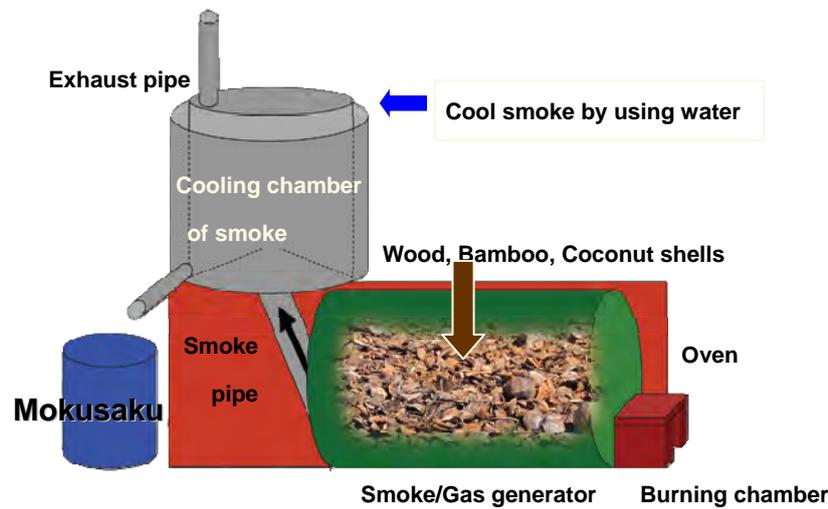
Group of chemicals	Name of chemical	(mg/1,000cc)				Characteristic
		Broadleaf tree bark	Oak	Japanese Cedar	Bamboo	
Alcohol	Methanol	1,777	3,318	56	2,662	Water-Solvent, Poisonous
	Ethanol	8	13	0	28	Water-Solvent
Ketone	Acetone	43	670	0	154	Water-Solvent
Carboxylic Acid	Acetic acid	29,290	70,046	4,302	15,224	Main-Ingredient of Vinegar, Pungent smell
	Propionic acid	1,173	2,500	114	649	Flavor material, Pungent smell
	Lactic acid	(260)	(1,893)	(76)	(240)	Flavor material, Rancid smell
	Valeric acid	0	39	12	0	Flavor material, Rancid smell
	Crotonic acid	31	40	17	0	
	Benzonic acid	33	83	24	28	Food antiseptic, Flavor, Cosmetics, Industrial material
Furan	Furfural	28	419	0	2,151	Flavor (Aromatic substance of coffee, etc.) Solvent
	Tetrahydrofurfuryl alcohol	8	20	0	0	Flavor (Aromatic substance of coffee, etc.) Solvent
	2-Acetylfuran	46	45	0	34	Flavor (Aromatic substance of coffee, etc.)
	5-Methylfurfural	10	99	0	48	Flavor (Aromatic substance of coffee, etc.)
	Furfuryl alcohol	15	0	0	0	Flavor (Aromatic substance of coffee, etc.)
Phenol	Phenol	244	323	7	354	Bactericidal antiseptic
Guaiacol	Guaiacol	188	396	18	260	Bactericidal, Pungent smell promoter
	4-Methylguaiacol	111	111	10	69	Bactericidal, Pungent smell promoter
	4-Ethylguaiacol	38	29	6	27	Bactericidal, Pungent smell promoter
	Vanillin	23	25	278	11	Flavor (Food flavor, Vanilla flavor)
	Acetoguaiacone	25				
Syringol	Syringol	178	1,303	0	209	Pungent smell palliative
	4-Methylsyringol	77	14	0	43	Pungent smell palliative
	4-Ethylsyringol	30	9	0	42	Pungent smell palliative

	4-Propylsyringol		58	0	20	Pungent smell palliative
	Syringaldehyde	50				
	Acetosyringone	44				
	Methyl Syringate	24				
Alkyl Phenol	<i>o</i> -Cresol	40	40	0	35	Bacterial disinfectant, Wood antiseptic
	<i>m</i> -Cresol	73	66	0	38	Bacterial disinfectant, Wood antiseptic
	<i>p</i> -Cresol	72	38	9	70	Bacterial disinfectant, Wood antiseptic
	2,6-Xylenol	16	9	0	2	Industrial material
	2,5-Xylenol	14	0	0	3	Industrial material
	4-Ethylphenol	22	0	0	170	Industrial material
	3,5-Xylenol					
Others	<i>γ</i> -Butyrolactone	(260)	(1,893)	(76)	(240)	Flavor (Food flavor)
	Cyclotene	101	95	67	113	Flavor (Aromatic substance of coffee, etc.) Solvent
	Maltol	43	346	67	0	Flavor (Food flavor, Sugar-like flavor)
Reference: Miyazaki-Midori Pharmaceutical Co. Ltd.						

However, contents of these substances in Mokusaku are dependent on the materials to be heated as well as the burning/carbonization process and the timing collecting cooled steam from the tube. Further researches are still needed to validate the chemical components as stated in the table, since the data are based on few studies in Japan.

II. HOW TO COLLECT MOKUSAKU

Mokusaku is liquid obtained by trapping smoke which comes from the organic materials when organic materials are heated, and then “cooled”. Hence, the most important issue in the collection process of Mokusaku is how to condense the smoke into liquid.



Condensation takes place inside a double-layered chimney system. It is inside the chimney that the trapped smoke is cooled to become liquid.

Mokusaku yield is dependent on how cold the chimney is. This will likewise depend on temperature or weather conditions of the place where the plant is installed. Here in the Philippines, we have only two seasons, the dry season and the rainy season and temperature is not low enough to obtain a high value of yield. We thus need to pour water into the chimney to hasten the cooling.





Bamboo
(cooling

Smoke outlet
from the
burning
chamber to the
bamboo (cooling

Mokusaku

Burning

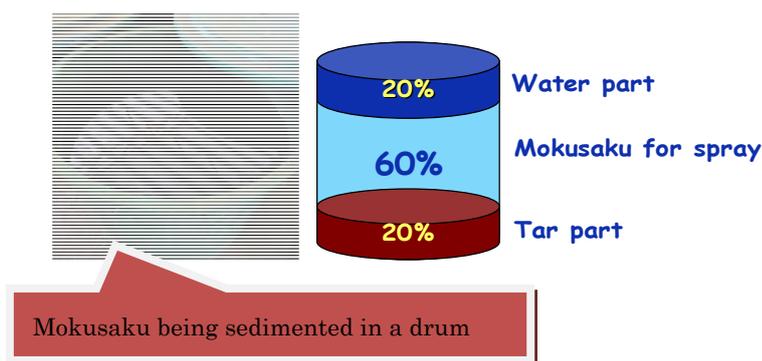
Farmers in Benguet collect Mokusaku using a long bamboo chimney.

Bamboo could be used as a substitute for the stainless cooling chamber. It is much cheaper although not as durable. If the place is cool, Mokusaku can be collected in a long chimney.

III. SEDIMENTATION OF MOKUSAKU

Sedimentation

- At least 6 months sedimentation
 - Upper 20% is mostly water part
 - Bottom 20% contains tar
 - Middle 60% is good quality Mokusaku for spraying
- For composting,
and for soil application



After Mokusaku is collected, the liquid must undergo sedimentation for at least six (6) months. The process is needed since there are some toxic substances such as tar mixed with Mokusaku. These substances can be separated by sedimentation.

After 6 months, Mokusaku will separate into three layers. The upper portions mostly contain the water, the middle portion will contain the Mokusaku and the bottom contains a higher percentage of tar. The water and tar portions could be used for composting, and as soil supplements. The middle portion containing good Mokusaku can now be used for spraying.

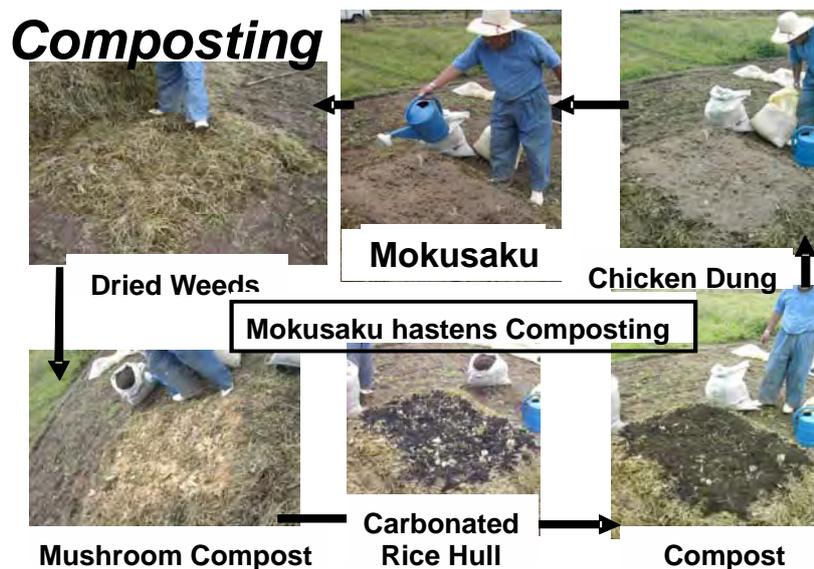
Quality of Mokusaku

Quality of Mokusaku would also depend on the kind of raw materials used, the smoking process, the temperature and others. The process of sedimentation determines the quality of Mokusaku.

Mokusaku is not fit for use for human consumption. It should never be taken internally. Mokusaku can be used for animal even for human-beings. However, this Mokusaku must be really purified by long sedimentation and distillation processes. And it must be examined by scientific study whether the Mokusaku is really safe or not.

IV. COMPOSTING

Basic Mokusaku Usage



Any kind of organic materials, such as grasses, weeds, rice straw, chicken dung, animal manure, rice bran, mushroom compost and others could be used for composting. The use of wood and sawdust, however, would require a longer time of decomposition.

The first step is to heap these materials like sandwich. As illustrated above, the sequence of layers would be as follows: dried weeds first which should be at least 30cm in height. Chicken dung and other materials such as mushroom compost, rice bran, charcoal or carbonated rice hull, and old compost are spread on the first layer. Pure or diluted Mokusaku evenly over the first layer. After this, composting materials are again piled on top of the first layer and then followed by the additional materials. Mokusaku is spread evenly on top of every layer. The procedure is repeated until all collected materials are piled. It is not necessary to look for or complete list of all these materials at hand before start composting. We can produce compost using only the locally available materials at hand. But we should always add any available source of nitrogen such as chicken dung or any kind of manure.

As the pile of compost materials undergo decomposition or fermentation, temperature

also increases. The temperature would vary, depending on the kind of materials used, amount of nitrogen source added, aeration and the balance of the used of water and dry mater in the pile. Good compost is obtained if inside reaches temperature as high as 75 degrees Celsius. This temperature kills pathogenic microorganisms.

But it is not advisable to maintain this temperature throughout the decomposition process. Further, if the temperature goes beyond 75 degrees Celsius, it kills beneficial microorganisms. To avoid overheating, mix the heap at least once a week. When turning the pile, the outer potion should be put inside the new pile while the inner portion of the old pile should be put outside. Water should also be added if the pile becomes dry to continue decomposition.

A good for composting indicator is the presence of Actinomyces in the pile. These are the molds like and white in color attached to the compost material.

After one or two months, the compost can be used in the garden. You can use 3 kgs of compost per 1 m².



Actinomyces

V. SOIL SUPPLEMENT

Soil Supplement Charcoal and Mokusaku



It become Nest (Charcoal) and Food (Mokusaku) for Microorganisms

Mokusaku can also be used together with charcoal. But the charcoal must be pulverized. Carbonized rice hull size will be okay. Charcoal should be dried before being mixed with Mokusaku.

Mokusaku is poured on charcoal and should be mixed well. Suggested ratio is: Charcoal: Mokusaku = 2:1. It means 30% water contents of charcoal with Mokusaku mixture.

If you have 600-700 grams charcoal, mix it with 300 ml. Mokusaku. A good mixture is attained when a handful of mixture does not crumble when it is held by the hand.

The finished mixture should be evenly spread immediately on the field. 100-500 kgs. of this mixture is applied on a 1,000 m² area. The mixture of charcoal and Mokusaku should be incorporated in the soil immediately. However, it can also be stored in cellophane. It must be tightly sealed so that it may not dry up. It is not necessary to apply the 5000kg/1000m² at once, but it's better to apply smaller quantity in every cropping season

VI. FERTIGATION



Fertigation



- **Ratio**
 - **Mokusaku:Water**
= 1: 10-20
- **1L Diluted Liquid/ Plant**
- **At least 3times**
- **Control Nematodes in Soil**
- **Activate useful micro-organisms**

We use clued Mokusaku for fertigation. We can also use liquid collected from upper and lower portions of the liquid container after sedimentation is complete. It has high water contents and tar, so it is not good for direct spraying, but it is good for the soil. (On the other hand you can use Mokusaku after sedimentation and separation and this middle part is recommended for spraying purposes.)

One liter of Mokusaku is diluted with water to 10 to 20 times. We use 1 liter of the liquid to fertigate your plant. The 1 liter is good for one plant, such as tomato, cucumber and eggplant. In the case of leafy vegetable, you can use the 1 liter to more plants, or you can fertigate before planting.

It is most important is to continue fertigation and improve your soil condition so that it will bring back the natural nutrients. It needs effort and patience to achieve a great outcome.

There are several advantages in using Mokusaku to fertigate the field:

- (a) They control nematodes**
- (b) It activates beneficial micro-organisms.**

(c) It makes the plant vigorous.

If your plants are affected by club roots, it means that population of microorganisms is not balanced in the soil. The existences of club root means that the number of nematodes is increasing in the soil. In this case, we must normalize balance of microbes population in the soil.

Fertigation is a good practice and solution in creating better microbes population balance.

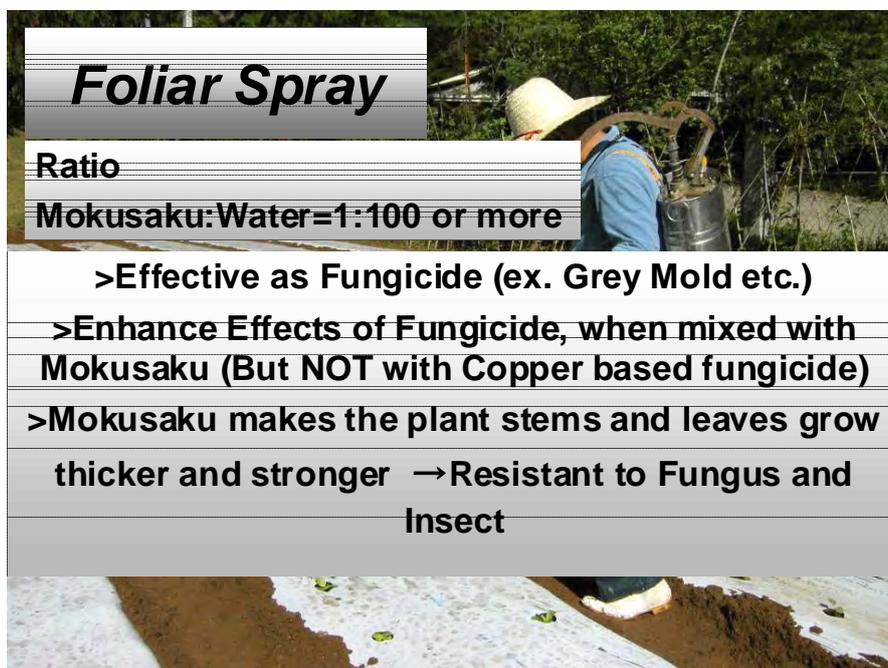
Mokusaku has two main effects.

(a). It controls pathogenic bacteria.

(b) Food for useful micro-organisms: If we continue fertigating Mokusaku in every cropping season, the micro-organisms population in the soil will be balanced.

However, we must also consider other activities for the soil. You must find out the reason of soil deterioration.

VII. FOLIAR SPRAY



You can further reduce cost of pesticides using Mokusaku. Mokusaku has capability to break water into smaller clusters. It means that pesticides diluted in water and added with Mokusaku will penetrate faster and better into plant leaves. Plants sprayed with Mokusaku-mixed liquid dry faster too.

You can reduce almost 1/2 of the recommended dosage of pesticides when added with Mokusaku, and you can still expect the same effect as you spray the normal dosage.

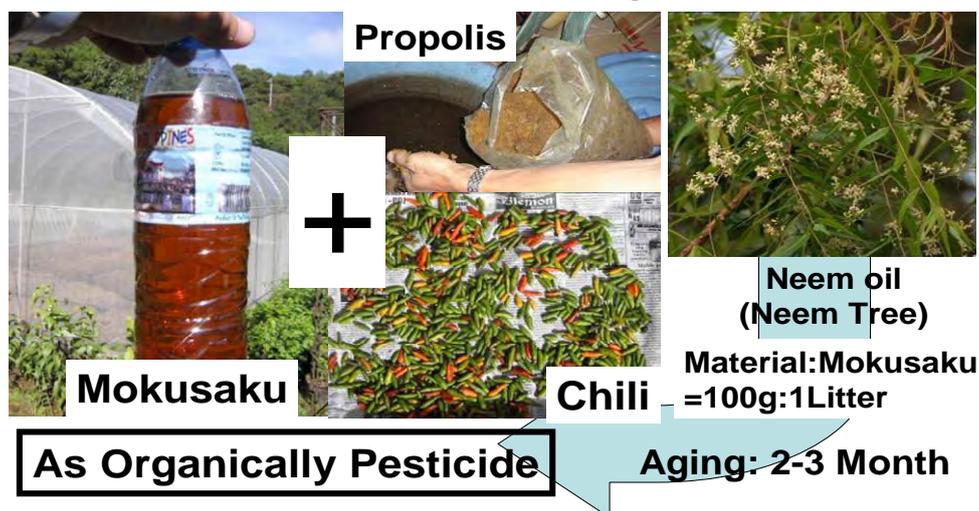
If you use Mokusaku, you can use 100 ml - 300ml in 1 knapsack sprayer (16liter), and mixed with half dosage of pesticides.

However, you must not mix Mokusaku with copper based pesticides and miticides. If you mix Mokusaku with pesticides, you don't need to use sticker. Mokusaku evaporates faster. Mokusaku can also make the leaves thicker. This will make the plants more resistant to diseases and insects. This technology helps you to reduce pesticides costs.

However, Mokusaku is **NOT a chemical pesticide**. You must understand it has effect not same as chemical since it is natural material. You must observe your plants and adjust dosage of Mokusaku and pesticides.

VIII. EXTRACTION

Extract useful substances using Mokusaku



Mokusaku has an ability to absorb plant substances. It is one of major functions of this technology.

We can use Chili, Neem Oil (Neem Tree), garlic, ginger, lantana, and any extract as an insecticide/pesticide. We can also use Propolis extract as pesticide or fungicide. Propolis is made from honey bee, the materials that guard the nest from microorganisms and diseases. The substance has sterilization effect. Fish intestines can also be extracted by Mokusaku. The extract is called “Amino Acid Extract”. You can use it as foliar fertilizer.

How do we prepare fortified Mokusaku with useful substances contained in plants?

- The materials are better being dried.
- Soak the material into Mokusaku. Plants may be put into sacks or nets or which lets water easily.
- The ratio of plant materials: Mokusaku = 1: 10 (100g: 1 liter)
- If the material is floating, put a heavy object like stone.
- Mix them once a week
- Continue extraction for 2-3 months.
- After 2-3 months, the extract has smell of the plant extract.
- You can spray the extract, diluted to 100-500 times. (Extract: Water = 100ml:

10-50 liter)

REPORT ON THE RESULTS OF MOKUSAKU TRIALS BY FARMERS IN BENGUET



Mr. and Mrs. Sotero Capsuyan

(Sitio Losong, Boyakawan, Buguias, Benguet.)

Sotero Capsuyan had been engaged in farming business for the past 35 years up to the present. He farms at least one fourth of a hectare. His main crops are chinese cabbage, carrots, potatoes and lettuce. Capsuyan mentioned that during the earlier years of his farming, farm inputs did not cost that much. But when the leaf miner broke out during the late 1990's, everything changed and farming became harder and more expensive.

Capsuyan came to know Mokusaku thru a seminar conducted in 2010 at Abatan, Buguias. He believes Mokusaku is big help for his family.

He applied Mokusaku on carrots. He sprayed once a week at five to seven days interval with a dosage of one small can of sardines (180 ml) plus fungicides (mancozeb and other fungicide) and insecticides (half of the recommended dosage) in a 16 liter capacity knapsack sprayer during the

vegetative stage.

He noticed the following results after using Mokusaku on his carrots:

- (a) The strong odor of pesticide was controlled/reduced.
- (b) The harvested carrots were almost uniform in size.
- (c) He harvested 4 tons of carrot from a 400 grams seed. He swears that his yield increased that can be attributed to low quantity of rejects.
- (d) He planted this in the cold month of December.
- (e) He observed that the leaves of his carrot plant became were wider and thicker and the carrots had uniform big sizes.

He used the same dosage of Mokusaku on his celery. He noticed the following results:

- (a) His yield increased since before, he usually produced six tons but after using the Mokusaku plus insecticide/ fungicide, he was able to harvest 12 tons with the same dosage of fertilizer applied on the same area.
- (b) The stems also became sturdy and no hallow petiole was observed.
- (c) The celery plants become taller and heavier.

He even suggested that the dosage of Mokusaku can be lowered to 50 ml per knapsack sprayer.

He also used Mokusaku in lettuce and he observed that the leaves became wider and thicker. But the dosage of Mokusaku should be lowered to 50 ml when the lettuce is at its maturity stage (head is being formed).

He wants to continue using the Mokusaku because believes that it could bring back the fertility of the soil. He even wants to make his own compost using Mokusaku.



John Dampilag
(Loo, Buguias, Benguet)

John Dampilag is a farmer for 15 years. However, he became a fulltime farmer in 2006. He utilizes an area of 1,000 square meters of farm land. The usual vegetable he plants is potato, lettuce, celery, and carrots.

Dampilag said that he has experienced a lot of periods. These problems included limited financial resources to buy farm inputs. His potatoes also suffered from diseases such as bacterial wilt and blight.

He learned about Mokusaku from his father. His father attended the seminar conducted by Masaki Yokomori in 2010 at Abatan, Buguias. His

father shared with him what he learned from the seminar and desirable results he obtained from his own farm trial.

John Dampilag used five to twelve table spoons of Mokusaku and added two table spoons of insecticide or fungicide. He diluted them in 16 liter of water (knapsack sprayer). He sprayed at a five day interval during the vegetative stage of his crop.

He noticed the following results:

- (a) The leaves became thicker.
- (b) The celery leaves became deep green, which means that the crop was robust and healthy.
- (c) The strong odor of pesticides was lessened after adding Mokusaku to the mixture spray.
- (d) Pesticides had no burning effect despite the increase in the dosage of Mokusaku.

With these positive results, he said he would try Mokusaku more often on other crops.



Rudy Atas

(Baculungan Sur, Buguias)

Rudy Atas is currently in charge of the Buguias municipal nursery at barangay Manatong. Despite his employment, he still manages to produce vegetables from his garden near his house. His farm has an area of 2,500 sq.meters. He is in charge of the maintenance and production of Mokusaku from the Mokusaku production area put up by the municipality. He has been joining seminars on how to prepare Mokusaku conducted by the agriculture office. These gatherings earned made him interested t to apply Mokusaku in his garden. He wanted to conduct trials in order for him to find out if Mokusaku is really effective

Atas used Mokusaku on bell pepper. He started spraying Mokusaku from the seedling stage towards its fruiting stage. He used one half of a small can of sardine (about 90 ml) of Mokusaku and added one table spoon of fungicide and one table spoon of insecticide (Fenvalerate). He diluted them on 16 liter of water place inside a knapsack sprayer. He sprayed the combination to his

bell pepper at a 14 day interval. He also sprayed pesticides without a mixture of Mokusaku for an interval of 14 days likewise. He alternately sprayed his crops.

After spraying, he had observed the following results on his bell pepper:

- (a) The leaves became greener and thicker.
- (b) The bell pepper produced lots of fruits (50 % increases from previous cropping).
- (c) The yellowing of leaves was minimized.
- (d) He enjoyed several harvests.



Shirley Palaw-ay
(Poblacion, Tuba)

Mrs. Shirley Palaw-ay is the current president of TUBENGGCOGA (Tuba Benguet Coffee Growers) and the treasurer of the Cordillera Regional Arabica Coffee Growers. Despite her busy schedule she can still, manage her family's approximately 500 square meter backyard planted with anthurium with the help of her husband. She started planting anthurium last 2007 to the present. She plants different varieties of anthurium. She also plants sayote, coffee, citrus, banana, cucumber, garden pea, tomato and beans.

Jeffrey Palaw-ay, her husband, who is the principal of the elementary school in Kibungan, was the first to learn about Mokusaku through a seminar he attended at Poblacion, Kibungan on 2010. Jeffrey Palaw-ay became so interested in Mokusaku. That he brought home a Mokusaku sample and applied it in their back yard garden in Tuba. Mrs. Palaw-ay was also able to

attend other seminars on Mokusaku. She was able to learn more about Mokusaku.

In the past, she observed that the common disease that affected her plants was the discoloration of the anthurium spadex (it turns to black) and rotting. She used the Mokusaku thru fertigation at a ratio of 750 ml Mokusaku to 16 liters of water at a weekly interval. During rainy season, when her husband did the spraying, she used one and one half table spoon of fungicide (insecticide or fungicide) plus 350ml of Mokusaku. They sprayed at an interval of seven days.

After the application of Mokusaku, she was able to observe the following:

- (a) The anthurium plant grew faster.
- (b) The leaves were more vigorous and green.
- (c) The leaves and flowers were shiny.
- (d) She also observed that Mokusaku enhanced the emergence of suckers (a shoot from the roots or lower part of the stem of a plant).
- (e) After fertigation, she noticed that the leaves of the plant dried faster.
- (f) They also tried Mokusaku in compost making and observed that the decomposition became faster.





Judith Jacinto
(Adereg, Gusaran, Kabayan)

Judith Jacinto had been in the farming business for almost 20 years. Since childhood, she was exposed to the hardship of tilling the soil and producing good quality vegetables. Her garden is located at the mountainous hills of sitio Adereg, Gusaran, Kabayan. She had been planting cauliflower and carrots. She has been encountering various pest and diseases. Among them is the black rot that affects the leaves.

She came to know about Mokusaku in a seminar conducted at the municipality by Mr. Yokomori last 2010. Encouraged by their municipal agriculture technician, she applied Mokusaku to her crops and saw positive effects.

In a one knapsack sprayer with 16 liters of water, she diluted one table spoon

of insecticide (Chlorpyrifos), two table spoons of fungicide and five to eight table spoons of Mokusaku. He sprayed these to his crop at seven days interval.

She observed that the carrots sprayed with Mokusaku had vigorous growth and the color of the leaves became dark green. Before she observed that the carrots were infested by leaf blight especially during the rainy season. With the use of Mokusaku, she found that the said leaf blight was controlled. According to her, Mokusaku had a foliar effect. She said it made the leaves thicker .Blight also minimized. She said that the more she used Mokusaku, her demand for pesticides was lessened.



Clavier Mendoza and wife Lucia
(Gusaran, Kabayan, Benguet)

In his 30 years of farming, Clavier Mendoza, had been planting broccoli, cauliflower and carrots. He observed that there is a big difference in farming before when compared to farming today. He said that before, the land he tilled was rich in organic matter which made vegetable production easier. However, at present, he observed that the soil had become deteriorated which resulted too many problems such as the emergence of the club root and the leaf miner. He later learned about Mokusaku. He tested, for five months and saw that Mokusaku could really help reduced the incidence of pest.

He first started with a dosage of five to eight table spoons Mokusaku mixed in three table spoons of insecticide (fenvalerate) mixed with a 16 liters water

and started using it as a spray during the seedling stage of cauliflower. He increased the dosage of Mokusaku to 10 table spoons when the crop reached the vegetative stage. The leaves of his cauliflower became thicker after using Mokusaku on the mixture of his pesticide, he said.

He sprayed of seven days interval. He also observed that:

- (a) The vegetables became softer and tenderer.
- (b) The use of pesticides was reduced since the normal dosage of pesticide can be lowered to 50 percent.
- (c) It minimized the strong odor of the pesticides used.

He mentioned that probably the use of Mokusaku may help to solve the problem of club root. He believes that Mokusaku could be used to combat other insect pests.



Reynelde Balong
(Gusaran, Kabayan, Benguet)

Mrs. Reynelde Balong is a farmer for more than five years. She had been planting cauliflower and carrot as her main crops. In her years of farming, she encountered various problems attending her crops such as molds, and nutrient deficiency that is indicated by the yellowing of the leaves. She also complained about club root, black rot and other pests.

In the past, she sprayed her crops with one to two table spoons of insecticide (chlorpyrifos) which she put in a knapsack sprayer. The results were



Mrs. Balong showing cauliflower treated with Mokusaku with firm curd

normal and most often, her yield were not attractive. Then she came to know about Mokusaku. She was convinced to experiment on her own. She mixed eight table spoons of Mokusaku to a one to two table spoons of insecticide (chlorpyrifos) in a knapsack sprayer. She sprayed it with Mokusaku during vegetative stage of cauliflower at seven days of interval. She initially observed that the nutrient deficiency of her crops slowly disappeared. The yellowish plants became deep green. The leaves became thick and the harvested cauliflowers had a more compact curd. Black rot and grey mold were also minimized.

Kabayan Municipal Agriculture Office

The staff of the Municipal Agriculture Office of Kabayan conducted several experiments on Mokusaku at the municipal nursery in sitio Adereg, barangay Gusaran, Kabayan. The Mokusaku plant of Kabayan is also located within their nursery area. The test was done to define its viability before it would be released to the farmers for their use.

The office planted several crops such as broccoli, zucchini and potato.

They used two table spoons of cypermethrin (insecticide), one table spoons of spinosad (insecticide), two table spoons of fungicide and eight table spoons of Mokusaku in one knapsack sprayer (16 liters). They also did fertigation of Mokusaku after 14 days of transplanting. They diluted two liters of Mokusaku to 200 liters of water.

The agriculture office recorded the following observations after the application of Mokusaku:

- (a) Mokusaku helped minimize soil borne diseases.
- (b) The soil became more porous.
- (c) The stems of the crops became stronger.
- (d) The leaves became dark green in color.
- (e) The plants were good to eat and easy to cook.



Fig.1. The broccoli not treated with Mokusaku



Fig.2. This broccoli grew well after it was applied with Mokusaku.



Fig.3. This is the farm where Mokusaku was tested. The crops are broccoli raised at the Kabayan municipal nursery as of April to June 2011.



Lucy Lucas
(Daclan, Tublay, Benguet)

Lucy Lucas started fulltime farming in 2002. She had been planting broccoli, beans and other vegetables. For past two years, she shifted to the planting of chrysanthemum (Fiji and Reagan variety).

In her years of farming, she had been troubled by the club root. She suspected that the soil fertility of her garden could have deteriorated.

Lucas had been planting chrysanthemum for two years now. Within the span of that period, she meets various problems, such as black rot and fusarium wilt. She added that the core of the plant stem also turned to brown.

Lucas used two table spoons of Mokusaku plus two table spoons of fungicide (except copper based) and diluted them with 16 liters of water. She placed in a knapsack sprayer which she used her plant at seven days interval.

During the formation of the flower buds, Lucas used the following ratio: one table spoons of insecticide plus two table spoons of Mokusaku mixed in 16

liters of water. When the bud started to mature and the petals started to appear, she sprayed at least two times a week using one table spoon of insecticide (Profenophos) plus two table spoons of insecticides (Cyromazine). She observed that Mokusaku was useful in controlling aphids. The green colored insects eating the shoots of the chrysanthemum were controlled. White flies were also lessened. She added that before she used Mokusaku, she noticed that the stems of her chrysanthemum were not as strong and they easily bend. However, the stems became stronger when Mokusaku was used.

Lucy Lucas also used Mokusaku to fertigate the young chrysanthemums. She used one liter Mokusaku and diluted it to 200 liters water (one drum capacity). She observed that destructive soil insects, such as mole cricket and white grub, could be controlled. During the transplanting, she used one liter of Mokusaku and a one drum of water (200 liters) added with sunflower leaves. The smell was usually not good but she still used the mixture. She observed that the stem become bigger and the color of the leaves became deep green. She applied Mokusaku three to four times with a weekly interval.

She said that the used of pesticides may decrease once farmers used Mokusaku.



Jeffrey D. Sotero
(Daclan, Tublay, Benguet)

Mr. Jeffrey Sotero is the current Municipal Agricultural Officer of the municipality of Tublay and a farmer at the same time. Prior to his current position, he had opportunities to visit several prefectures of Japan and was able to observe the Japanese way of farming. He also spent a year of hands on training in Kumamoto prefecture in Japan thru the Benguet Young Farmers program of the province of Benguet. Until today, he still finds time to do gardening.

Mokusaku was introduced in the municipality thru Mr. Sotero's initiative when he approached Mr. Masaki Yokomori, an expert on Mokusaku and who is also Mr. Yokomori the technical adviser of the current project being conducted in the municipality of La Trinidad. Mr. Yokomori then conducted several seminars regarding Mokusaku application in the different barangays of Tublay. Mr. Sotero became interested in the project he then conducted

experiments regarding Mokusaku.

Due to his interest in Mokusaku, Sotero decided to use Mokusaku in his own garden. He has a farm of about 1,000 square meters. He first tried Mokusaku on pole beans. He sprayed six to ten table spoons (6-10 tbsp.) of Mokusaku diluted in 16 liters of water on a seven day interval. He had no basal application of synthetic fertilizer. He only applied processed chicken manure.

Prior to his experiment on Mokusaku, his usual practice was that he sprayed green level pesticides on a seven day interval. He diluted four to five table spoons of fungicide and pesticide in 16 liters of water. However, he observed that the pods are still being eaten by insects even though he sprayed regularly. He harvested six times during the season of the crop.

When he sprayed Mokusaku, he observed that the harvesting period became more frequent. The taste of the bean pod became more sugary compared with the harvests he had before he used Mokusaku. The pods sprayed with Mokusaku were also darker in color.



Renato Dingwas

(Sitio Samoyao Alapang, La Trinidad, Benguet)

Mr. Renato Dingwas has been engaged in farming for 35 years already. He was a conventional farmer until 2005. He has a very wide experience in farming. He had been planting different vegetables and cut flowers. He shifted into organic farming in 2005.

He was one of the founding members of an organic cooperative, the La Trinidad Organic Practitioner (LaTOPMPC) in 2005. Since then, he had been producing organic vegetables.

He declared a two hectare area for organic farming which included the used of compost. His main crops are chayote tops, sweet potato tops, watercress and cucumber.

He came to know about Mokusaku from a seminar conducted in Alno, La Trinidad Benguet last 2007. He bought Mokusaku from the project booth during the Adivay festival on 2009. Since then, he had been using Mokusaku.

Here are different ways of Mokusaku applications which Dingwas practiced:

1. Compost Tea for spray and also fertigation:

Materials:

- a. Vermi compost tea
- b. Sea weeds(dry)
- c. Molasses
- d. Mokusaku



The making of the mixture

In a drum (200 liters) of water, he mixes one liter of Mokusaku, one kilo

of sea weeds, 10 kilos of vermi compost and one liter of molasses. These were fermented for two weeks. After two weeks the mixture can now be used. If the mixture will be used for spray, one gallon or four liters must be diluted in 16 liters of water level and put into knapsack sprayer at a 15 day interval.

He noticed the following effects:

The leaves of the cucumber with Mokusaku, the leaves became darker. The presence of common insect pest was minimized.

On sweet potato, He noticed that his mixture was able to control insect pest such as beetles that feed on the leaves and also leaf folders that feed on the young shoots. The growth was also robust. The sweet potato was also fertigated with the mixture once a month which he said served also as foliar.

2. Fertigation

Dingwas also added molasses to the mixture. Dingwas also did fertigation on sayote being utilized for tops and he observed that it grew robustly. New shoots easily grew and sprouted faster. The harvested tops had also a longer shelf life in the store.



Sweet potato applied with the mixture

He also made his spray of the mixture to water cress. He noticed that the flea beetle was controlled. The water cress became robust and new shoots grew fast. The snails that commonly attacked the plant was likewise controlled and minimized.



The water cress being applied with the mixture



Westmore Martini
(Bineng, La Trinidad, Benguet)

He is a farmer in Bineng, La Trinidad Benguet. He plants different types of crops such as tomato, chayote, bell pepper, Chinese cabbage, cucumber, lettuce, broccoli and beans. He patiently collects raw materials and makes them as his own as compost. He finds the result encouraging.

Composting:

He uses 15 liters of Mokusaku mixed to a drum of water (250 liters). He pours the same to a heap of pure chicken dung. He



Mr. Westmore mixing his compost



mixes 10 liters of Mokusaku in a drum of water which he applied to his compost. His compost matures after 45

days. With this practice of composting, he observed that mole crickets were controlled. The growth of his crops improved.

Spraying:

He uses 500 ml of Mokusaku mixed with any kind of insecticide (at a minimum dosage) to 16 liters of water knapsack sprayer.

He observed that the odor of insecticide was minimized. The odor of Mokusaku became dominant. He sprays early in the morning.

He observed that the growth of cabbage also became robust after using Mokusaku.



Westmoore also practiced crop rotation. The pictures show his Chinese cabbage and lettuce farms.



Isaac Laruan:

(Alapang, La Trinidad, Benguet)

Mr. Laruan has been a farmer since 1989. He had been planting different kinds of vegetables. In 1993, he started planting roses since 1997, he also planted chrysanthemum. He also plants broccoli, cucumber, lettuces and other vegetables on his farm.

He has a wide greenhouse (6,000 square meters) for his chrysanthemum and broccoli. He uses Mokusaku one of his supplements.

Chrysanthemum (Cut flowers)

Spraying- one liter of Mokusaku plus pesticides and fungicide



Overview Greenhouse of Mr. Isaac

(dosage was reduced to half of the maximum dosage) to a drum (200 liters) of water. He sprays weekly from vegetative stage until flower bud formation.

Observations:

Leaves were thicker and wider.

The stems became stronger. The growth of the plant was very desirable.



Leafy Vegetable (Green Ice):

The growth was also desirable. The leaves became shiny, clean and crispy. The stems became bigger.

Celery:

Method of application-spraying:

He observed that the leaves are shiny and wide. The petioles are hard. The used of Mokusaku also brought out hollow petioles.

Cucumber:

Whiteflies were repelled. The fruit shape became better. Curly shapes were reduced and the leaves became wider.

He used Mokusaku plus garlic (native) – 30 litres: 5 kilos native garlic.

Garlic was pounded and fermented for almost four months.

Dosage: 200 ml/one knapsack sprayer (16liters).

Crops: Chrysanthemum and Strawberry

Result: He observed that thrips and mites were minimized. The some holds through for the moth pests.



Leonard Valdez

(Tawang, La Trinidad, Benguet)

Leonard Valdez is a farmer for 15 years. He also keeps several colonies of honey bees. He has a 300 square meter of greenhouse located at Tawang La Trinidad. He usually plants chrysanthemum and alternates it with celery. He has been using Mokusaku for a year already. He learned about Mokusaku in a seminar.

He is using Mokusaku as deodorant since Mokusaku lessens the strong odor of pesticide. He mixes two table spoons of Mokusaku to the three table spoons of pesticides. However, he said that the dosage of Mokusaku may vary depending on the strength of label of the pesticide being used. He used Mokusaku only during the vegetative stage of the crop.

After using Mokusaku on celery, Valdez has observed the following:

- (a) The celery sprayed with Mokusaku became resistant to diseases, like fungi and insects such as leaf miner.
- (b) Insects were repelled.
- (c) The leaves became thicker and shiny.
- (d) The petioles became hard
- (e) The leaves became robust and green.
- (f) Celery grew in uniform height.
- (g) The smell of pesticides was lessened.
- (h) Good feed back from the buyers who said the used of Mokusaku prolonged the shelf life of their crops.

He is currently conducting Mokusaku trials on chrysanthemum. He initially observed that the leaves became thicker and grew uniformly.



Chrysanthemum applied with Mokusaku



**Stember Ngayaan
(Kibungan, Benguet)**

He as co-operator farmer in Kibungan who also helps in the management and maintenance of Mokusaku and compost facility. He uses Mokusaku for making compost. He uses Mokusaku on beans following the dosage of two cups (650 ml) per 16 liters of water.

After he sprayed he noticed the following changes: The leaves become robust. The larvae of the pests were eliminated using only Mokusaku. The quantity of chilli increased. Mokusaku spray can also control bean rust. And as foliar, it makes the leaves thicker.



Applying Mokusaku on compost

Kibungan Municipal Agriculture Office



After

Before

The pictures above show the initial result of Mokusaku on coffee and lemon tress. Mokusaku as foliar was applied /used in coffee trees (Arabica coffee) when it was affected by coffee molds. These molds affects the growth of the young shoots. It was observed that the molds stopped when Mokusaku was applied. The falling flowers stopped and fruit form.

Mokusaku result to Cabbage (*Cucurbita maxima*) and beans (*Phaseolus vulgaris*) plant

Before applying Mokusaku, it was observed that there was very poor soil fertility, pore density, bulk density and organic matter. Due to these factors, plant growth was slightly affected. The plants are very thin, dwarfed and yellowish in color. The application of compost with Mokusaku did not have much effect. However, it was observed that there was less pest infestation. To enrich the soil, it is recommended that Mokusaku must be sprayed at least 5to 10 times.



Reactions:

Mokusaku is good and effective. However, enriching the soil must be prioritized first in order to see the greater effect on plants. Mokusaku should be fertigated to soil. Poor soil must be enriched for at least three- four months by applying compost or any organic farm inputs. As for the foliar, it is then quite effective against pests especially when chili is used as an additive and fermentation takes place in a longer period of time.

SAVERS PROJECT DEMO FARM

The project staff tried to use Mokusaku in experiments during the 1st phase of the project in 2007. Mr. Masaaki Yokomori, senior technical adviser wanted to share Mokusaku to farmers in Benguet to lessen their dependence on chemical inputs used in farming. He said that with this technology, farmers can save the natural nutrients of the soil.

Mokusaku with neem oil for cucumber

Cucumber under greenhouse cover is very susceptible to aphids. Aphids infestation on cucumber will lead to a very low productivity and stunted growth. We used neem oil mixed with Mokusaku to control aphids. We used Mokusaku-Neem oil 80 ml for 16 liters knapsack sprayer (1:200). It is recommended that spraying must be done once a week. However, we increased the dosage and the frequency of spray due to heavy infestation. The effect is not seen, but suddenly felt but there is marked reduction in the appearance of aphids



1. Effect of Mokusaku fertigation on bell pepper (diluted 1 is to 10).

Pepper has many pests and diseases which affect its growth and productivity. These make it hard to maintain the crop. Farmers will suffer from low income if this is the situation. Some pest prevents the plant to produce new shoots. They even halt the growth of new shoots.



In this photo, the shoots of the pepper appeared stunted and seem hopeless to rejuvenate. This was before the fertigation of Mokusaku diluted with water. We diluted one liter Mokusaku in 10 liters of water (1:10). The diluted Mokusaku was fertigated to the pepper. 1 liter of the liquid per plant was used once a week for three consecutive weeks.



After two to three weeks of fertigation, new shoots grew and continued to bear fruit.

Several weeks after fertigation, healthy shoots continued to grow.



Tomato: fertigation (1:10)/spray (1:80) half dosage of pesticides. Once a week. Tomatoes have a longer harvesting period. In the demonstration farm, we planted tomato. We fertigated diluted Mokusaku (1:10) once a week and also sprayed (1:80) with half dosage of pesticides. We observed the treated tomato yielded a longer harvesting period.



Satur Bulay

(Baculungan Sur,Buguias,Benguet)

Satur Bulay has been a fulltime farmer for almost seven years. His main crop is potato. He also produces his own potato seeds to be planted for the next planting season.

He came to know Mokusaku when he attended a seminar conducted by Masaki Yokomori at Abatan, Buguias in 2010. He got interested in testing Mokusaku on his crop. He took a free sample of Mokusaku which was distributed during the seminar. He used it and observed it had a desirable effect on his crops. He decided to buy more Mokusaku from the municipality of Buguias.

Using his knapsack sprayer, he applied Mokusaku on his potato farm , using a combination of one hundred eighty (180) ml or (one small can of sardines) of Mokusaku plus two table spoons of insecticide (Fenvalerate) diluted on sixteen liters of water and sprayed to the potato at a seven day interval.

He observed that the potato tubers were of very good sizes. The weight of the harvest also increased. The common disease of potato plants, blight, was also minimized. The height of the growing potatoes was almost uniform. The leaves also became thicker and greener.



Polonia Alos
(Daclan, Tublay, Benguet)

Mrs. Alos is a farmer for almost twenty years together with his husband. They plant beans and broccoli. She came to know about Mokusaku in a farmer's congress at Tublay Municipal Gymnasium. She became curious about the effectiveness of Mokusaku and so she applied it on her broccoli during the vegetative stage.

She and her husband tried the dosage explained during the seminar on Mokusaku. They diluted 180 ml of Mokusaku three tablespoons of insecticide to 16 liters of water and sprayed it at seven (7) days of interval.

Alos observed that after using Mokusaku, the curd of the broccoli became uniform. She also observed the following:

- (a) The broccoli on its vegetative stage grew uniformly.

- (b) The leaves are very green and thick.
- (c) The broccoli had a longer shelf life (curd does not turn to yellow as fast as those not applied with Mokusaku).



Emilia Alos
(Daclan, Tublay, Benguet)

Emilia Alos at her old age is still an active farmer. She is the mother in law of Polonia Alos. She is planting different kinds of vegetable. The water shortage during the dry season was the only reason to prevent her to producing vegetables all year round. Thus, she plants a lot of plant during the rainy season.

She was one of those who attended during the Tublay Farmer's Congress in 2010 held at the municipal gymnasium. There, she learned about Mokusaku from Masaki Yokomori, who is an expert on Mokusaku and the current senior technical adviser of the project being implemented here in Benguet. Mr. Yokomori spoke about Mokusaku and this got Alos interested. She wanted to try Mokusaku on her crops. She was able to get Mokusaku from the municipal office.

Emilia Alos applied Mokusaku during the vegetative stage of her Mokusaku

plant. She used one hundred eighty (180) ml (small sardine can) plus three table spoons of insecticide diluted in 16 liters of water. She sprayed at a seven day interval.

She mentioned that Mokusaku seemed to act like a sticker. She said that the flea beetle, which is a very destructive pest of mustard, was controlled.

While using Mokusaku proved initially successful, she said that she still wanted to use Mokusaku for a longer time as they could further observations how it works.



Roderick Sudango
(Baculungan Norte, Buguias)

Mr. Sudango is a contractual worker at the municipal nursery in Buguias, Baculungan Norte and one of the persons in charge of Mokusaku. But during his free time, however, he also farms. He usually plants carrots and helps his father attend to the family's chrysanthemum gardens.

He came to know about Mokusaku in seminar at Abatan, Buguias, Benguet. Being the person in charge of nursery, it was easy for him to use Mokusaku and find out its effects so that he would have something to share to the other farmers.

He usually mixed two tablespoons of insecticide, three tablespoons of fungicide and 180 ml. of Mokusaku in a sixteen liters of water. He sprayed at four to seven days of interval during the vegetative stage. He also used same

dosage in the chrysanthemum garden but only when up to when the flower buds begin to form.

Observation:

- (a) He observed that leaves of the carrots become robust and the sizes of the tubers were big and uniform.
- (b) He and his father observed that the height of chrysanthemum increased.
- (c) The leaves also became thicker.



Renante Casenio
(Palew, Kaponga, Tublay, Benguet)

Renante Casenio is a native of Iloilo before he came to Benguet to work as a farmer . He later married a native of tublay.

Being stranger, here in Benguet he had to adapt to the culture and traditions of his wife. He was also forced to learn Ibaloi. His mother in law trusted him to work on her small parcel of land (500 sq.meter).

He worked in the farm for two years. He planted different kinds of vegetables such as lettuce, polinsay, pechay (chingkang), mustard and coriander (wansoy). He uses tunnel type farming so that the attack of insects on the leaves of vegetables will be minimized.

He came to know Mokusaku when he attended the Farmers Congress at Municipal Gym, Tublay, Benguet.

He was impressed with the presentation that Mokusaku will help in the soil fertility. He decided to buy Mokusaku to try it on his farm.

To fertigate on his plan, he used a dosage of fifty ml. of Mokusaku in sixteen liters of water. But when he us sprays, he mixed twenty to thirty ml. of Mokusaku added to three to four tablespoons of fungicide. According to him, he observed within a short period of time that Mokusaku help the soil enrichment

He also observed the following:

- (a) The plants grew faster.
- (b) The leaves became green and thicker
- (c) The (wansoy) vegetable easily recovered after a typhoon.



Soriano Manuel
(Tublay, Benguet)

Soriano Manuel is a farmer for almost 12 years. He is currently employed as a municipal nursery man. He is in charge of the Mokusaku plant and other technical work at Tublay, Benguet. He also plants cucumber.

He came to know about Mokusaku when the Japan Exchange Council introduced it 2009. Mokusaku chamber of the municipality. He also tested Mokusaku on his own farm. He used the dosage of eight tablespoons of Mokusaku and four tablespoons of fungicide (mancozeb) to sixteen liters of water during vegetative stage.

These are his following observations:

- (a) Mokusaku acts like a sticker. It helps in the development /fertilization of flowers to fruits.
- (b) It controlled worm insects.
- (c) The leaves became thicker.
- (d) Mokusaku repelled honey bees and earth worm.



Geronia Kimpa-oy
(Daclan, Tublay, Benguet)

Mrs. Kimpa-oy is practicing organic farming since 1996 and a practitioner of Bio Dynamic farming. She said that in organic farming she was able to produce safe vegetables. She is always active attending seminars regarding agriculture. She came to know about Mokusaku from a seminar she attended in farmer's congress in Tublay. She was informed that one of the uses of Mokusaku is to enhance composting. She used two tablespoons of Mokusaku in sixteen liters of water through fertigation. She applied it once a week and decided not to use any synthetic insecticide. She observed that butterfly larvae did not attack the young shoots of the leaves.

The taste of the cabbage became sweeter compared to the crops she harvested before. The leaves became thicker and robust. She said that her workload also became easier because the rate of the decomposition of the

compost was hastened.



Dominga Tope
(Gusaran, Kabayan, Benguet)

Dominga Tope is farmer for almost 10 years. She had been planting vegetables. She said that farming at present is very hard compared in the past years because she believed that the soil has deteriorated and that needed proper care. She said that crop rotation could help the soil regain its vigor. Tope observed from the farm of her mother the good effect of compost added with Mokusaku on cauliflower. Having been convinced of the good result of the Mokusaku, she made her own compost and applied it to her own garden. She planted it with cauliflower.

Before transplanting the plant, she just applied the compost as basal

fertilizer and transplanted the cauliflower seedlings later.

She observed that the newly transplanted cauliflower recovered immediately and developed new roots faster. She also said that the leaves became darker.

Tope also noticed that the plants were resistant to pest and diseases.



Renita Taplin

(Gusaran, Kabayan, Benguet)

Mrs. Renita Taplin is a mother and a young farmer at the same time. She is engaged in farming for five years now. Her main crops are broccoli, cauliflower and carrot. She commonly observed pest and diseases on her garden but the most common problem she encountered was club root. She is a current farmer co-operator of Kabayan who uses or experiments on Mokusaku on her crops.

She used Mokusaku in broccoli with a dosage of eight to ten table spoons of Mokusaku plus two table spoons of fungicide mixed in 16 liters of water. He sprayed on her broccoli at an interval of seven days during the vegetative

stage. During the seedling stage, she used Mokusaku for fertigation with a dosage of 100 liters water + 1 liter of Mokusaku. She applied it twice at a seven day interval.

She observed that the broccoli plants grew robust despite the presence of club root. The leaves were also robust and thicker. The curd of the broccoli was also compact. She said that Mokusaku is good and it could be also applied to other crops.

SAVERS TECHNOLOGY

SAFE VEGETABLE FROM RICH SOIL

