

G. C. WALL

CURRENT RESEARCH PROJECTS



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PROJECTS

TITLE: Soil Fertility Survey of Guam Agricultural Soils

PRINCIPAL INVESTIGATOR: Dr. J.L. Demeterio

NATURE OF PROJECT:

Soil fertility evaluation using soil testing needs a great deal of background research data to be effective. The project deals with fertilizer response studies on the different soils of Guam. Such studies are site specific. A soil taxonomy report which describes soils to the family level could, however, allow use of experimental data on other fields.

Soil response to added fertilizer and soil amendments vary from year to year. Hence continuous experimental monitoring should be done. There is a need to reclaim the acid soils of southern Guam using lime from northern Guam.

RESULTS/ IMPACT TO DATE OR EXPECTED:

The identified the main limiting element is phosphorus. There is indication that potassium could also be limiting on soils on top of limestone.

Research on assessing alternate sources of fertilizer nitrogen has shown that tangan-tangan (Leucaena leucocephala) can adequately supply the nitrogen needs of vegetable crops. Certain agronomic practices (i.e. intercropping and cropping schemes to include legumes) have shown that the nitrogen economy of Guam soils can be maintained without addition of petroleum based commercial nitrogen fertilizer.

It has also been demonstrated that there is no need to apply nitrogen in split amounts. A single application at planting is sufficient.

The project provides soil testing services free to the public. A 10-year soil test summary is being readied.

TITLE: The Effect of Varied Nitrogen, Phosphorus, and Potassium Fertilization on the Yield of Selected Vegetable Grown in the Agricultural Soils of Micronesia

PRINCIPAL INVESTIGATOR: Dr. J.L. Demeterio

NATURE OF PROJECT:

The agricultural soils of Kosrae, Phonpei, Truk, Yap, and Belau are examined using the principles of soil testing. Based on soil test results, an N P K response study is conducted in the various islands. Research results are used as basis for fertilizer application.

RESULTS/IMPACT TO DATE OR EXPECTED:

Agriculture personnel involved with fertilization have been identified and made aware of soil testing services offered by Guam. Soil samples have been collected and tested. It appears that the main limiting nutrient in all islands is phosphorus. A guide for proper fertilization will be published. Fertilizers that are obtained should be applicable to island needs.

TITLE: The Biological Control of the Weed, Chromolaena odorata

PRINCIPAL

INVESTIGATOR: Mr. Thomas Seibert, Research Associate
Dr. Claron Bjork
Dr. R. Muniappan

NATURE OF PROJECT:

The noxious weed, Chromolaena odorata (known locally as Masiksik), was introduced into the Marianas islands in the early 1960's and has rapidly spread over the islands. It is particularly a problem of pasture and waste lands being toxic to cattle and containing volatile chemicals that become a fire hazard during the dry season. Chemical control using herbicides is not practical because of the expense and large number of acres covered by the weed. As a result, this project was initiated to introduce natural insect enemies of the weed from its native habitat in the new world tropics. It is hoped that these insects can suppress or kill the weed and reduce its abundance to a tolerable level, allowing more desirable vegetation to increase.

RESULTS/ IMPACT TO
DATE OR EXPECTED:

After resolving some problems related to establishing insects in the field, two sites are currently being defoliated by the moth, Pareuchaetes pseudoinsulata. Nearly 100% of the leaves are being eaten and new buds are being destroyed so that the plants have not been able to produce new leaves for up to seven months now. It is too early to tell whether the insects will be able to maintain this level of attack, however the results so far are promising. We are trying to bring in two other insects both of which kill stem tips, look very promising. These introductions will be attempted in 1986. For the near future, efforts will be concentrated on evaluating the effect of the insects on the weed and continuing to introduce the moth to infested lands of Guam and the other Marianas islands.

TITLE: Use of Local and Available Feedstuffs for Animal Production

PRINCIPAL

INVESTIGATOR: Dr. A.L. Palafox

NATURE OF PROJECT:

The project objective is to determine the feeding value of locally produced and available feedstuffs to meet the requirements of the animal industry. Tangantangan, limestone (white coral), cassava and sweet potato are produced locally, whereas concentrate sources of energy, protein, minerals and vitamins are available from off island sources.

RESULTS/IMPACT TO
DATE OR EXPECTED:

An experiment was conducted with starting 9-kg pigs. They were fed 0, 10, 15 and 20 percent coconut meal (CM). Results showed that pigs fed 10 percent CM were the heaviest. They gained the most at the end of the experiment. Pigs fed 10 percent CM consumed the least per unit of gain, whereas those fed 20 percent consumed the most feed per unit of gain.

Another test was conducted with growing 19-kg pigs fed 0, 10, 15 and 20 percent CM. Pigs fed 0, 10 and 15 percent CM were superior in average daily gain when compared with those fed 20 percent. As much as 15 percent coconut meal may be fed to growing pigs with optimum performance. The two preceding experiments suggest that feed per unit of gain increased with the concentration of CM in the diet.

A third experiment was conducted with 27-kg pigs to determine the feeding value of fresh cassava tubers. The data showed that pigs fed 1 kg fresh cassava tubers daily gained more weight than the control. The feed mash consumed by pigs fed the fresh cassava tubers was 23 percent less than those fed mash alone.

It was concluded that 27-kg pigs may be fed fresh cassava roots with good feed conversion.

TITLE: Potential of Cassava as a Crop for Guam and Micronesia

PRINCIPAL
INVESTIGATOR: Dr. A.L. Palafox

NATURE OF PROJECT:

Guam and Micronesia are dependent on imports to meet the demands of the region for a source of energy for the people and for the animal industry. Cassava is a good source of energy. The objective of the project is to determine the potential of cassava as a crop: 1) to identify the accessions presently growing in the villages and islands of Micronesia; 2) to determine those which may be called cultivars; 3) to compare tuber yields and 4) to determine the comparative yields of local and off-island varieties.

RESULTS/ IMPACT TO
DATE OR EXPECTED:

An experiment was conducted to determine the productive performance of Guam cassava accessions. It was conducted at the Inarajan AES. Five accessions were compared. Results showed that tuber yield ranged from 11.3 to 22.7 t/ha, and the number of roots per plant ranged from 4.3 to 6.6.

A second experiment was a replicate of the preceding experiment. The main difference was that the first experiment was conducted in December of the previous year, whereas the other was conducted in October of the following year. Both tests started during the wet season. Results of the first test showed that tuber yield ranged from 6.7 to 16.2 t/ha. Real differences among accessions were noted. The data also showed that tuber yield differed greatly due to time. Root yield obtained in the second experiment was inferior to that of the first. The difference may be attributable to weather conditions. The amount of rain, moisture in the air, wind velocity, etc. may be real factors to be considered.

Another experiment was also conducted on the effect of ridged and unridged rows on the productive performance of two cassava accessions. The data showed that tuber yield and number of roots per plant for cassava planted in ridged rows were superior to those planted in unridged rows. Root yield of cassava planted in ridged rows was 30.3 t/ha, compared with only 19.8 t/ha, for those planted in unridged rows. Number of roots per plant was 7.1 for ridged rows, whereas it was only 4.8 for unridged.

The impact of the results of the preceding experiments suggest cassava may be grown in Guam and Micronesia with fairly good results. Root yields of cassava grown locally are comparable with those obtained from other tropical areas. Cassava is fairly disease-free in Guam. This is an advantage.

Title: Improve and Evaluate Biological Control in Pest Management

Principal

Investigator: Dr. Donald M. Nafus

Nature of Project:

Biological control is a safe, economic way to control insects. Often new insects enter Guam without their natural enemies and they become serious pests. The goal of this project is to find suitable natural enemies for serious pests on Guam and establish them here.

Results/Impact

Date or Expected:

Ganaspidium sp. was imported from Hawaii to aid in the control of the agromyzid leafminer Liriomyza trifolii and has been released at six locations on Guam. Periodic samples of leafminers and associated parasitoids are being collected from a variety of crops (principal tomato, cucumber, and beans), weeds (Bidens), and ornamental (marigold) near the release areas. The first recoveries of Ganaspidium were made in northern Guam on marigold in August about 1 mile from the release site and it is spreading slowly. In addition to Ganaspidium, other parasitoids found are Eucoilidea micromorpha Perkins, E. guamensis Yoshimoto, Cothonaspis (Eucoilidea?) pacifica Yoshimoto, Hemiptarsenus semialbiclavus (Girault), and Chrysonotomyia formosa (Girault).

Preliminary studies on the impact of B. jocosatrix on mango were initiated as background information preparatory to introducing new natural enemies. Mango trees were treated with Servin every two weeks or one group left untreated. B. jocosatrix had a significant impact on the mango. The treated trees produced new leaves in synchronous flushes twice during the year. Untreated trees produced major flushes twice and individual branches continued to flush sporadically throughout the year. Total leaf area was 5.2m^2 per 25 shoots on the treated trees and 3.3m^2 in the untreated trees. Shoot growth averaged 20 cm on treated trees compared to 11 cm on untreated trees. Flowers were produced on 35% of the treated branches and 13% of the untreated ones. Trees with a leaf area of less than $4.5\text{m}^2/25$ shoots did not produce flowers. B. jocosatrix is a significant pest of mangoes and may be responsible for poor fruit production on Guam.

Title: Development of Integrated Pest Management Systems on Guam

Principal

Investigator: Dr. Ilse Schreiner

Nature of Project:

This project is concerned with developing management techniques for insects of economic significance on Guam. Pests worked on in the last several years include leafminers, aphids, the mango shoot moth and the newly introduced Thrips palmi.

**Results/Impact To
Date or Expected:**

Past successes have been to identify an insecticide which would control the leafminer on beans. This material is currently under review by the EPA to determine if it can safely be applied to beans. A chemical to control the mango shoot moth on foliage has also been found, and the most effective times for applying the material have been identified.

In 1985, an experiment was run to determine the importance of the mango shoot moth *Bombotelia jocosatrix* as a flower feeder, compared to the importance of anthracnose, which has been considered the primary reason for poor fruit set of mangoes on Guam. Trees were sprayed to induce flowering and were treated once weekly with *Bacillus thuringiensis*, Captan, or a mixture of the two. In the trees treated with B.t. or the mixture, two thirds or more of the flower stalks were undamaged, although several trees were completely stripped of flowers. In the trees treated with nothing or captan alone, over half of the flower shoots were consumed. Most trees were stripped, although several escaped heavy damage. Trees treated with a mixture of B.t. and captan set slightly more fruit than trees treated with B.t. alone. Weekly treatment with insecticide appeared to not be frequent enough to ensure protection of the flowering shoots.

A trial was begun to determine whether mulching affects the number of Thrips palmi on cantaloupes. In the first trial, the number of thrips was very low, and the evaluation was not successful. The trial will be repeated. Previous work suggested that for cucumber, trellissing is likely to aggravate thrips problems.

Title: Management of Ostrinia furnacalis on Corn in the Micronesia

Principal

Investigator: Drs. Donald M. Nafus and Ilse H. Schreiner

Nature of Project:

In Asia and some of Micronesia the Asian corn borer is a severe pest of corn. On Guam, very high numbers of corn borers are present throughout the year and frequently corn plantings are totally destroyed. Currently, sweet corn and corn for making tortillas are imported from the U.S., but both could be produced locally to meet market needs if this pest problem could be resolved. The aim of this project is to explore a variety of techniques which might be useful in the management of the corn borer. These include evaluation and manipulation of natural enemies, pesticide trials, evaluation of cultural controls and screening of corn varieties.

Results/Impact To

Date or Expected:

Screening trials of insecticides have shown that on Guam, the most effective material of those tested was Bacillus thuringiensis (B.T.). Removing the tassels at the pollen-shedding stages reduces corn borers in the field by about 50 percent. Tassels were removed from four out of every six rows of corn. A combination of detasselling and B.T. sprayed once weekly gives good yields under a moderately heavy borer infestation (50 borers per untreated plant) where neither technique alone, or use of methomyl does. Under heavy infestation (over 100 borers per untreated plant), no technique was successful.

We found no parasites in Guam or in the Northern Marianas which were very effective in reducing corn borer numbers and there were not larval parasites.

Corn screening trials revealed some field corn varieties which have some resistance to the borer. There was also some resistance in sweet corn lines but overall the sweet corn is much less resistant than the field corn. Progress is being made towards developing a rating scale for tassel resistance to supplement the traditionally used leaf resistance scale. Preliminary results show some variation between corn lines for the amount of damage seen in the tassel. The 10 varieties with the most resistant leaf rating scores were A619, Hi40, H60, AntC5-S5, HIX4231, CIM. T 11ES, C166, INV138, Mp496 and Hi31. The 10 varieties with the most resistant tassel ratings were ICAL29, ICAL25, Mp68:616, Hi34, HIX4267, Fla 2BT 106, PhiIDMR6-S5, Hi41, H95, and NC246. There was a significant relationship between leaf ratings and tassel ratings. There was also a significant relationship between tassel ratings and stalk damage.

O. furnacalis feeds on the following weeds: Phragmites carca, Panicum maximum, P. muticum, Eleusine indica, Echinochloa colonum, Pennisetum purpureum, P. polystachyon, and Paspalum paniculatum. Miscanthus floridulus is not a suitable host.

Title: Genetics and Physiology of Sweet Corn Quality, Pest Resistance and Yield

Principal

Investigator: Drs. Donald M. Nafus and Ilse H. Schreiner

Nature of Project:

Sweet corn is expensive and not widely grown on Guam. Many U.S. varieties do poorly and do not have the sugar content they have on the mainland. The objectives of this project are to screen sweet corn varieties for resistance to the Asian corn borer and to find the proper agronomic practices for Guam.

**Results/Impact To
Date or Expected:**

Two groups of sweet corn were screened for resistance to *Ostrinia furnacalis*. The first was a series of 17 commercial varieties. Their leaf ratings varied from 6.1 for Hawaiian Supersweet # 10 to 3.2 for Golden Cross Bantam and NK51036. The tassel rating varied from 4.5 in Quicksilver and Stylepak down to 3.1 in Golden Cross Bantam and Supersweet #10. The second group consisted of 39 developmental lines. The mean leaf damage rating varied between 5.3 for line 5417-2 and 1.8 for line 5367-2. The mean tassel ratings varied from a high of 3.9 for 5417-2 to a low of 1.5 for 5366-1. Duncan's analysis showed some significant differences between the various breeding lines in both tests. The named varieties appeared to be more susceptible than the best of the breeding lines in both leaf ratings and tassel ratings. There was an highly significant correlation ($p < 0.0001$) between the leaf rating and the tassel rating for the 5,000 series corn breeding lines, but not for the named varieties.

A plant spacing trial was run to compare the standard spacing used by Guam farmers when planting sweet corn, with other, higher planting densities. The number of plants per hectare ranged from 28,000/ha to 420,000/ ha. The best yield obtained was one and a half times greater than the yield obtained at the traditional planting density.

TITLE: Promote Flowering and Dwarfing of Winged Bean with Plant Growth Regulators

PRINCIPAL
INVESTIGATOR: Dr. C.T. Lee

NATURE OF PROJECT:

It has been shown that naturally occurring plant hormones play an important role in the process of flower bud induction and control of plant size. Synthetic plant growth regulators have been developed that will induce flowering at desired times and reduce plant size on many agricultural crops. No work has been reported on the application of plant growth regulators for the flower induction and dwarfing on winged bean. The objective of this project are: (a) to assess the possibility of year round production on winged bean through flower induction, and increasing of the number of lowers, and pod sets by the application of growth regulators; (b) to evaluate the use of plant growth regulators on dwarfing to reduce labor and material costs of staking in the production of winged bean; and (c) to study the effect of plant growth regulators on the quality of winged bean pods and seed.

RESULTS/IMPACT TO
DATE OR EXPECTED:

The initial experiment was to study the influence of plant growth regulators on the flowering and growth of winged bean. Seven growth regulators, namely: succinic acid 2, 2-dimethyl hydrazine, 2, 4-dichlorophenoxy acetic acid; 4 chlorophenoxy acetic acid; (2-chloroethyl) trimethyl ammonium chloride; 2, 3, 5-triodobenzoic acid; spray and grow, and B-naphthoxy acetic acid were included in this experiment. The results are not available at this time.

TITLE: Effect of Exogenous Growth Regulators on Growth, Yield and Quality of Solanaceous and Cucurbit Crops

PRINCIPAL INVESTIGATOR: Dr. C.T. Lee

NATURE OF PROJECT:

Most of the research work on the use of synthetic growth regulators to promote the growth and development of vegetable crops has been conducted at low temperature and low humidity situations of temperate areas. Very little work has been reported on the application of growth regulators for the increase in production of solanaceous and cucurbit crops under humid tropical environmental conditions. The objectives of this project are: (a) to assess the possibility of increasing yield of solanaceous and cucurbit crops by increased fruit size, number of fruit set and improving the fruit quality by the application of growth regulators; (b) to evaluate the growth regulators on fruit ripening to enable earlier harvest and increasing the number of solanaceous and cucurbit crops per year; and (c) to study the possible interactive effects of the application of mixtures of growth regulators on fruit quality of solanaceous and cucurbit crops.

RESULTS/ IMPACT TO DATE OR EXPECTED:

The initial experiment was to study the effect of two growth regulators (4-chlorophenoxy acetic acid and B-naphthoxy acetic acid) on fruit set and yield of tomatoes during dry and wet seasons. The tomato hybrid 'N-65' was investigated using six concentrations (0, 15, 30, 45, 60, and 75 ppm) of 4-chlorophenoxy acetic acid, and five concentrations (0, 250, 500, 750, and 1,000 ppm) of B-naphthoxy acetic acid. The application of 4-chlorophenoxy acetic acid at the concentration at/or above 30 ppm or B-naphthoxy acetic acid at/or above 750 ppm on the tomato flower at a ten-day interval, resulted in the increases of fruit weight, number of fruit-set and yield.

Title: Evaluation of Different Cultural Methods for Production of Ornamental Plants in Guam

Principle

Investigator: Dr. James McConnell

Nature of Project:

This project was established to evaluate various ornamentals for use in commercial operations in Guam and to determine the cultural methods for optimum production of selected plant materials. Three species have been selected for advance testing: vandas, dendrobiums, and anthuriums. Three other species are being evaluated bird of paradise, heliconias and gingers. Additionally, local ferns are being collected and evaluated for use as cut foliage.

Results/Impact To

Date and Expected:

Vanda Miss Joaquim is a good choice for beginning commercial production in Guam. Miss Joaquim is easily propagated from cuttings which are available locally. Currently coconut husk and crushed coral are being compared for use as growing media. The plants growing in coconut husk are larger than the plants growing in coral. Vandas grown in coral also require more fertilizer than when grown in coconut husk. The advantages of coral over coconut are that coral is readily available and does not need frequent replacement as coconut husk requires. Preliminary results indicate that slow release fertilizers work better than liquid fertilizers and a combination of different fertilizers appears to be the best treatment. New plantings are being established to evaluate growing the vandas with mounded soil and also to conduct an expanded fertilizer study. Additional vanda cultivars have been collected for evaluation. Vanda Miss Joaquim 'Atherton' was identified as a superior cultivar with larger flowers and greater production of flowers.

Dendrobium cultivars have been collected from Hawaii and Thailand. The cultivars will be evaluated for total number of flowers produced, size of flowers, and how long the cut flowers last. Media and fertilizer trials have begun using several cut flower cultivars developed at the University of Hawaii. Three cultivars are included in a media and fertilizer study: Dendrobium Jaquelyn Thomas 'Uniwai Pearl', D. Jaquelyn Thomas 'Uniwai Blush', and D. Jaquelyn Thomas 'Uniwai Supreme' commercial cut flowers. Thirteen cultivars were collected.

Anthurium cultivars were collected in Hawaii to evaluate for use in Guam. The following cultivars were selected for further testing: Kaumana, Kozohara, Nitta, Paradise Pink, Manoa Mist, Mauna Kea, and Anuenue. Propagation by stem node cuttings is currently under evaluation as a method of propagating the anthuriums. These cuttings are readily available in Hawaii, ship well, and are inexpensive. First flowering occurred three months after planting the cuttings. Further experiments will evaluate various media, fertilizers, and shading requirements.

Title: Determination of Plant Diseases on Guam

Principal

Investigator: Dr. James McConnell

Nature of Project:

This project is accumulating information on what disease organisms are present on Guam. Incidences of bacteria, viruses, fungi, and nematodes on both ornamental and food crop plants are being collected.

Results/Impact To
Date or Expected:

Currently 950 reports of disease have been accumulated. Many of the diseases have been reported more than one time. The accumulation of this data is important, since it directly affects the ability of Guam to export plant products. If it can be demonstrated that a particular pathogen does not exist here, exportation of products will be made much easier. Currently all of the data is maintained on a computer. This allows for efficient searching of previous records and allows for the determination of patterns of occurrence of pathogenic organisms.

Title: Use of Soil Factors and Soil-Crop Interactions to Suppress Diseases Caused by Soil-Borne Plant Pathogens

Principal

Investigator: Dr. James McConnell

Nature of Project:

The major objectives of this project are to investigate the physical properties of the soil, and cropping methods as they affect soil-borne plant pathogenic fungi.

Results/Impacts to Date or Expected:

Two studies were conducted to determine the effects of incorporating Casuarina needles or Leucaena leucocephala into soil as compared to treating the soil with fungicide drenches. Bell peppers were grown in four different soil treatments: Soil only, Soil with Casuarina needles (10% by volume), Soil with Captan-Terraclor drench,, Soil with Casuarina needles plus Captan-Terraclor drench. Soil with Casuarina needles and soil with Captan-Terraclor drench produced significantly more fruits with higher fresh weights than the other two treatments. Soil with Casuarina needles also produced plants with higher canopy dry weights. Fruit production and canopy dry weight was lower in the treatment receiving both Casuarina needles and the Captan-Terraclor drench than the single treatments. Tomatoes were grown in six different soil treatments: Soil only, Soil with Captan-Terraclor drench, Soil with mulched L. leucocephala branches (10% by volume) with and without fungicide drench, Soil with Casuarina needles (10% by volume) with and without fungicide drench. The number of fruits and fresh weights were highest in the treatments of soil with Casuarina needles and soil with mulched L. leucocephala branches both without fungicide.

Title: Effect of Cultural Practices on Disease Incidence on Bell Peppers

Principal

Investigator: Dr. James McConnell

Nature of Project:

This project was initiated to evaluate the effectiveness of cultural methods other than pesticide application for control of diseases on bell pepper.

Results/Impacts to

Date or Expected:

Plantings during the wet and dry seasons have shown that cultural methods alone were not effective in controlling diseases during the wet season. Pesticides were necessary. Currently none of the cultural methods make growing bell peppers economically feasible during the wet season. Over the past year, seedlings of bell pepper (Capsicum annum L. var. annuum Grossum Group) cultivar Keystone Giant were planted on a monthly basis to identify which months are acceptable for growing peppers. The months of October through February produced the greatest number of fruits and the largest fruits. Plant dry weights were also greatest during this period. Plantings from March through August produced very few fruits. Many of the plants died before 16 weeks of harvest during the period of June through September. Plant death, due to foliar disease, was the main cause of reduced yield of March through August plantings. Current plantings will evaluate the use of polyethylene coverings effectiveness in reducing the incidence of disease.

TITLE: Improving the Status of Tropical Fruit Crops Through Selection, Introduction, and Breeding

PRINCIPAL INVESTIGATOR: Dr. R. Rajendran

NATURE OF PROJECT:

One objective of the project is to evaluate currently growing fruit crops on the island and introduce superior lines for direct cultivation or scientific breeding work for producing high yield and greater resistance to environment, pests and diseases. The second objective is to establish and maintain a genetic bank with superior clones from the tropics. The third objective is to standardize the suitable cultivation recommendations for increasing quality and yield of fruit plants on Guam.

RESULTS/IMPACT TO DATE OR EXPECTED:

Fruit Crop Survey - A survey of fruit crops on Guam was continued. Twenty-two different species of local plants producing edible fruits were identified and planted at the Experimental Station which includes. Cashew, Pineapple, Jackfruit, Papaya, Star Apple, Lime, Coconut, Mabola or Butter fruit, Surinam Cherry, Roselle, Macademia, Mango, Horse radish tree, Banana, Avocado, Guava and Tamarind. Fifteen acres of different fruit crops have been planted at Ija station.

Guava and Mango - A trial on mango and guava seedlings has been initiated to study growth and development under acid soil conditions of Southern Guam with different doses of N, P, K and Ca.

Trials were initiated on induction of flower in mango trees with KNO_3 , flowering could be induced on Carabao and Pico mango cultivars. Fruit drop was very high and sprays of insecticide and fungicide could not control it. Work on this is being strengthened.

Papaya - It was observed that UOG's Dwarf Papaya was superior in performance in both early and total yield as compared to Solos and other local cultivars. This line was low bearing early and high yielding. This was identified in 1983, evaluated, purified and initial trials were conducted in 1984 at the station and extended to cultivators fields. It did well in both Northern and Southern Guam. In Southern Guam adding of Ca, in the form of manufactured sand at the

rate of 2 lbs per square meter reduced the spread of root and stem-rot. Infected plants were drenched with Terrachore and Dithane M-45. Hybridization of this line with "Solo" resulted in plants with low transportation and storage quality. Work is in progress.

Mulberry- Dwarf, purple fruit table mulberry was introduced to the station in 1980, it was observed to be productive. It is recommended for, home school and public gardens.

Banana - A multiple bunch producing dwarf banana (Cavendish group) was identified. This clone produced 2 bunches per plant in 1982 and 1983. In 1984 one of the suckers produced seven flowering stocks in a tree with 429 fruits as compared to 90 fruits in a normal bunch. The pseudo-stem in this plant was oblong as compared to round in normal plants. The leaf base made a fan like configuration producing leaves on opposite sides as compared to spiral in normal plant.

TITLE: Water and Nutrient Management of Crops Under
Micro-Irrigation

PRINCIPAL
INVESTIGATOR: Mr. C. Saruwatari
Dr. C.T. Lee

NATURE OF PROJECT:

One of the major problems facing agriculture in the United States and Guam is the shortage of water. Micro-irrigation has the ability to provide plants with the required water for maximum yields and to prevent water stress. Research on micro-irrigation has shown that such systems can improve crop quality, production, and/or plant growth; decrease water usage through reduced water losses due to evaporation and deep seepage; conserve soil, fertilizer, labor, and energy compared to other methods of irrigation; and allows the possibility of irrigation with low yielding wells and low water quality.

RESULTS/IMPACT TO
DATE OR EXPECTED:

Farmers on Guam have increasingly turned to micro-irrigation due to the water shortages that occur during the dry season and to reduce the labor and time needed to irrigate their crops. Micro-irrigation is defined as the precise and uniform application of irrigation water through devices such as drip/trickle emitters, micro-jet, micro-spray, or spitters. Research continues to focus on determining the optimum quantity, frequency and rate of application for optimum yields for various commercial crops using micro-irrigation systems. With the installation of a weather station at the Agricultural Experiment Station in Inarajan, work will begin on making estimates on the evapotranspiration rate. Additional field work will begin on the use of fertilizer injectors and tests on plugging rates for various water treatment methods.

TITLE: Micronesian Area Tropical Agriculture Database Center
Project Under Section 406

PRINCIPAL
INVESTIGATOR: Dr. Kenneth Carriveau

NATURE OF PROJECT:

A serious problem facing researchers in Micronesia is the lack of information concerning agricultural research. The objective of the Center is to gather in one location all published and unpublished documents produced in or about Micronesia concerning tropical agriculture and related topics, and to provide bibliographic information retrieval and dissemination services.

RESULTS/IMPACT TO
DATE OR EXPECTED:

Memoranda of understanding have been negotiated with the Commonwealth of the Northern Mariana Islands, the Federated States of Micronesia, the Republic of Belau, and the Republic of the Marshall Islands for the automatic deposit of agricultural materials in the Center's collection.

A bibliographic database (MATADB) has been developed and implemented to provide reference services similar to those provided by AGRICOLA. The Micronesian Areas Database is intended to compliment rather than supplant the national database's scope.

A computerized registry of scientists and other project participants (ACREG) has been developed and implemented. Its content is similar to CRIS, but is limited in scope to the Micronesian region. The database is updated annually.

The feasibility of establishing a Pacific region bibliographic information network is currently being investigated. The Center has the capability of sharing its resources with other centers either electronically or in hard copy.

PUBLICATIONS:

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TITLE: Potential of Potato in Guam, Saipan and other Micronesian Islands

PRINCIPAL

INVESTIGATOR: Mr. Jose A. Cruz
Dr. M. Marutani

NATURE OF PROJECT:

Potato, Solanum species, is one of the important food source in Guam and other micronesian islands. Although the demand for the crop has increased recently, no commercial production of potatoes has been attempted by farmers locally. Traditionally, potatoes have been bred and cultivated in cool temperate regions. However, the recent studies on potato production in the hot tropical areas of South East Asia have shown the potential of self potato production in the Pacific islands. The project was initiated to identify good hot-climate cultivars; to investigate various cultural practices to overcome heat and water stress; to investigate practical storage methods to maintain local seed tubers; and to develop an in-vitro germplasm storage program as well as the rapid multiplication program of disease-free planting materials by tissue culture and stem cutting.

RESULTS/ IMPACT TO
DATE OR EXPECTED:

Previous varietal tests have shown various responses of cultivars with locations over the island and from year to year. In general, total yields were low compared to other tropical areas such as the Philippines. The 1984-1985 result showed potentials of two cultivars, Kennebec and Sequoia, which could be grown in Guam. Two varietal trials are currently being conducted using seven cultivars from the International Potato Center of the Philippines, six from Cornell University, and three from Australia. Varietal trials will be repeated in the dry seasons in order to obtain sufficient data to determine which cultivars are suitable for growing in a tropical environment.

Various cultural management techniques are being evaluated. A planting date experiment is being conducted using three planting dates with an interval of four weeks (Nov. 18, Dec. 16, and Jan. 13). Three varieties, Kennebec, Sequoia and Red Pontiac, were selected for this trial. Climatological data such as rain fall, air temperature, and humidity will be evaluated for their effects on plant performance. Some other cultural practices which will be studied include irrigation plus mulching effects and intercropping with Zea

mays to overcome heat and water stress problems. Results of these agronomical studies will give additional information on good cultural management to improve potato production in the tropics.

From March 1985 to November 1985, three storage methods were evaluated using tubers harvesting from the 1984-1985 experiment. Two cultivars, Kennebec and Sequoia, responded relatively the same in three storing methods (cold storage, air-conditioned, and diffuse light storage). LT-2, on the other hand, showed its poor storability in both air-conditioned and diffuse light storage. Although cold storage was the best storage method, two other methods still have potential. Modification of such methods will be investigated again. Currently, tubers which had been stored in three methods are being evaluated for their field performance.

The introduction of growing potatoes to farmer was initiated this year. Farmers from different locations of the island were selected and three cultivars, Kennebec, Sequoia and Red Pontiac, are being grown under different micro-climates, soil types and cultural practices. Any disease problems associated with farming sites will be observed. Three cultivars were also sent to, Phonpei and Saipan is being contacted for an on-farm trial.

In-vitro plantlets and microtubers of six cultivars were obtained from Cornell University. These plant materials will be maintained and propagated through tissue culture methods and stem cutting for future planting.

TITLE: Developing Crop Models for Cassava, Corn and Papaya on Guam

PRINCIPAL

INVESTIGATOR: Dr. Chu-Tak Tseng

NATURE OF PROJECT:

In micronesian islands, particularly on Guam, agricultural farming methods have undergone great change since World War II. The widespread use of fertilizers, the application of irrigation, the induced soil erosion, the change of farmland ecology, and the introduction of new crop varieties, have made farm management increasingly complicated. The small sizes and the limited technological manpower of these islands compound the problems and render the task more difficult.

One way of alleviating some of the problems is to use computer technology to simulate the growth of crops under different possible conditions, such as variation of soil types, amount of rainfall and irrigation, degree of fertilization, crop varieties, and date of planting. Knowing these simulated growths under such conditions, useful farming information pertaining to crop yields, data of maturity for harvest, and production costs can be predicted with reasonable certainty.

The present project is designed to use computer modelling to simulate crop growths on Guam under various field-observed cultivation conditions. The growths of perennial crops cassava and papaya are to be simulated by the USDA developed model EPIC, and the annual crop of corn by the IBSNAT (International Benchmark Sites Network for Agrotechnology Transfer) developed model CEREAL. These crops are important not only in term of the cash values that they bring to farmers, but also in the contributions of self-sufficiency of food crop to the islands.

RESULTS/ IMPACT TO
DATE OR EXPECTED:

A comprehensive data base of Guam's weather over the the last thirty years has been established and is ready to be used in computer simulations. The data were acquired from the U.S. Weather Service and were transformed into agroclimatic quantities such as heat units and rainfall probabilities. An agroclimatic atlas of Guam on precipitation has now been completed and shall be published by the Experiment Station. It was found that except in typhoon periods, the weather pattern on Guam over the last thirty years was rather regular. The seasonal variations of temperature were small

as compared to the U.S. mainland, and the rainfall pattern can be characterized by sharply divided wet and dry periods. The compilation of a soil data base with data from the U.S. Soil Conservation Service on Guam is now in progress. The computer program of CEREAL model computers. The model is now in the testing and verifying stage with data collected by Dr. Cope in the Experiment Station. It is expected that when the model is fully tuned, computer simulated results of the model would yield realistic projections and shall be useful for farm management on Guam.

TITLE: Analysis of Nitrogen Processing in Tropical Aquaculture Systems

PRINCIPAL INVESTIGATOR: Dr. Stephen G. Nelson

NATURE OF PROJECT:

To determine aspects of the nitrogen budgets of several aquatic organisms with potential for aquaculture on Guam.

RESULTS/IMPACT TO DATE OR EXPECTED:

We have examined the assimilation efficiencies of two common species of rabbitfishes (siganids) from Guam in order to assess their potential for cultivation in algal-based aquaculture systems. These fishes are herbivores which feed on a wide variety of marine plants, primarily macroalgae, in their natural habitats. We determined the assimilation efficiencies for total organics and for nitrogen for groups of fish which were fed selected macroalgal diets so that we could evaluate these algal species as potential food sources for the culture of siganids. In particular, red algae of the genus Gracilaria were found to be readily assimilated by the rabbitfish. This is interesting since other work has focused on the cultivation of Gracilaria in nearby areas, especially in Taiwan and the Philippines. A preliminary trial in a commercial milkfish pond on Guam proved that the fish grow rapidly in a brackish environment. There has been no significant impact to date on the local aquaculture industry. However, local culturists are enthusiastic about siganid culture, which may be realized in the future.

APPENDIX

APPENDIX

Project Numbers	Title/Project Leader	Allotment Numbers
QJ0008	Determination of Plant Disease on Guam - J. McConnell	3033-6-102
QJ0011	Soil Fertility Survey of Guam Agricultural Soil - J.L. Demeterio	3033-6-103
QJ0015	Improve and Evaluate Biological Control in Pest Management System - D.M. Nafus	3033-6-202
QJ0020	Improving the Status of Tropical Fruit Crops Through Selection, Introduction, and Breeding - R. Rajendran	3033-6-105
QJ0022	Water and Nutrient Management of Crops Under Micro-irrigation - C.A. Saruwatari and C.T. Lee	3033-6-203
QJ0024	Development of Integrated Pest Management Systems on Guam - I.H. Schreiner	3033-6-106
QJ0025	Use of Local and Available Feedstuffs for Animal Production - A.L. Palafox	3033-6-107
QJ0026	Use of Soil Factors and Soil Interactions To Suppress Diseases Caused by Soil- Borne Plant Pathogen - J. McConnell,	3033-6-204
QJ0030	Evaluation of Different Cultural Methods for Production of Ornamental Plants in Guam - J. McConnell	3033-6-109
QJ0037	Potential of Cassava as a Crop for Guam and Micronesia - A.L. Palafox	3033-4-223
QJ0038	Micronesian Area Tropical Agricultural Database Center Project Under Section 406 - K. Carriveau	3033-4-224
QJ0040	Management of <i>Ostrinia furnacalis</i> on Corn in the Micronesia - D.M. Nafus and I.H. Schreiner	3033-4-225
QJ0042	Analysis of Nitrogen Processing in Tropical Aquaculture Systems - S. Nelson	3033-6-112
QJ0043	Genetics and Physiology of Sweet Corn Quality, Pest Resistance and Yield - D.M. Nafus and I.H. Schreiner	3033-6-201

Project Numbers	Title/Project Leader	Allotment Numbers
QU0045	Effect of Cultural Practice on Disease Project on Bell Pepper - J. McConnell	3033-4-217
QU0046	The Biological Control of the Weed, <u>Chromolaena odorata</u> - T. Seibert, C. Bjork and R. Muniappan	3033-4-218
QU0048	The Effectiveness of Varied Nitrogen, Phosphorus, and Potassium Fertilization on the Yield of Selected Vegetable Grown on the Agricultural Soils - J.L. Demeterio	3033-4-221
QU0049	Potential of Potato in Guam, Saipan and other Micronesia - J.A. Cruz and M. Marutani	3033-4-226
QU0050	Developing Crop Models for Cassava, Corn and Papaya on Guam - C.T. Tseng	3033-4-227
QU0052	Effect of Exogenous Growth Regulators on Growth, Yield and Quality of Solanaceous and Cucurbit Crops - C.T. Lee	3033-6-104
QU0053	Promote Flowering and Dwarfing of Winged Bean with Plant Growth Regulators - C.T. Lee	3033-4-228

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