

BIBLIOGRAPHY

OSTING, JAZZEL B. APRIL 2011. Preferences on the Different Mulching Materials of Strawberry Farmers in Swamp, La Trinidad, Benguet. Benguet State University, La Trinidad, Benguet.

Adviser: Jovita M. Sim, MSc.

ABSTRACT

This study was conducted in the municipality of La Trinidad, Benguet specifically at the strawberry fields at swamp area on January 2011. This study aimed to determine the preferences in mulching materials by strawberry farmers at swamp area, the reasons for the preference of mulching material and the effect of mulching materials to strawberries in terms of yield, volume of marketable and non-marketable output and weed, pest and disease infestation.

Majority of the respondents have been in strawberry production for 11 to 15 years thus were all knowledgeable on the production technology. All of the farmers used polyethylene for mulching their strawberry. Cogon grasses are only resorted to when farmers have no capital to purchase polyethylene.

Majority of the strawberry farmers preferred using polyethylene and would only use cogon grass as a substitute in mulching their strawberry plants. Polyethylene would produce a much better quality of strawberry fruit. Mulching material has no effect on yield in terms of kilograms but the effect is on the quality of berries produced. More marketable berries are produced from strawberries mulched with polyethylene. Cultural management practices such as pest and disease management, fertilization and irrigation also affects the quality of strawberry produced. Weeds are also controlled with polyethylene mulch.

Therefore, farmers should use polyethylene/plastic mulch in mulching their strawberries to get a better quality of produce, reduce labor cost for weeding and pesticides.



TABLE OF CONTENTS

	Page
Bibliography.....	i
Abstract.....	i
Table of Contents.....	iii
INTRODUCTION.....	1
Rationale	1
Statement of the Problem	2
Objectives of the Study	3
Importance of the Study	3
Scope and Limitation of the Study.....	4
REVIEW OF LITERATURE.....	5
Strawberry	5
Strawberries and Health	5
Mulching	6
Disease and Pest Control	7
Weed Control.....	8
Mulching Materials and their Advantages and Disadvantages.....	10 16
METHODOLOGY	
Locale and Time of the Study.....	16
Respondents of the Study.....	16
Data Gathering Procedure	16
Data Gathered.....	16

Data Analysis.....	16
RESULTS AND DISCUSSION	16
Profile of the Respondents.....	17
Years in Strawberry Production	19
Varieties of Strawberry Planted by the Farmers.....	19
Land Area for Strawberry Production by Farmers.....	20
Major Source of Income	21
Mulching Materials Used	21
Preferred Mulching Materials	22
Reasons for Choosing Materials	22
Satisfaction in Using the Material	24
Land Ownership	24
Post Harvest and Marketing Activities of the Farmers	24
Total Volume of Output	25
Weed, Pest and Disease Infestation	26
Problems Encountered on the Material.....	26
SUMMARY, CONCLUSIONS AND RECOMMENDATION	29
Summary.....	29
Conclusions	31
Recommendations.....	32
LITERATURE CITED.....	33

APPENDIX	35
A, Letter to the Respondents.....	35
B. Survey Questionnaire	36



INTRODUCTION

Rationale

A small red fruit from the *Rosaceae* family that has a delicious taste that best grow in a cool and moisture climate is the Strawberry fruit. The fruit don't grow on a tree but rather develop its small yet tasty heart-shaped fruit closed to the ground.

Strawberry plants produce attractive fruit with fine flavor. Strawberries have a very high vitamin C content and are versatile as a dessert food. Most cultivars of strawberries are well suited to freezing and processing as well as for fresh use. Many people enjoy eating the fresh-picked fruit. Strawberries are also excellent for jams, jellies, and pies. Freshly sliced and sugared strawberries are excellent when served chilled either alone or over shortcake or ice cream. In addition, strawberries contain a natural substance called ellagic acid, which is an anti-carcinogenic (cancer-preventing) compound (Gao, 2001).

Planting systems for strawberries vary, depending on the environment and production goals. The grower must decide the relative priorities of yield, size, flavor, or other qualities of the fruit, and seek a system that balances these goals. Systems that focus primarily on yield are the least sustainable because of the enormous amount of energy used for maintenance, plastic, and transportation. In many of these systems, the plants are grown on raised beds as annuals. This results in removal of the plants, plastic mulch, and irrigation system at the end of every season. Regardless of the system used, conventional yields are usually higher than organic yields. However, studies have shown that organic producers can earn more profit per acre than conventional producers (Guerena and Born, 2007).

Strawberry fruit is protected by mulching. The materials that will be used in mulching are very important considerations because it affects the quality of the fruit. Protective mulch can



protect strawberries from cold by providing insulation and from desiccation by providing a barrier against drying winds. Mulches will also protect plants from injury caused by soil heaving, which results from freezing/ thawing cycles during the winter. So, a key to consistent quality strawberry production in cold climates is in protecting the plants from severe temperatures or temperature swings through the practice of mulching (Schloemann, 2004).

Mulch used by strawberry farmers includes rice straw, cogon grasses and other type of grasses that could be used as mulch. The use of black plastic was introduced as much as a result of S&T activities. Mulch materials affect the quality and yield of produce. However, the effect was not documented as to its economic importance and viability. Strawberry is the major crop of La Trinidad, Benguet. The place is known as the Strawberry Capital of the Philippines. It is one of the major tourist attractions in La Trinidad. Thus, it is a necessity that growers should produce high yield and quality fruits. This study therefore aimed. to determine the most effective and economical mulching materials for strawberry.

Statement of Problem

1. What are the preferences in mulching materials by strawberry farmers in Swamp, La Trinidad, Benguet?
2. What are the reasons for the preference of mulching material?
3. What is the effect of mulching materials to strawberries as to the following parameters:
 - a. Yield (kg)
 - b. Volume of marketable and non-marketable output
 - c. Weed, pest and disease infestation



Objective of the Study

1. To determine the preferences on the mulching material used by strawberry farmers in Swamp, La Trinidad, Benguet.
2. To determine the reasons for the preference of mulching material.
3. To determine the effect on the kind of mulching materials to strawberries as to the following parameters:
 - a. Yield (kg)
 - b. Volume of marketable and non-marketable output
 - c. Weed, pest and disease infestation

Importance of Study

Mulching and mulching materials used in the production had a great effect on the quality of berries produced as mentioned by one farmer in swamp area (Bay-an, 2010), thus most strawberry farmers always mulch on their strawberry plants. However, the type of mulching materials to be used will depend on the budget/capital available. The result of this study would serve as guide and basis of farmers in their decision on the mulching materials to be used. This would also serve as basis for further research especially for technical researchers in the development of appropriate mulching technology.

Scope and Delimitation of Study

The study focused on the preference of the different kind of mulching materials used by strawberry farmers in Swamp, La Trinidad, Benguet and its effect on the yield quality of



strawberry produced, weed, pest and disease. This was limited to strawberry farmers at the Swamp Area of Benguet State University.



REVIEW OF LITERATURE

Strawberry

The strawberry is a member of the rose family, with the most common varieties being a hybrid of the wild Virginia strawberry (native to North America) and a Chilean variety. The plant produces succulent, red, conical fruit from tiny white flowers, and sends out runners to propagate. Although the plants can last 5 to 6 years with careful cultivation, most farmers use them as an annual crop, replanting yearly. Crops take 8 to 14 months to mature. Strawberries are social plants, requiring both a male and female to produce fruit. The word strawberry comes from the Old English streawberige, most likely because the plant sends out runners which could be likened to pieces of straw. Although they have been around for thousands of years, strawberries were not actively cultivated until the Renaissance period in Europe (Filippone, 2008).

There are many explanations, some believe that the name came from the practice of placing straw around the growing plants for protection, others believe the name originated over 1000 years ago because of the runners which spread outward from the plant. The name may have been derived from the Anglo-Saxon verb to strew (spread) and the fruit came to be known as streabergen, straberry, streberie, straubery, straubery, and finally, "STRAWBERRY" to the English (Manzanita Berry Farms, 2001).

Strawberries and Health

Not only are strawberries tasty, but they are also low in calories and very nutritious. They are high in vitamin C (more than citrus fruits, ounce for ounce), which has been shown to be a deterrent to some forms of cancer and also helps prevent oxidation of LDL or bad cholesterol. They are also a good source of fiber. Most importantly, strawberries are one of the few sources,



along with grapes and cherries, of ellagic acid, a compound which has been shown to prevent carcinogens from turning healthy cells into cancerous ones. Strawberries are fat-free and have no cholesterol. One cup of sliced strawberries has 50 calories, 11.5 grams carbohydrates, 4 grams fiber, and 45 mg of potassium (Filippone, 2008).

Mulching

Mulching is extensively used in Eastern growing regions. Mulching helps to control freezing and thawing of the soil, which pushes plants out of the soil and exposes roots to drying. Mulching with natural materials also helps in weed control if it is applied so that it is thick enough (3 or 4 inches of straw). It helps to conserve moisture and keeps the fruit clean. Small grain straw makes the best mulch, but almost anything that does not contain seed weeds and stays in place is suitable. Black plastic mulch makes excellent mulch except where excess heat builds up. Plastic mulch takes much of the danger out of winter planting by increasing soil temperature as much as 10 degrees. This results to earlier ripening of fruit, longer harvests and longer harvest seasons (Reiley and Shry, 2002).

Mulching is strongly recommended for strawberries, as it helps keep down weeds, conserves moisture, feeds the plants, and keeps berries clean. It also protects plants against low temperatures and soil heaving. The plants should be mulched right after planting, at least before really hot weather is expected - unless black plastic film is used, in which case the plastic is spread over the patch, anchored down with soil or stones, and the plants are set in the ground through holes cut in the plastic. Good mulching materials include clean straw, salt marsh hay, pine needles, very strawy manures, leaves, cottonseed hulls, peanut shells, bagasse (sugar cane fiber), grass clippings, and even old newspapers and rags. Apply the mulch to a depth of 3 to 4



inches after the ground has been thoroughly watered, covering the soil all around the plants, but not the plants themselves (Laurence, 2004).

Organic growers will find that some hand weeding is necessary. Weeds in organic plasticulture systems can become troublesome even where black plastic mulch is used. In such situations, the weeds emerge from the planting holes made for the strawberry plants. The rows must be straight and the plastic laid precisely to allow mechanical cultivation of the furrows without damaging the beds and plastic (Guerena and Born, 2007).

Disease and Pest Control

Mulch can reduce the splashing of fungal spores off hard ground up onto the rose plant, and may even reduce the harmful effects of soil fungi and nematodes (Belendez, 2010).

Mulches provide a barrier between plant foliage and soil that may contain disease spores or pests. They also served as a barrier for pests that are headed for the floor of your garden, either to lay eggs or to rest for the winter. Besides being useful for pest control, mulches of various material served many other cultural purposes such as retaining soil moisture, adding organic matter to the soil, warming the soil for heat-loving plants, and controlling weeds. An organic mulch replaced several times each year, will help prevent disease spores from building up and prevent splashing rain drops that carry spores.

Protection offered: Control aphids, leaf-hoppers, and thrips on cabbages and peppers in the garden and greenhouse with a mulch of aluminum foil. You will also control the plant diseases that these pests carry. Use a black plastic mulch to discourage sowbugs and other crawlings pests that can't stand the heat; black plastic also keeps leafminers from emerging from infested soil and prevents their return to the soil to pupate. By blocking sunlight from the soil, black plastic mulch provides weed control as well. A thick layer of organic mulch will prevent



shallow-rooted plants from being heaved out of the soil by frost action during winter, because it moderates changes in soil temperature (Ellis *et al.*, 1996).

Weed Control

Some good mulching materials in controlling weeds are grass Clippings, Leaves, Pine bark, Shredded Hardwood Mulch, wood chips, Gravel, Pebbles and Crushed Stone and Black plastic (Kluepfel, 2009).

The best use for grass clippings is to leave them on the lawn. Grass clippings will decompose rapidly, adding nutrients back into the soil. A two-inch layer of grass clippings provides weed control if they are not full of weed seeds. It is best to build up the layer gradually using dry grass, not fresh clippings, to prevent the formation of a solid mat. Be careful not to use clippings from lawns that have been treated with herbicides (Kluepfel, 2009).

A 2- to 3- inch layer of leaves provides good weed control. It is best to shred the leaves coarsely, using a shredder or your lawn mower. Whole leaves have a tendency to blow away, while finely shredded leaves do not allow water to penetrate. Oak and beech leaves help to acidify the soil for acid-loving plants. Leaves are usually easy to get, attractive as a mulch, and they will improve the soil once they decompose. After the leaves decompose, dig them into the soil and add a new layer of mulch on top (Kluepfel, 2009).

A 2- to 3- inch layer of pine bark is good for weed control. Pine bark makes an attractive, usually dark-colored mulch. It can be purchased in various particle sizes, from shredded to large-sized particles, called nuggets. Large pine bark nuggets float in water and may not stay in place during a heavy rain. They may also attract termites and other insects (Kluepfel, 2009).

Shredded Hardwood mulch is good at suppressing weeds. It does not wash away easily. It decomposes relatively slowly, and it is



very attractive (Kluepfel, 2009).

Wood Chips contains bark and pieces of wood of various sizes and makes an attractive mulch. A 2- to 3- inch layer of wood chips provides good weed control. Small wood chips decompose very rapidly using nitrogen from the soil, which needs to be replaced by nitrogen fertilizer. Wood chips may attract termites and other insects (Kluepfel, 2009).

Pebbles and Crushed Stone are permanent and are best used for permanent plantings such as foundation plants. A 1- inch layer of small rocks will provide good weed control. Do not use them around acid-loving plants since the rocks may add alkaline elements and minerals to the soil. These materials reflect solar radiation and can create a very hot landscape environment during the summer months (Kluepfel, 2009).

Black polyethylene film is very effective in preventing weed growth. It also holds water in the soil. Therefore, plastic is not recommended for poorly-drained areas as it may cause the soil to remain too wet, which could result in root disease problems. You may have to cut holes in the plastic if water does not go through it. There is black plastic available that has small holes in it to help with drainage. If exposed to sunlight, black plastic is broken down fast, losing its effectiveness as a mulch. However, if you bury black plastic in the soil, it will last for many years. Covering the black plastic with a layer of wood chips or pine needles will reduce heat absorption and mask its artificial appearance (Kluepfel, 2009).

Mulching Materials and their Advantages and Disadvantages

Aluminum foil or backed paper, will not decompose, apply one layer. Advantages: Increases light around plants; aphids and other insects avoid. Reusable. Disadvantages: Can tear



if handled roughly. Expensive. Artificial looking. Comments: Keeps ground very cool. Apply only after ground has warmed up.

Bark chips, bio-degradable, apply 2-3 inches. Advantages: Attractive; good for permanent mulch. Reusable. Disadvantages: May hinder water penetration. Comments: Decomposes slowly unless composted first. Redwood decomposes slowest; may repel insects. Reusable brick chips, will not decompose, apply 2-3 inches. Advantages: Cheaper than stone mulch. Non-flammable. Disadvantages: Not readily available; high moisture retention. No organic matter added. Comments: Decorative; made from brick overburns.

Compost, bio-degradable, apply 1-2 inches. Advantages: Contributes nutrients; turns quickly to humus. Disadvantages: Needs heating period to kill off weed seeds and diseases; may have unpleasant odor. Comments: Plan and start ahead so compost will be ready.

Corn cobs and corn stalks, bio-degradable, apply 3-4 inches. Advantages: Readily available in most areas. Good weed control. Disadvantages: Water doesn't penetrate well; may generate heat. Comments: Add nitrogen to aid decomposition. Avoid diseased stalks and cobs.

Cottonseed hulls, bio-degradable, apply 2-4 inches. Advantages: Fertilizing value similar cottonseed meal. Disadvantages: Very light, wind scatters. Comments: Keeps down weeds between rows. Top layer of another mulch prevents scattering.

Grass clippings (dry), bio-degradable, apply 2-3 inches. Advantages: Improves soil by adding organic matter. Disadvantages: Absorbent; may carry weed seed. Comments: Mix with other materials to prevent packing. Bottom layer decomposes rapidly; add more.

Hay, bio-degradable, apply 4-6 inches. Advantages: Legume hays (alfalfa) add nitrogen. Disadvantages: First cut hay full of weed seeds. Poor weed control. Comments: Fewer weed seeds in 2nd or 3rd cut. Fluff up during season.



Leaves, bio-degradable, apply 2-3 inches. Advantages: Contain many trace minerals; best food for earthworms. Disadvantages: May become soggy and pack, hindering water penetration. Comments: Chip or mix with another mulch to prevent matting.

Paper, bio-degradable; apply 5-6 pages or 4-6 inches, shredded. Advantages: May add trace minerals. Decomposes readily. Newspaper or scrap paper. Disadvantages: May pack and hinder water penetration. Scatters. Lead in colored pages; use black and white only. Comments: Hold edges with rocks or dirt. Best shredded. Frost protection.

Peanut hulls, bio-degradable, apply 2-3 inches. Advantages: Adds nitrogen, phosphorus and potassium; decomposes rapidly. Disadvantages: Not readily available in North. Comments: Attractive to rodents if not completely free of peanuts.

Peat moss, bio-degradable, apply 3-5 inches. Advantages: Clean and free of weed seeds. Improves water retention when tilled into sandy soil. Disadvantages: Extremely absorbent, water penetration hindered; expensive. Adds little or no nutrients. Comments: Good soil conditioner to loosen heavy soils; acidic. Decomposes slowly.

Pine needles, bio-degradable, apply 3-4 inches. Advantages: Light; usually free of weed seeds; absorbs little moisture. Does not pack. Reusable. Disadvantages: Decomposes very slowly. Comments: Add nitrogen for faster decomposition. Slightly acidic.

Polyethelene (black or clear), will not decompose, apply one layer. Advantages: Retains but absorbs no moisture. Black is effective weed control. Disadvantages: Weeds grow under clear plastic. Rain can't go through easily. Adds no nutrients. Comments: Warms soil--effective with tropical crops (melons, tomatoes). Ground must be moist before applying.

Rock, crushed gravel or marble chips, will not decompose, apply 1-2 inches. Advantages: Relatively inexpensive; not absorbent. Water penetrates, non-flammable. Disadvantages: Poor



weed control. Adds no organic matter to soil. Comments: Should be considered permanent mulch.

Salt marsh hay, bio-degradable, apply 4-6 inches. Advantages: Usually weed-free; available in marshy areas or along coast. Long lasting. Disadvantages: Not available to everyone. Expensive if purchased. Comments: Till under at end of season. Chopping may make more attractive.

Straw, bio-degradable, apply 4-6 inches. Advantages: Adds nutrients; lightens soil when tilled under at end of season. Disadvantages: Can be a fire hazard. Comments: Add nitrogen to aid decomposition unless aged.

Vermiculite or perlite, will not decompose, apply 1-2 inches. Advantages: Totally sterile, so will not carry disease. No weed seeds. Disadvantages: Expensive; very light; scatters. Hinders water penetration. Comments: Good for greenhouse use (Anonymous, 2002).

Added information (Kluepfel, 2009):

When applied correctly, mulch has the following beneficial effects on plants and soil:

Mulches prevent loss of water from the soil by evaporation.

Mulches reduce the growth of weeds, when the mulch material itself is weed-free and applied deeply enough to prevent weed germination or to smother existing weeds. Mulches keep the soil cooler in the summer and warmer in the winter, thus maintaining a more even soil temperature.

Mulches prevent soil splashing, which not only stops erosion but keeps soil-borne diseases from splashing up onto the plants.

Organic mulches can improve the soil structure. As the mulch decays, the material becomes topsoil. Decaying mulch also adds nutrients to the soil.



Mulches prevent crusting of the soil surface, thus improving the absorption and movement of water into the soil.

Mulches prevent the trunks of trees and shrubs from damage by lawn equipment.

Mulches help prevent soil compaction.

Mulches can add to the beauty of the landscape by providing a cover of uniform color and interesting texture to the surface.

Mulched plants have more roots than plants that are not mulched, because mulched plants will produce additional roots in the mulch that surrounds them (Kluepfel, 2009).

Runoff and erosion. Mulch is the perfect agent for reducing water run off and erosion. This keeps your plants from becoming infected with soil-borne diseases such as fungi. Saving your soil from erosion is reason enough to use mulch in your garden every year.

Temperature and worms. Another valuable benefit to garden mulch is that it keeps your soil at a uniform temperature and promotes the growth of microorganisms and earthworms. Mulch acts as a blanket for your soil and keeps it in tip top condition for maximum growth (Richardson, 2006).

Despite the fact that mulching is recommended and that it has a lot of benefits to your lawn, there are also certain disadvantages that are usually associated with this noble activity. One of the major disadvantages is the fact that it can be a very tedious job. Mulch is something that is very bulky and moving it around can be a tedious job.

Getting mulch from places where you do not know can also be counterproductive because you might get some mulch from a place where there was a certain pest or disease, only for you to come and spread the same on your lawn. If this happens, then you are likely to infect your lovely



lawn with some strange diseases and pests which you might not be able to deal with in the long run (Desouza, 2010).



METHODOLOGY

Locale and Time of Study

This study was conducted in the strawberry farm of Swamp area which is now the Strawberry field of La Trinidad. The study was conducted on January 2011.

Respondents of the Study

A total of 30 strawberry farmers in the swamp area “strawberry farm” in La Trinidad, Benguet were the respondents of the study.

Data Gathering Procedure

A survey questionnaire was prepared and used to gather the necessary information. A personal interview was conducted to each respondent.

Data Gathered

The data gathered included the preferences of farmers on mulching material used, reasons for using such mulching material and its effect on yield, volume of marketable and non-marketable fruits, weed, pest and disease infestation.

Data Analysis

The collected data were analyzed using frequency analysis and other appropriate statistical tools.

RESULTS AND DISCUSSION

Profile of the Respondents



Table 1 presents the profile of the respondents in terms of age, gender, civil status, educational attainment and ethnic grouping.

Age. There were seven or 23.33% respondents that belonged to the 21 – 30 years old age bracket, 9 or 30% belonged to the 31 – 40 years old age bracket, 10 or 33.33% to the 41 – 50 years old age bracket and four or 13.33% to 51 years and above. The mean age is 38.23. This finding implies that majority of the farmers were of middle age.

Gender. Majority (80%) of the respondents were males and only 20% were females. The result shows that more males were engage in strawberry farming than females.

Civil status. Majority (86.67%) of the respondents were married and only 13.33% were single. This finding indicates that majority of the strawberry farmers were married.

Educational attainment. Majority (56.66%) of the respondents reached high school level or high school graduates, while 23.33% were elementary graduate and 20% were college level or college graduate. This implies that all the respondents attended formal education and that majority had reached high school and college. This therefore means that the farmers can understand farming technologies..

Ethnic grouping. Majority (73.33%) of the respondents were Kankana-ey, while 20% were Ibaloi and 6.66% were Ilokano. This implies that majority of the respondents were Kankana-ey.

Table 1. Profile of the respondents

CHARACTERISTICS	FREQUENCY	PERCENTAGE
Age		
21-30	7	23.33



31-40	9	30.00
41-50	10	33.33
51 and above	4	13.33
TOTAL	30	100.00
Mean Age = 38.23		
Gender		
Male	24	80.00
Female	6	20.00
TOTAL	30	100.00
Civil Status		
Married	26	86.67
Single	4	13.33
TOTAL	30	100.00
Educational Attainment		
Elementary	7	23.33
Secondary	17	56.67
College	6	20.00
TOTAL	30	100.00
Ethnic Affiliation		
Kankana-ey	22	73.33
Ibaloi	6	20.00
Ilokano	2	6.67
TOTAL	30	100.00

Years in Strawberry Production

Table 2 presents the years farmers are engaged in strawberry production. Some (40%) of the respondents were engaged in strawberry production for 11-15 years, while 30 % were



engaged for 16 years and above, 16.67% were engaged for five to ten years and 13.33% were into strawberry production for one to five years.

Varieties of Strawberry Planted by the Farmers

There were five common varieties of strawberry identified by the farmers in the swamp area. The most common variety was Tioga planted by 29 (96.66%) farmer respondents, followed by Sweet Charlie by 14 farmers (46.66%). These two varieties have similar characteristics, highly perishable, sweet, big fruit and ideal for salads. The festival planted by six farmers (20%) is newly introduced variety in the area and the Chinese variety planted by two (6.66%) farmer respondents. The Aliso variety is not a new variety but this is a variety that is sour, flattened fruit and has a longer shelf life thus a good variety that could be travelled to farther areas. However, when cooked into jam, this variety has a dark colored jam even if white sugar is used in processing.

Table 2. Years engage in strawberry production

YEARS	FREQUENCY	PERCENTAGE
1-5	4	13.33
5-10	5	16.67
11-15	12	40.00
16 and above	9	30.00
TOTAL	30	100.00

Land Area for Strawberry Production by Farmers

Table 4 shows the average area cultivated by strawberry farmers. Majority (63.33%) of the farmer respondents have an area of 750 – 999 sq. m. eight or (26.67%) farmer respondents



have an area of 500 – 749 sq m. while two or (6.67%) farmer respondents have an area of 1000 – 1249 sq m. and one or (3.33%) farmer have an area of 1250 – 1500 sq m. The mean area for strawberry production is 722.76 sq m. Result shows that area devoted for strawberry production is small from 500 – 1500 sq m.

Table 3. Varieties of strawberry planted by the farmers

VARIETIES	FREQUENCY	PERCENTAGE
Tioga	29	96.66
Sweet Charlie	14	46.66
Festival	6	20.00
Aliso	4	13.33
Chinese variety	2	6.66

Table 4. Land area planted by the strawberry farmer respondents

AREA (sq. m)	FREQUENCY	PERCENTAGE
500-749	8	26.67
750-999	19	63.33
1000-1249	2	6.67
1250-1500	1	3.33
TOTAL	30	100.00

Mean area = 722.76 sq. m.

Major Source of Income

Table 5 shows the sources of income of respondents. All the farmers' major source of income is farming. This implies that all farmers depends their needs through farming. Others



(13.33%) generate an additional income by helping other farmers or as farm worker of other farms while some (10%) makes additional income through business.

Mulching Materials Used

There were only two types of mulching materials currently used by the respondents; the polyethylene (black plastic) and cogon grass. All of the respondents have tried and used polyethylene as their mulching material but 12 (40.00%) farmer respondent is currently using cogon grass. Cogon grass is used when there is no fund to purchase polyethylene which is much expensive than cogon grass.

Table 5. Major source of income of the respondents

MAJOR SOURCE:	FREQUENCY	PERCENTAGE
Farming	30	100.00
Other sources		
Business	3	10.00
Labor work	4	13.33

Table 6. Mulching materials used

MULCHING MATERIAL	FREQUENCY	PERCENTAGE
Polyethylene	30	100.00
Cogon grass	12	40.00

Preferred Mulching Material

Table 7 shows the mulching material preferred by the respondents. All respondents prefer to use Polyethylene to mulch their strawberries. However, twelve (40%) farmers stated that they



also prefer using Cogon grass. This implies that 40% of the respondents prefer both mulching materials to be used in their strawberries.

Reasons for Choosing Material

Table 8 shows the reason why the respondents choose such material in mulching their strawberries. As shown in Table 7, all farmers prefer to use Polyethylene and twelve of the 30 respondents also prefer to use cogon grass.

The reasons for choosing polyethylene plastic were presented in Table 8. There were 27 farmers (90%) who mentioned that using polyethylene will reduce cost for labor and pesticides. Twenty four (80%) of the farmers also mentioned that using polyethylene mulch improves the quality of berries produced. Twenty two farmers (73.33%) stated that using Polyethylene is expensive but reusable. Thirteen farmers (43.33%) reasoned out that Polyethylene mulch was used because it is available. Furthermore, eleven farmers (36.66%) said that Polyethylene can control weeds.

Table 7. Preferred mulching material

PARTICULARS	FREQUENCY	PERCENTAGE
Polyethylene	30	100
Cogon grass	12	40

Table 8. Reasons for choice of material

REASONS	POLYETHYLENE		COGON GRASS	
	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE
Cheaper	0	0.00	12	40.00



Expensive but reusable	22	73.33	0	0.00
Available	13	43.33	4	13.33
Better quality of produced	24	80.00	0	0.00
Can control weed	11	36.66	0	0.00
Less expensive on labor and pesticides	27	90.00	0	0.00

Some farmers also prefer to use cogon grass. Twelve (40%) of the farmers opt to use cogon grass because it is cheaper and four of the farmers (13.33%) mentioned that cogon grass is available.

Satisfaction in Using the Material

All the respondents were satisfied in the kind of mulching materials they were using. All these respondents were using polyethylene/plastic mulch.

Land Ownership

Results show that all the farmer respondents rented the area cultivated for strawberry product. It is a fact that the strawberry fields in swamp area is owned by the Benguet State University and thus are rented out to employees as “sariling sikap” on the farmer who are entrusted. The employees are partnered with farmers. The rental is P10.00 per sq. m. per year or the whole strawberry cropping season.

Post Harvest and Marketing Activities of the Farmers



Table 9 shows the post harvest activities done by farmers. All respondents sell their fresh berries in Baguio City or retailers in the swamp area, while 24 farmers (80%) process the berries that are reject yet could be marketed. Reject are those berries that are small in size, deformed or with little damage. These reject are still marketable, sold to processors at a lower price. Twenty six farmers (86.66%) process the small berries to strawberry jam, while 12 farmers (40%) process it into wine.

The result implies that farmers sell good berries in the market as fresh, or sell rejects to strawberry processors, though most of the farmers process their rejects into jam or wine.

Table 9. Post harvest and marketing activities of the farmers

ACTIVITY	FREQUENCY	PERCENTAGE
Sell to market as fresh berries	30	100.00
Process	24	80.00
Processed Products		
Strawberry jam	26	86.66
Strawberry wine	12	40.00

Total Volume of Output

Table 10 shows that all famer respondents mentioned that there is no effect of mulching materials on the yield/volume of outputs in strawberry production. What is important is that the nutrient requirements were supplied and proper cultural management practices were employed.



Farmers mentioned that yield is affected by the cultural management practices employed such as fertilization, irrigation and pest and disease control.

From a 500 sq. m. area a farmer can get an output ranging from 300 to 499 kilograms. Those who got about 500 kilograms are those with a wider area. Twelve (40%) of the farmer respondents got a total yield of 400 – 449 kilograms. Eight (26.66%) of the farmers generate a total output ranging from 450 – 499 kilograms of good quality berries. Five (16.66%) of the farmers got a total output ranging from 300 – 349 kilograms of good quality berries. Three (10%) of the farmer respondents got a total yield ranging from 500 kilograms and more and two (6.66%) of farmers had yield ranging from 350 – 399 kilograms of good quality berries.

Table 10. Volume of outputs

TOTAL VOLUME OF PRODUCT	FREQUENCY	PERCENTAGE
300 – 349	5	16.66
350 – 399	2	6.66
400 – 449	12	40.00
450 – 499	8	26.66
500 and above	3	10.00
TOTAL	30	100.00

Table 11. Distribution of yield as to big and small berries

TOTAL VOLUME (KILOGRAMS)	AVERAGE VOLUME OF MARKETABLE BIG BERRIES	AVERAGE VOLUME OF MARKETABLE SMALL BERRIES
300 – 349	312.00	23.00
350 – 399	325.00	25.00
400 – 449	380.83	26.66



450 – 499	430.62	28.12
500 and above	960.00	40.00

Weed, Pest and Disease Infestation

Table 12 shows the mulching materials that farmers used to control weed, pest and disease infestation. Respondents mentioned that using polyethylene has a moderate control over weed, pest and disease infestation. On the other hand, some farmers who had been using cogon grass answered that using cogon grass have observed a severe infestation on weeds, leafminers, abatel, cutworms, white grubs, frog eye, brotrites, mole cricket and graymolds and it has a moderate control on mites, thrips, blackspot and leafspot.

Problems Encountered on the Material

Table 13 shows the problems encountered by the farmers in using the polyethylene mulch. Majority (96.67%) of farmers said that using polyethylene is expensive but 1 (3.33%) farmer said that it is not the price that is considered it requires more time and more labor to apply the polyethylene on each plot. This implies that the problems encountered by the farmer in using polyethylene are expensive and at the same time takes time to apply on plots.

Table 12. Weed, pest and disease infestation

PARTICULARS	POLYETHYLENE	COGON GRASS
Weeds	2	3
Pest		
leaf miner	2	3
abatel	2	3



mites	2	2
mole cricket	2	3
cutworms	2	3
white grubs	2	3
thrips	2	2
Disease		
frog eye	2	3
botrites	2	3
blackspot	2	2
graymolds	2	3
leafspot	2	2
Rating Scale		
1. No Infestation		
2. Moderate Infestation		
3. Severe Infestation		

Table 13. Problems encountered on the materials used in mulching

PROBLEMS	FREQUENCY	PERCENTAGE
Expensive	29	96.66
Not always available	0	0.00
Too much reject/non-marketable	0	0.00
Insect, pest infestation	0	0.00
Hard to apply	1	3.33
TOTAL	30	100.00



SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study was conducted in the municipality of La Trinidad, Benguet specifically at the strawberry fields, swamp area on January 2011. This study aimed to determine the preferences in mulching materials by strawberry farmers at swamp area, the reasons for the preference of mulching material and the effect of mulching materials to strawberries in terms of yield (kg), volume of marketable and non-marketable output and weed, pest and disease infestation.

Finding shows that most of the farmers were at middle age between 41 to 50 years old bracket. Majority of were male. Majority of the respondents reached high school level or high school graduates.

As to the ethnic grouping, majority of them were Kankana-ey. Most of the farmer respondents were engaged in strawberry production for 11 to 15 years, thus, farmer respondents have the experience in the production of strawberry. Majority of the farmer respondents planted Tioga variety. Majority of the farmer respondents has a small area devoted for strawberry production. As to major source of income, all farmer respondents depends their income on farming.

There were two types of mulching materials used by farmer respondents; the polyethylene and cogon grass.

The farmer's perception on the mulching materials, they stated that using polyethylene will reduce the cost for labor and pesticides, that using polyethylene improves the quality of berries produced, polyethylene mulch is expensive but reusable, available and can control weeds. While others stated that cogon grass is cheaper and also available. Cogon grass is resorted when



resource/fund is limited to purchase polyethylene. Thus, all the farmer respondents prefer to use polyethylene and would use cogon grass only as a substitute. .

As to the satisfactory in using the material, all of the farmer respondents stated that they are much satisfied in using the polyethylene mulch.

As to the land ownership, all of the farmer respondents rent their area cultivated for strawberry production from Benguet State University. All farmer respondents have to pay an amount every year to Benguet State University for using the land for strawberry production.

All farmers sell good berries in the market as fresh and sell the rejected or small berries to processors or process into jam or wine.

Mulching materials used have no effect on the volume of the strawberry production. What's important is the management of the product.

The advantages of using polyethylene over cogon grass is that using polyethylene has more advantage in controlling the infestation of pests such as leaf miner, abatel, mites, mole cricket, cutworms, white grubs and thrips. It has also an advantage in controlling diseases such as frog eye, botrites, blackspot, graymolds and leafspot.

Polyethylene mulch can control weeds, its produce is better in terms of quality and it reduces the cost of labor and pesticides and it is available.

Conclusions

Based on the findings, the following conclusions were made:

1. Strawberry farmers at swamp area would prefer to use polyethylene/ plastic mulch in their strawberries and would only use cogon grass as a substitute.
2. Using black polyethylene would reduce the expense on labor and pesticides and would give a much better quality of berries produced.



3. The kind of mulching materials used does not affect the yield in terms of volume or quantity but the quality of produce. Thus, it affects the volume of marketable (big size berries) and small berries which is marketed as rejects bought by processors of wine and jams.

Recommendation

Based on the conclusion, it is recommended that farmers should use polyethylene/plastic mulch in mulching their strawberries to get a better quality of produce, reduce labor cost for weeding and pesticides.



LITERATURE CITED

- ANONYMOUS. 2002. Mulch. Types of Mulch. Retrieved October 9, 2010 from <http://www.farminfo.org/garden/mulch.htm>
- BAY-AN, E. 2010. Swamp Strawberry Farmer. Personal Interview. October 2, 2010
- BELENDEZ, K. 2010. Santa Clarity Valley Rose Society. Reap the Rewards of Mulching Your Rose. Retrieved October 9, 2010 from <http://scvrs.homestead.com/mulching.html>
- DESOUZA, D. 2010. The Advantages and Disadvantages of Mulching Your Lawn. Retrieved October 9, 2010 from <http://ezinearticles.com/?The-Advantages-and-Disadvantages-Of-Mulching-Your-Lawn&id=5065449>
- ELLIS, B. W., BRADLEY, F.M. and ATTHOWE, H. 1996. The Organic Gardener's Handbook of Natural Insect and Disease Control: complete Problem-Solving Guide to Keeping Your Garden and Yard Healthy without Chemicals. Retrieved October 9, 2010 from http://books.google.com.ph/books?id=v5WeH9B4kcC&pg=PA444&lpg=PA444&dq=disease+control+mulch&source=bl&oi=book_result&ct=result&resnum=3&ved=0CCEQ6AEwAg#v=onepage&q=disease%20control%20mulch&f=false
- FILIPPONE, P. T. 2008 Strawberry History, Strawberry is native to North America Retrieved August 7, 2010 from <http://homecooking.about.com/od/foodhistory/a/strawbhistory.htm>
- GAO, G. 2001. Ohio State University Extension Fact Sheet, Horticulture and Crop Science 2001, Fyffe Court, Columbus, OH 43210-1096, Strawberries are an Excellent Fruit for the Home Garden, HYG-1424-98 Retrieved July 30 2010 from <http://ohioline.osu.edu/hyg-fact/1000/1424.html>
- GUERENA, M. and H. BORN. 2007. Strawberries: Organic Production, NCAT Agriculture Specialists © NCAT 2007 ATTRA Publication # IP046 Retrieved August 13, 2010 from <http://attra.ncat.org/attra-pub/strawberry.html>
- KLUEPFEL, M. 2009. All About Mulch. HGIC Information Specialist, and Bob Polomski, Extension Consumer Horticulturist, Clemson University. Retrieved October 9, 2010 from <http://www.savvygardener.com/Features/mulch.html>
- LAURENCE, R. 2004. Care of Strawberries, Mulching of Strawberry Beds Retrieved August 7, 2010 from http://www.allaboutstuff.com/garden_tips_of_Strawberries.asp



MANZANITA BERRY FARMS CALIFORNIA. 2000. Site Version 1.2 Revised March 28, 2001
Retrieved August 6, 2010 from [http:// www. Berries 4u. com /history .htm](http://www.Berries4u.com/history.htm)

REILEY, E. H. and SHRY, C. L. JR. 2002. Introductory Horticulture Sixth Edition Pp.
479-480

RICHARDSON, K. 2006. The Advantages of Garden Mulch. All About Lawns Columnist.
Retrieved October 9, 2010 from http://www.allaboutlawns.com/lawn_maintenance-care/fertilizing/the-advantages-of-garden-mulch.php

SCHLOEMANN, S. 2004. Department of Plant and Soil Sciences, West Experiment
Station, University of Massachusetts, Amherst, MA Retrieved July 30, 2010 from
<http://www.fruit.cornell.edu/Berries/strawpdf/strwintermulch.pdf>



APPENDICES**APPENDIX A**

Letter to the Respondents

COLLEGE OF AGRICULTURE
Department of Agricultural Economics and Agribusiness Management
Benguet State University
La Trinidad, Benguet

January 5, 2010

Sir/Madam:

I am a graduating Student of Benguet State University taking up Bachelor of Science in Agribusiness, major in Enterprise Management and in currently conducting my undergraduate thesis. My study is entitled “Preferences of Mulching Materials used by Strawberry Farmers in Swamp, La Trinidad, Benguet.

In connection to this, may I permit for an interview in gather information needed in the study. Rest assure that all you answers will be treated confidentially.

Your heartly acceptance to this request will surely be appreciated. May God Bless you.
Thank you and more power.

Very truly yours,

JAZZEL B. OSTING
Student Researcher

Noted by:

JOVITA M. SIM
Adviser



APPENDIX B

Survey Questionnaire

I. General Information

Name: _____ Age:

_____ Gender: _____ Civil Status: _____

Educational Attainment: _____

Ethnic Grouping: _____ Years in Strawberry production: _____

Variety of Strawberry Planted: _____

Land area (or number of plots): _____

Major source of income:

 farming employment business others, specify _____

II. Materials Used

1. What mulching material have you been using? (Kindly check all that you have used)

a. Black polyethylene b. Cogon grass c. Rice Straw d. Pine Needles others please specify: _____

2. Among these material what is the most preferred by you?

a. Black polyethylene b. Cogon grass c. Rice Straw d. Pine Needles

3. Why have you chosen such material (above) to use in mulching your strawberry?

 cheaper expensive but reusable available better quality of produced can control weeds others, specify _____

4. Are you satisfied/contented with the mulching materials you use in strawberry production?

NO

YES

If no, why?

5. Do you own the land?

NO

YES

If no, how much do you pay for the rent? _____

6. What do you do with your harvest?

Sell to market as fresh berries

Process to another product

If you process it, what kind of product?

Strawberry jam

Strawberry wine

Please specify other product: _____

Others please specify: _____

II. Production Volume

A. VOLUME OF PRODUCTION (total number of harvested Strawberry fruit)

INPUTS	TOTAL YIELD (kg)			
	Polyethylene	Rice Straw	Cogon Grass	Others
Total volume of product				
Total volume of Big berries				
Total number of Small Berries				

B. Weed pest and disease infestation as to the mulching materials used.

Rating scale:

1. No infestation

2. Moderate infestation

3. Severe infestation

PARTICULAR	Polyethylene	Rice Straw	Cogon Grass	Others
Weeds				
Pest				
-				
-				
-				



Disease				
-				
-				
-				

C. What are the problems you encountered regarding the mulching materials you used in the following?

- expensive
 - not always available
 - too much reject/non-marketable
 - insect, pest infestation
 - others, specify _____
-

