GROWTH AND YIELD RESPONSES OF EGGPLANT TO COMMERCIAL AND AGRICULTURAL LIME UNDER CATBALOGAN SOIL AND CLIMATIC CONDITIONS

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Master of Arts in Teaching Vocational Education

FELICISIMA O. ORALE

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APPROVAL SHEET

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F. O. O.

DEDICATION

To my dearest old loving parents,
To my brothers and sisters-in-law,
To all my relatives and friends,
Whose genuine love and care I owe,

To dear Andrew and family circle,
To my ever benevolent neighbors,
To my ever dedicated professors,
To my supporters and benefactors,

To dear comrades in agriculture,
And above all to my only Savior,
I should have no other recourse,
But consecrate this humble work.

FELY

ABSTRACT

This study attempted to determine and compare the growth and yield responses of eggplant to commercial and agricultural lime under Catbalogan soil and climatic conditions. With regard to the highest effect with a mean of 10.63 fruits per hill per treatment every 15 days of harvest within three months period at an interval of three days per harvest. Those fertilized with agricultural lime follow with a mean of 10.55 fruits, while the control plants is the last, having a mean of 10.36 fruits. The total yield of the fruits in kilograms were registered as follows: (1) 16.02 kilograms for the plants treated with agricultural lime; 14.98 kilograms for those treated with commercial lime; and 14.28 for the control plants. For the conclusion, eggplant responds better to agricultural lime in terms of average height, crown of plants, length and circumference of fruits, and yield in kilograms. Commercial lime has a better effect as to the number of fruits of eggplant. For the recommendation, agricultural lime is strongly recommended for eggplant production in Catbalogan, in its absence, commercial lime is also recommended.

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CHAPTER I

THE PROBLEM

Introduction

Eggplant (Solanum Molongena L.) which belongs to the night shade family and the fruiting group of solanaceous vegetable, is one of the most popular and important crops grown in types of home gardens and backyards. It is an erect plant growing to a height of 100 to 120 centimeters. (Knott and Deanon, 1967: 67).

Eggplant is believed to have originated in northern India near Burma and later brought to China and Arabia before it was introduced to Europe during the dark ages when the Moores invaded Spain. The cultivation of this crop spread as far as Brazil and several places in the United States of America, then to the Asian countries, particularly Japan and the Philippines. (Ware and Mccollum, 1975: 518).

Eggplant is a warm-season crop and thrives best in relatively high temperature. In the Philippines, particularly, it is produced primarily for its fruit for vegetables, although it is also grown for its seeds for reproduction purposes. It is often stewed with other vegetables and it is the base ingredient for "Pinakbet", a common delicacy among the Ilocanos. The fruit may also be boiled, roasted or fried and eaten with "patis" or soy sauce with little vinegar or calamansi juice. It goes well with meat and eggs, especially in the preparation of eggplant omelet. (UPCA, 1973: 62).

Eggplant is delicious and highly marketable, although it contains a small quantity of incomplete protein and carbohydrates, a fair amount of minerals, vitamin A, C and B complex. According to PCARR (1982), eggplant is a fiber-rich vegetable that prevents cancer of the intestine. While it has less food value, if compared with other vegetables, it is popular among both rich and poor Filipinos because of its fine taste and versatility. This vegetable is concurrently one of the greatest money earners particularly for those living in the rural areas. It is also a substitute for some nutrients found in royalty foods. It cannot be denied that people nowadays plant this vegetable not only for domestic consumption but also for money. Planting it therefore becomes a profitable business. (Galon, 1980: 15).

Ventura (1979: 26), according to Federico Ballon, Chief of the Bureau of Plant Industry's Horticulture Section, says that eggplant is a very popular crop because it is easy to grow, requires little care and can be planted any time of the year on any type of fertile, moist but well-drained soil. The plant can withstand typhoons and pests that even the affected developing fruit will continue to mature fully and still be marketable.

As mentioned earlier, eggplant grows in any kind of fertile and well-drained soil, although sandy loam is preferable because sand contains a considerable amount of lime which is favorable to various crops. Adding lime to the soil enhances the availability of phosphorous, calcium and magnesium, thus making the soil favorable to eggplant. Lime serves as an indicator for the growth and yield of this crop. The most commonly known kinds of lime are the commercial and the agricultural lime. Commercial lime is composed of magnesium, alumina, iron oxide and silica. Magnesium as an active element of commercial lime functions as an essential constituent of the chlorophyll, helps in the translocation of phosphorous, and corrects the acidity of the soil. (UPCA, 1978: 85). Agricultural lime, on the other hand, exists in various forms. The chief forms of agricultural lime are crushed limestone, burned lime, and hydrated lime. Most lime originally come from limestone rock where it occurs as calcium carbonate ($CaCO_3$), the active element being calcium. The value of limestone depends upon the purity as well as the degree of fineness of the crushed particles. Limestone becomes more effective as the rock is ground finer. (Leonard, 1976: 31). Calcium as an active element contributes some specific functions, such as: hastens the development of terminal buds, reduces toxicity or acidity of the soil, improves the structure and texture of the soil, and induces plant vigor. (UPCA, 1978: 84).

As what had been observed from the previous condition of the soil in the experimental lot, the soil was acidic in the sense that crops planted did not show vigorous growth. So, one way of correcting soil acidity or neutralizing acidic soil is by liming. With the use of the soil test kit adopted by Department of Soil Science, UP, Los Baños, Laguna in analyzing soil sample, the result shows that the soil in the experimental area was slightly acidic having a pH reading of 5.7 pH value. The experimental lot has a clay loam type soil.

To get the soil sample for soil analysis, the experimental area must be cleared first. Clear the soil surface, dig a pit of 20 centimeters deep three centimeters wide and get a soil sample weighing one-fourth kilogram since the experimental area is only 124.80 square meters and level. Only one composite sample gathered to an area less than five hectares and level. To an irregular or slopping area, getting five to ten spot soil sample is needed. Each sampling area should not be more than five hectares. The main objective of soil sampling is to collect a small amount of soil sample weighing about one-half kilogram.

Although commercial lime is commonly used by many gardeners because of its availability in many local markets throughout the country, it cannot be concluded that its use is more profitable, because of its high cost. The abundance of agricultural lime in the neighboring municipalities of Catbalogan, Samar, motivated the researcher to experiment on the use of commercial and agricultural lime and compare their effects on the growth and yield of eggplant and to find out which of the two kinds of lime would give better economic returns to the gardener.

Eggplant production could be a lucrative business in Catbalogan and in many parts of the country if properly managed because of the great market demand for this commodity. One of the limiting factors for eggplant production is the lack of technological know-how in soil management and in the cultural aspect of the plant. Because of these problems, the researcher endeavored to discover new cultural practices that may contribute to the enrichment of knowledge and skills in the production of eggplant.

Hopefully, the results of this experiment will open new avenues towards food self-sufficiency through the discovery of new techniques of plant production and through the dissemination of valuable information to guide the small farmers towards socio-economic prosperity.

Theoretical Framework

The soil is the natural medium for plant growth. It provides anchorage for plants. The minute solid particles that comprise the soil and the resulting pore spaces between the aggregates are capable of storing nutrients, air and water. Biological life is favored by this condition. The soil biological activity in turn causes the release of nutrients from the soil for immediate utilization by plants. It is this nutrient-supplying capacity of the soil that determines its fertility.

The three general properties of the soil are: physical, chemical and biological. These properties in relation to the environmental factor (e.g. climate, soil manipulation, etc.) influence the soil productive capacity. They interact in such a way that they serve as a control mechanism to soil fertility to which the growth and yield of plants respond. Proper manipulation of the different soil properties in relation to the environmental factors may be done in order to make a soil fertile or restore and maintain its fertility level. (PCARR, 1978: 2).

When lime is added to an acidic soil, the calcium in calcium hydroxide from the lime replaces some of the hydrogen ions in heavy circles on the acid clay particles. Lime in strongly acidic soil increases the availability of nitrogen, phosphorus, potassium and molybdenum. By hastening the decay of organic matter, lime makes more nitrogen available to plants. (Donahue, 1970: 141).

The correction of soil acidity favors the production of almost all crops. The cheapest material for the correction of soil acidity is ground limestone from quarries in different parts of the country. It is usually applied in units of 1,000 pounds to the acre. Limestone is not considered to be a fertilizer but, rather a soil conditioner. (Dungan, 1957: 124).

Strongly acidic soils are troubled by a variety of problems that interfere with the normal growth of many plants. By and large, harmful effects are the result of unsatisfactory nutritional conditions. A wide range of substance can be used to neutralize soil acidity. However, ground limestone is ordinarily used, primarily for economic reasons. (Hausebuiller, 1977: 353).

Samonte, (1982: 5), states that, as soon as the pH goes below 5.3, however, yield decreases significantly and lime has to be applied. For soils with a pH of 5.3 and above, very little or no lime is necessary.

Eggplant is grown in many parts of the United States and is commercially important in New Jersey, Florida, and Louisiana. It thrives in loam soils well supplied with limestone. (Tiedings, 1974: 634).

There are some easy ways to maintain the fertility of the soil: apply fertilizers; add lime before the soil gets too acidic; add organic matter; and never allow the soil to erode by careless tillage practices. If you do not apply fertilizers, soil fertility will continuously decline because the soil can never keep up with the demands of crops for nutrients. However, use the fertilizers properly. Know what kind, how much and how to apply the fertilizers. On the other hand, fertilizer may not be effective if the soil is strongly acidic. Adjust the soil pH (the acidity or alkalinity of the soil) to about 6.5 by such liming materials as calcium carbonate or delomite. The amount of lime needed depends on how acidic the soil is, the type of crops as well as the texture of the soil. (FARMTECH, 1985: Vol. II, 14).

There are two major causes of acidity in soils, one is the decrease in the amount of bases like potassium, calcium, magnesium and sodium. This is brought about by crop removal and leaching. The removal of bases by economic crops increases as greater yield is obtained, whether the crops are fertilized or not. On the other

Scheme of the Theoretical Framework

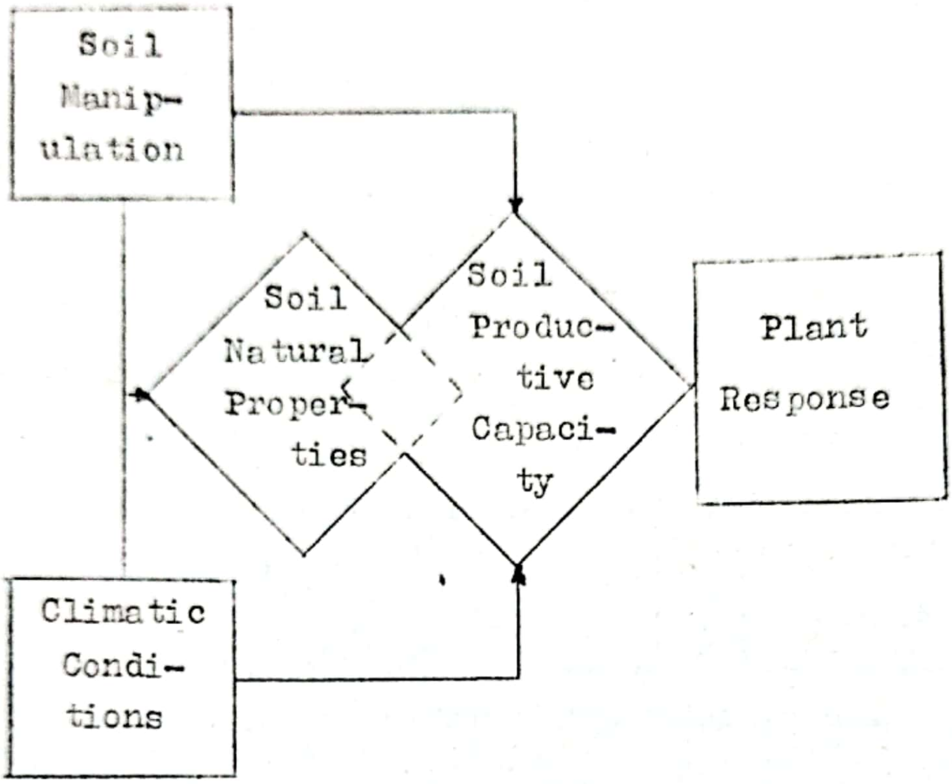

Figure 1. This schema represents the theories of Donahue, Dugan, Hausebiller, Samonte and Tiedings as adopted by PCARR and FARMTECH. It shows how soil manipulation and climatic conditions interact with the soil natural properties to influence soil productive capacity to which the growth and yield of plants generally respond.

hand, leaching of bases occurs where rainfall is sufficiently high to move the dissolved bases of salts through the soil, with the consequent build-up of the hydrogen and aluminum species. Hydrogen and aluminum cause acidity in the soil. The second major cause is the increase of acidic constituents resulting from the use of fertilizer containing ammonium or ammonia and from microbiological activities producing sulfate and weekly dissociated organic acids. (Samonte, 1982: 4).

Conceptual Framework

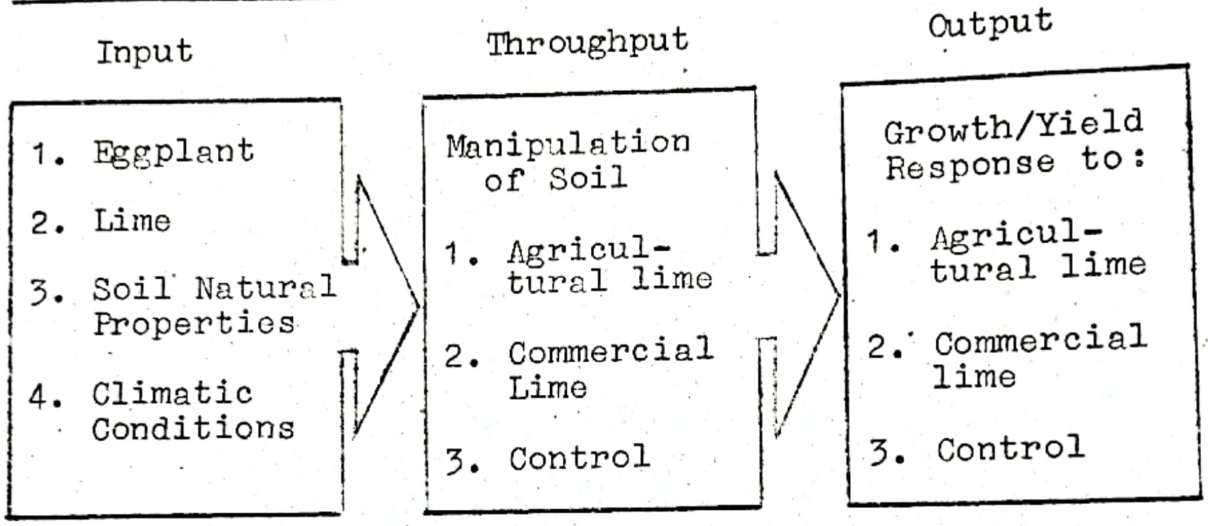

Figure 2. This CONCEPTUAL PARADIGM presents the eggplant, the lime, the soil properties, and the climate as the input variables; the manipulation of the soil as the throughput; and the comparison of the growth and yield responses as the expected output of the study.

In the conduct of this experimental study, the input consists of the plant (eggplant), the soil and its general properties, the lime, and the climate. Proper manipulation of the soil with lime, in relation to the environmental factors makes a soil fertile or restores and maintains its fertility level, thus helping the growth and yield of eggplant. The gardener acts as a useful agent of change in the cultural practices of eggplant production. These factors are responsible in making the throughput work.

The throughput which includes the different soil treatments such as application of agricultural lime, commercial lime and soil without lime are the factors used that determine the effectiveness of the input. With the application of agricultural lime to the soil the plants produces higher yields. (Fleischel, 1970: 19). Therefore the supply of lime to crop is necessary.

The output stresses on the comparison of the growth and yield responses of eggplent to agricultural lime, commercial lime, and no lime at all. Their influence may vary as may be indicated the sizes of the plant and the fruits as well as the growth of the plants and the yield of fruits.

With the different soil treatments made on this study, varied yield and growth responses of eggplant are expected.

Statement of the Problem

This study attempts to determine and compare the growth and yield performance of eggplant in response to commercial and agricultural lime under Catbalogan soil and climatic conditions. Specifically, this study sought to answer the following questions:

1. What is the performance of eggplant under Catbalogan soil and climatic condition in response to

commercial and agricultural lime in terms of:

1.1 average height of plant per hill, per treatment

1.2 average crown of plant per hill, per treatment

1.3 average number of fruits per hill, per treatment

1.4 average length of fruits per hill, per treatment

1.5 average circumference of fruits per hill, per treatment

1.6 total weight of fruits per treatment

2. What is the cost and return analysis of the experimental research on eggplant production using 124.80 square meters of land?

Hypotheses

1. The performance of eggplant under Catbalogan soil and climatic conditions are significantly the same in terms of:

1.1 average height of plant

1.2 average crown of plant

1.3 average number of fruits

1.4 average length of fruits

1.5 average circumference of fruits

1.6 total weight of fruits

2. The cost and return analysis of eggplant production does not show significant benefit to the readers.

Significance of the Study

The findings of this study would be beneficial to the farmers, mothers, out of school youths, students, gardeners, teachers, to the school, community and to the country as a whole.

Since this vegetable is grown in most backyards and school gardens throughout the country, truck crop growers near cities, big towns, and some in rural areas grow eggplant in commercial scale. The students, out-of-school youths, the mothers, the farmers and the small gardeners as well as the teachers in agriculture and other interested parties are the clients; it is they whom we must serve. This objective is trivial if compared with the aim to improve the well-being of the rural population and to strengthen agricultural production.

Teachers in agriculture subjects will likewise be benefited in the sense that they will be guided by the findings that eggplant production can be adapted to particular cultural aspect of the locality. This useful information would in turn be transmitted to the students through lessons taken up during classes in agriculture.

Technologists in the Ministry of Agriculture and Food and the lead agencies of the government will make use of the result of this study as a ready reference in their tasks of improving people's income especially through increased food production.

Hopefully, the result of this study would also make a concrete demonstration of sound cultural practices in growing eggplant. If there is a successful carry over of this practice through lime manipulation in an acidic soil learned from the researcher as an educator to the home or interested party, the financial status of the implementor would be improved.

Furthermore, this study will encourage the families to plant eggplant in their backyards for home consumption and even to produce more to meet the great demand in the market, thus, improving their socio-economic status and attaining sufficiency of food supply in the community, thereby augmenting their income.

Scope and Delimitation

The study compared the growth and yield performance of eggplant in response to different treatments (commercial lime, agricultural lime and no lime), under Catbalogan soil and climatic conditions within a five-month period from transplanting.

This experimental study was conducted at the side of the Ministry of Agriculture and Food Office, Catbalogan, Samar.

This study is focused on effects of commercial lime and agricultural lime on the growth and yield of eggplant under Catbalogan soil and climatic conditions during the period from November 7, 1984 to May 31, 1985.

The experimental area used was 8.0 x 15.60 meters or 124.80 square meters. The Randomized Complete Block Design was used with three treatments replicated four times. Each treatment or sub-plot measured 1.0 x 4.20 or 4.20 square meters. Treatment one (T_1) was applied with 1.05 kilogram of commercial lime, treatment two (T_2) was applied with 1.05 kilogram of agricultural lime and treatment three (T_3) served as control group (no lime applied). The basis of using 1.05 kilogram of both commercial and agricultural lime in a 4.20 square meters plot is derive from the recommended rate given by PCARR, (1982: 78), that for pH value ranging from 5.0 to 6.0 will use 2.5 tons or 2,500 kilograms per hectare. Since the pH reading on the experimental research area was 5.7, the researcher used the 2.5 tons per hectare as its basis of computation for ratio and proportion using 4.20 square meters plot (see appendix V on page 121). The test crop used in this study was eggplant garden (EG) long purple variety.

The basis of using 60 x 60 centimeters between rows and in between plants was from the study conducted by Barro (CJAC: 1984) entitled "Yield Performance of Eggplant Varieties at Can-avid, Eastern Samar" which produced fruits 22 to 25 centimeters. Another study conducted by Basio (CJAC, 1983) using also 60 x 60 centimeters distance of planting entitled "Yield Performance of Eggplant as Influenced by Varying Rates of Complete Fertilizer (14-14-14)" revealed that yield excelled in performance as to average number of fruits, size of fruits and total yield of fruits per hill, per treatment.

The return of investment on the cost-benefit analysis of this study in a 124.80 square meters land shows that there are 181.10 kilogram of fruits harvested within three-month period. The fruits sold at ₱6.00/kilo earned a total gross income of ₱1,086.60. Subtracting the cost of ₱481.70, the researcher profited ₱604.90 within three-month period or an average of ₱201.30/month in an area of 124.80 square meters.

<u>Definition of Terms</u>

In order to insure understanding on the part of the readers, the following terms are defined as used in this study:

<u>Agricultural lime</u>. This is locally-made powdered

rock which has calcium oxide (CaO) and calcium carbonate ($CaCO_3$). (Maniego 1985, see appendix Q, page 115).

Alleyway. This refers to the passageway provided between plots or between sub-plots.

Commercial lime. This is a laboratory-made and a composition of magnesia, alumina, iron oxide, and silica. (Webster, 1965: 1433).

Crown. This term applies to the total spread of the leaves and branches.

Data. These are the accepted numbers, quantity, facts or relationship used as bases for drawing conclusions or making inferences.

Experimental design. This refers to the arrangement or assignment of treatment using a particular model, (PCARR, 1982: 98).

Growth. This applies to the stage or estate in development, particularly the increase in size. (Webster, 1965: 1108).

Hammock land. An area characterized by hardwood vegetation, the soil being of a greater depth and containing more humus than that of the flatwood or pine lands, hence being more suitable for cultivation. (Webster, 1965: 1131).

Harvestable sample. This refers to the harvestable plants considered as sample plants in this study.

Lime. This refers to the commercial and agricultural lime used in this study. Lime is not considered as fertilizer but, rather a soil conditioner. It neutralizes or corrects soil acidity. Liming in acidic soil enhances the effectiveness of fertilizer applied.

Mesh size. This refers to the opening or the sieve through which the lime particles are screened.

Randomized block. An experimental design wherein the total area is divided into blocks in a random order.

Replication. The opportunity given to a treatment to appear more than once in an experiment to provide a means for estimating experimental error. (PCARR, 1982: 98).

Sample. This refers to a representative portion taken from a larger population, usually consisting of several randomly chosen parcel of plots.

Soil test kit. This is a quick method of evaluating the fertility status and determining the pH or acidity of the soil. This is a small box 19 centimeters by 11 and by 11 centimeters respectively, weighing about one kilogram. It contains chemical reagents, procedure and color charts, tables of fertilizer recommendation for various crops, and procedure for proper sampling technique.

Soil sample. This is a soil weighing about one-fourth kilogram taken from the 124.80 square meters experimental area in a depth of 20 centimeters and three centimeters wide ready for chemical analysis using a soil quick test. (UPLB & NFAC).

Solanum melongena. A scientific name of eggplant. It is a genus of herbs, shrubs or trees characterized by alternate, often pricky veined leaves, showy flowers with five stamen and two-celled ovary, cells containing many ovules. (Webster, 1965: 2391).

Spread. The expansion of leaves from the main stem of the plants to the widest portion. It is also known as the crown of the plant.

Sterilization. The process of heating the soil in order to free it from living germs or micro-organism usually present in the soil.

Variance. This is a measure of variation in a sample or population, the average squared deviation for the series of item being measured. This applies to the fact or state of being in disagreement; differences or deviation not in harmony or agreement. (MATEA, 1976: 10).

Yield performance. It refers to the yield components selected as indicators in the use of commercial lime, agricultural lime and with no lime (control).

CHAPTER II

REVIEW OF RELATED LITERATURE AND STUDIES

In order to gather information relevant to the problem under study, the researcher had exhausted her efforts in looking for various literatures and studies conducted in our country and abroad. This chapter includes the literatures and studies of several authorities written in books, unpublished theses, magazines, brochures, newsletters and other reading materials which have relevance to the present study.

RELATED LITERATURE

Foreign

Reading of foreign related literature, provide a broader field of information to this study, so it was resorted to by the researcher.

Description of the crop. The eggplant (Solanum melongena var. esculentum) often referred to as "Guinea squash" is a native of the tropics. It has been cultivated for many centuries in India, China, Arabia and was probably introduced into Europe during the Moorish invasion of Spain.

Eggplant is believed to have originated in northern India near Burma. Small fruited types were later secondarily developed in China. Apparently the specie was spread to Europe by Arabic people during the Dark Ages, and yellow and purple-fruited types were known to both northern Europe and Brazil before the close of seventeenth century. The United States seldom utilized the eggplant as food before the present century although it was widely planted for ornament. It is being more widely utilized today, although its importance in the northern world is not so great as in the orient. It is the fourth ranking vegetable in Japan. (Schery, 1958: 447).

Varieties. Black beauty variety, a study grower, produce very large fruits. Florida high bush variety, is specially desirable variety where summer rains are frequent, because the fruits are borne well up from the ground. New York purple variety, is sometimes preferred for its light color and greater length. Long purple variety, as its name suggest, produce fruits unlike that of the cocozelle squash variety. (Folay & Farland, 1944: 91).

Cultural requirements. Eggplant is grown commercially in only a few states, but it is produced for local market and in home gardens in many areas. This is a warm-season crop and thrives best in relatively high temperatures. It is more susceptible to injury by low temperature than tomatoe or pepper. It also has a high moisture requirements and respond well to irrigation during the periods of drought and high temperature. A growing season from 100 to 140 days with high average day and night temperature is desired for this crop.

For best development, the eggplant requires a well-drained, fertile, sandy loam soil with a high organic content. In Florida, well drained hammock lands are preferable because of their fertility and moisture holding capacity. In northern areas, a location with woods or windbreaks in the north and west sides is desirable because the young plants are susceptible to wind injury after being set in the field. (Ware & Mccollum, 1975: 520).

In the far south, seeds are planted from June to August for the fall and early winter crop and in February and March for the spring crop. In more northern regions plants are started in greenhouses or hotbeds about eight to ten weeks before they are to be transplanted, (Schery, 1958: 447). Eggplants were set in the field at a distance of 2 1/2 feet between plants and three feet between rows. They needed thorough watering after transplanting and soil pulverization to keep weeds from growing faster then the plant.

The common attacking insects were beetles and the common diseases were leaf blight, wilt and fruit rot. Crop rotation was made as a preventive measure to combat insects and fungus diseases.

Harvesting was done as soon as the fruits attained their marketable size. (Folay & McFarland, 1944: 91).

Local

Although eggplant has originated in northern India near Burma, its popularity had also been extended to other foreign countries as in China, Arabia, Europe, Japan and most especially here, in the Philippines.

Description of the crop. While the eggplant has the least food value among vegetables, it is popular among both rich and poor Filipinos because of the fruits' fine taste and versatility. Planting it has become a profitable business.

In some parts of the Philippines, one long eggplant could be sold for as much as P0.50 as of 1980. Thus, if one eggplant yields a minimum of 25 fruits per year (some varieties produce as many as 40 fruits per fruiting season) that plant will yield P12.50 worth of fruit per year. This vegetable is currently one of the greatest money earners particularly to some living in rural areas. It is also a substitute for some nutrients found in royalty foods. (Galon, 1980: 15).

Varieties. There are many known local improved varieties of eggplant. These includes Negros purple, Pampanga purple, Dumaguete long purple, long green, round purple, round white, college long purple and aroma..

Some new varieties are BPI master 1, Dingras long purple, and EG (eggplant garden) long purple. The variety used in this study is the EG long purple. This variety can be grown any time of the year. (Galon, 1980: 16).

Cultural requirements. About one-half to three-fourths kilo of seeds is enough to plant a hectare. Sow seeds in seedboxes or seebeds about 25-30 days in advance of planting in the field or garden. Sow seeds thinly and evenly into the shallow furrows spaced 15 centimeters apart. Increase growth of seedlings by applying fertilizers prepared by dissolving eight level tablespoon of ammonium sulfate fertilizer in five gallons of water. Seedlings are ready for transplanting 25-30 days from sowing.

Land preparation. The land is plowed several times until a fine tilth is obtained. Double furrows are made about 15.centimeters deep and 50 centimeters apart with each double furrows spaced one meter apart, (Jamora and Sarian, 1975: 11).

Liming. Based on Samonte's theory that for soils with a pH of 5.3 and above, very little or no lime is necessary. As also cited in Tiedings theory, eggplant thrives in loam soils well supplied with limestone.

As stated in the theory adapted by PCARR the three properties of soil in relation to the environmental factor as climate, and soil manipulation by using lime as an example to this, influence the soil productive capacity. They interact in such a way that they serve as a control mechanism to soil fertility. For more efficient control of acidity, two thirds of the lime requirements is broadcast and plowed under, one third is also broadcast and harrowed in one month before planting. The recommended rate could also be applied in the following manner: one-half plowed under and one-half harrowed in, (Samonte, 1982: 5).

Transplanting and care of plants. Water seedbed or seedbox to facilitate lifting of seedlings. Set the seedlings 60 centimeters apart in the furrows and water about a month from transplanting the double-rows of planted seedlings are bedded or banked to facilitate irrigation and minimize cultivation and weeding.

Harvesting. Pick fruits as soon as they attain satisfactory size or before they loose their bright, glossy appearance. Heavier crop is obtained if the fruits are removed before they reach full maturity. (Jamora & Sarian, 1975: 11).

Description of lime. The purpose of liming is primarily to neutralize the exchangeable aluminum and thet this is normally accomplished by raising the negative logarithm of hydrogen ion concentration in the soil (pH) to 5.5. When manganese toxicity is suspected, the negative logarithm of hydrogen ion concentration in the soil should be raised to 6.0. The factors to be considered are: (1) the amount of lime needed to decrease the percentage of aluminum saturation to a level at which the particular crop and variety will grow well; (2) the quality of lime; and (3) the placement method.

For every milliequivalent of calcium carbonate ($CaCO_3$) equivalent should be applied.

In most cases when one to three milliequivalent of exchangeable aluminum is present, lime application are now on the order of 1.6 to 5.0 tons per hectare. In the past, rates on the order of 10 to 30 tons per hectare where frequently recommended and applied with mixed results.

The term "lime requirement" frequently refers to the quantity of lime applied to neutralize the acidity of a given soil. Soils with negative logarithm of hydrogen ion concentration (pH) value below 6.0 need to be limed, (Sanchez, 1979: 78).

Lime Requirements for Different Soil Types

The lime requirement for different soil type, emphasizing the negative logarithm of hydrogen ion concentration in the soil (pH reading) and the average amount of ground limestone ($CaCO_3$) in tons per hectare for soils of average organic matter content. (PCARR, 1982: 78). See appendix T on page 119.

The Calcium Carbonate Equivalent of Some Liming Materials

The calcium carbonate ($CaCO_3$) of different kinds of liming materials showing their own formula in terms of symbols and in weight and also its calcium carbonate equivalent are shown below:

The calcium carbonate equivalent of liming materials is obtained by the following formula:

$$CaCO_3 = \frac{100}{\text{Formula Weight of Liming Material}} \times 100$$

Among the liming materials are: burnt lime, slaked lime, magnesium oxide, magnesium hydroxide, magnesium carbonate, calcium calcite and dolomite. (See appendix U on page 120).

Agricultural limestone produced by regular crushing method will have a range of particle sizes. It should however, be fine enough for at least 50 percent to pass a 100 mesh sieve.

A typical particle size analysis of regular limestone is given below:

Mesh size	Weight Percentage
10	8.3
10 - 20	21.50
20 - 40	25.40
40 - 60	19.50
60 -100	2.30
100	23.00
Calcium carbonate equivalent =	90.40
Mg content	2.70

Mesh size opening of the sieve, the diameter usually a little more than one-half of the quotient obtained by dividing one of the mesh ratings. For instance 10 mesh will mean, the size of lime particles that will pass through sieve whose opening has a diameter of 1.78 centimeters those of 50 mesh, .03 centimeters and those 1.0-mesh screen approximately, .015 centimeters, (PCARR, 1982: 80).

RELATED STUDIES

Foreign

The researcher did not come across any foreign related study on eggplant. The studies herein reviewed were all locally conducted in different places in the archipelago.

Local

A study conducted on eggplant production based on statistics shows that in one year, our farmers planted 16,520 hectares to the crop and harvested 46,737,200 kilograms high degree of production aspect. (Ventura, 1974: 26).

The new varieties developed by the Bureau of Plant Industry are fast gaining popularity among growers. These varieties are EG long purple and Dingras multiple purple. The new variety developed by the UPLB College of Agriculture is Dumaguete long purple. (UPCA, 1973: 62).

A study conducted by the Bureau of Soils on the effect of Nitrogen, Phosphorus and Potassium (NPK) on the growth and yield of eggplant at a distance of 100 centimeters between rows and 80 centimeters in the row gives a yield of 8,500 kilograms per hectare. (BS, 1978).

Another study conducted with a distance of 50 centimeters in the row and in between rows, revealed that it matures 90 to 150 days from sowing seeds to harvesting. (Samaka, 1962: 54).

According to Suico, (VCA, 1974) EG long purple variety outyielded another eggplant variety trial under

VAC conditions. This is a Randomized Complete Block Design (RCBD) containing three replications. A total area of 17 by 27 meters was used. Each block having an area of 5.0 by 27 meters was further divided into sub-plots or treatments. The area planted for each variety was five by five meters. Every replication or block was separated by one-half meter alleyway to facilitate operation and management of the experiment.

Barro (CJAC, 1974) revealed that the EG long purple variety at a distance of 60 centimeters between rows and in between plants grow to a height of 2.8 feet, started to bear fruits 82 days after seedling emergence and bear long purple fruits 22 to 25 centimeters.

Another unpublished masteral thesis on EG long purple variety reveals that the plant applied with hog manure outyielded the plants applied with dried ipil-ipil leaves and carabao manure in terms of yield in kilograms per treatment; average number of fruits per hill, per treatment; average weight in kilograms per hill, per treatment. (Jaralbio. CJAC, 1983).

A study conducted on the yield of eggplant applied with different levels of commercial fertilizers using long purple eggplant variety at a distance of 60 by 60 centimeters shows that 500 kilograms of complete fertilizer per hectare excelled in performance as to average number of fruits, average size of fruits and total yield of fruits per hill per treatment. (Basio, CJAC, 1983).

According to Samonte (October, 1981) liming at the rate of 5.0 tons $CaCO_3$ per hectare over all rates of nitrogen, phosphorus and potassium significantly produced the highest yield. This optimum lime rate raised and soil pH from 4.9 to 5.5 with concomitant lowering of exchangeable aluminum from 0.37 to 0.06 m.e/100 grams. Based on the changes in soil pH and yield results the lime recommendation for manpla clay loam are 0.17, 4.0, 5.0 and 8.0 tons $CaCO_3$ per hectare if the pH values are 5.5 and 5.3 for sugarcane.

Relationship with the Present Study

The local studies just reviewed are closely related to this study in the sense that most of the authors focus their study on EG long purple variety. They were also similar as to specific aspects to be answered as in average number of fruits per hill and per treatment; average size of the fruits and total yield of fruits in kilograms per hill and per treatment. They differ only in the kind of fertilizers applied and the cultural aspect used (as in liming).

Another study conducted about lime ($CaCO_3$) on the influenced of lime rates and ratio of sugarcane. This study is something similar to the present study because it focused on the effect of ratio of lime. It differs on the crop being studied since the previous study is about sugarcane while the present study is about eggplant -- its growth and yield responses to commercial and agricultural lime under Catbalogan soil and climatic conditions.

All of the related literature and studies were of great help in conducting this experimental study.

Furthermore, this study would attest the extent of the relationship between the findings of previous experiments conducted. With the readings of related literature and studies conducted previously, the researcher was guided on what to do in conducting her experimental study. It is hoped that the findings of this study will serve as a reliable tool for countless innovations geared towards increased production of the test crop, the EG long purple variety.

CHAPTER III

METHODOLOGY

This chapter presents the materials and methods used in this study.

The Materials Used

The materials used were of great importance in the completion of this study. The different materials used in this study are the following:

1. Commercial lime - 4.20 kilograms
2. Agricultural lime - 4.20 kilograms
3. Ammonium sulfate - 1.0 teaspoon
4. Malathion - 1.0 small bottle (1.0 qrt.)
5. Thiodan - 1.0 small bottle (1.0 qrt.)
6. Eggplant garden (EG) long purple seeds - 1.0 tablespoon
7. Bolo
8. Mesh sieve
9. Seedbox
10. Shovel
11. Sprinkler can/improvised tin can sprinkler
12. Tape measure
13. Meter stick/ruler
14. Weighing scale
15. Bamboo
16. Poles
17. Nails
18. Harrow
19. Plow
20. Knap sack/Horsepower sprayer

The Method Used

The researcher employed the experimental method adopting the randomized complete block design (RCBD) with four plots sub-divided into three sub-plots each. The experimental lot had a total area of 124.80 square meters divided into 12 sub-plots, each measuring 1 x 4.20 meters or 4.20 square meters. An alleyway of one meter was provided between sub-plots. The 12 sub-plots were grouped into three treatments and replicated four times. The samples were determined by simple random sampling using fish ball technique, not by deliberate collection. (See appendix F on page 87).

Experimental treatment. The three treatments used are as follows:

T_1 - with commercial lime

T_2 - with agricultural lime

T_3 - control (no lime)

Cultural Operation of Eggplant

Land preparation. The area of 8 x 15.60 meters or a total area of 124.80 square meters was cleared with the use of bolo and cut grasses were removed from the experimental area. The area was plowed and harrowed thrice at the interval of one week by the use of animal drawn implement. Sticking soon followed after the last harrowing to determine the size of the plots and alleyways. Each sub-plot measured 1 x 4.20 meters or 4.20 sq. meters with a one meter alleyway in between plots and blocks.

Getting soil sampling. The spot soil sample was taken in the following manner:

a. Before digging the pit, the soil surface was cleared.

b. Using spade, the pit was dug to a depth of 20 centimeters.

c. From one vertical side of the pit, a slice of two centimeters thick was taken with a single downward thrust of the spade. The main objective of soil sampling was to collect an amount of soil sampling weighing about one-half kilogram that would represent the soil in large area. Since only a small areas was used in this study, only one-fourth kilogram was gathered as a composite sample.

After collecting the spot soil sample from the experimental area, pulverizing and mixing was done. The researcher saw to it that the soil sample was free from stones and fresh leaves. The composite soil sample which represented the soil of the experimental area was ready for chemical analysis using a soil test kit (see appendix H on page 90). Only one composite sample is to be gathered in an area of less than five hectares if it is level. For a larger or wider area and slopping or irregular land, five samples should be taken, four at the sides and one in the center of the land.

Rate of commercial lime and agricultural lime application. All plots representing treatment one (T_1) were applied with a 1.05 kilogram of commercial lime. All treatment two (T_2) were applied with agricultural lime at the rate of 1.05 kilogram per plot. All treatment three (T_3) were not treated with either commercial or agricultural lime. Treatment three served as control group, hence no lime was applied. The 1.05 kilogram rate of application for each plot in both treatment one (T_1) and treatment two (T_2) was based on the recommended rate adopted by PCARR (1982: 78) at 2.5 tons per hectare. Computation by means of ratio and proportion was based on the sample area alone excluding that of the alleyways. A 1.05 kilograms of commercial or agricultural lime is only good for an area of 4.20 square meters. (See computation on Appendix V on page 121).

Method of applying the lime. The 1.05 kilogram of commercial lime was applied to every 1 x 4.20 meters or 4.20 square meters plot. The same procedure was done to agricultural lime. All treatment one (T_1) was applied with commercial lime and all treatment two (T_2) was applied with agricultural lime. The liming material was uniformly mixed with the surface layer of the soil, 15 centimeters deep. Both limes were applied manually and mixed thoroughly one month before planting the seedlings in order to allow some of the particles to react with the soil.

<u>Sowing the seeds</u>. The seeds were germinated in a sterilized loam soil in a 45 cm. long, 30 cm. wide, 7.5 cm. high seedbox. Before sowing the seeds, the surface soil in the seedbox was flattened and several thin furrows were made from one side to the other side with the use of a pointed stick. The long purple egg-plant garden (EG) seeds were sown evenly on the furrows, then covered thinly by the loose top soil and pressed gently by the stick to prevent the seeds from scattering and from attacked of insects. The soil was moisened with the use of an improvised tin can sprinkler.

<u>Care of the seedlings</u>. Regular watering every morning of the young plants was strictly observed. Proper mixture of malathion insecticides was applied three weeks after the seeds have germinated, to prevent the seedlings from attack of pests and diseases. Moderate

amount of water mixed with ammonium sulfate fertilizer was applied to hasten the growth of the seedlings. However, after fertilizing, the seedlings was at once rinsed by fresh water.

Thinning was also done with the use of pointed stick to avoid overcrowding of the seedlings and to promote vigorous plants.

Transplanting. At the age of 42 days from sowing, the seedlings were ready for transplanting to the designated experimental area. Minutes before transplanting, the seedbox was watered to loosen the soil. Transplanting started late in the afternoon to avoid direct exposure to sunlight. Only one seedling was planted to a hill at a distance of 60 x 60 centimeters. Great care was taken into consideration not to harm the root system of the seedlings in the transplanting operation.

Care of transplanted eggplant. To insure normal growth and to prevent damage of the plants the following precautions were taken: (1) The experimental area was fenced to protect the plants from astray animals and careless persons, (2) Watering of the plants with the use of the sprinkler can was done regularly every morning and afternoon up to initial fruiting, when there is rain watering during fruiting stage was done only when it was necessary, (3) Canals were made around the experimental area so as not to flood the plants during rainy days, (4) Weeding and cultivation was done every week during Saturdays and Sundays up to initial fruiting, observing extra care during cultivation at the base of the plants so that their roots would not be injured, (5) Spraying of malathion or thiodan was done at the interval of 12 days following the manufacturer's recommended rate of spraying. Spraying was done up to initial fruiting with the use of knap sack and horsepower sprayer. During the fruiting stage spraying was done once a month. Hand-picking of insects, pests and diseases causing creatures were done regularly and burning the collected rotted fruits and infected leaves.

Harvesting. The fruits were harvested as soon as they attained satisfactory size or before they lose their bright glossy appearance. Harvesting was done by handpicking and great care was being observed, so as not to mix the fruits harvested by hill, by treatment for accurate recording of data.

The harvesting period was done within three months period. Initial harvesting started March 1, 1985 and lasted up to May 31, 1985. Harvesting was done at the interval of three days per harvest excluding that when spraying was made.

Marketing. The fruits harvesting were immediately bought at producers price at ₱6.00 per kilo.

Storing eggplant fruits. Eggplant can be kept in moist sawdust and sand. (See appendix K on page 101).

Gathering of Data

Simplie random sampling by means of a fish ball technique was employed in this study in order to get the samples or representative from the total population to compose the sampling unit. The researcher assigned number to each plant or hill in every plot throughout the four replications. The numbering was done corresponding the number of desired sample to be taken in per plot. The cards were placed in a bowl and shuffled thoroughly before the nine cards were drawn to represent the size of the sample. This procedure was followed in every plot throughout the four replications.

Classifying of Data

The data were obtained through measuring, counting and classifying as to the number of fruits per hill, per treatment, the bimonthly increase of the height and crown of the plant up to initial fruiting per hill, per treatment; the average number of fruits per hill, per treatment; the average length and circumference of fruits per hill, per treatment and the total yield of fruits per hill, per treatment among the three treatments were made as bases of comparison on the commercial lime, agricultural lime and without lime. The measuring unit used were in terms of centimeters for the height and crown (spread of leaves) of the plants, the length and circumference of the fruits, and kilograms in terms of yield. Cost and return benefit of this study was also included if it shows profit or not.

Tallying of Data

The following data were gathered and tallied in this study:

1. The average height of plant among the three treatments. These were the data collected and recorded beginning the 15th day after transplanting and every 15 days thereafter up to initial fruiting. These covered a period of two months.

2. The average crown of the spread of leaves among the three treatments.

3. The average number of fruits among the three treatments. The data collected and recorded were the number of fruits harvested per hill, per treatment every 15 days of harvest at the interval of three days per harvest.

4. The average length of fruits among the three

treatments.

5. The average circumference of fruits among the three treatments.

6. The total weight yield of fruits among the three treatments.

7. The cost and return benefit derived from a 124.80 square meters experimental lot.

Tabulating the Data

After collecting, recording and tallying, the necessary data were tabulated as follows:

1. The average height of plants per hill, per treatment 15 days from transplanting up to initial fruiting. This was two-month period.

2. Analysis of variance for the average height of plants per hill, per treatment 15 days from transplanting up to initial fruiting.

3. The average crown of plants per hill, per treatment.

4. Analysis of variance for the average circumference of plants per hill, per treatment.

5. The average number of fruits per hill, per treatment every 15 days of harvest at the interval of three days per harvest up to three months period.

6. Analysis of variance for the average number

of fruits every 15 days of harvest at the interval of three days per harvest up to three months period.

7. The average length of fruits per hill, per treatment every 15 days of harvest at the same interval up to three months period.

8. Analysis of variance for the average length of fruits per hill, per treatment 15 days of harvest at the interval of three days up to three months period.

9. The average circumference of fruits per hill, per treatment. The same procedure.

10. Analysis of variance for the average circumference of fruits per hill, per treatment 15 days of harvest at the interval of three days per harvest, up to three months period.

11. The total weight yield of fruits per treatment every 15 days at the same interval up to three months period.

12. The analysis of variance of the total weight yield of fruits every 15 days of harvest at the interval of three days within three months period.

13. The cost and return analysis derived from the 124.80-square meter experimental lot within three months period.

Statistical Treatment of Data

The analysis of variance (ANOVA) for a randomized complete block design (RCBD) was used to determine the difference in the growth and yield responses of eggplant subjected to the three treatments. The less significant difference test was used to specify the particular pair of treatments that differ significantly.

Such statistical tool was at the same time used to evaluate the critical F-value if it falls within the region of acceptance or rejection of the null hypothesis. The following are the steps in the computation of the analysis of variance:

A. Find the Correction Factor

1. Correction Factor (CF) = $\frac{(\text{Grand Total})^2}{\text{No. of Blocks}}$

B. Calculate the Sum of Squares (S.S.) of the data:

1. Replication S.S. = $\frac{\text{Sums of Squares}}{\text{No. of Treatments}}$ − C.F.

2. Treatment S.S. = $\frac{\text{Sums of Squares}}{\text{No. of Replication}}$ − C.F.

3. Total S.S. = Sums of Squares − C.F.

4. Error S.S. = Total S.S. - R.S.S. - T.S.S.

C. The Sum of Squares are entered in analysis of variance (See appendix W on page 122).

D. Find the Mean Square (M.S.). To obtain the M.S. divide each number of squares by the corresponding number degree of freedom:

1. Replication M.S. = $\frac{\text{R.S.S.}}{\text{d.f.}}$

2. Treatment M.S. = $\frac{\text{E.S.S.}}{\text{d.f.}}$

E. Find the F-value for replication

$$\text{E.F. Value (R)} = \frac{\text{Replication M.S.}}{\text{Error M.S.}}$$

F. Find the F-value for Treatment

$$\text{E.F. Value (T)} = \frac{\text{Treatment M.S.}}{\text{Error M.S.}}$$

If the F-test gives highly significant results, the critical difference (C.D.) or the least significant difference is used to specify the particular pair of treatments that differ significantly.

The Least Significant Difference (LSD) test is the simplest and the most commonly used procedure for making pair comparisons. The procedure provided for a single LSD value at a prescribed level of significance, which serves as the boundary between significant and non-significant difference between any pair of treatment means. That is two treatments are declared significantly different at a prescribed level of significance if their difference exceeds the computed LSD value otherwise they are not significantly different.

The LSD test is most appropriate for making planned pair comparison but strictly speaking, is not valid for comparing all possible pairs of means, especially when the number of treatment is large. This is so because the number of possible pairs of treatment means increases rapidly as the number of treatments increases. (Gomez, 1984: 188).

The data gathered as to the average height and average crown of the plants were expressed in terms of centimeters. Measurement was observed 15 days from transplanting up to initial fruiting. This covered a two-month period. The average number of fruits was harvested with an interval of three days every 15 days up to three months period. The counting was done to obtain the average number of fruits per hill, per treatment. The average length and circumference of fruits was measured in terms of centimeters per hill, per treatment at the interval of three days per harvest within 15 days up to three months period. The total yield of fruits was measured in terms of kilograms per treatment.

Cost and return were computed to determine whether or not the experimental study had a profit, based on 124.80 square-meter area within three-month period of harvesting.

CHAPTER IV

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter covers the presentation of the data as well as their analysis and interpretation to enable the readers to draw information on the growth and yield responses of eggplant to commercial and agricultural lime under Catbalogan soil and climatic conditions. The data presented in this chapter specifically answer the questions posed in chapter 1, particularly under the statement of the problem. The foregoing data are those on the average height, crown, number of fruits, length of fruits, circumference of fruits per hill, per treatment and the total weight of fruits per treatment. It also includes the cost and return analysis of the experiment.

The Average Height of Eggplant Per Hill Per Treatment Every 15 Days from Transplanting up to Initial Fruiting

Table 1 shows the summarized data on the average height of eggplant per hill, per treatment starting on the 15th day after transplanting and every 15 days thereafter up to initial fruiting covering a period of two months. The results of the study show that there was a continued increase in plant height at each period of observation. It was observed that plants treated with agricultural lime were the tallest, having yielded an average height of 26.38 centimeters as against those with commercial lime with only 26.06 centimeters. Those not treated with lime were only 25.48 centimeters in average height. The data just presented indicate that eggplant responds more favorably to agricultural lime than to commercial lime and to no lime at all in so far as the height of plant is concerned.

Table 1

Average Height of Eggplant Per Hill Per Treatment Every 15 Days from Transplanting up to Initial Fruiting (in centimeters)

Treatment	Replications				Treatment	
	I	II	III	IV	Total	Mean
1	25.19	25.28	29.60	24.17	104.24	26.06
2	27.76	23.79	25.67	28.32	105.54	26.38
3	21.80	28.62	25.04	26.44	101.90	25.48
Replication Total	74.75	77.69	80.31	78.93		
Replication Mean	24.92	25.90	26.77	26.31		
Grand Total					311.68	
Grand Mean						25.97

Analysis of Variance on the Average Height of Plants Per Hill Per Treatment Every 15 Days from Transplanting up to Initial Fruiting

The analysis of variance on the average height of plants per hill per treatment revealed that replication and treatment have no significant effect on the growth in height of eggplant as the computed F-values of .23 and .10 for these two sources of variation, the replication and treatment, respectively, were less than the tabular F-value at both .05 and .01 levels of significance. This result simply indicates that blocking and the application of liming materials did not significantly influence the growth in height of plants.. Therefore, the first null hypothesis that "the average height of plants among the three treatments are significantly the same," is accepted.

Table 1a

Analysis of Variance on the Average Height of Plants Per Hill Per Treatment Every 15 Days After Transplanting up to Initial Fruiting

Source of Variation	d-f (n-1)	Sum of Squares	Mean Square/ Variance	Experimental F-Value	F-Table .05	F-Table .01
Replications	3	5.61	1.87	0.23^{ns}	4.76	9.78
Treatments	2	1.70	0.85	0.10^{ns}	5.14	10.92
Error	6	49.26	8.21			
Total	11	56.57				

ns = not significant

cv = 11.03%

This analysis and interpretation is made at the coefficient of variation of 11.03 percent which means that the measurement of data on the average height of the plants is 88.97 percent precise.

Average Crown of Eggplant Per Hill Per Treatment Every 15 Days After Transplanting up to Initial Fruiting

Table 2 shows the average crown of eggplant per hill, per treatment in centimeters after 15 days from transplanting up to two months period. It shows that plants grown on area planted with agricultural lime has the widest spread of leaves with a mean crown of 40.82 centimeters, while those plants planted to plots treated with commercially-prepared liming material ranked next with the average crown of 39.85 centimeters. The control plants exhibited a narrow spread of leaves with an average of 39.01 centimeters. The same observation gleaned on the growth of plants in terms of average height and average crown of the plants that the taller the plant and the wider its crown, the bigger and the longer the fruits were and the greater the yield, although the fewer the fruits harvested. The growth in terms of the average crown of plants was observed and compared to determine if the growth in terms of the spread of leaves of the eggplant among the three treatments significantly differ.

Table 2

Average Crown of the Plants Per Hill Per Treatment Every 15 Days After Transplanting up to Initial Fruiting (in centimeters)

Treatments	Replications I	II	III	IV	Treatment Total	Mean
1	38.79	32.18	43.28	45.31	159.56	39.89
2	38.12	29.45	43.15	42.56	163.28	40.82
3	35.26	41.04	43.73	36.00	156.03	39.01
Replication Total	112.17	112.67	130.16	123.87		
Replication Mean	37.39	37.56	43.39	41.29		
Grand Total					478.87	
Grand Mean						39.91

Analysis of Variance on the Average Crown of Plants Per Hill Per Treatment Every 15 Days After Transplanting up to Initial Fruiting

A statistical analysis was made on the average crown of plants per hill, per treatment during the period indicated thereof. This measure was used to test if the growth of the crown (spread of leaves) significantly vary among the three treatments.

The stȃtistical analysis on table 2a reveals that there was no significant difference among blocks or treatments as the experimental F-value are less than

Table 2a

Analysis of Variance on the Average Crown of Plants Per Hill Per Treatment Every 15 Days After Transplanting up to Initial Fruiting

Source of Variation	d-f (n-1)	Sum of Squares	Mean Square/ Variance	Experimental F-Value	F-Table .05	F-Table .01
Replications	3	77.64	25.880	1.71^{ns}	4.76	9.78
Treatments	2	6.57	3.285	0.22^{ns}	5.14	10.92
Error	6	91.03	15.172			
Total	11	175.24				

ns = not significant   cv = 9.76%

the tabular F-value at both .05 and .01 levels of significance. The coefficient of variation which is 9.76 percent shows that the measurement of data on the average crown of the plants is 90.24 percent reliable. Because the differences on the average crown of plants among treatments are not significant, the second null hypothesis is accepted.

Average Number of Fruits Per Hill Per Treatment Every 15 Days of Harvest at an Interval of three Days Per Harvest Within Three Months Period

Table 3 presents the data on the average number of fruits harvested per hill, per treatment every 15 days of harvest within three months period at an interval of three days per harvest.

Table 3

Average Number of Fruits Per Hill Per Treatment Harvested Every 15 Days at the Interval of Three Days Per Harvest Within Three Months Period

Treatments	Replications				Treatment	
	I	II	III	IV	Total	Mean
T_1	10.55	10.66	10.66	10.66	42.53	10.63
T_2	10.00	10.55	10.88	10.77	42.20	10.55
T_3	10.33	10.22	10.00	10.88	41.43	10.36
Replication Total	30.88	31.43	31.54	32.31		
Replication Mean	10.29	10.48	10.51	10.77		
Grand Total					126.16	
Grand Mean						10.51

As gleaned from the table, the plants subjected to the first treatment (with commercial lime) produced the most number of fruits with an average of 10.63 pieces followed by those plants under the second treatment (T_2-WAL) with a mean fruit harvest of 10.55 pieces. The control plants had the least number of fruits produced per hill with 10.36 pieces on the average. The total in all the four replications of the three treatments is 126.16 pieces and has a grand mean of 10.51 pieces.

Analysis of Variance on the Average Number of Fruits Per Hill Per Treatment Every 15 Days of Harvest at the Interval of Three Days Per Harvest Within Three Months Period

The results of the analysis of variance on the average number of fruits per hill, per treatment every 15 days of harvest at an interval of three days per harvest within the period of three months reflected in table 5a reveal that there is no significant difference in the number of fruits among blocks and among treatments as indicated by the computed F-values lower than the tabulated F-values at both .05 and .01 levels. This result implies that blocking and the use of liming materials have not affected greatly the production of eggplant fruits. This analysis and interpretation is made at a coefficient of variation of 2.85 percent, which shows a 97.15 precision in the measure used.

The third null hypothesis that "the average number of fruits among the three treatments are significantly the same" is accepted.

If evaluated in terms of profitability aspect, the use of commercial lime may even come out less profitable despite its little advantage as to the number of fruits because commercial lime is bought and agricultural lime is not. The only cost to be considered with regard to agricultural lime is that of the transportation.

Table 3a

Analysis of Variance on the Average Number of Fruits Per Hill per Treatment Within 15 Days of Harvest at an Interval of Three Days Per Harvest Within Three Months Period

Source of Variation	d-f (n-1)	Sum of Squares	Mean Square/ Variance	Experimental F-Value	F-Value .05	F-Value .01
Replications	3	0.35	0.12	1.33^{ns}	4.76	9.78
Treatments	2	0.16	0.08	0.89^{ns}	5.14	10.92
Error	6	0.54	0.09			
Total	11	1.05				

Average Length of Fruits Per Hill Per Treatment Every 15 Days of Harvest at the Interval of Three Days Per Harvest

Table 4 shows the average length of fruits per hill, per treatment in centimeters every 15 days of harvest at the interval of three days per harvest within three months period. Of the plants grown under lime treatments, those treated with agricultural lime were longer than those treated with commercial lime having an average length of 26.46 and 25.97 centimeters, respectively. The fruits harvested from the control plants were the shortest with a mean length of 24.78 centimeters. The grand total length of fruits in all of the four replication in three treatments is 308.86 centimeters thus making a grand mean of 25.74 centimeters.

Table 4

Average Length of Fruits Per Hill Per Treatment Every 15 Days of Harvest at the Interval of Three Days Per Harvest

Treatments	Replications I	II	III	IV	Treatment Total	Mean
T_1	24.96	26.72	26.98	25.23	103.89	25.97
T_2	26.20	26.57	24.63	28.46	105.86	26.46
T_3	24.06	28.94	22.10	24.01	99.11	24.78
Replication Total	75.22	82.23	73.71	77.70	308.86	
Replication Mean	25.07	27.41	24.57	25.90		
Grand Total					102.95	
Grand Mean						25.74

<u>Analysis of Variance on the Average Length of Fruits Per Hill Per Treatment</u>

The analysis of variance on the average length of fruits shown in table 4a, shows the corresponding computed F-value of 1.24 and 0.81 which are less than the tabular F-values at .05 and .01 levels of significance among replications and treatments. The same table also shows

Table 4a

Analysis of Variance on the Average Length of Fruits Per Hill Per Treatment

Source of Variation	d-f (n-1)	Sum of Squares	Mean Square/ Variance	Experimental F-Value	F-Value .05	F-Value .01
Replications	3	13.884	4.628	1.24^{ns}	4.76	9.78
Treatments	2	6.024	3.012	0.81^{ns}	5.14	10.92
Error	6	22.294	3.716			
Total	11	42.202				

ns = not significant

cv = 7.49%

a coefficient of variation of 7.49 percent which indicates that the measure is 92.51 percent reliable. The fact that the differences on the average length of fruits among treatments are not significant the fourth null hypothesis is therefore accepted.

Average Circumference of Fruits Per Hill Per Treatment Every 15 Days of Harvest at the Interval of Three Days Per Harvest

Table 5 presents the average circumference of fruits harvested every 15 days at the interval of three days per harvest within three months period. The fruits were measured in terms of centimeters at the middle portion, using a tape measure.

Table 5

Average Circumference of Fruits Per Hill Per Treatment 15 Days Harvest at the Interval of Three Days Per Harvest

Treatments	Replications				Treatment	
	I	II	III	IV	Total	Mean
T_1	11.29	11.48	11.12	11.46	45.35	11.34
T_2	11.89	11.88	12.16	12.10	48.03	12.01
T_3	10.88	11.06	11.24	11.58	44.76	11.19
Replication Total	34.06	34.52	34.52	35.14		
Replication Mean	11.35	11.47	11.51	11.71		
Grand Total					138.14	
Grand Mean						11.51

As shown in the table, the fruits harvested from the second treatment (T_2-agricultural lime) are the biggest with a mean circumference of 12.01 centimeters. Those fruits produced from plants grown on plots treated with commercial lime (T_1) ranks next with a circumference of 11.34 centimeters on the average and those fruits harvested from the control plants had a mean circumference of 11.19 centimeters. The grand total of all replications in the three treatments is 138.14 and the grand mean is 11.51 centimeters.

Analysis of Variance on the Average Circumference of Fruits Per Hill, Per Treatment

Table 5a shows the analysis of variance of the average circumference of eggplant fruits per hill, per treatment in terms of centimeters every 15 days of harvest at the interval of three days per harvest within three months period.

Table 5a

Analysis of Variance on the Average Circumference of Fruits Per Hill Per Treatment

Source of Variation	d-f (n-1)	Sum of Squares	Mean Square/ Variance	Experimental F-Values	F-Table .05	F-Table .01
Replications	3	0.202	0.067	1.91 ns	4.76	9.78
Treatments	2	1.519	0.760	21.71 **	5.14	10.92
Error	6	0.212	0.035			
Total	11	1.933				

ns = not significant cv = 1.62%

** = highly significant at .01 level and .05 level

The result of the analysis reveals that blocking did not effect significantly the yield of eggplant in terms of its average circumference. However, there existed a highly significant difference on the average circumference of fruits among treatments as the experimental F-value of 21.71 exceeds the tabular F-value of 5.15 and 10.92 at both .05 and .01 levels of significance. Therefore, the null hypothesis that "the average circumference of fruits among the three treatment are significantly the same" is rejected.

The above findings indicate that application of liming materials has a significant effect on the performance of eggplant fruit in terms of its average circumference of fruits harvested. The same analysis of variance presents that the coefficient of variation is 1.62 percent which expresses that there is an experimental error of a little less than 2.0 percent of the mean.

To compute the significant difference among the treatments, the least significant difference among the treatments, the least significant difference (LSD) test was used. Table 5b shows the Comparison of treatment means on the average circumference of fruits harvested per treatment by least significant difference test.

The results of the least significant difference (LSD) test shows that treatment two (T_2-with agricultural lime) differs significantly from the first treatment (T_1- with commercial lime) and the third treatment (T_3-control) as their mean difference of 0.67 and 0.82,

Table 5b

Comparison of Treatment Means on the Average Circumference of Fruits Harvested Per Treatment

Treatment	Treatment Mean	Mean Difference
T_1 vs T_2	11.34 - 12.01	0.67^{**}
T_1 vs T_3	11.34 - 11.19	0.15^{ns}
T_2 vs T_3	12.01 - 11.19	0.82^{**}

ns = not significant LSD 0.05 = 0.32

** = highly significant LSD 0.01 = 0.49

respectively, is greater than the LSD value of 0.32 at 0.05 and 0.49 at .01 level of significance. The results of the three pair comparisons point out that agricultural lime is superior to commercial lime with regard to its effect on the response of eggplant in so far as the circumference of fruits is concerned.

Fruit Yield in Kilograms Per Treatment Within Three Months from the First Harvest

Table 6 are the data on the yield responses of eggplant to the application of liming materials in terms of weight of fruits in kilograms per treatment.

Table 6

Fruit Yield in Kilograms Per Treatment Within Three Months from the First Harvest

Treatment	Replications I	II	III	IV	Treatment Total	Mean
T_1	15.0	15.1	14.3	15.5	59.9	14.98
T_2	15.4	16.3	16.2	16.3	64.1	16.02
T_3	14.8	13.9	13.4	15.0	57.1	14.28
Replication Total	45.1	45.3	43.9	46.8		
Replication Mean	15.03	15.1	14.63	15.6		
Grand Total					181.1	
Grand Mean						15.09

Among the three treatments the second treatment (T_2-with agricultural lime) had the heaviest fruit yield with a mean of 16.02 kilograms while the first treatment (T_1-with commercial lime) produced the next heaviest fruit yield with a mean yield of 14.98 kilograms. Fruits harvested from the control plants weighed only 14.28 kilograms on the avergae.

<u>Analysis of Variance on Fruit Yield in Kilograms Per Treatment</u>

The statistical analysis on the fruit yield, as reflected in table 6a, shows that there exists no significant difference on the weight yield of fruits harvested among blocks but a significant difference was observed among treatments, hence the null hypothesis that "the total weight yield of fruits among the three treatments are significantly the same" is rejected.

Table 6a

Analysis of Variance on Fruits Yield in Kilograms Per Treatment

Source of Variation	d-f (n-1)	Sum of Squares	Mean Square/ Variance	Experimental F-Value	F-Table .05	F-Table .01
Replications	3	1.416	0.472	1.62^{ns}	4.76	9.78
Treatments	2	6.207	3.104	10.67^{*}	5.14	10.92
Error	6	1.746	0.291			
Total	11	9.369				

ns = not significant   cv = 3.57%

* = significant at .05 level

The results on the same analysis imply that the yield response of eggplants to the three treatments tested significantly differed as evaluated by observable variation on the weight yield of harvested fruits. This analysis and interpretation is made at a coefficient of variation of 3.57 percent. In other words, the data on the weight yield of fruits harvested among treatments is 93.37 percent reliable. The experimental error made may be attributed to the weighing instrument or to the measurement process.

Statistical Comparison on Treatment Means Using the Least Significant Difference

Statistical comparison on treatment means using the least significant difference test was done to specify the pair of treatments that differ significantly.

Table 6b

Statistical Comparison on Treatment Means Using the Least Significant Difference

Treatment	Treatment Mean	Mean Difference
T_1 vs T_2	14.98 - 16.02	1.04^{*}
T_1 vs T_3	14.98 - 14.28	0.78^{ns}
T_2 vs T_3	16.02 - 14.28	1.74^{**}

* = significant at .05 percent level

ns = not significant LSD 0.05 = 0.93

** = significant LSD 0.01 = 1.41

Results obtained from the test reveal that highly significant difference occurs between treatment two (T_2-with agricultural lime) and treatment three

(T_3-control) with a mean difference of 1.74 as against the LSD value of 1.41 at .01 level of significance. Treatment one (T_1-with commercial lime) and treatment two (T_2-with agricultural lime) differ significantly, having a difference of 1.04, which exceeds the LSD value of 0.93 at .05 level. However, a negligible difference existed between treatment one (T_1-with commercial lime) and treatment three (T_3-control) with a mean difference of .070 which is smaller than the LSD value at either the .05 or .01 levels of significance.

Cost and Return Analysis of Research on Eggplant Production Using 124.80-Square Meter of Land

Table 9 shows the estimated average cost of production and return analysis of eggplant production per 124.80 square meter of land. The net income was computed by subtracting the cost of production from the total yield income at producer's price of ₱6.00 per kilo. Thus 181.1 kilogram of fruits at ₱6.00/kilo is equal to ₱1,086.60 - ₱481.70 = ₱604.90.

The following is the cost and return analysis of eggplant production in an experimental lot of 124.80 square meters when the fruits are sold at a minimal farm price of ₱6.00 per kilo as in the case of this study:

Total income from 181.1 kg . . . . . ₱1,086.00

Less production cost 481.00

Net income P604.00

Assuming that a gardener is capable of cultivating one fourth of a hectare or 2500 square meters, a net income of P12,117.25 may be generated every three or four months or a monthly net income of P4,039.08. This computation was made by roughly doubling the experimental lot of 124.80 square meters, thus resulting in 249.60 square meters or putting it roughly at 250 square meters.

Table 7

Cost and Return Analysis of the Research on Eggplant Production (Using 124.80 Square Meter Area of Land)

Activities	Man/day (P15.00)	Man-Animal/day (P25.00)	Cost
I - LABOR COST			
A. Land Preparation			
a. Clearing the site	1 day	3 days	P15.00
b. Plowing	2 days	3 days	75.00
c. Harrowing		2 days	50.00
d. Layouting and construction of plots	2 days		30.00
B. Sowing the Seeds			7.50
C. Care of Seedlings	2 days		30.00
D. Transplanting	1 day		15.00

	Man/Day (₱15.00)	Man-Animal/ day (₱25.00)	Cost
E. Weeding and Cultivation (2 times)	5 days		₱75.00
F. Control of Pest and Diseases	2 days		30.00
G. Harvesting and Hauling of Fruits (3 times)	3 days		45.00
		Total . .	₱372.00

II - COST OF FARM INPUTS

A. Seeds	₱ 3.00
B. Agricultural lime	10.00
C. Commercial lime	20.00
D. Fertilizer	3.00
E. Chemicals for Pests and Diseases Control	16.00
F. Bamboo Fence	20.00
G. Poles	16.00
H. Nails	4.75
Total . . .	₱109.20

Total Production Cost . . . . ₱481.70

TOTAL YIELD IN KILOGRAMS BY TREATMENT

T_1 - (with commercial lime) = 59.9 kg.

T_2 - (with agricultural lime) = 64.1 kg.

T_3 - (control) = 57.1 kg.

T o t a l . . . . 181.1 kg.

at ₱6.00/kilo . . . . . . ₱1,086.60

NET INCOME . . . . ₱ 604.90

Estimated Cost and Return Analysis of Eggplant Production in a Hectare of Land Within Three Months

As shown in appendix X on page 143 the production cost is equal to ₱38,597 per hectare. The computation is based on the total production cost from a 124.80 square meter of lot (experimental lot). The forecasted total yield of eggplant fruits is 14511.22 kilograms at ₱6.00 per kilo, thus makes a total income of ₱87,067.30. Subtracting the production cost from the total yield income, the forecasted net income will amount to ₱48,469.55.

The computation of the total net income is based only on a three-month-period of harvesting the fruits. Assuming that there is a market for eggplant within the region and a gardener is capable of cultivating only one fourth of a hectare or 2500 square meters, a net income of ₱12,117.25 may be generated every three or four months or a monthly net income of ₱4,039.08.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study was conducted to determine the growth and yield responses of eggplant to commercial and agricultural lime under Catbalogan soil and climatic conditions. Specifically, it sought answers to the following questions:

1. What is the performance of eggplant under Catbalogan soil and climatic conditions in response to commercial and agricultural limes in terms of:

   1.1 average height of the plant per hill per treatment every 15 days from transplanting up to initial fruiting?

   1.2 average crown of the plant per hill per treatment every 15 days after transplanting up to initial fruiting?

   1.3 average number of fruits per hill per treatment every 15 days of harvest at an interval of three days per harvest within two-month period?

   1.4 average size (length and circumference) of fruits per hill per treatment every 15 days of harvest at an interval of three days per harvest?

1.5 total weight of fruits in kilograms per treatment within three months from the first harvest?

2. What is the cost and return analysis of the experiment on eggplant production?

This study employed the experimental method adopting the Randomized Complete Block Design (RCBD). This was conducted in the Ministry of Agriculture and Food (MAF) compound just adjacent to the right front yard of the MAF Administration Building, Catbalogan, Samar, covering the period from November 7, 1984 to May 31, 1985. The experimental area used was 8.0 x 15.60 meters or a total of 124.80 square meters with a clay loam soil. The area was divided into blocks or rows with three sub-blocks per row replicated four times to represent each treatment. Each block measures 1.00 x 4.20 meters or 4.20 square meters. Treatment one (T_1) was treated with 1.05 kilograms of commercial lime; treatment two (T_2), with 1.05 agricultural lime; and treatment three (T_3), without lime. Each block consisted of 12 hills spaced at 60 x 60 centimeters center to center. The test crop used was the EG long purple variety. There were two major independent variables in this study. The independent variables are the two kinds of lime (the commercial and the agricultural lime). The dependent variables are the growth and yield responses of eggplant in terms of average height of the plant, average circumference of the plant, average number of fruits, average size (length and circumference of fruits) and the total weight of fruits in kilograms.

To determine the effect of the independent variables upon the dependent variables, the statistical measure used was the Analysis of Variance (ANOVA).

Findings. The following are the findings of the study: (1) the plants treated with agricultural lime were the tallest having a mean height of 26.38 centimeters; (2) plants treated commercial lime ranks second with a mean height of 26.06 centimeters; (3) the control plants (without lime treatment) ranks last with a mean height of 25.48 centimeters.

As to the average crown of the plants, the following results were observed: (1) plants fertilized with agricultural lime had the widest crown (spread of branches and leaves) with a mean circumference of 40.82 centimeters; (2) those treated with commercial lime ranks second, having a mean circumference of 39.85 centimeters; and (3) the control plants had the narrowest crown, having registered a mean circumference of only 39.01 centimeters.

With regard to the average number of fruits, commercial lime had the highest effect with a mean of 10.63 fruits per hill per treatment every 15 days of harvest within three-months period at an interval of three days per harvest. Those fertilized with agricultural lime follows with a mean of 10.55 fruits, while the control plants is the last, having a mean of 10.36 fruits.

Considering the size of the fruits, those harvested from the plots treated with agricultural lime were the longest and biggest, having a mean length and circumference of 26.46 and 12.01 centimeters, respectively. Those with commercial lime follows with means 25.97 and 11.34 centimeters, respectively. The shortest and smallest came from plots without lime treatment with a mean length of 24.78 centimeters and a mean circumference of 11.19 centimeters.

The total yield of the fruits in kilograms were registered as follows: (1) 16.02 kilograms for the plants treated with agricultural lime; 14.98 kilograms for those treated with commercial lime; and 14.28 for the control plants.

Conclusions

Based on the findings just presented, the following conclusions are drawn:

1. Under the soil and climatic conditions of Catbalogan, eggplants respond better to agricultural lime than to commercial lime in terms of the average height, crown of plants, length and circumference of fruits, and the yield in kilograms.

2. Commercial lime has a better effect than agricultural lime on eggplants in terms of the average number of fruits.

3. Eggplant exhibits a better performance when planted in soil treated with either commercial or agricultural lime than in soil without lime treatment.

Although the variance in yield is insignificant under small scale production, as in the case of this study, the little advantage derived from the use of liming materials may lead to a larger profit in large-scale farming as proven by the cost and return analysis.

Recommendations

On the basis of the conclusions drawn from the findings of this study, the researcher makes the following recommendations:

1. Agricultural lime is recommended for eggplant production under the soil and climatic conditions of Catbalogan, Samar.

2. In the absence of agricultural lime, commercial lime is also recommended.

3. A study on the market of eggplant on a regionwide basis is also recommended.

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A P P E N D I C E S

APPENDIX A

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

January 30, 1984

The Dean of Graduate Studies
Samar State Polytechnic College
Catbalogan, Samar

S i r :

In my desire to start writing my thesis proposal, I have the honor to request approval of one of the following topics, for my thesis, particularly topic no. one:

1. EFFECTS OF SAND AND ASHES ON THE YIELD OF EGGPLANT IN THE SOIL OF CATBALOGAN, SAMAR

2. YIELD RESPONSES OF THE CORN VARIETY AT DIFFERENT LEVELS OF APPLYING COW MANURE AT CATBALOGAN, SAMAR

3. RELATIONSHIP BETWEEN THE REACTION OF TRADITIONAL AND MODERN FARMERS TOWARDS MASAGANA 99 IN THE PROVINCE OF SAMAR

I hope for your favorable action in this regard.

Very truly yours,

(SGD.) FELICISIMA O. ORALE
Graduate Student

Recommending Approval:

(SGD.) ALEJANDRO E. CANANUA, M. Ed.
Head, Research & Development

Approved Problem No. 1

(SGD.) DOMINADOR Q. CABANGANAN, Ed. D.
Dean of Graduate Studies

APPENDIX B

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

May 25, 1984

The Dean of Graduate Studies
Samar State Polytechnic College
Catbalogan, Samar

S i r :

I have the honor to request for a change of my approved research problem to:

GROWTH AND YIELD RESPONSES OF EGGPLANT TO COMMERCIAL AND AGRICULTURAL LIME UNDER CATBALOGAN SOIL AND CLIMATIC CONDITION

Instead of:

EFFECTS OF SAND ASHES ON THE YIELD OF EGGPLANT IN THE SOIL OF CATBALOGAN, SAMAR

I hope for your favorable consideration in this regard.

Very truly yours,

(SGD.) FELICISIMA O. ORALE
Graduate Student

Recommending Approval:

(SGD.) ALEJANDRO E. CANANUA, M. Ed.
Head, Research & Development

APPROVED:

(SGD.) DOMINADOR Q. CABANGANAN, Ed. D.
Dean of Graduate Studies

APPENDIX C

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

GRADUATE SCHOOL

APPLICATION FOR ASSIGNMENT OF ADVISER

Name: ORALE, FELICISIMA ORSAL
Family Name First Name Middle Name

Candidate for Degree in Master of Arts in Teaching Vocational Education (MATVE)

Area of Specialization AGRICULTURAL ARTS

Title of Proposed Thesis

GROWTH AND YIELD RESPONSES OF EGGPLANT TO COMMERCIAL AND AGRICULTURAL LIME UNDER CATBALOGAN SOIL AND CLIMATIC CONDITIONS

Name of Requested Adviser ALEJANDRO E. CANANUA, M. Ed.

Approval of Adviser SGD. ALEJANDRO E. CANANUA, M. Ed.
Signature

Disapproval ____________________
Signature

Approved:

(SGD.) DOMINADOR Q. CABANGANAN, Ed. D.
Dean of Graduate Studies

APPENDIX D

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

October 15, 1984

The Dean of Graduate Studies
Samar State Polytechnic College
Catbalogan, Samar

S i r :

I have the honor to submit the final draft to my thesis proposal for your perusal and scrutiny, after which I will produce five (5) copies for the pre-oral examination.

In this connection, may I request that I be scheduled for pre-oral defense on Sunday, October 28, 1984 per master plan.

I hope for your favorable action on this matter.

Very truly yours,

(SGD.) FELICISIMA O. ORALE
Graduate Student

Recommending Approval:

(SGD.) ALEJANDRO E. CANANUA, M. Ed.
Adviser

Approved October 31, 1984 at 2:00 P.M.

APPROVED:

(SGD.) DOMINADOR Q. CABANGANAN, Ed.D.
Dean of Graduate Studies

APPENDIX E

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

September 2, 1984

The Provincial Agricultural Officer
Ministry of Agriculture
Catbalogan, Samar

S i r :

I have the honor to request permission from your good office to use the vacant lot at the side of the Ministry of Agriculture Office for my experimental study entitled "GROWTH AND YIELD RESPONSES OF EGGPLANT TO COMMERCIAL AND AGRICULTURAL LIME UNDER CATBALOGAN SOIL AND CLIMATIC CONDITIONS."

I anticipate with gratitude your kind and favorable consideration on this request.

Very truly yours,

(SGD.) FELICISIMA O. ORALE
Researcher

A P P R O O V E D :

(SGD.) ANSELMO B. BARON, SR.
Provincial Agricultural Officer

APPENDIX E-1

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

June 2, 1986

The Dean of Graduate Studies
Samar State Polytechnic College
Catbalogan, Samar

S i r :

I have the honor to submit the six (6) copies of my reproduced semi-final draft to be distributed to my adviser, the dean and the members of the panel of examiners.

In this connection, I further request that I be scheduled for the final oral defense within the second week of June, preferably on June 21, 1986.

I hope for your favorable action on this matter.

Very truly yours,

(SGD.) FELICISIMA O. ORALE
Graduate Student

Recommending Approval:

(SGD.) ALEJANDRO E. CANANUA, M. Ed.
Adviser

APPROVED:

(SGD.) DOMINADOR Q. CABANGANAN, Ed. D.
Dean of Graduate Studies

APPENDIX E-2

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

November 30, 1986

The Dean of Graduate Studies
Samar State Polytechnic College
Catbalogan, Samar

S i r :

I have the honor to submit my final draft for the signature of the Panel Members. This draft has been reviewed by the researcher and properly edited by the adviser and all suggestions where incorporated therein.

Very truly yours,

(SGD.) FELICISIMA O. ORALE
Graduate Student

Recommending Approval:

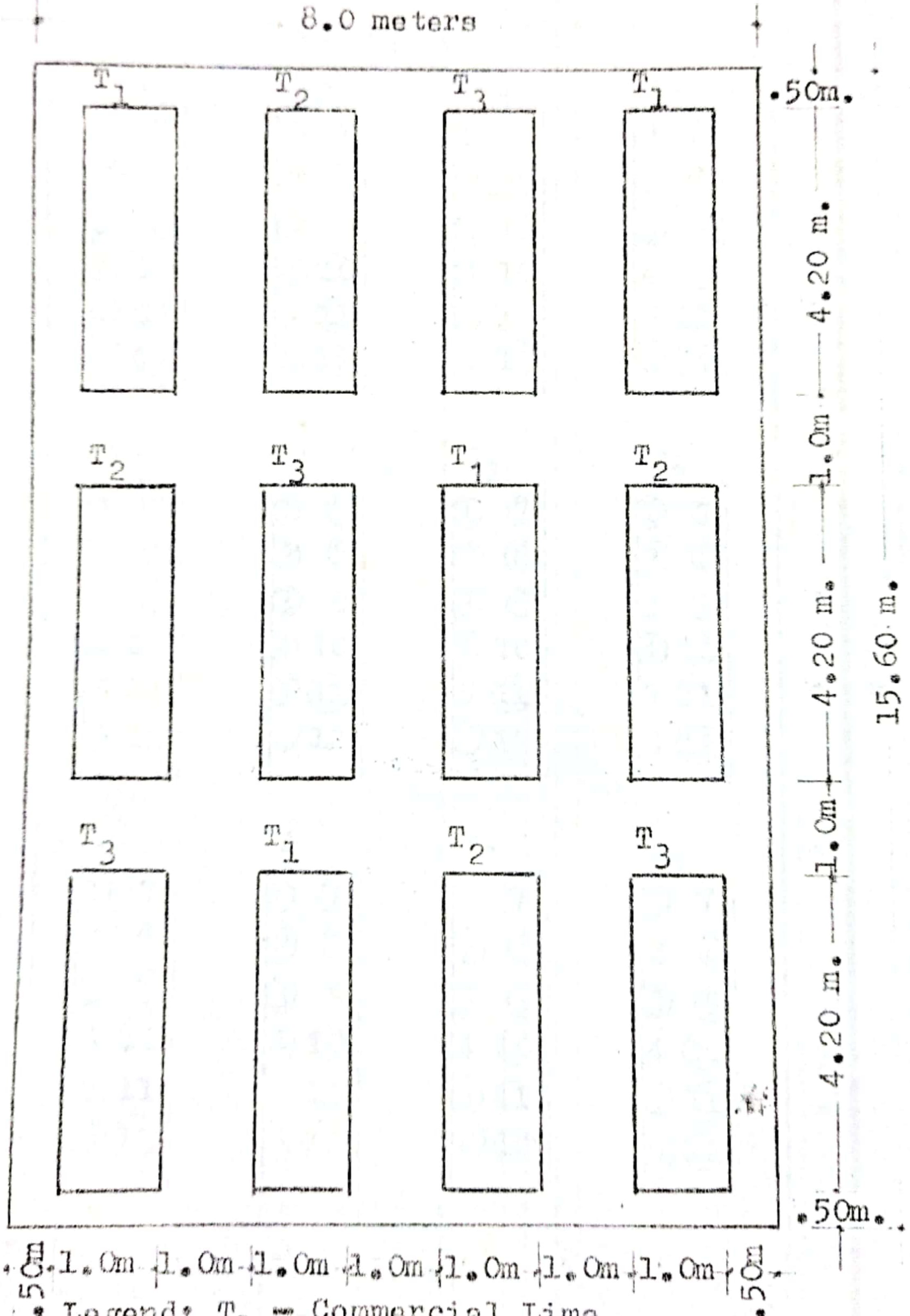
(SGD.) ALEJANDRO E. CANANUA, M.Ed.
Adviser

APPROVED:

(SGD.) DOMINADOR Q. CABANGANAN, Ed.D.
Dean of Graduate Studies

APPENDIX F

EXPERIMENTAL DESIGN
(Randomized Complete Block Design)



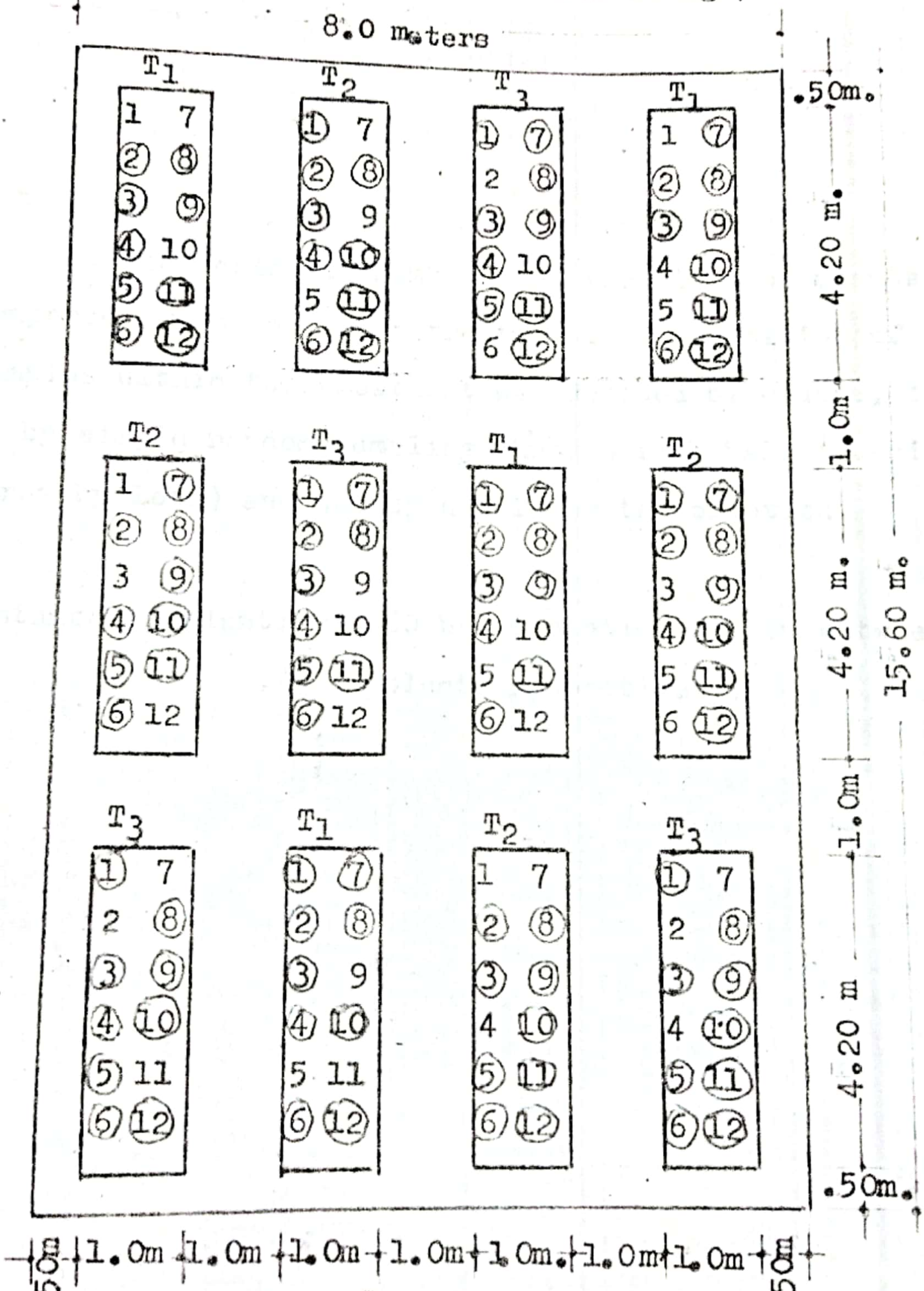
Legend: T_1 - Commercial Lime

T_2 - Agricultural Lime

T_3 - Control (no lime)

APPENDIX G

THE SAMPLES
(Encircled)
(Randomized Complete Block Design)



Legend: T_1 – Commercial Lime
T_2 – Agricultural Lime
T_3 – Control (no lime)

APPENDIX G
(Cont'd.)

THE SAMPLES

Note:

The encircled numbers are the hills or plants that composed the samples per treatment. The position of the samples within the treatment was decided by chance, that is by simple random sampling through fish ball technique (draw by lots) and not by a deliberate selection.

Distance of planting: 60 by 60 centimeters in between plants respectively.

APPENDIX H

CHEMICAL ANALYSIS USING A SOIL TEST KIT

Analysis by the soil Test Kit is a quick method of evaluating the fertility status of a soil. It involves a chemical analysis that measures what amount of nutrients in the soil that are available to the plant. Results are interpreted and used as a basis in making a recommendation on the right kind and amount of fertilizer for a particular crop when grown in the soil being tested.

The SOIL TEST KIT is a complete package of soil testing. It uses simple colorimetric chemical analysis in which chemical reagents are made to react with a soil sample in a test tube to give a characteristics color depending on the amount of available nutrients in the soil. The colors produced are then matched with a standard color chart which rates whether the soil is low, medium, or high in-available nitrogen, phosporus or potassium. Also determined in similar manner is soil pH or acidity.

The SOIL TEST KIT is cheap, quick, handy and easy to use. It does not require sophisticated laboratory instruments and specialized training for the user. Soil testing can be done right in the fields and results are obtained within the hour. It is, therefore, a useful tool to farmers and extension workers who, oftentimes, need immediate answer to the question of what kind and amount of fertilizer to use for a crop grown in a particular soil.

The SOIL TEST KIT is a small box 19 cm x 11 cm x 11 cm, weighing about one kg. It contains chemical reagents, procedure and color charts, tables of fertilizer recommendations for various crops, and procedure for proper sampling technique. It is a produce of research from the Department of Soil Science, University of the Philippines at Los Baños in cooperation with the National Food and Agriculture Council.

Important Reminders on the Use and Care of the Soil Test Kit

- Analyze or test only soil samples that are properly collected (See guide; proper soil sampling).
- Avoid contamination. Use only the test tube designated for the element being analyzed. For example, use test tube labelled N for testing nitrogen, K for potassium, P for phosphorus and pH for soil pH,
- Use clean and preferable dry test tube.
- Do not interchange droppers and caps. To avoid this, immediately put back the dropper or cap into the corresponding bottle after each use. Always keep bottles tightly covered.
- Do not smoke during soil sampling or analysis.

- The chemicals are corrisive and poisonous. Avoid inhalation or contact with your skin or clothing.
- Keep the test kit away from the reach of children. Store it in cool and dry place.
- When chemical reagents run out refills can be bought at the Department of Soil Science or a designated refill center at nominal cost.

Proper Soil Sampling

The main objective of soil sampling is to collect a small amount of soil sample weighing about one half kg. that will represent the soil in a large area, e.g., one hectare furrow slice that weighs about 2 million kg. Since only a small amount of soil sample is used in chemical analysis and results are projected for a large quantity of soil, the accuracy of soil testing depends on proper soil sampling.

Using the most common farm tools and materials such as shovel or spade, knife of trowel, small pail and plastic bags, the following are steps on proper soil sampling technique.

1. Make a map of the farm showing sampling areas.

   Divide the farm into sampling areas. Each sampling area should be more or less uniform in cropping history, past lime and fertilizer treatments, slope, degree of erosion, soil texture, and color. Each sampling area should be not more than five hectares.

2. Collect spot soil samples from each sampling area.

In each sampling area, dig five to 10 pits and collect spot soil sample in each pit. The number of spot samples (marked x in the illustration) depends on the following manner:

a. Before digging the pit, clear the soil surface litters and vegetation:

b. Using spade or shovel, dig a pit to a depth of 20 to 30 cm.

c. From one vertical side of the pit, take a slice of soil two to three cm. thick with a single downward thrust of the spade. Using a knife of a trowel, trim the slice of soil on both sides to a bar of three to four centimeters width. The bar of soil (representing one spot of soil sample) is then placed in the pail or any suitable clean container. If subsoil sample is needed, take a bar of soil from the succeeding 20 to 30 cms. soil depth. The subsoil and surface samples should be placed in separate containers. Cover the pit and move to another spot.

3. Take composite soil sample.

After collecting all the spot soil samples of a particular sampling area, pulverize, mix thoroughly and remove stones and fresh leaves from the soil sample in the container. A composite soil sample (about 1/2 kg.) is taken from the pail and placed in a clean plastic bag. The composite soil sample which represents the soil sampling area is ready for chemical analysis using a Soil Test Kit or may be sent to a Soil Testing Laboratory with pertinent label and information.

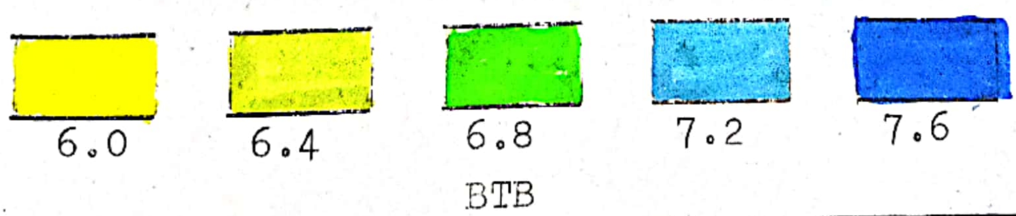
Source: The Department of Soil Science, U.P. at Los Baños, Laguna.

APPENDIX I

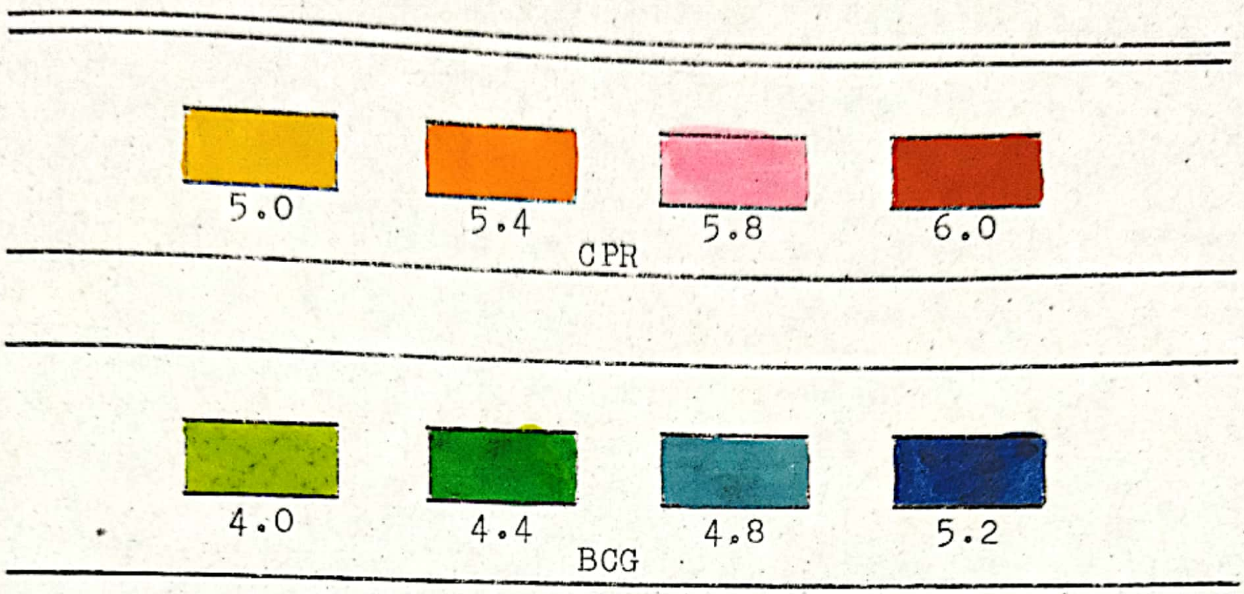
PROCEDURE ON HOW TO DETERMINE SOIL pH USING "UPLB" SOIL QUICK TEST

SOIL pH

1. Fill the test tube with soil sample up to scratch mark.
2. Add 10 drops of CPR pH indicator dye.
3. Mix by gently swirling the test tube 20 times.
4. Repeat step 3 after about two minutes and let the test tube stand for 5 minutes.
5. To get the pH of the soil match the color of solution on top of the soil with corresponding color chart of pH indicator dye used.
6. If soil pH is equal to or greater than 6 repeat steps 1 to 5 using BTB instead of CPR. However, if soil pH is less than or equal to 5 repeat steps 1 to 5 using BCG instead of CPR.
7. Wash test tube with tap water and then rinse with distilled water.



APPENDIX I (Continued)



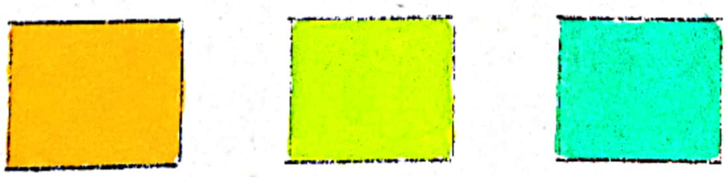
Source: The Department of Soil Science, U.P. at Los Baños, Laguna.

APPENDIX J

PROCEDURE ON HOW TO DETERMINE THREE IMPORTANT ELEMENT IN THE SOIL USING "UPLB" SOIL QUICK TEST

A. Nitrogen Test

1. Fill the test tube with soil sample up to the scratch mark.
2. Add 18 drops (1 ml.) of solution B.
3. Mix well by gently swirling the test tube 30 times.
4. Repeat step 3 after about 5 minutes and let the test tube stand for 30 minutes.
5. Match the color of the resulting solution on top note if the soil is low, medium or high in available nitrogen.
6. Refer to the table on FERTILIZER RECOMMENDATION FOR DIFFERENT CROPS.
7. Wash the test tube with tap water and then rinse with distilled water.



Low Medium High

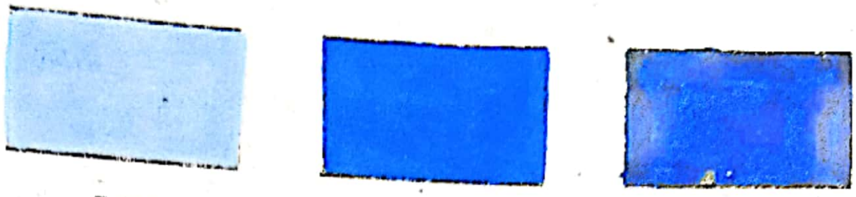
B. Phosphorus Test

1. Fill the test tube with soil sample up to the

scratch mark.

2. Add 16 drops or (1 ml.) of solution C and two drops of solution C_1. (Use the dropper of solution C to C_1).
3. Mix well by gently swirling the tube for about one minute.
4. Repeat step 3 after three minutes and let the test tube stand for five minutes.
5. Take one foil or tin strip and wrap it firmly at one end of the plastic stick.
6. Without disturbing the soil, stir the solution slowly with the tin strip for one minute. Repeat this step after about two minutes. (Note: the tin strip attached to the plastic can still be used for another set of four samples provided that analyses are done on the same day). Rinse the tin strip with distilled water after each analysis.
7. Match the blue color intensity of the solution with the color chart below and take note if the soil is low, medium, or high in available phosphorus.
8. Refer to the table on FERTILIZER RECOMMENDATION FOR DIFFERENT CROPS.
9. Wash the test tube with tap water and then rinse

with distilled water.



LOW MEDIUM HIGH

C. Potassium Test

1. Fill the test tube with soil up to the scratch mark.

2. Add 16 drops or (1 ml.) of solution D and four drops of solution D_1. Use the dropper of solution D for D_1.

3. Mix well gently swirling the tube for about one minute.

4. Repeat step 3 after about three minutes and let stand for five minutes or until the soil particles have settled at the bottom of the tube.

5. Add solution E as follows:

   a. slowly insert the dropper containing 0.6 ml. of solution E inside the test tube so that its tip is about two centimeters above the solution.

   b. slowly add 14 drops of solution E one drop at a time.

   c. do not mix or shake the solution

6. Let it stand for two minutes. Then observe the appearance of a cloudy yellow layer on top of the orange solution. A DISTINCT CLOUDY YELLOWISH LAYER indicates that soil has SUFFICIENT AVAILABLE POTASSIUM. There is no need to apply potassium fertilizers.

7. If no distinct cloudy yellowish layer appears on top of the orange solution, the soil is DEFICIENT in available potassium. Refer to the table on FERTILIZER RECOMMENDATION FOR DIFFERENT CROP.

Source: The Department of Soil Science, U.P. at Los Baños, Laguna.

APPENDIX K

SAWDUST AND SAND, STORE FRUITS AND VEGETABLES

The most common problem of farmers and housewives, especially in the rural areas, is the proper storage of newly harvested fruits and vegetables.

They just concluded Agritech/Aquatech '85 last April 10-14, features a very practical way of storing fruit and vegetables by using moist sawdust and sand.

The vegetables like eggplant and tomatoes can be kept in moist sawdust. However, newly harvested, disease and injury-free vegetables should be stores.

Wash the vegetables and fruits to be stores, preferably with chlorox to achieve longer storage life. One tablespoon of chlorox in every one liter of water. Air dry to remove excess water. Use this solution to moisten the sawdust.

Use clean and pure sawdust. If it has been used before, sterilize it by sun drying. Remove splinters to prevent then from injuring the commodities.

Moisten a kilo of sawdust with one liter of water. This can store one kilogram of tomatoes or eggplants.

Mix sawdust and water thoroughly. Put in a container or on clean floor in a cool, ventilated area. Bury the vegetables in the moist sawdust on a layer-by-layer arrangement. The first layer consists of sawdust, then layer of vegetables, a cover of sawdust and so on. Each layer of vegetables should be left covered with a medium-thick moist sawdust.

Eggplant can be stored for one week, while potatoes, tomatoes, mangoes and others can be stored for a short period of time. This method is not applicable for leafy vegetables.

When storing citrus fruits, use sand instead of sawdust. Sand can't be used for fruits and vegetables that can be easily bruised.

Source: Science News Service
Year 4 No. 153 May 8, 1985

APPENDIX L

CATBALOGAN CLAY LOAM

Description

1. Formation and origin. Primary soil developed from shades and sandstones.

2. Profile

   A. Surface soil. Grayish brown to dark gray when moist, light grayish brown to gray when dry; coarse granular to blocky clay loam to silty clay loam with an easy root penetration. Boundary to lower layer is gradual. Depth is 10 to 30 centimeters.

   B_1. Upper subsoil. Light yellowish brown. Coarse granular to blocky clay loam with an easy root penetration. Grayish brown spots with some crumbs and framents of highly weathered shale. Boundary to lower layer is diffused. Depth is from 25 to 50 centimeters from the surface.

   B_2. Lower subsoil. Yellowish gray to light gray, blocky clay loam with crumbs and blocks of highly weathered shale. The crumbs and blocks give either reddish brown to coloration or reddish black tints when cut. Boundary to substratum is diffused. Depth ranges from

APPENDIX L (Continued)

45 to 90 centimeters from the surface.

C. Substratum. Yellowish gray to pinkish brown clay loam with reddish brown freckles of highly weathered and partly massive, stratified shale and sandstone.

3. Relief. Rolling of hilly and mountainous.

4. Drainage. Excellent to excessive surface drainage. fair to poor internal drainage.

5. Vegetation. Talahib, cogon, aguinay, secondary and primary forests, and agricultural crops.

Source: Soil Series Notes and Soil Mapping Procedure, Bureau of Soils, p. 263.

APPENDIX M

SEVEN CLIMATE TYPES IN MAJORITY OF THE PROVINCES IN THE PHILIPPINES

Provinces	Type of Climate
Abra	A and B
Agusan del Norte	E and G
Albay	F and G
Antique	A
Bataan	A
Batanes	D
Batangas	A and B
Bohol	D and G
Bukidnon	C, F and G
Bulacan	A and B
Cagayan	D
Camarines Norte and Sur	C
Capiz	A
Catanduanes	C
Cavite	A and B
Cebu	A
Davao	E, F and G
Ilocos Norte and Sur	A and C
Iloilo	A
Isabela	D

APPENDIX M (Continued)

Provinces	Type of Climate
Laguna	B
Lanao del Norte and Sur	C, F and C
La Union	A and B
Leyte	D, E, F, and G
Maguindanao	F and G
Marinduque	D
Masbate	D
Misamis Occidental and Oriental	C
Mountain Province	B and G
Negros Occidental	B and E
Negros Oriental	E and G
North Cotabato	F and G
Nueva Ecija	A and B
Occidental Mindoro	A, B and D
Oriental Mindoro	E
Palawan	B and D
Pampanga	A
Pangasinan	A and B
Quezon	E
Rizal	B
Romblon	E
Samar	E and G

APPENDIX M (Continued)

Province	Type of Climate
Siquijor	C and E
Sorsogon	C and D
Sulu	G
Sultan Kudarat	F and G
Tarlac	A
Tawi-tawi	G
Surigao del Norte and Sur	E
Zambales	A and B
Zamboanga del Norte	A, C and D

Legend:

Type A - characterized by a long dry season (October-March) and a very pronounced wet season during the rest of the year.

Type B - has a shorter and less severe drought period than Type A; lasting from 1-4 months.

Type C - has a short dry season lasting from 1-3 months (October-March).

Type D - short dry season like type C with a duration of 1-3 months (April-September).

Type E - marked by a heavy rainfall (third week of march).

Type F - heavy rainfall during third week of September.

APPENDIX M (Continued)

Type G - even distribution of rainfall with no marked seasonality.

Source: Agricultural Arts for Secondary Schools by Danilo and Edgar Ricamonte, 1980, pp. 69-70.

APPENDIX N

SOIL AND CLIMATIC REQUIREMENTS OF SELECTED VEGETABLES PRODUCTION

Crop	Soil Type	Climatic Require- ment	Days to Harvest	Sowing Month	
				Wet	Dry
Garlic	Sandy loam & Silty loam	Mild season w/o extreme heat	100-	-	-
Onions-bulb	Sandy loam & Silty loam	Cold and excessive rainfall	90-100	-	Any Nov.
Lettuce, Leaf	Silty loam	Cool climate	45-70	Any	Any
Potato (Sweet)	Sandy-clay loam	Year round	80 120	-	-
Cabbage	Clay loam	Cool, moist	62 110	-	July Nov.
Pechay	Clay loam	Year round preferably cool	30-45	Apr. May	Aug. Dec.
Raddish	Silty loam	-do-	30-100	-	-
Ampalaya	Sandy clay loam	Dry weather	75-80	-	-
Patola	-do-	-do-	75-80	-	-
Squash (Bush)	-do-	-do-	45-50	-	-
Upo	-do-	-do-	75-80	-	-

APPENDIX N (Continued)

Crop	Soil Type	Climatic Require-ment	Days to Harvest	Sowing Month	
				Wet	Dry
Watermelon	Sandy clay loam	Dry weather		-	-
Sitao (Bush)	-do-	Sunny-high R. H.	45-	-	-
Okra	-do-	Year round	60-70	-	-
Carrot	Silty loam	Cool	-	-	-
Eggplant	Sandy Clay loam	Mild season	90	Any	Any
Sweet	Sandy to Sandy loam	-do-	80 120	-	July-Nov.
Tomato	-do-	-do-	75-120	Apr.	Aug.
Cow pea	Sandy loam and clay	Dry weather	Before beans become dry	-	-

Source: Ministry of Agriculture
Catbalogan, Samar

APPENDIX O

PLANTING MONTH, RATE OF SEEDING, PLANT SPACING AND AGE OF TRANSPLANTING OF SELECTED VEGETABLE PRODUCTION

Crop	Planting Month		Rate Seeding kg/ha.	Spacing cm/hill Row	Age of Transplanting (Week)
	Wet	Dry			
Garlic	-	Sept.-Jan.	500-700	15 x 15	-
Onions-bulb	-	Sept.-Jan.	4-14	8 x 8	6-7 (days)
Lettuce, Leaf	Any	Any	0.2-0.3	25 x 30	3-4
Potato	Any	Any	20000-45000	25 x 90	-
Cabbage	-	Sept.-Jan.	0.3-0.5	30 x 100	4-5
Pechay	May-June	Sept.-Jan.	0.3-0.2	12 x 30	8-12 (days)
Raddish	Sept.-Jan.	-	1-2	30 x 75	-
Ampalaya	Any	Any	2-4	50 x 100	-
Patola	Any	Any	1-1.5	100 x 200	-
Squash (Bush)	Any	Any	2-5.5	60 x 90	-
Upo	Any	Any	1.3-2	100 x 200	-
Watermelon	-	Sept.-Feb.	4-7.5	25 x 75	-

APPENDIX O (Continued)

Crop	Planting Month		Rate of seeding kg/ha.	Spacing cm/hill Row	Age of Transplanting (Week)
	Wet	Dry			
Sitao	Any	Nov.	12-22	10 x 50	-
Okra	April-June	Sept.-Jan.	2-10	30 x 60	-
Carrot	-	Sept.-Feb.	0,3-0.5	3 x 45	-
Eggplant	Any	Any	0.2-	50 x 100	4-6
Sweet Pepper	-	Sept.-Jan.	0.2-0.5	30 x 50	4-6
Tomato	May-June	Sept.-March	0.2-0.3	30 x 100	4-6
Cowpea	-	-	34-45	10 x 50	-

Source: Ministry of Agriculture
Catbalogan, Samar

APPENDIX P

PLANT POPULATION AND FERTILIZER REQUIREMENT IN SELECTED VEGETABLE PRODUCTION PER HECTARE

Crop	Plant Population (Maximum)	Fertilizer Requirement	
		A. Sulphate tbsp/plant	12-24-12 tbsp/plant
Garlic	44,444	1.1 - 5.5	-
Onions-bulb	1,562.5	-	0.6 - 0.14
Lettuce, Leaf	133,333	.54 - .81	-
Potato (sweet)	44,444	-	2.5 - 3.5
Gabbage	33,333	-	4.5 - 6.7
Pechay	120,000	.59 - .90	-
Raddish	44,444	1.6 - 2.4	-
Ampalaya	20,000	-	3.3 - 5.6
Patola	5,000	-	13.3 - 22.2
Squash (Bush)	18,519	-	3.6 - 5.9
Upo	5,000	-	10 - 23.2
Watermelon	53,333	-	1.2 - 3.1
Sitao (Bush)	200,000	-	0.33 - 0.56
Okra	17,600	-	1.2 - 1.8
Carrot	740,740	0.09 - 0.15	-
Eggplant	20,000	-	8.2 - 11.1
Sweet Pepper	66,667	-	25 - 33

APPENDIX P (Continued)

Crop	Plant Population (Maximum)	Fertilizer Requirement	
		A. Sulphate tbsp/plant	12-24-12 tbsp/plant
Tomato	33,333	-	3.3 - 5.5
Cowpea	-	-	-

APPENDIX O

Assay for Agricultural Limestone at Lawa-an, Wright, Samar

Name: Felicisima O. Orale Date Submitted: 10-19-84

Address: MAF, Catbalogan, Samar Date Finished: 1-14-85

Submitted by: Felicisima O. Oralo Laboratory No.: SA-163

Address: MAF, Catbalogan, Samar

Source of Sample: Lawa-an, Wright, Samar

(CONSTITUENTS) Contents	Air Dry Basis (%)	Oven Dry Basis (%)
Total Nitrogen	-	-
Total Phosphoric Acid (P_2O_5)	-	-
Available Phosphoric Acid (P_2O_5)	-	-
Total Potassium (K_2O)	-	-
Calcium Oxide (CaO)	55.43	55.57
Calcium Carbonate ($CaCO_3$)	98.99	99.25
Magnesium Oxide (MgO)	-	-
Moisture Content	0.255	-
Organic Matter (Walkey-Black Method)	-	-
pH	-	-

NOTED:

(SGD.) AVELINA G. MANIEGO
Laboratory-in-Charge

(SGD.) MELECIA C. CULAR
Senior Soil Technologist

Source: Ministry of Agriculture
BUREAU OF SOILS
Region VIII
Tacloban City

APPENDIX R

Composition of Selected Fruit Vegetables
(Not viny and not leguminous vegetables)

Food Composition	Food & Description			
	Talong (Solanum Melongena Linn)	Kamatis (Lycopersicum esculentum miller)	Okra (Hibiscus esculentus Linn)	Papaya (Carica papaya Linn)
E.P. %	91	95	90	64
Moisture %	72.5	95.1	89.1	93.2
Food Energy (cal)	24	19	34	24
Protein (gm)	1.0	1.0	1.8	1.0
Fat (gm)	0.2	0.2	0.1	0.1
Carbohydrate (gm)	5.7	4.1	8.2	5.2
Fiber (gm)	0.8	0.8	0.7	0.8
Ash (gm)	0.6	0.6	0.8	0.5
CA (gm)	30	18	120	0.5
P (gm)	24	18	49	26
Fe (mg)	0.6	0.8	0.8	0.3
NA (mg)	4	4	4	...
K (mg)	223	236	246	...
Vit. A Value (I.U.)	130	735	240	...
Thiamine (mg)	0.10	0.06	0.08	0.03
Reboflavin (mg)	0.05	0.04	0.09	0.02
Niacine (mg)	0.6	0.06	0.08	0.2
Ascorbid Acid (mg)	5	29	17	22

Source: Food Composition Table Recommended for Use in the Philippines, 1976, pp. 15-37.

APPENDIX S

ABBREVIATIONS, SIGNS AND SYMBOLS

gm	gram
mg	milligram
kg	kilogram
I.U.	International unit
Tr	traces of negligible amount
...	not analyzed
pc	piece
cm	centimeter
diam	diameter
cal	calories
E.P.	edible portion
ha	hectare
m	meter
pH	negative logarithm of hydrogen ion concentration
me	melliequivalent
$CaCO_3$	calcium carbonate
PCARR	Philippine Council for Agriculture and Resource Research
UPCA	University of the Philippines College of Agriculture

APPENDIX S (Continued)

gal	gallon
RCBD	Randomized Complete Block Design
ANOVA	Analysis of Variance
cv	Coefficient of Variance
C.F.	Correction factor
R.S.S.	Replication Sum of Squares
Tr.S.S.	Treatment Sums of Squares
T.S.S.	Total Sums of Squares
E.S.S.	Error Sums of Squares
R.M.S.	Replication Mean Squares
T.M.S.	Treatment Mean Squares
E.M.S.	Error Mean Square
E.F. Value (R)	Experimental F-value Replication
E.F. Value (T)	Experimental F-value Treatment
L.S.D.	Least Significant Difference
ns	not significant
*	significant
**	highly significant
/	per

APPENDIX T

Lime Requirement for Different Soil Type

Negative Logarithm of Hydrogen ion Concentration in the Soil pH reading	Average amount of ground limestone ($CaCO_3$) in tons per hectare for soils of average organic matter content				
	Sandy	Sandy Loam	Loam	Silt & Clay Loam	Clay
4.0	2.0	3.5	4.5	6.0	7.5
4.5	1.5	2.5	3.2	4.2	5.2
5.0	1.0	1.5	2.0	2.5	3.0
6.0	None	None	None	None	None

APPENDIX U

The Calcium Carbonate Equivalent of Some Liming Materials

Material	Formula	Formula Weight	CaC_3 Equivalent
Burnt lime	CaO	56	178.50
Slaked lime	$Ca(OH)_2$	74	135.10
Magnesium Oxide	MgO	40	250.00
Magnesium Hydroxide	$Mg(OH)_2$	58	172.40
Magnesium Carbonate	$MgCO_3$	84	119.00
Calcium Calcite	$CaSiO_3$	122	81.96
Dolomite	$MgCO_3$ $CaCO_3$	184	54.35

APPENDIX V

COMPUTATION OF AGRICULTURAL LIME AND COMMERCIAL LIME IN AN AREA OF 4.20 SQUARE METER

Recommended Lime Application per Hectare

of land = 2.5 tons

2.5 tons = 2500 kg.

2500 kg : 10000 sq. m.

? : 4.20 sq. m.

Ratio and Proportion

$$2500 : 10000 = X : 4.20$$

$$10000X = 2500 \times 4.20$$

$$= \frac{10500}{10000}$$

= 1.05 kg. lime/4.20 squre meter

APPENDIX W

Table of Analysis of Variance

Source of Variation	d.f.	S.S.	M.S.	F-Value	F-Value .05	F-Value .01
Replications	(r-1)					
Treatments	(t-1)					
Error	(r-1)(t-1)					
Total						

APPENDIX W-1

COMPUTATION OF THE ANALYSIS OF VARIANCE FOR THE AVERAGE HEIGHT OF PLANTS PER HILL PER TREATMENT EVERY 15 DAYS AFTER TRANS-PLANTING UP TO INITIAL FRUITING

(1) Correction Factor (C.F.) = $\frac{(\text{Grand Total})^2}{\text{No. of Blocks}}$

$$C.F. = \frac{(311.68)^2}{12}$$

$$= \frac{97144.422}{12}$$

$$= 8095.3685$$

(2) Replication Sums of Squares = $\frac{\text{Sums of Squares}}{\text{Treatments}} - C.F.$

$$R.S.S. = \frac{(74.75)+(77.69)+(80.31)+(78.93)}{3} - 8095.3685$$

$$= \frac{24302.94}{3} - 8095.3685$$

$$= 5.61$$

(2) Treatment Sums of Squares = $\frac{\text{Sums of Squares}}{\text{Replications}} - C.F.$

$$T.S.S. = \frac{(104.24)^2+(105.54)^2+(101,90)^2}{4} - 8095.3685$$

$$= \frac{32388.279}{4} - 8095.3685$$

$$= 8097.0698 - 8095.3685$$

$$= 1.70$$

(4) Total Sums of Squares = Sums of Squares - C.F.

T.S.S. = $(25.19)^2+(25.28)^2+(29.60)^2+(24.17)^2+$
$(27.76)^2+(23.79)^2+(25.67)^2+(28.32)^2+$
$(21.80)^2+(28.62)^2+(25.04)^2+(26.44)^2-$
8095.368

= 634.5361 + 639.0784 + 876.16 + 584.1889 + 770.6176 + 565.9641 + 658.9489 + 802.0224 + 475.24 + 819.1044 + 627.0016 + 699.0736 - 8095.368

= 8151.936 - 8095.368

= 56.57

(5) Error Sums of Squares = Total S.S - R.S.S. - T.S.S.

E.S.S. = 56.57 - 5.61 - 170

= 56.57 - 7.31

= 49.26

(6) Replication Mean Square = $\frac{\text{Replication S.S}}{\text{d.f.}}$

R.M.S. = $\frac{5.61}{3}$

= 1.87

(7) Treatment Mean Square = $\frac{\text{Treatment S.S}}{\text{d.f}}$

T.M.S. = $\frac{1.70}{2}$

= 0.85

(8) Error Mean Square = $\frac{\text{Error Sums of Squares}}{\text{d.f}}$

$$\text{E.M.S.} = \frac{49.26}{6}$$

$$= 8.21$$

(9) Experimental F-value (R) = $\frac{\text{Replication M.S.}}{\text{Error M.S.}}$

$$\text{E.F. Value (R)} = \frac{1.87}{8.21}$$

$$= 0.23$$

(10) Experimental F-value (T) = $\frac{\text{Treatment M.S.}}{\text{Error M.S.}}$

$$\text{E.F. Value (T)} = \frac{0.85}{8.21}$$

$$= 0.10$$

(11) Coefficient of Variance = $\sqrt{\frac{\text{Error M.S.}}{\text{Grand Mean}}} \times 100$

$$\text{cv} = \sqrt{\frac{8.21}{25.97}} \times 100$$

$$= 11.03\%$$

APPENDIX W-2

COMPUTATION OF THE ANALYSIS OF VARIANCE FOR THE AVERAGE CIRCUMFERENCE OF PLANTS PER HILL PER TREATMENT EVERY 15 DAYS AFTER TRANSPLANTING UP TO INITIAL FRUITING

(1) Correction Factor (C.F) $= \frac{(\text{Grand Total})^2}{\text{No. of Blocks}}$

$$C.F. = \frac{(478.87)^2}{12}$$

$$= \frac{229316.48}{12}$$

$$= 19109.706$$

(2) Replication Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Treatments}} - C.F.$

$$R.S.S. = \frac{(112.17)^2 + (112.67)^2 + (130.16)^2 + (123.87)^2}{3} - 19109.706$$

$$= \frac{57562.04}{3} - 19109.706$$

$$= 19187.347 - 19109.706$$

$$= 77.64$$

(3) Treatment Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Replications}} - C.F.$

$$T.S.S. = \frac{(159.56)^2 + (163.28)^2 + (156.03)^2}{4} - 19109.706$$

$$= \frac{76465.113}{4} - 19109.706$$

$$= 19116.278 - 19109.706$$

$$= 6.57$$

(4) Total Sums of Squares = Sums of Squares - C.F.

$$T.S.S. = (38.79)^2+(32.18)^2+(43.28)^2+(45.31)^2+(38.12)^2+(39.45)^2+(43.15)^2+(42.56)^2+(35.26)^2+(41.04)^2+(43.73)^2+(36.00)^2-19109.706$$

$$= 1504.5541+1035.5524+1873.1584+2052.9961+1453.1344+1556.3025+1861.9225+2052.9961+1243.2676+1684.2816+1912.3129+1296.00-19109.706$$

$$= 19284.946 - 19109.706$$

$$= 175.24$$

(5) Error Sums of Squares = Total S.S. - R.S.S.-T.S.S.

$$E.S.S. = 175.24 - 77.64 - 6.57$$

$$= 175.24 - 84.21$$

$$= 91.03$$

(6) Replication Mean Square $= \frac{\text{Replication S.S.}}{\text{d.f}}$

$$R.M.S. = \frac{77.64}{3}$$

$$= 25.880$$

(7) Treatment Mean Square $= \frac{\text{Treatment S.S.}}{\text{d.f}}$

$$T.M.S. = \frac{6.57}{2}$$

$$= 3.285$$

(8) Error Mean Square = $\frac{\text{Error Sums Squares}}{\text{d.f}}$

$$E.M.S. = \frac{91.03}{6}$$

$$= 15.172$$

(9) Experimental F-value (R) = $\frac{\text{Replication M.S.}}{\text{Error M.S.}}$

$$E.F.\ Value\ (R) = \frac{25.880}{15.172}$$

$$= 1.71$$

(10) Experimental F-value (T) = $\frac{\text{Treatment M.S.}}{\text{Error M.S.}}$

$$E.F.\ Value\ (T) = \frac{3.285}{15.172}$$

$$= 0.22$$

(11) Coefficient of Variance (cv) = $\sqrt{\frac{\text{Error M.S.}}{\text{Grand Mean}}} \times 100$

$$CV = \sqrt{\frac{15.172}{39.89}} \times 100$$

$$= 9.76\%$$

APPENDIX W-3

COMPUTATION OF THE ANALYSIS OF VARIANCE FOR THE AVERAGE NUMBER OF FRUITS PER HILL PER TREATMENT AT 15 DAYS HARVEST AT AN INTERVAL OF THREE DAYS PER HARVEST WITHIN THREE MONTHS PERIOD

(1) Correction Factor (C.F.) $= \frac{(\text{Grand Total})^2}{\text{No. of Blocks}}$

$$C.F. = \frac{(126.16)^2}{12}$$

$$= \frac{15916.35}{12}$$

$$= 1326.36$$

(2) Replication Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Treatments}} - CF$

$$R.S.S. = \frac{(30.88)^2+(31.43)^2+(31.54)^2+(32.31)^2}{3} - 1326.36$$

$$= \frac{3980.12}{3} - 1326.36$$

$$= 0.35$$

(3) Treatment Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Replication}} - C.F.$

$$T.S.S. = (42.53)^2 + (42.20)^2 + (41.43)^2 - 1326.36$$

$$= \frac{5306.08}{4} - 1326.36$$

$$= 0.16$$

(4) Total Sums of Squares = Sums of Squares - C.F.

T.S.S. = $(10.55)^2 + (10.66)^2 + (10.66)^2 + (10.66)^2 +$
$(10.00)^2 + (10.52)^2 + (10.88)^2 + (10,77)^2 +$
$(10.33)^2 + (10.22)^2 + (10.00)^2 + (10.88)^2 -$
1326.36

= 111.30 + 113.64 + 113.64 + 113.64 +
100.00 + 111.30 + 118.37 + 115.99 +
106.71 + 104.45 + 100.00 + 118.37 - 1326.36

= 1327.41 - 1326.36

= 1.05

(5) Error Sums of Squares = Total S.S. - R.S.S. - T.S.S.

E.S.S. = 1.05 - 0,35 - 0.16

= 0.54

(6) Replication Mean Square = $\frac{\text{Replication S.S.}}{\text{d.f}}$

R.M.S. = $\frac{0.35}{3}$

= 0.12

(7) Treatment Mean Square = $\frac{\text{Treatment S.S.}}{\text{d.f}}$

T.M.S. = $\frac{0.16}{2}$

= 0.08

(8) Error Mean Square = $\frac{\text{Error Sums of Squares}}{\text{d.f}}$

$$E.M.S. = \frac{0.54}{6} =$$

$$= 0.09$$

(9) Experimental F-Value (R) = $\frac{\text{Replication M.S.}}{\text{Error M.S.}}$

$$E.F.\ Value\ (R) = \frac{0.12}{0.09}$$

$$= 1.33$$

(10) Experimental F-Value (T) = $\frac{\text{Treatment M.S.}}{\text{Error Mean Squares}}$

$$E.F.\ Value\ (T) = \frac{0.08}{0.09}$$

$$= 0.89$$

(11) Coefficient of Variance (cv) = $\frac{\sqrt{\text{Error M.S.}}}{\text{Grand Mean}} \times 100$

$$cv = \frac{\sqrt{0.09}}{10.51} \times 100$$

$$= \frac{0.30}{10.51} \times 100$$

$$cv = 2.85\%$$

APPENDIX V-4

COMPUTATION OF THE ANALYSIS OF VARIANCE FOR THE AVERAGE LENGTH OF FRUITS PER HILL PER TREATMENT

(1) Correction Factor (C.F.) $= \frac{(\text{Grand Total})^2}{\text{No. of Blocks}}$

$$\text{C.F.} = \frac{(308.86)^2}{12}$$

$$= \frac{95394.5}{12}$$

$$= 7949.5416$$

(2) Replication Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Treatments}} - \text{C.F.}$

$$\text{R.S.S.} = \frac{(75.22)^2 + (82.23)^2 + (73.71)^2 + (77.70)^2}{3} - 7949.5416$$

$$= \frac{23,890.275}{3} - 7949.5416$$

$$= 7963.4251 - 7949.5416$$

$$= 13.883533$$

(3) Treatment Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Replications}} - \text{C.F.}$

$$\text{T.S.S.} = \frac{(103.89)^2 + (105.86)^2 + (99.11)^2}{4} - 7949.5416$$

$$= \frac{31822.264}{4} - 7949.5416$$

$$= 7955.566 - 7949.5416$$

$$= 6.024$$

(4) Total Sums of Squares = Sums of Squares - C.F.

$$T.S.S. = (24.96)^2 + (26.72)^2 + (26.98)^2 + (25.23)^2 + (26.20)^2 + (26.57)^2 + (24.63)^2 + (28.46)^2 + (24.06)^2 + (28.94)^2 + (22.10)^2 + (24.01)^2 - 7949.5416$$

$$= 623.0016 + 713.9584 + 727.9204 + 636.5529 + 686.44 + 705.9649 + 606.6369 + 809.9716 + 578.8836 + 837.5236 + 488.41 + 576.4801 - 7949.5416$$

$$= 7991.744 - 7949.5416$$

$$= 42.202$$

(5) Error Sums of Squares = Total S.S. - R.S.S. - T.S.S.

$$E.S.S. = 42.202 - 13.884 - 6.024$$

$$= 42.202 - 19.908$$

$$= 22.294$$

(6) Replication Mean Square = $\frac{\text{Replication S.S.}}{\text{d.f}}$

$$R.M.S. = \frac{13.884}{3}$$

$$= 4.628$$

(7) Treatment Mean Square = $\frac{\text{Treatment S.S.}}{\text{d.f}}$

$$T.M.S. = \frac{6.024}{2}$$

$$= 3.012$$

(8) Error Mean Square = $\frac{\text{Error Sum of Squares}}{\text{d.f}}$

$$E.M.S. = \frac{22.294}{6}$$

$$= 3.716$$

(9) Experimental F-Value (R) = $\frac{\text{Replication M.S.}}{\text{Error M.S.}}$

$$E.\ F\text{-value (R)} = \frac{4.628}{3.716}$$

$$= 1.25$$

(10) Experimental F-value (T) = $\frac{\text{Treatment M.S.}}{\text{Error M.S.}}$

$$E.\ F\text{-value (T)} = \frac{3.012}{3.716}$$

$$= 0.81$$

(11) Coefficient of Variance (cv) = $\frac{\sqrt{\text{Error M.S.}}}{\text{Grand Mean}} \times 100$

$$cv = \frac{\sqrt{3.716}}{25.74} \times 100$$

$$= 7.49\%$$

APPENDIX W-4a

COMPUTATION OF THE ANALYSIS OF VARIANCE FOR THE AVERAGE CIRCUMFERENCE OF FRUITS PER HILL PER TREATMENT

(1) Correction factor (C.F.) $= \frac{(\text{Grand Total})^2}{\text{No. of Blocks}}$

$$C.F. = \frac{(138.14)^2}{12}$$

$$= \frac{19082.66}{12}$$

$$= 1590.2216$$

(2) Replication Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Treatments}} - C.F.$

$$R.S.S. = \frac{(34.06)^2 + (34.42)^2 + (34.52)^2 + (35.14)^2}{3} -$$

$$1590.2216$$

$$= \frac{4771.27}{3} - 1590.2216$$

$$= 1590.4233 - 1590.2216$$

$$= 0.202$$

(3) Treatment Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Replications}} - C.F.$

$$T.S.S. = \frac{(45.35)^2 + (48.03)^2 + (44.76)^2}{4} - 1590.2216$$

$$= \frac{6399.961}{4} - 1590.2216$$

$$= 1591.7403 - 1590.2216$$

$$= 1.519$$

(4) Total Sums of Squares = Sums of Squares - C.F.

T.S.S. = $(11.29)^2 + (11.48)^2 + (11.12)^2 + (11.46)^2 + (11.89)^2 + (11.88)^2 + (12.16)^2 + (12.10)^2 + (10.88)^2 + (16.06)^2 + (11.24)^2 + (11.58)^2 - 1590.2216$

= 1592.1546 - 1590.2216

= 1.933

(5) Error Sums of Squares = Total S.S. - R.S.S. - T.S.S.

E.S.S. = 1.933 - 0.202 - 1.519

= 1.933 - 1.721

= 0.212

(6) Replication Mean Square = $\frac{\text{Replication Sum of Squares}}{\text{d.f}}$

R.M.S. = $\frac{0.202}{3}$

= 0.067

(7) Treatment Mean Square = $\frac{\text{Treatment Sum of Squares}}{\text{d.f}}$

T.M.S. = $\frac{1.519}{2}$

= 0.760

(8) Error Mean Square = $\frac{\text{Error Sums of Squares}}{\text{d.f}}$

E.M.S. = $\frac{0.212}{6}$

= 0.035

(9) Experimental F-value (R) $= \frac{\text{Replication M.S.}}{\text{Error M.S.}}$

E. F-value (R) $= \frac{0.067}{0.035}$

$= 1.91$

(10) Experimental F-value (T) $= \frac{\text{Treatment M.S.}}{\text{Error M.S.}}$

E.F-Value (T) $= \frac{0.760}{0.035}$

$= 21.71$

(11) Coefficient of Variance (cv) $= \frac{\sqrt{\text{Error M.S.}}}{\text{Grand Mean}} \times 100$

cv $= \frac{\sqrt{0.035}}{11.51} \times 100$

$= 1.62\%$

APPENDIX W-5

COMPUTATION ON THE COMPARISON OF TREATMENT MEANS OF THE AVERAGE CIRCUMFERENCE OF FRUITS HARVESTED PER TREATMENT USING LEAST SIGNIFICANT DIFFERENCE

(1) L S D

$$0.05 = 2.447 \sqrt{\frac{2 \times 0.035}{4}}$$

$$= 2.447 \times 0.132287565$$

$$= 0.32$$

(2) L S D

$$0.01 = 3.707 \sqrt{\frac{2 \times 0.035}{4}}$$

$$= 3.707 \times 0.132287565$$

$$= 0.49$$

APPENDIX W-6

COMPUTATION OF THE ANALYSIS OF VARIANCE ON THE FRUIT YIELD IN KILOGRAMS PER TREATMENT

(1) Correction Factor (C.F.) $= \frac{(\text{Grand Total})^2}{\text{No. of Blocks}}$

$$C.F. = \frac{(181.1)^2}{12}$$

$$= \frac{32797.21}{12}$$

$$= 2733.1008$$

(2) Replication Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Treatment}} - C.F.$

$$R.S.S. = \frac{(45.1)^2 + (45.3)^2 + (43.9)^2 + (46.8)^2}{3} - 2733.1008$$

$$= \frac{8203.55}{3} - 2733.1008$$

$$= 2734.5167 - 2733.1008$$

$$= 1.416$$

(3) Treatment Sums of Squares $= \frac{\text{Sums of Squares}}{\text{Replications}} - C.F.$

$$T.S.S. = \frac{(59.9)^2 + (64.1)^2 + (57.1)^2}{4} - 2733.1008$$

$$= \frac{10957.23}{4} - 2733.1008$$

$$= 2739.3075 - 2733.1008$$

$$= 6.207$$

APPENDIX W-6 (Continued)

(4) Total Sums of Squares = Sums of Squares - C.F.

$$T.S.S. = (15.0)^2 + (15.1)^2 + (14.3)^2 + (15.5)^2 + (15.3)^2 + (16.3)^2 + (16.2)^2 + (16.3)^2 + (14.8)^2 + (13.9)^2 + (13.4)^2 + (15.0)^2 - 2733.1008$$

$$= 225.50 + 228.01 + 204.49 + 240.25 + 234.09 + 265.69 + 262.44 + 265,69 + 219.04 + 193.21 + 179.56 + 225.0 - 2733.1008$$

$$= 2742.47 - 2733.1008$$

$$= 9.369$$

(5) Error Sum of Squares = Total S.S. - R.S.S. - T.S.S.

$$E.S.S. = 9.369 - 1.416 - 6.207$$

$$= 9.369 - 7.623$$

$$= 1.746$$

(6) Replication Mean Square $= \frac{\text{Replication S.S.}}{\text{d.f.}}$

$$R.M.S. = \frac{1.416}{3}$$

$$= 0.472$$

(7) Treatment Mean Square $= \frac{\text{Treatment S.S.}}{\text{d.f}}$

$$T.M.S. = \frac{6.207}{2}$$

$$= 3.104$$

APPENDIX W-6 (Continued)

(8) Error Mean Square = $\frac{\text{Error Sums of Squares}}{\text{d.f}}$

$$E.M.S. = \frac{1.746}{6}$$

$$= 0.291$$

(9) Experimental F-value (R) = $\frac{\text{Replication M.S.}}{\text{Error M.S.}}$

$$E.F\text{-Value } (R) = \frac{0.472}{0.291}$$

$$= 1.62$$

(10) Experimental F-Value (T) = $\frac{\text{Treatment M.S.}}{\text{Error M.S.}}$

$$E.\ F\text{-Value } (T) = \frac{3.104}{0.291}$$

$$= 10.67$$

(11) Coefficient of Variance = $\frac{\sqrt{\text{Error M.S.}}}{\text{Grand Mean}} \times 100$

$$cv = \frac{\sqrt{0.291}}{15.09} \times 100$$

$$= 3.57\%$$

APPENDIX W-6a

COMPUTATION ON THE COMPARISON ON TREATMENT MEANS OF THE FRUIT YIELD IN KILOGRAMS PER TREATMENT WITHIN THREE MONTHS FROM THE FIRST HARVEST USING LEAST SIGNIFICANCE DIFFERENCE

(1) L S D

$$0.05 = 2.447\sqrt{\frac{2 \times 0.291}{4}}$$

$$= 2.447 \times 0.381444622$$

$$= 0.93$$

(2) L S D

$$0.01 = 3.707\sqrt{\frac{2 \times 0.291}{4}}$$

$$= 3.707 \times 0.381444622$$

$$= 1.41$$

APPENDIX X

ESTIMATED COMPUTATION OF COST AND RETURN ANALYSIS OF EGGPLANT PRODUCTION IN ONE HECTARE OF LAND WITHIN THREE MONTHS

A. Production Cost

₱481.70/124.80 sq. m.

$$\text{Production Cost} = \frac{\text{PC of EA} \times \text{Ha}}{\text{EA}}$$

$$= \frac{481.70 \times 10000}{124.80}$$

$$= ₱38597.75$$

B. Forecasted Total Yield - No. of Fruits Harvested

181.10 kg/124.80 sq. m.

$$\text{Yield in kg.} = \frac{\text{Total Yield EA} \times \text{Ha}}{124.80}$$

$$= \frac{181.10 \times 10000}{124.80}$$

$$= 14511.22$$

14511.22 at ₱6.00/kilo = ₱87067.30

C. Forecasted Total amount in terms of pesos at ₱6.00/kilo

₱1086.60/124.80 sq. m.

$$\text{Total Amount} = \frac{\text{Total amount EA} \times \text{Ha}}{124.80}$$

$$= \frac{₱1086.60 \times 10000}{124.80}$$

$$= ₱87067.30$$

APENDIX X (Continued)

D. Forecasted Net Income

₱604.90/124.80 sq. m.

$$\text{Net Income} = \frac{\text{NI of EA} \times 10000}{124.80}$$

$$= \frac{604.90 \times 10000}{124.80}$$

$$= ₱48469.55$$

OR

Net Income = Total amount of Production

Yield - PC

= ₱87067.30-₱38597.75

= ₱48469.55

APPENDIX Y

F-Ratios for 0.05 (upper) and 0.01 (lower) levels of Significance

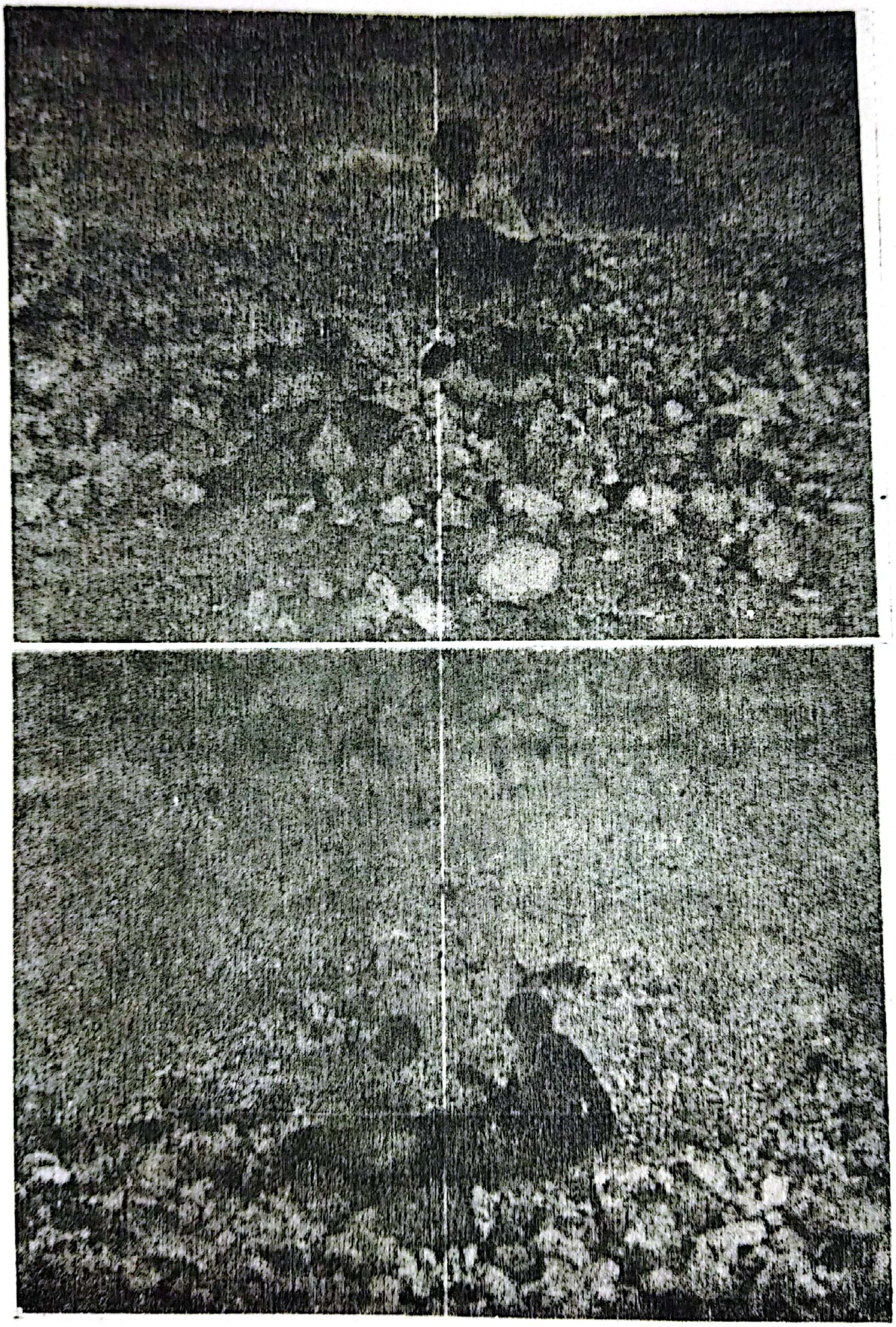
	Degrees of Freedom for Greater Mean Square									
	1	2	3	4	5	6	8	12	24	00
1	161.45 4052.10	199.50 4999.03	215.72 5403.49	224.57 5625.14	230.17 5764.08	233.97 5859.39	238.89 5981.34	243.91 6105.83	249.04 6234.16	254.32 6366.48
2	18.51 98.49	19.00 99.01	19.16 99.17	19.25 99.25	19.30 99.30	19.33 99.33	19.37 99.36	19.41 99.42	19.45 99.46	19.50 99.50
3	10.13 34.12	9.55 30.81	9.28 29.46	9.12 28.71	9.01 28.24	8.94 27.91	8.84 27.49	8.74 27.05	8.64 26.60	8.53 26.12
4	7.71 21.20	6.94 18.00	6.59 16.69	6.39 15.98	6.26 15.52	6.16 15.21	6.04 14.80	5.91 14.37	5.77 13.93	5.63 13.46
5	6.61 16.26	5.79 13.27	5.41 12.06	5.19 11.39	5.05 10.97	4.95 10.67	4.82 10.27	4.68 9.89	4.53 9.47	4.36 9.02
6	5.99 13.74	5.14 10.92	4.76 9.78	4.53 9.15	4.39 8.75	4.28 8.47	4.15 8.10	4.00 7.72	3.84 7.31	3.67 6.88
7	5.59 12.25	4.74 9.55	4.35 8.45	4.12 7.85	3.97 7.46	3.87 7.19	3.73 6.84	3.57 6.47	3.41 6.07	3.23 5.65
8	5.32 11.26	4.46 8.65	4.07 7.59	3.84 7.01	3.69 6.63	3.58 6.37	3.44 6.03	3.28 5.67	3.12 5.28	2.93 4.86
9	5.12 10.56	4.26 8.02	3.86 6.99	3.63 6.42	3.48 6.06	3.37 5.80	3.23 5.47	2.07 5.11	2.90 4.73	2.71 4.31
10	4.96 10.04	4.10 7.56	3.71 6.55	3.48 5.99	3.33 5.64	3.22 5.39	3.07 5.06	2.91 4.71	2.74 4.33	2.54 3.91
11	4.84 9.65	3.98 7.20	3.59 6.22	3.36 5.67	3.20 5.32	3.09 5.07	2.95 4.74	2.79 4.40	2.61 4.02	2.40 3.60
12	4.75 9.33	3.88 6.93	3.49 5.95	3.26 5.41	3.11 5.06	3.00 4.82	2.85 4.50	2.69 4.16	2.50 3.78	2.30 3.36

Source: Statistical Procedure for Agricultural Research.

P I C T O R I A L S

APPENDIX Z-1

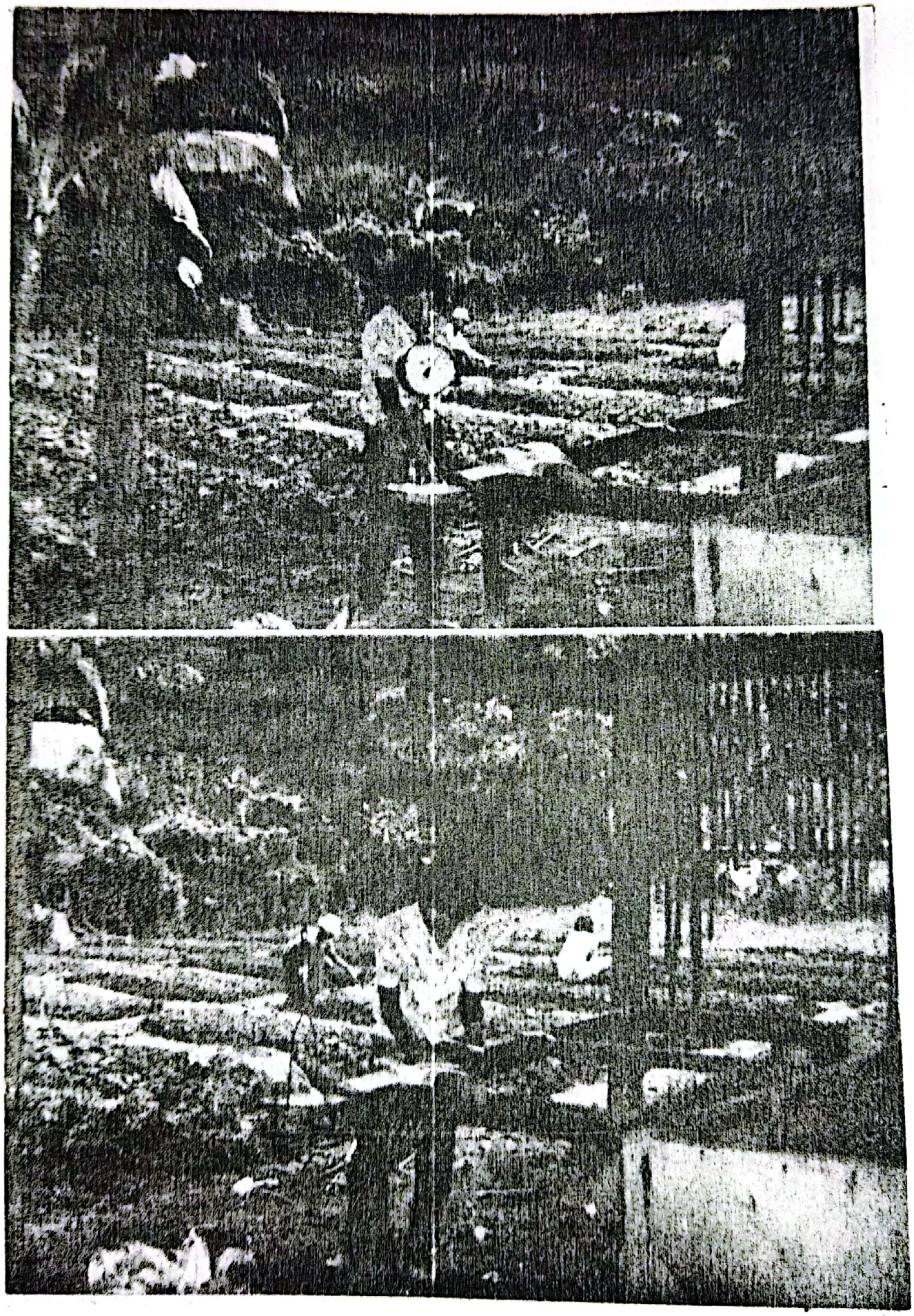
GATHERING AGRICULTURAL LIME



The researcher and a hired laborer gathering Agricultural lime.

APPENDIX Z-2

WEIGHING AND RECORDING COMMERCIAL AND AGRICULTURAL LIME

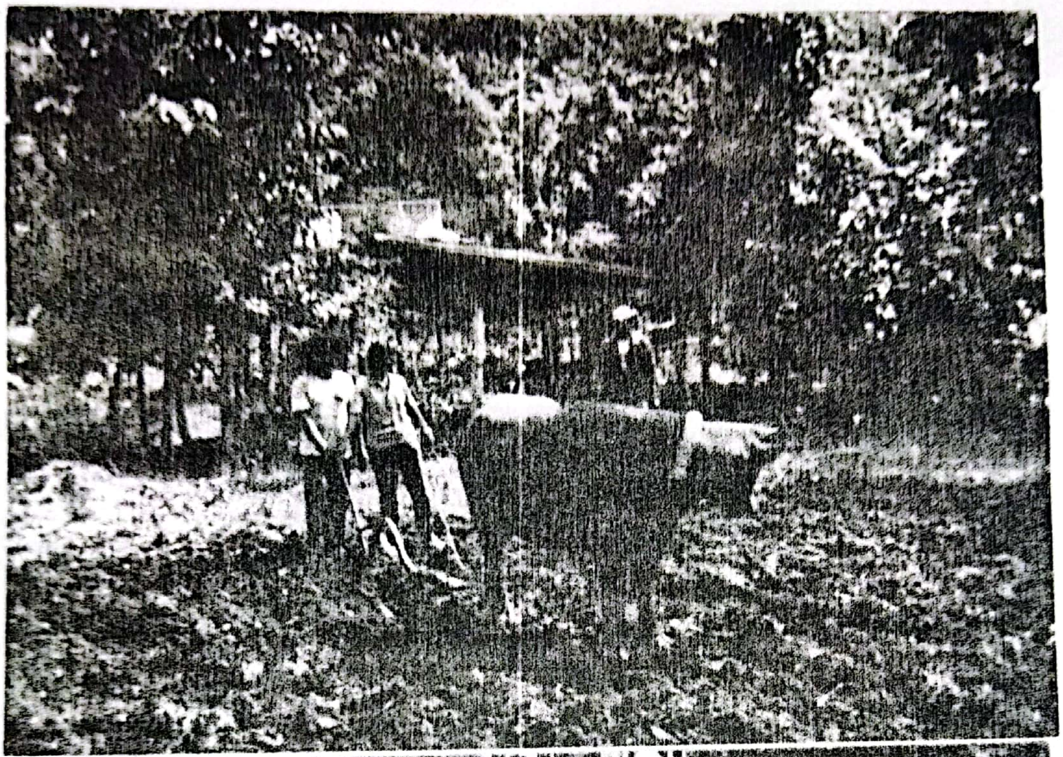


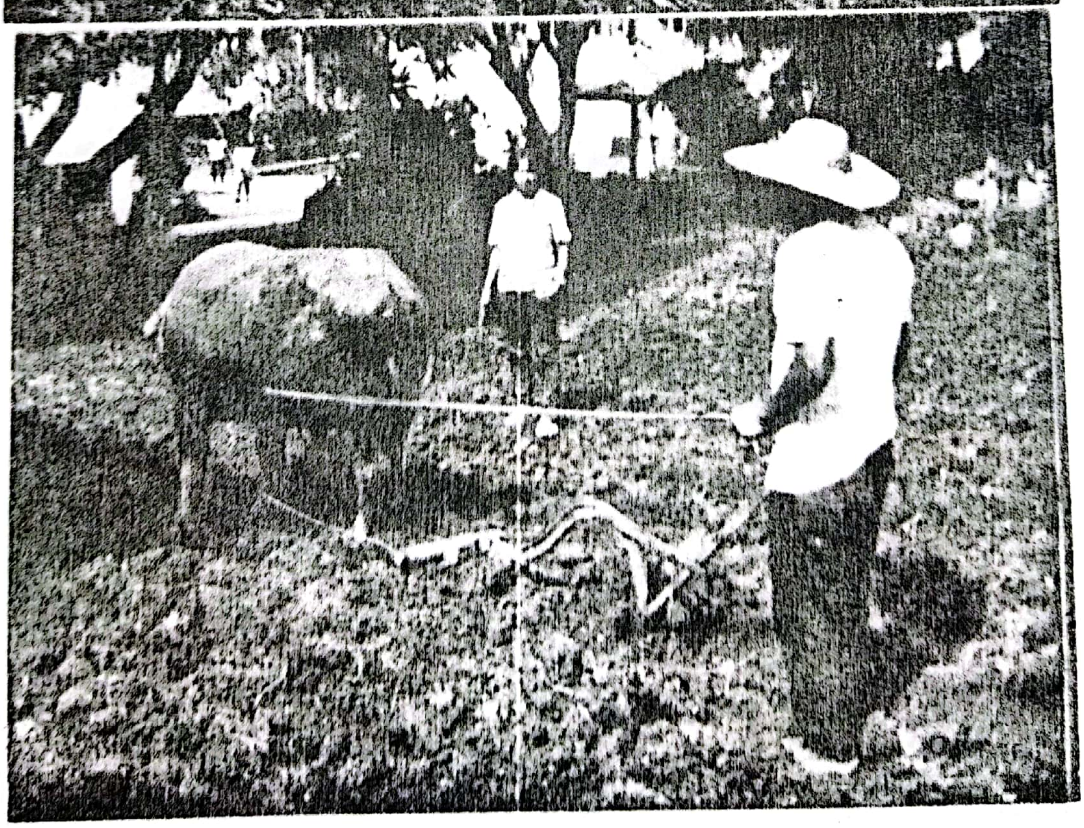
The researcher weighing and recording both Commercial and Agricultural lime.

APFENDIX Z-3

LAND PREPARATION

PLOWING





The researcher and a laborer plowing the experimental lot.

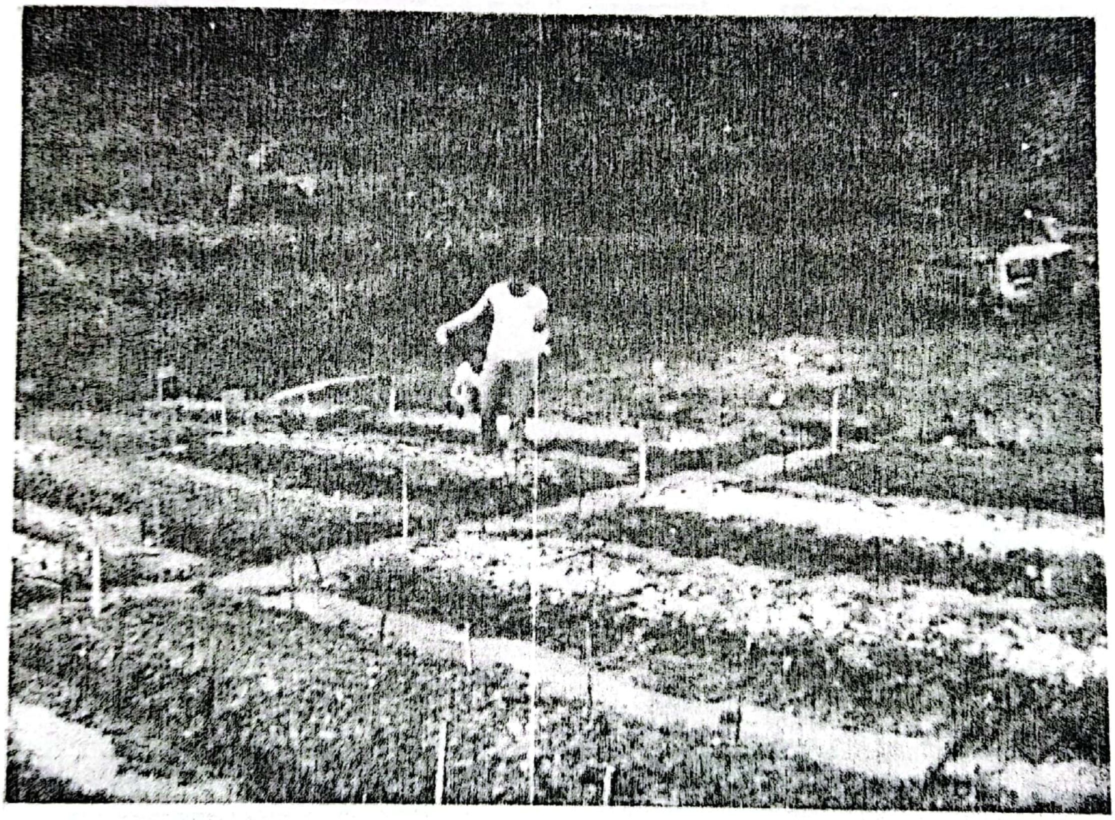
APPENDIX Z-3a

HARROWING

A hired laborer harrowing the experimental area.

APPENDIX Z-3b

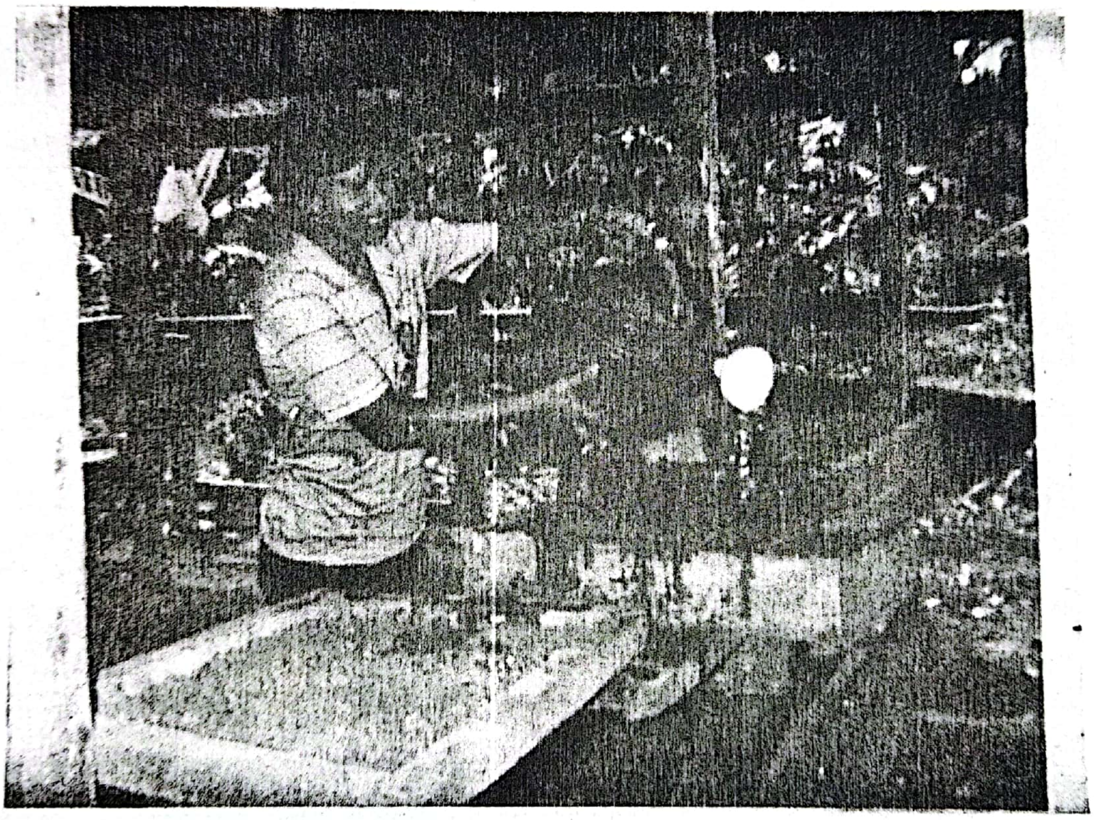
LIME APPLICATION



The researcher applying both Commercial and Agricultural lime at the rate of 1.05 kilograms per sub-plot of 4.20 square meters.

APPENDIX Z-4

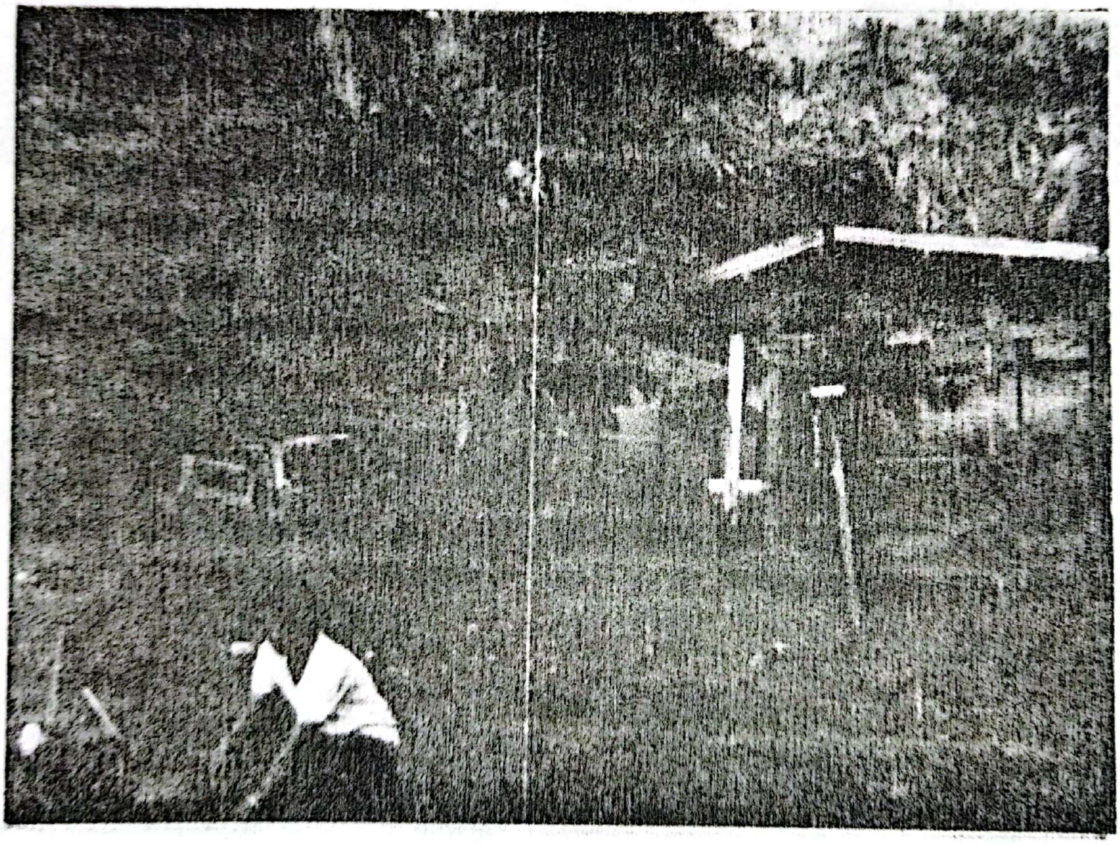
CARE AND MANAGEMENT OF THE EGGPLANT SEEDLINGS



The researcher watering eggplant seedlings with one teaspoonful of ammonium sulfate fertilizer dilluted in a 1/4 gallon of water. This served as a starter salution for seedlings at their early growth.

APPENDIX Z-5

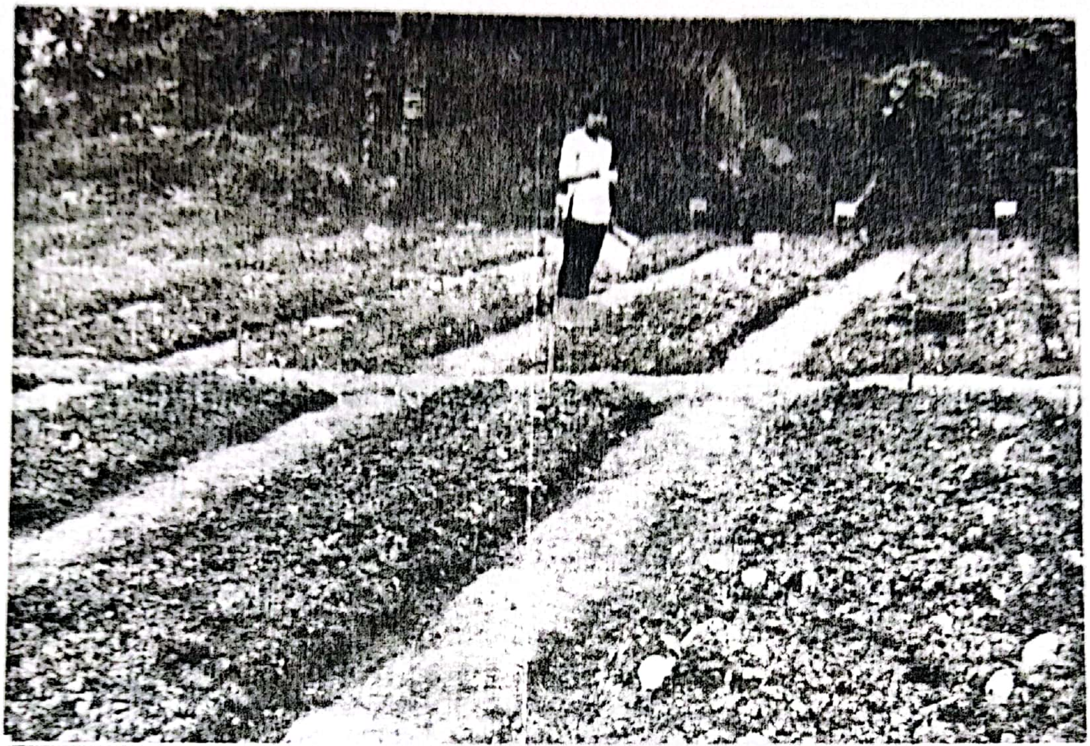
TRANSPLANTING EGGPLANT



The researcher transplanting eggplant seedlings.

APPENDIX Z-6

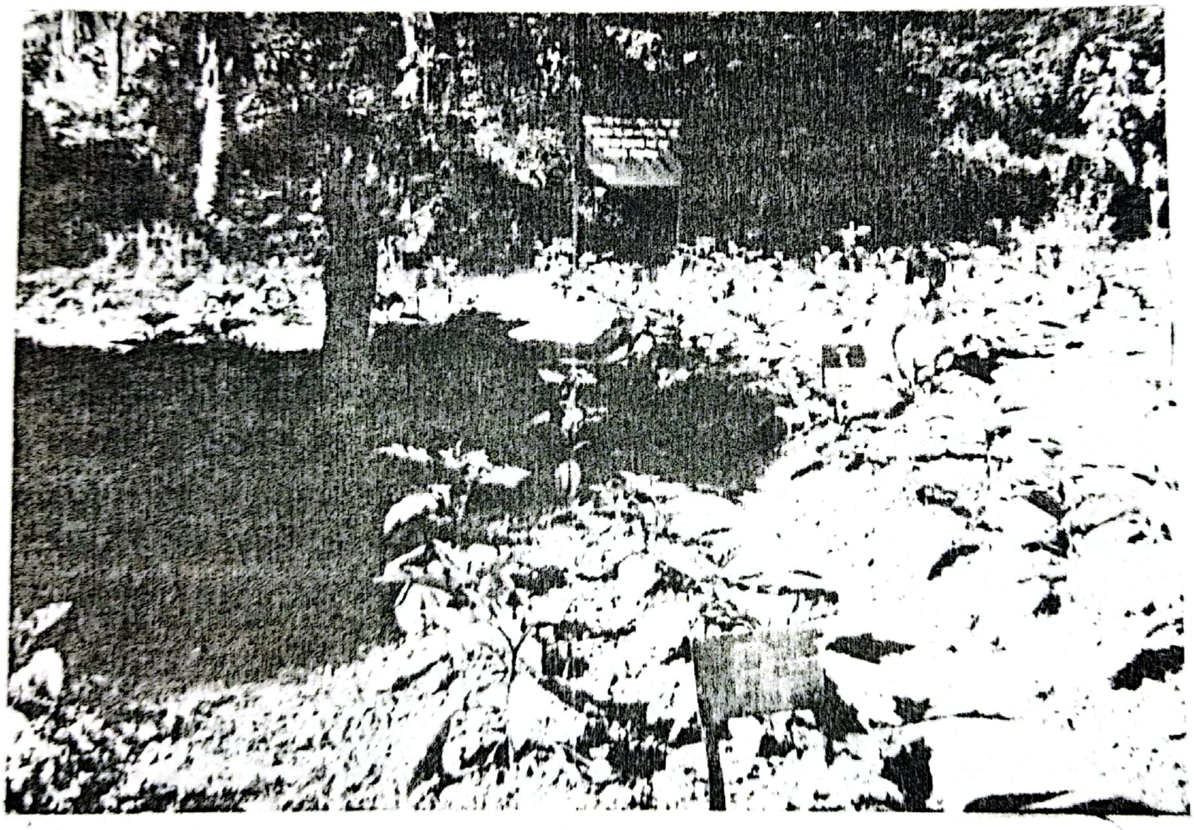
RANDOM SAMPLING AND FIRST MEASUREMENT OF EGGPLANT



The researcher on her random sampling of plants for the first set of data on the height and the crown of eggplant. This was done 15 days after the date of transplanting.

APPENDIX Z-7

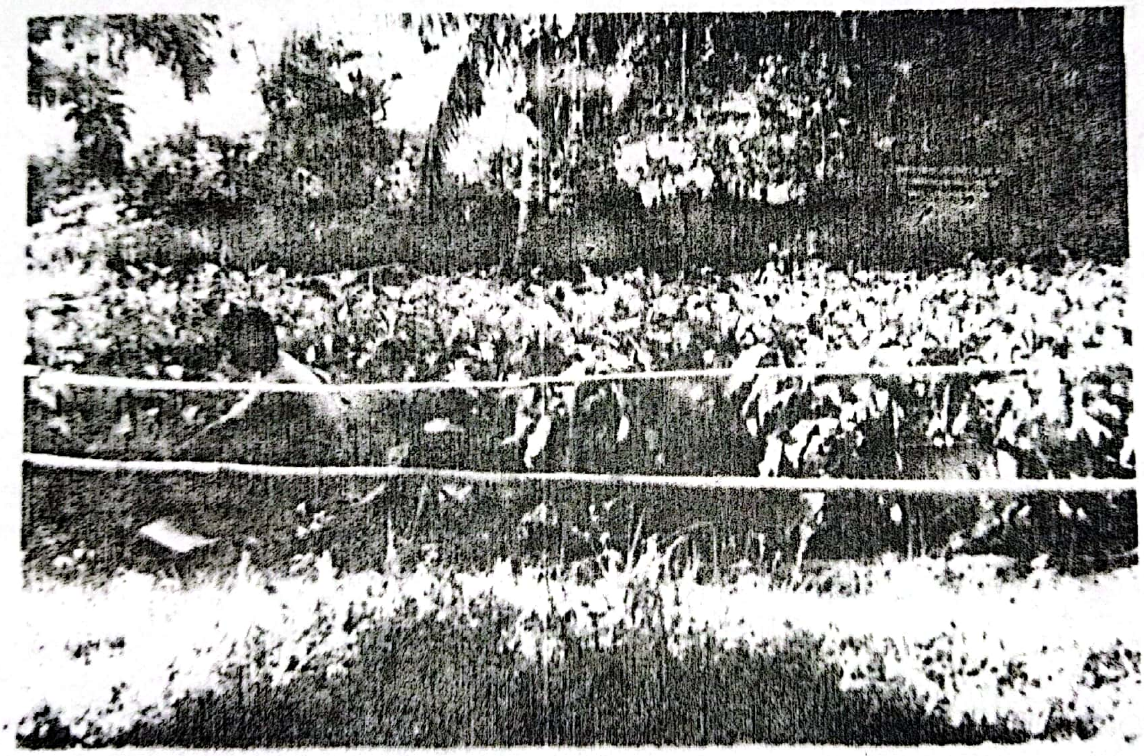
SECOND MEASUREMENT OF EGGPLANT



The researcher on the second measurement of the height and the crown of the plants. The tallying and recording of the data was carefully done one month after transplanting.

APPENDIX Z-8

THIRD MEASUREMENT OF EGGPLANT



This picture was taken one and a half months from transplanting. This was the third measurement or collection of data.

APPENDIX Z-9

FOURTH MEASUREMENT OF EGGPLANT

The two farmers were observing how to collect data for the height and the crown of eggplant. This was done to months from transplanting. This was the last collection of data on the height and crown of plants for they were already on their initial fruiting.

APPENDIX Z-10

PEST CONTROL AND WEEDING

The researcher and a laborer working on mechanical control of pests and diseases by hand picking. The other laborer is weeding the experimental area.

APPENDIX Z-10a

PEST CONTROL AND WEEDING

Identifying pests and diseases as well as control by hand picking and weeding.

APPENDIX Z-10b

SPRAYING

The researcher and a hired laborer spraying Malathion insecticides to the eggplants at two months old.

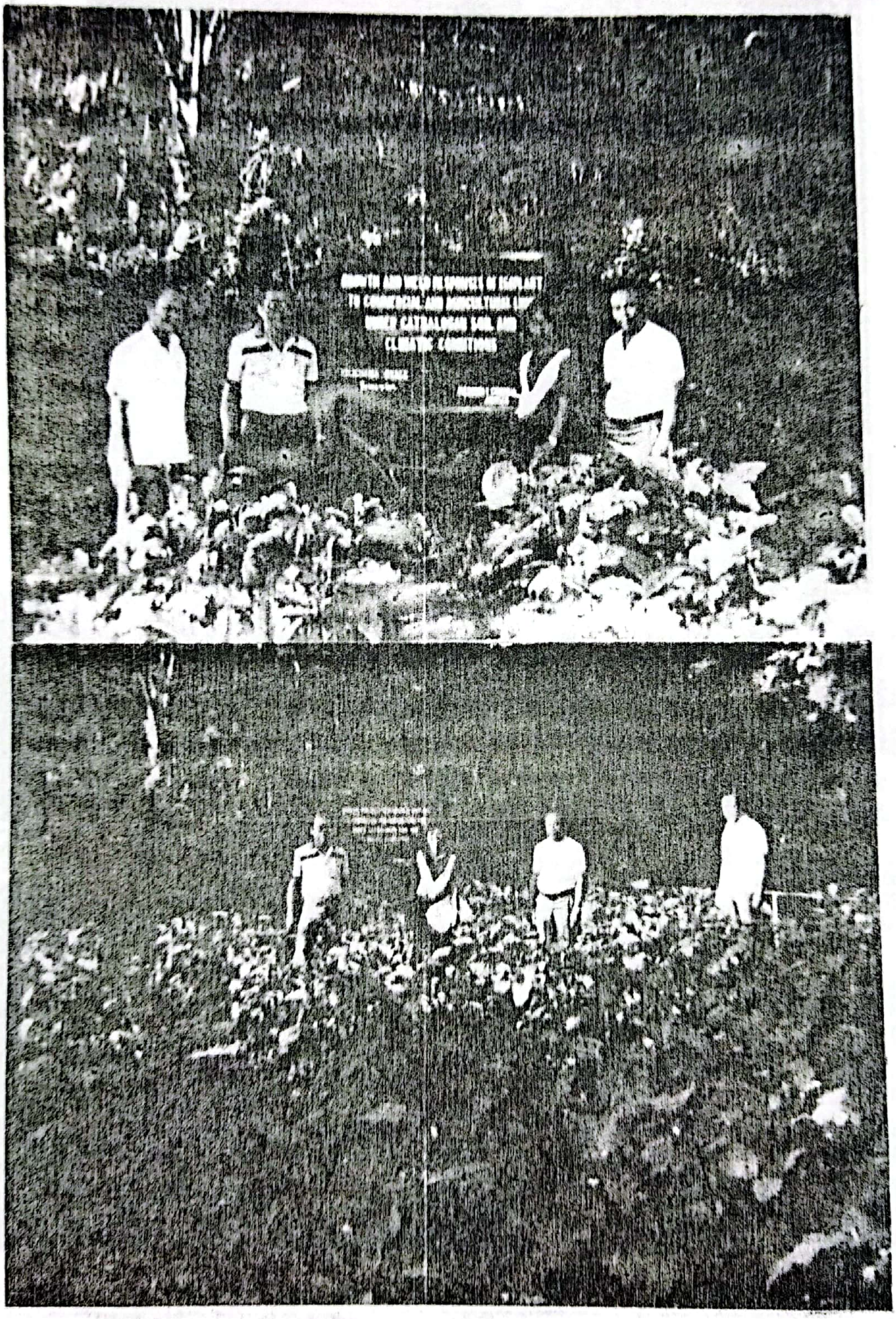
APPENDIX Z-10c

SPRAYING

A hired laborer spraying the plants in the experimental lot under the direction of the researcher.

APPENDIX Z-11

VISITATION OF THE EVALUATORS



The members of the thesis committee inspecting the experiment during the fruiting stage.

APPENDIX Z-11 (Continued)

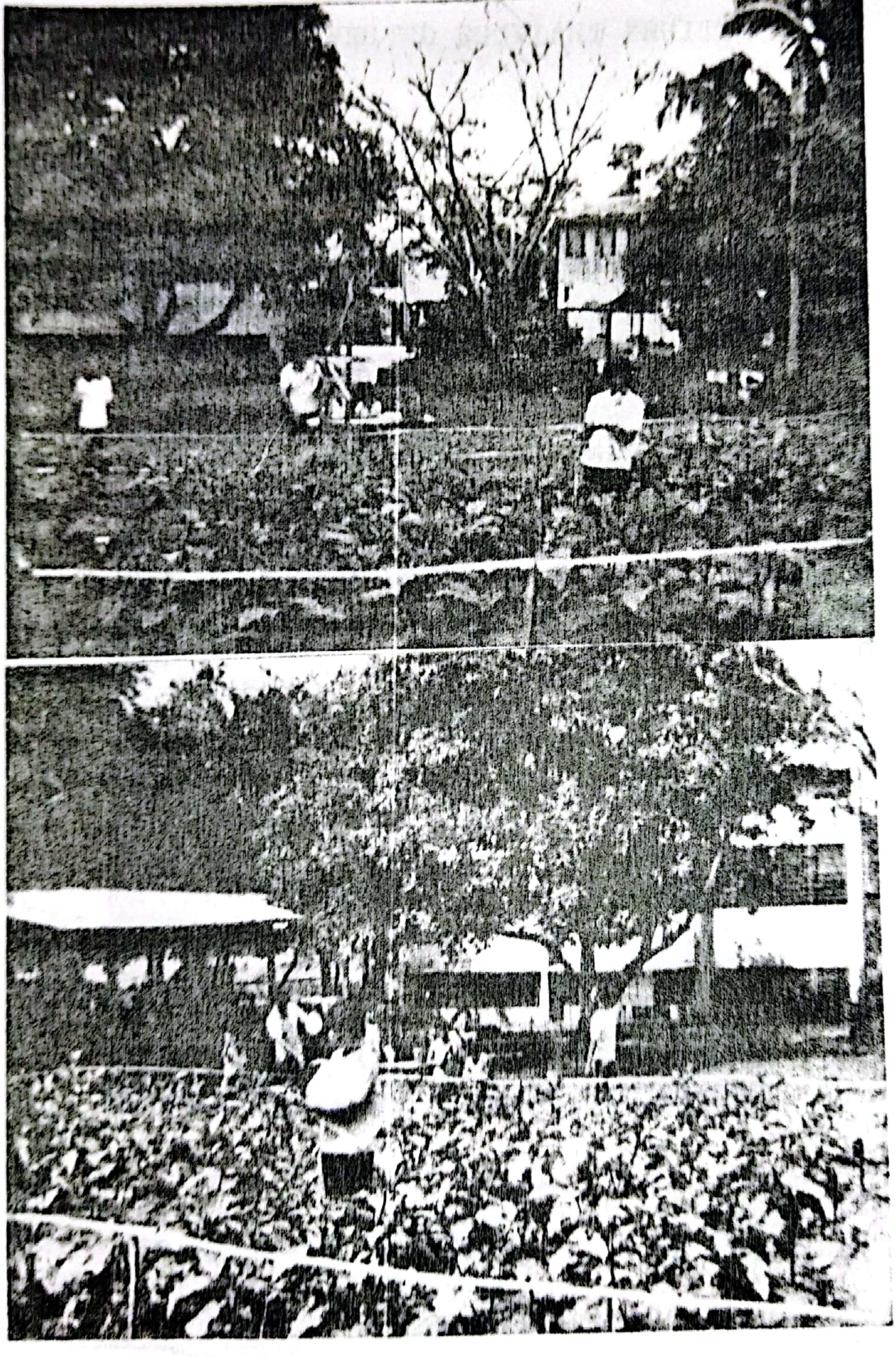
A pose of the evaluators with the researcher. Left to right (upper) Mr. Florencio L. Advincula, Chief, Soil Section; the researcher; Dr. Dominador Q. Cabanganan, Dean of the Graduate Studies; Asso. Prof. Alejandro E. Cananua, Thesis Adviser; Dean Bernardo S. Oliva, Statistician.

APPENDIX Z-11 (Continued)

The evaluators looking closely at the fruits of eggplant. The fruits shown on this picture were from treatment two (T_2) applied with Agricultural lime.

APPENDIX Z-12

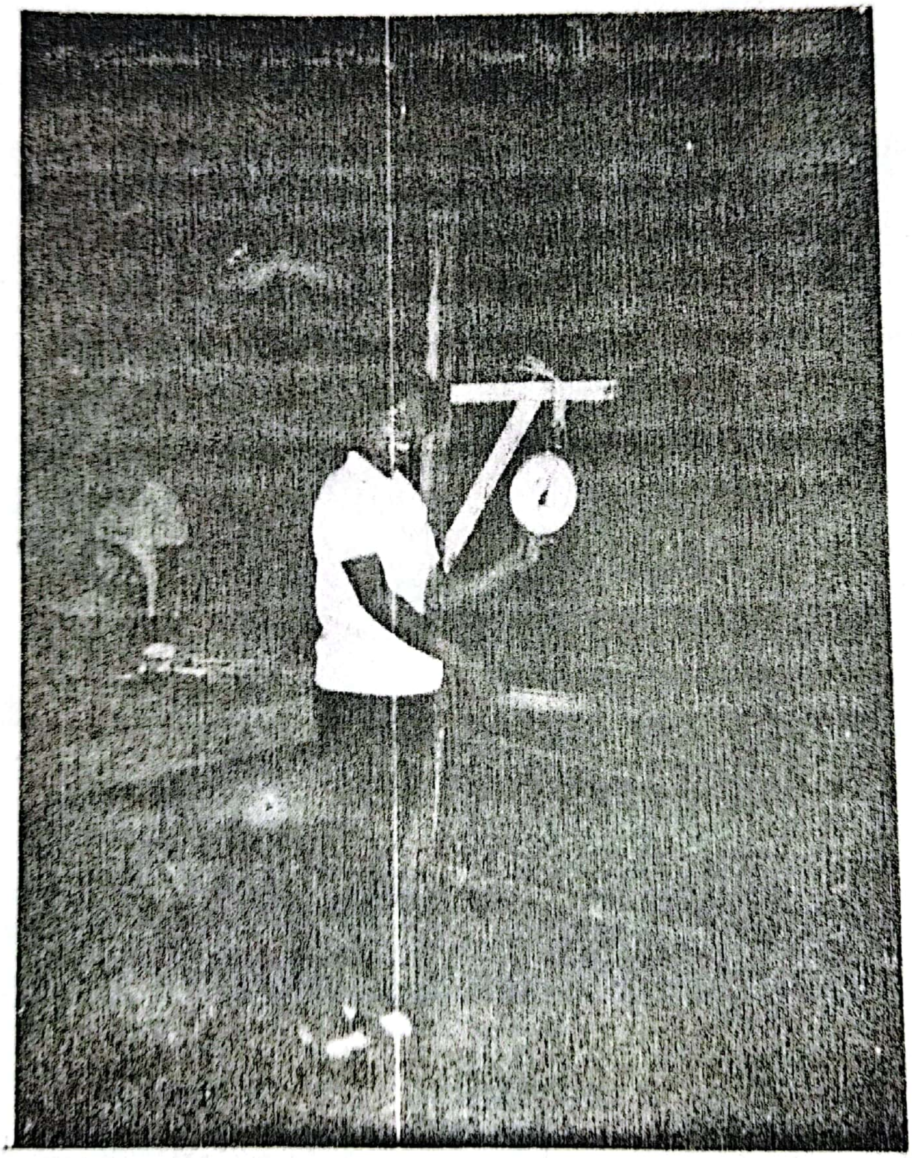
HARVESTING, MEASURING AND RECORDING DATA



This picture shows the researcher measuring the length and circumference of harvested fruits in centimeters using a tapemeasure.

APPENDIX Z-13

WEIGHING HARVESTED EGGPLANT FRUITS



The researcher adjusting the weighing scale ready for measuring harvested fruits. The data gathered were expressed in kilograms per treatment.

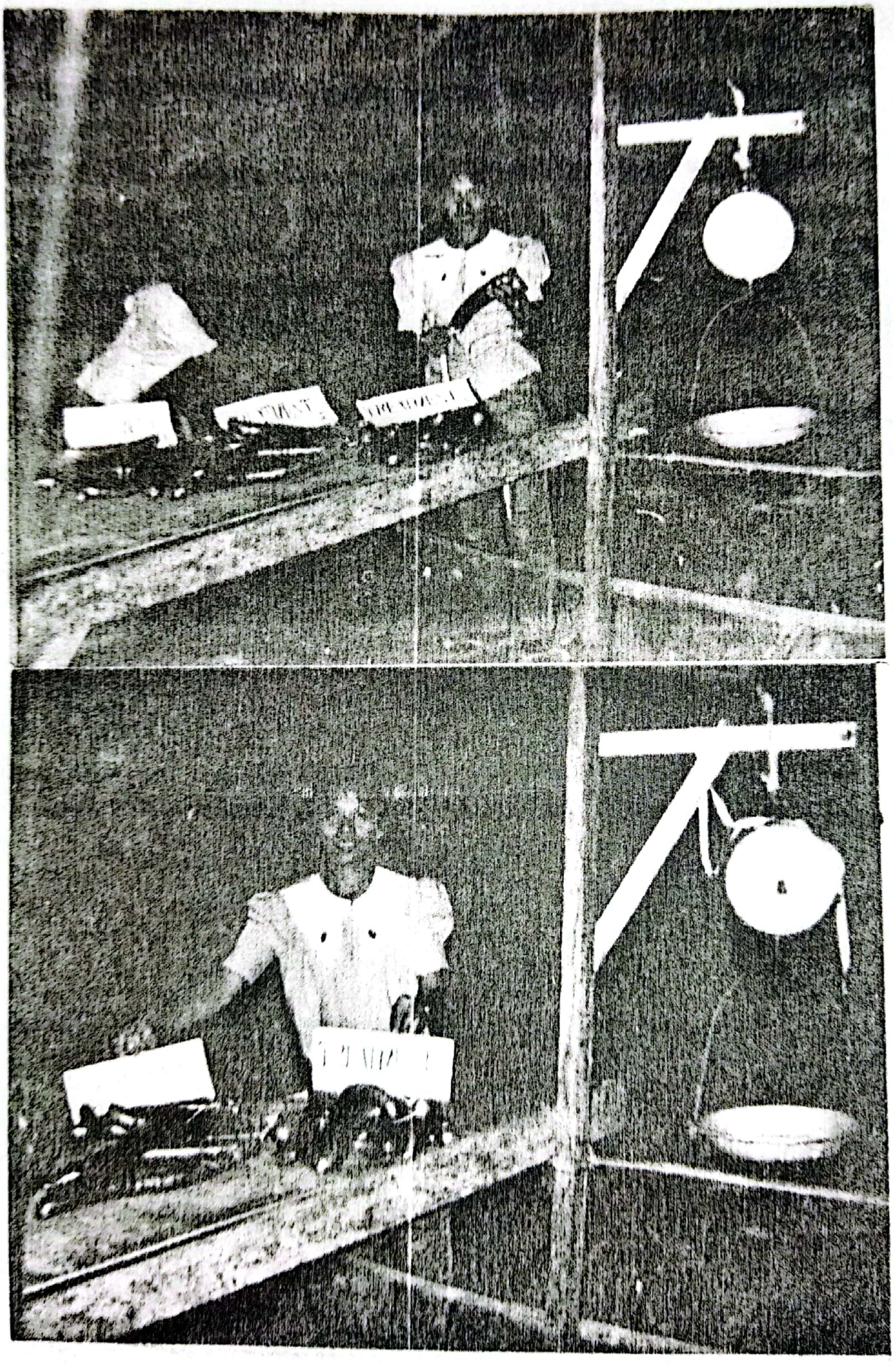
APPENDIX Z-14

MARKETING

A pose of the researcher with a buyer of eggplant fruits after recording the data needed in the research study.

APPENDIX Z-15

SEPARATING HARVESTED FRUITS BY TREATMENT



As shown in this picture harvested fruits for treatment two (T_2) out yielded treatment three (T_3) and treatment one (T_1).

CURRICULUM VITAE

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Auditor	Class sub-chapter, SSAC, Salcedo, Eastern Samar First year to third year 1972-1975
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Professional Board for Teachers	May 25, 1980

SEMINARS AND WORKSHOPS ATTENDED

Live-in Seminar on Vegetable Production, MA, Catbalogan, Samar, July 2-3, 1982

Seminar Workshop on Performance Appraisal System (PAS), Sunburst Hotel, Catbalogan, Samar, September 23-24, 1982

Evaluation Seminar Workshop on MA Reports, July 12-14, 1983

Re-echo Seminar on Training and Visit System, August 1-2, 1983

1983 Division Science Fair, SNS, Catbalogan, Samar, October 11, 1983

Seminar Workshop on Food Nutrition and Agribusiness Components, EDS-TC, Barugo, Leyte, December 19-23, 1983

Cost Reduction Training on Rice Production, MAF, Catbalogan, Samar, June 7-8, 1985

Integrated Pest Management Training for "AFT's", Napuro, Sta. Margarita, Samar, November 17-18, 1986

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