

Palau Agriculture Development

Current Program and Future Plans

The following report represents a detailed summary of the accomplishments of the District Agriculture Department during the past year together with an outline of the program contemplated for the next twelve months. This statement includes cost estimates and, where possible, target completion dates for various parts of the total program. Estimates have been based on existing budgetary and personnel ceilings and the program could be readily expanded to accommodate any increase in either.

COCONUT REHABILITATION

The coconut rehabilitation project has been the most satisfactory part of the program. Even though the people are concerned and reluctant to attempt coconut replanting because of the rhinoceros beetle, they are cooperative and interested.

The purpose of the government supporting this program is to carry out adult education, and to encourage and supervise the coconut replanting so that good producing and clean groves of coconuts are established that will be able to withstand the ravages of the rhinoceros beetle.

The program aims to have all plantings made in accordance with the best approved practices known at the time. Through constant inspection any outbreaks of disease or insects will be checked by appropriate measures.

I. Accomplishments

- A. In October of 1953 the program was initiated in areas declared to be out of danger from attacks by the rhinoceros beetle. A complete survey of all existing groves was made in order to determine the availability of good seed nuts, soil conditions, planting procedures, and the general feeling of the Palauans toward the project.
- B. Meetings and conferences were held to determine planting sites, how the people would support the program, and a planting method that would not interfere with the beetle control and clean-up procedure.
- C. It was necessary for the District Agriculturist to make two trips to Yap and one to the southwest islands in order to collect 11,000 seed coconuts.
- D. Coconut nurseries were established in three different locations.
- E. Seven thousand five hundred trees have been planted in Peleliu in accordance with the best planting practices and in agreement with the beetle control program.

XVIII. A (High Island - Palau)

- F. Eight hundred dwarf coconut seedlings were distributed to most of the homes in Koror for subsistence food production. These small plantings are subject to beetle damage and must be frequently inspected and handpicked by the owners.
- G. A planting of 1,100 coconuts is practically completed at Ngardmau.

II. Future Coconut Rehabilitation Program (12 month program)

A. Seed Coconut Procurement

- 1. 20,000 selected seed coconuts (at least 4 shipments of 5,000 each) must be secured from Yap.
- 2. Estimated cost of seed at \$.03 each -- \$600.00
(This cost would pay landholder and the expense of gathering)
- 3. Transportation costs from village to dock area at \$20.00 per cargo truckload -- \$100.00
- 4. Comments
 - a. In the past the transportation and labor costs of bringing the seed nuts to the dock on Yap have been absorbed by the Yap district. Shipping costs have been absorbed by HiCom.
 - b. Other districts are interested in securing the superior seed coconuts from Yap so it appears that the seed selection program might be big enough to justify an inter-district project with special funds allotted
 - c. More stress could be placed on selecting superior mother trees and stockpiling all nuts produced by these better trees.

B. Palau District Coconut Rehabilitation Program

- 1. Establish nurseries in all municipalities interested in planting coconuts and declared safe for planting by the beetle control program.
- 2. Supervise clearing and ground preparation for municipal plantings of 10,000 to 15,000 coconuts selected from the 20,000 nursery seedlings.
- 3. Educate, supervise and assist with all coconut plantings made by individual homesteaders or landholders.
- 4. Establish an adequate ground coverage of adaptable legumes in all new plantings.
- 5. Encourage the renovation and cleaning of existing coconut plantings.

C. Estimated Costs

$\frac{1}{2}$ time	Native Extension Agent	\$825
	Trainee Extension Agent	425
	Per diem	360
	Tools and miscellaneous expenses	200

DEMONSTRATION FARM (started in January, 1954)

The demonstration farm was planned in the present program to serve three purposes, namely: demonstration of approved methods; plant and animal propagation for distribution; and experimentation on a limited scale. All phases are being developed simultaneously and as the needs of the project dictate.

I. Construction

A. Accomplishments

1. Clearing and cleaning -- An approximate four acres of former Japanese residential area in Koror has been cleared out. The concrete rubble is being used for road and path improvement. The old floors and foundations are being retained as building floors and feeding areas.
2. Buildings Completed --
 - a. Bamboo nursery and potting shed (25' x 30').
This building was the first to be constructed. It was immediately filled with plant flats of vegetables and trees. The experimentation in the use of native material that was carried out in the early months of this project will make possible faster progress in the future.
 - b. Brooder house (10' x 12')
A permanent and existing concrete slab was used; the balance of material was secured locally. The house was an experiment to determine the use of deep litter in the tropics, thereby saving the added cost and importation of wire mesh for floors. Rat control has been achieved by the use of an electric fence in conjunction with the swine project. No disease was encountered although eye trouble was observed which may have been caused by using sawdust litter instead of shavings.
 - c. Office and tool room
This building was a small ruined concrete structure without a floor or roof. The present building is too small and a work room and warehouse must be added.
 - d. Pig Shelters (4) are all native material using poles and thatch carefully wired together and are completely portable. They will rest on concrete slabs in the feeding pens and farrowing pen.
 - e. Feeding pens (3)
Old concrete slabs were cleared off and hibiscus poles were planted all around. These will provide adequate and clean pens for swine.
 - f. Poultry laying house (20' x 30')
An adequate laying house for over 100 laying hens has been completed out of native material. The cost has been nominal.
 - g. Materials used
Salvage materials such as steel, corrugated roofing, transite, and lumber have been available in this district, but

Public Works is reluctant to release these because it was claimed that all such salvage materials were already allocated to contemplated construction plans elsewhere. Although more time was required to utilize native materials the end results have been satisfactory and more in line with what Palauans themselves can hope to achieve. Concrete is the only imported material absolutely essential for sanitary livestock production.

B. Future Construction and Improvements

1. Clearing

- a. Remove about 15 large seedling mango trees.
- b. Continue brushing and cleaning the hog pastures until the stumps are decayed enough to be removed.
- c. Continue removal of concrete rubble to clean and provide space for planting. Use of such rubble material will be limited (unless possible use could be made of the crushed concrete by Public Works as a road fill material. In this way double value would result and both Agriculture and Public Works would benefit.

2. Buildings to be constructed

- a. A second brooder house (10' x 12') to be made out of thatched roof, pole construction, and salvaged wire.
Estimated cost and labor \$75.00
- b. Food dryer and soil sterilizer oven--materials all salvaged if available. Estimated cost: \$50.00
- c. Warehouse and work room (20' x 30')
Concrete floor, 4 foot high concrete block walls with salvaged tin and lumber roof. Total estimated cost: \$300.00
- d. Second bamboo lath house--all native construction
- e. Miscellaneous feeding equipment and construction in and about swine and poultry pens will be completed as regular maintenance by swinekeeper and poultryman. Estimated miscellaneous expenses for all this construction: \$100.00
- f. Comments
Planned completion time of buildings is four months.

II. Planting Program

A. Accomplishments

1. Demonstration plantings of about 50 trees each of:
Coffee (Coffea arabica, coffea liberica)
Rambutan
Papaya (2 varieties)
Bananas (3 local varieties)
Cacao (Criollo)
Teak (Tectona grandis)
Mahogany (Swietenia mahogani)
2. The remaining rough land on the Demonstration Farm not in pasture or trees is being planted to root crops. When roots and stumps are decayed and the rubble is further removed, it will be suitable for nursery stock planting.

B. Future Planting Program

1. Demonstration Plantings
 - a. 50 Black Pepper vines as soon as made available by the Cacao Plantation.
 - b. Propagate as large a variety of cash crop and ornamental trees as possible, using existing importations made by the Japanese, as part of the landscaping of the farm area.
 - c. Legume ground cover in all tree plantings on demonstration farm.
2. Comments--The labor and costs of these plantings will be supplied from regular maintenance.

III. Swine Breeding and Distribution Program

A. Accomplishments

1. The swine program was initiated with the purchase of three purebred Berkshire gilts and one boar from Angaur with school farm funds. The production of 27 weanling pigs has been sold.
2. Seven head of breeding stock were received from Japan and are in excellent condition; about half of the females are with pig at present.
3. As noted under the section devoted to construction, all building development for the swine is in process of completion.
4. The sanitation system relies on light movable shelters placed over concrete slabs so that all surfaces will be exposed to sunlight. Pastures will be used sparingly and by older breeding stock only. Three pastures will be rotated in use.

B. Future Swine Program

1. Increase the herd to 12 productive sows, replacement gilts, and 2 active boars.
2. Distribute the 8 week old weanling pigs at cost.
3. Improve the methods of securing and preserving feed so that easier ways are developed to use the surplus feeds available from Babelthaup.
4. Cost analysis for Swine Project --First year.
 - a. The present average daily feed cost per pig is \$.08, a ration consisting of 3½ pounds of tapioca, 1 coconut and sweet potato top with a small portion of salted fish (spoiled).
 - b. Estimated cost with anticipated improvements in feeding methods is \$.10 a day for each animal and its litter

Total cost for feed	\$375.00
Labor for feeding	325.00
Miscellaneous expenses	25.00
	<u>\$725.00</u>
 - c. Estimated returns from sale of weanling pigs: 1 sow and 7 gilts (15 litters at 6 each); 90 weanling pigs (6 gilts and 2 boars retained)
82 pigs @ \$5.00 each or the equivalent
in feed \$410.00
 - d. Deficit at end of 1956 \$310.00

IV. Chicken Breeding and Distribution Program

A. Accomplishments

1. Importing hatching eggs

Prior to this year four successful direct orders for cases of hatching eggs were made with farm funds; however, this was considered an irregular procedure by Supply and was subsequently discontinued. Orders placed through Supply were sent by air freight, delivered to LNO Office in Guam. When they arrived in Koror, they were covered with fly larvae and pupae; because of breakage only 40 hatched. Another order placed in October 1953 arrived in March of 1954. It missed three flights from Guam to Koror; no eggs hatched. A third order arrived in fair shape but the hatch was less than fifty percent. Ordering through channels under the present setup is not satisfactory.

2. Breeding flock

In July, 23 pullets started to lay. To date 375 chicks have been hatched and 200 eggs are being incubated. Mortality including rat damage has been less than 5 percent.

3. Thirty-five roosters and 150 four weeks old chicks were distributed to the school animal club and to agriculture employees at school and farm; the rest are being reared by the school and the agriculture department. All roosters will be distributed at cost.

4. Rat damage--Rats got into a hatch of imported chicks and killed 30 in one night. In desperation, the house was wired with the electric fence used for the hogs. No further loss has occurred. Rat poisoning is continually being carried out.

B. Future Plans

1. Increase the breeding flock to 100 laying hens and frequently replace the old hens with pullets by heavy culling and distribution of non-laying birds. All pullets will be in production in May of 1955. Close supervision and maintaining a satisfactory ration necessary to insure good fertility will also produce enough eggs to supply the American personnel with about 40 dozen eggs every month. Distributing one incubator load each month and being able to save hatching eggs for only 15 days allows 15 days' production of eggs to be utilized for these commercial purposes.
2. Keep the incubator (600 egg machine) running to capacity and distribute young birds at three to four weeks of age. 600 eggs @ 70% hatchability = 420 chicks @ 5% mortality = 400 chicks for distribution each hatch.
3. Place enough birds on experimental rations to determine if island grown feeds may be used and still maintain production and fertility. The present ration is about 50 per cent island grown feeds; however, spoiled milk is also being fed which helps the ration tremendously.
4. Supply the school children with a number of 25 bird flocks as individual or committee projects; a certain percentage of these birds would belong to the children upon completion of the school year.
5. Import one-half case of eggs to obtain new roosters.

6. Estimated Cost Analysis for one year at full production level.

Feed Costs

	Local feed	Imported feed
120 Breeding Chickens	6,000 lb.	6,000 lb.
Replacement flock (young birds)	1,000 lb.	1,200 lb.
Baby chicks (held to 4 weeks of age)	<u>1,000 lb.</u>	<u>5,000 lb.</u>
	8,000 lb.	12,200 lb.
8,000 lb. local root crop @ \$.02	\$160.00	
12,200 lb. imported feed @ \$.07	<u>854.00</u>	
Total feed cost		\$1,014.00
Caretaker		350.00
Hatching eggs		50.00
Improvement of equipment & supplies		<u>150.00</u>
Total expenses for one year		\$1,564.00
Receipts--full production, June-December 1955		
400 four weeks chicks per month for 7 months @ \$.20 each		560.00
40 dozen eggs x 7 months @ \$.75		<u>210.00</u>
Anticipated receipts first year of program		\$ 770.00
*Net cost		\$ 794.00

* Project self-supporting when in full production.

V. Ducks and Guinea

A. Accomplishments

Originally initiated as a personal hobby project, 24 duck eggs and 7 guinea fowl eggs were hand carried from the States. Fifteen ducks and two guinea fowl hatched. Mortality for the ducks at 3½ months has been four, one killed by a boar, one killed by a falling limb during a wind storm, and two from natural causes.

The duck project has proven particularly interesting because of the birds' fondness for the Giant African Snail. The ducks eat the small snails whole and are able to shake and break a large snail from its shell when found extended. The snail population in the area has depreciated to a point where snails are difficult to find.

The snails have no apparent poisonous or harmful effect on the ducks. However, the two unexplained deaths may possibly be attributed to the slime of snails. When posting the ducks upon death, no apparent abnormality could be detected except a large amount of clotted blood in the body cavity in one case and possibly a very dark blood condition in the second duck. Close observation of the live ducks showed large amounts of slime collected around the mouths and difficulty in breathing and quacking in some cases. The ducks were in good condition and appearance otherwise. A possible conclusion might be that given certain conditions the slime had gathered and caused asphyxiation.

B. Future plans for ducks and guineas

1. If HiCom approves the special duck project requested by the Staff Agriculturist, funds will be made available and the program will be carried out as planned.
2. If HiCom rejects the special project proposal, the above mentioned ducks will be used for breeding purposes and all eggs incubated for further increase and distribution.
3. More guinea eggs are being ordered to further the project as the fowl appears to be vigorous and healthy.
4. Estimated costs: none at present because ducks demand no special care and glean all food from swine and waste chicken feed.

VI. Plant Propagation and Distribution

Materials for grafting, etc. have just arrived; only a little work has been accomplished, as labor has been needed elsewhere. However, work has been carried out because all phases of the program have been planned to develop simultaneously.

A. Accomplishments

1. Air layering of avocado was successful.
2. Twenty-five breadfruit root cuttings were started and distributed.
3. Practice grafting on hibiscus was made with five varieties on a root stock in the office yard.
4. Three hundred pounds of peanuts of Jumbo and Spanish varieties were distributed. The plantings were very successful with a good production of nuts. However, the resulting crop of seed would not germinate very well. Many other seeds saved for reproduction fail because the seed is not viable.
5. Plants or seeds given for trial and seed production.
 - a. Citrus from Manila (not viable)
 - b. Passion fruit--distributed to all interested Palauans and American personnel; also being grown on Demonstration Farm.
 - c. Nama Papaya--planted in bamboo pots and distributed.
 - d. Solo Papaya--fifty trees planted, the rest distributed.
 - e. Dwarf corn--four generations produced with good success; seeds also distributed. Yield good and very fast producer. Seeds lost when refrigerator went bad.
 - f. Hawaiian Sugar Corn--Excellent quality and easy to grow; seeds distributed to interested natives.
 - g. Crotalaria intermedia from Costa Rica--Excellent vegetative growth; excessive snail damage while small, very good seed producer. All seed is being saved; also planted experimentally in Peleliu coconut planting.
 - h. Superior grass selection from University of Hawaii--lost in LNO Guam office; never delivered to Koror.
 - i. Selected taro from Rota--Condemned by Entomologist.
 - j. Three week cucumber--no outstanding results.

B. Future plans for plant propagation and distribution.

1. Two people will be trained to do all the plant propagation and nursery work. They will be assisted at times by the Extension Agent Trainee and general maintenance workers.
2. Vegetative propagation will be attempted on most of the old trees imported by the Japanese in order to preserve them.
3. At least 5,000 seedlings of cacao, mahogany, and teak will be produced this year for distribution. Increased distribution can be anticipated with more personnel and better distributing procedures in following years.
4. 300 breadfruit plants will be propagated for distribution in the outer islands.
5. Estimated cost:

Two laborers	\$650.00
Building materials	75.00
Miscellaneous tools, supplies, etc.	75.00

VII. Experimentation

Developing a farm in a new situation demands a great deal of conditions where experimental procedures are set up to determine the correct methods; however the systems of checks and replications are not rigid enough to become conclusive and truly valid.

There have been many times and situations that would offer opportunity for further study; however time, materials, and technical know-how are not available.

A. Accomplishments

1. Snail Bait Experiment

An incomplete but very promising experiment was carried out with poison stakes using 2%, 4%, and 6% metaldehyde, 1 part arsenic, 2 parts lime, one-half part cement, and 1 part old chicken mash in one-half the experiment

An inverted half coconut shell was nailed on each of 130 stakes and a paste of either 2%, 4%, or 6% metaldehyde was smeared under the shell and on the stake. Chicken mash was added to some of the stakes of each percentage. The stakes were driven into the ground 20 feet apart on both sides of a deserted road. A count of snail mortality the first week showed a better kill on the 4 and 6 percent metaldehyde, a slightly higher kill on stakes with chicken mash. However, subsequent weeks showed all stakes about equal as the attractant became less strong. Killing power remained for at least five months. A survey of the area showed very few snails around the stakes for at least 20 feet. Results of this experiment, though encouraging, are not conclusive or accurate as there were not enough trials or checks made on the results. More work should be done on the formula. The new idea was the use of the inverted coconut shell for rain protection.

2. General Experimentation
 - a. Legume varietal tests
 - b. Techniques of handling forestry seedings
 - c. Test plantings on limestone soils.
 - d. Various techniques of rat baiting.
- B. Future plans for one year
 1. Snail bait. More materials are ordered and more complete experimental methods are planned as soon as materials arrive.
 2. Livestock mineral and vitamin concentrate--Mineral and vitamin concentrates are on order. These will be added to the ration of breeding swine and chickens. The aim is to better utilize the bulky low energy foods in the hope that less imported feeds will be necessary.
 3. Trial Plots--Increase the trial plot and testing program for the many exotic and economic plants that will be introduced.
 4. Legume Testing--Study and test the existing legumes available in Palau to determine how to make better use of them.
 5. Low islands show a marked mineral deficiency in the food crops. Two hundred pounds of trace element fertilizer have been ordered for a simple experiment program.

EXTENSION SERVICE (Coconut Rehabilitation has been listed separately due to its importance in the Palau economy. Other extension service offerings are incidental to the coconut program)

I. Reforestation and Municipal Woodlots

A. Accomplishments

1. School children assisted with the collection of mahogany and teak seeds.
2. By trial and error the best methods of handling the seeds were determined and improved upon.
3. Experimental plantings of both teak and mahogany were made.
4. Mahogany seeds were shipped to Yap.
5. Municipal plantings of over 500 trees were made in two villages resulting in a great deal of enthusiasm in other communities.
6. Comments
 - a. Mahogany groves planted by the Japanese show remarkable growth. Nursery seedlings produced this year have recovered rapidly and grown well when transplanted.
 - b. The interest of the Palauan people has been remarkable and great progress seems possible in the reforestation program.

B. Future Plans for Reforestation and Municipal Woodlots for one year.

1. Enlist the help of the Education Department to organize a collection program to gather all available seed which is ripe in December. These seeds will be sent to other districts and grown into seedlings.
2. Supervise the planting of at least 10,000 seedlings of mahogany and teak.

3. Participation with Land and Claims and Island Affairs in devising a program whereby municipalities could acquire public land for use for forestry plantings.
4. Comments--Little selling of this program is required as there is a greater demand for seedlings than we can meet. The aim will be to supervise the planting of as many as possible with the limited personnel available. A good cooperative turnout of native people is able to clear ground and plant 500 to 1,000 seedlings in one day.

II. Vegetable seed distribution

Fresh vegetable seeds were distributed regularly with the assistance of the school children. The program was very effective and the interest was pronounced, considering the fact that there is such a limited use made of seed plants in the true Palauan agriculture. The Japanese influence appears strong and evidently seed supplies were available when there was a large Japanese population in the islands. Without help the Palauans would import few seeds and almost none would be collected. It is only through government help that we can attempt to continue increasing the interest in growing vegetables. The cost of maintaining a fresh supply of seeds is negligible.

A. Problems involved in seed distribution are:

1. Maintaining the seeds in a good viable condition. The best method to date has been:
 - a. Small regular airmail shipments of seeds of guaranteed quality.
 - b. A regularly scheduled time for distribution.

B. Future Plans for Seed and Plant Distribution

1. Aims

- a. Send a small supply of seeds at cost to each municipality monthly, being sure the seeds are of high quality prior to distribution.
- b. Have the school children package the seeds and place distribution boxes in certain stores twice each month at a prearranged time. The varieties distributed would be egg-plant, okra, Chinese cabbage, mustard, cucumbers, daikon,-- enough in each packet to plant a small subsistence garden.
- c. Place plant flats of vegetables in individual open bottomed bamboo pots for distribution to the people of Koror. These flats will be placed in strategic places for distribution.
- d. Teach elementary school teachers in the villages to raise vegetable plants for distribution to their people.
- e. Distribute 200 pounds of peanuts again.

2. Estimated Costs

- a. Vocational agriculture students supply most of the labor involved.
- b. Estimated seed costs: \$125.00

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