

FIFTH ANNUAL PROGRESS REPORT

OF THE

*Cooperative Program*

IN

AGRICULTURE, FORESTRY AND FISHERIES

UNDER THE

JOINT LIBERIAN - UNITED STATES COMMISSION

FOR ECONOMIC DEVELOPMENT

DEPARTMENT OF AGRICULTURE AND COMMERCE

JOHN W. COOPER  
*Secretary*

TABLE OF CONTENTS

	<u>Page</u>
Introduction	1 - 4
Personnel	5
CHAPTER 1	
Agricultural Experimentation	6 - 24
CHAPTER 11	
Agricultural Extension:	
Section 1 - Montserrado and Cape Mount Counties, Salala and Bopolu Districts	25 - 54
Section 2 - Western Province	55 - 57
Section 3 - Sines County	58 - 66
Section 4 - Maryland County and Eastern Province	67 - 70
CHAPTER 111	
Vocational Agriculture	80 - 92
CHAPTER 1V	
Forest Conservation	93-105
CHAPTER V	
Fresh Water Fisheries	106-110

## INTRODUCTION

Liberia is located on the West Coast of Africa approximately 5° north of the Equator. It is bordered on the west by British Sierra Leone, on the east by French Guinea, and on the south by the Atlantic Ocean. Areawise Liberia is about the size of the State of Ohio -- 42,000 square miles. Its climate is representative of the rain forest belt averaging 180 inches per annum with a long dry period lasting some five to six months.

Due to lack of census data, Liberia's real population is unknown but is roughly estimated at 1½ million people. In spite of some 23 or more tribal dialects, English is the recognized language of the country and is taught in all schools.

Although recent progress has been made in the exploitation of iron ore, etc., for some time to come the economy of Liberia will continue to be centered around its agricultural resources. At present 90 per cent of the population is directly employed in agriculture, while another 10 per cent gain their living in closely related fields. Agricultural resources produce for export such crops as rubber, cocoa, coffee, palm kernels, palm oil, bananas, and piassava. Percentage wise rubber represented 94.8 per cent of total agriculture exports followed by palm products 2.8 per cent; cocoa .09 per cent; piassava .08 per cent, and coffee .07 per cent. Except piassava that is harvested from the wild swamp palm (*raphia vanifera*), plantings of cocoa, rubber, coffee, improved oil palms and bananas are definitely on the increase and may be observed as one travels throughout Liberia. This is particularly true in connection with a large number of small indigenous farmers who are supplementing their subsistence agriculture by putting in several acres of cash crops such as coffee, cocoa, etc.

Rice, the principal food in the diet, is showing a marked increase in acreage planted over previous years. This may be attributed, in part, to emphasis placed on increased rice production by the GOL spearheaded by the Departments of Interior and Agriculture and Commerce. At the writing of this report, indications are that locally grown rice will be in sufficient quantity to last until the new 1957 crop has been harvested. Biggest improvements in the 1955-56 rice program were observed in the field of swamp rice production, particularly the Gbedin Project where some 240-250 acres were placed under cultivation. Rice is supplemented with cassava, eddoes, yams, vegetables and tropical fruits.

The fishery potentials are good and are being exploited to a limited extent. During fiscal year '56, two new commercial companies went into operation after consummating deals for the purchase of trawlers, freezing units, mobile equipment and heavy fishing gear. The introduction of trawlers, in addition to catches by native fishermen, has somewhat brought the price (20 cents per pound) of fish within reach of the "little man", thereby increasing his protein potential. The Marine Fishery Biologist rendered invaluable service to the above companies through the Department of Agriculture and Commerce Bureau of Fisheries. At the conclusion of assignment on December 13, 1955, this position was phased out and integrated into the Department of Agriculture and Commerce Bureau of Fisheries.

With the consummation of road program through heavily forested areas by 1960, chances are that major timber exploitation will commence and coincide with the completion of roads in the Western and Eastern Provinces. This is in line with the recent signing of several timber agreements between the GOL and American and European concessionaires. To date, about 648,000 acre

have been surveyed and set aside as reserves.

The U.S. Technical Assistance Program began in Liberia in early 1944 with a one-man mission (Agricultural Adviser) assigned to the COL by the United States Department of Agriculture. This mission was soon followed by such organizations as FEA, USEM, TCA, FOA and presently ICA. The present technical assistance program started in the field late March 1950. Due to recruitment and late arrival of supplies the program got off to a slow start. As the program got under way and developed to its present stages, it now includes experimentation, extension, vocational agriculture, fresh water fisheries and forestry.

Experimentation was continued at Sukoko at the Central Agricultural Experiment Station and results of significant value are beginning to be obtained.

Through agricultural councils, method and result demonstrations, field days, in-service training and regular on-the-farm visits, the agricultural extension service continued to do a most effective job in disseminating useful agricultural information to farmers throughout Liberia. During fiscal year '56 some 39 nursery and demonstration units supplied approximately 5 million plants of superior planting materials (mostly coffee, cocoa, citrus, rubber and kola) to interested farmers in the five counties and three hinterland provinces. Two farmers' councils were organized in Sinoe County with a membership of 250 and a similar number of field days were held in Grand Cape Mount and Maryland Counties (one each) which brought together several thousand farmers for the purpose of observing improved agricultural practices in their respective areas.

Eleven Future Farmers of Liberia clubs were organized (Cape Mount, Montserrado, Kakata, Central Province, Grand Bassa, Sinoe, Maryland, Salala and

Gbarnga) with an enrollment of 504 members. This is an increase of 37½ per cent in the number of clubs and a 99 per cent increase in enrollment over the previous year.

During the 1956 Inauguration of President William V. S. Tubman, the Department of Agriculture and Commerce held its First Agricultural and Industrial Fair in connection with the inaugural ceremonies. Exhibits were representative of Liberia's agricultural and industrial development program under the Nine Year Development Plan. All ICA agricultural, forestry and fishery technicians participated in the Fair that brought together some 15 to 20 thousand spectators to review exhibits.

Although roads continue to be few and most travel must be made by boat, small plane or on foot, considerable travel was accomplished by technicians to all parts of the country to investigate diseases, render technical advice and to obtain information on the adaptability of crops to certain areas. In most cases these trips were made at the request of Government officials, private interest groups and tribal authorities of the respective areas. The Chief Agriculturist, Frank E. Pinder, journeyed to Teheran, Iran, on October 28, 1955, for the purpose of attending the NEA Regional Chief Agriculturists and Water Resources Meeting which lasted for a period of five days. The Chief Agriculturist also spent four weeks (May 25-June 21) in the Gold Coast and Western Nigeria assisting both governments in firming up ICA/W programs for those areas.

Training continues to be the most important phase of the program and is receiving major attention and aims to train a corps of Liberian Technicians to replace their American counterparts as rapidly as possible.

Regional headquarters were established in Liberia for Mr. Marvin Klemme, Forest and Range Management Specialist, who arrived on April 4, 1956. Upon request, Mr. Klemme will assist the agricultural program in Liberia in addition to supervising ICA activities in the DOT areas of West Africa.

### Personnel

Frank E. Pinder, Chief Agriculturist

#### Experimentation

Thomas S. Buchanan\* - Suakoko - Director of Research and Plant Pathologist  
 Leroy Girardot\* - Suakoko - Agronomist  
 Clinton Meacham\* - Suakoko - Animal Husbandman  
 Woodrow Franklin\* - Suakoko - Entomologist  
 Ervin T. Bullard\* - Suakoko - Horticulturist  
 James F. Jones - Suakoko - Farm Management

#### Fisheries

Charles Jones - Suakoko - Fresh Water Biologist  
 Lew McFerren\* - Monrovia - Marine Biologist

#### Forestry

Torkel Holsoe - Monrovia - Forester  
 Eugene Fobes\* - Monrovia - Assistant Forester  
 James White - Monrovia - Junior Forester  
 Frank Lara\* - Monrovia - Junior Forester  
 Robert Schirck\* - Monrovia - Junior Forester

#### Agricultural Extension

Lamar E. Fort - Southwest Liberia - Extension Adviser  
 Cedar A. Walton - Western Province - Extension Adviser  
 S. J. McCorvey - Maryland County and Eastern Province - Extension Adviser  
 Charles H. Burton - Sinoe County - Extension Adviser  
 David Banks - Monrovia - Vocational Agriculture  
 Under recruitment - Gbedin - Extension Adviser  
 " " - Gbedin - Extension Agriculture Engineer  
 " " - Gbedin - Extension Maintenance Engineer

\* Completion of tour of duty during fiscal year 1956.

Replacements requested for all positions except Animal Husbandman, three Junior Foresters, and Marine Biologist.

## Chapter 1

### AGRICULTURAL EXPERIMENTATION

The experimental work of the Central Agricultural Experiment Station continued during fiscal year '56 and can be divided into three major categories: a) in-service training of personnel; b) swamp rice production; and (c) experimental projects per se.

Definite progress has been made in all three categories and plans have been laid for continued development along all lines. The in-service training classes are serving as a means of upgrading Liberians to assume positions of responsibility as ICA technicians are gradually withdrawn from program. The swamp rice production demonstration farms continued to prove more and more how Liberia can become self-sufficient in the production of her basic food crop. The research projects are beginning to produce results of direct application to agricultural practices in Liberia, and are demonstrating their worth in obtaining increased production, higher quality products, or higher returns to the farmer in the production of both food crops and cash crops for export.

#### In-Service Training

In-service training classes have been conducted as a means of raising the standards of those sub-professional employees of the Station assigned to assist with the conduct of experimental work. All 15 Technical Aides assigned to the Station are required to attend these classes, and any other Station employees interested in further development are welcome to attend.

The initial in-service training classes were brought to a close on April 14, 1955. During this session instruction was given in Arithmetic, Lettering, General Agriculture, and English. Each student was given a

standard placement test at the beginning of the course and again at the end of the course 10 months later. That the training was effective can be demonstrated from these tests which showed that the average student increased his arithmetic achievement by the equivalent of one year and two months of scholastic work.

In-service training classes were resumed on September 15, 1955 with classes again offered in General Agriculture and in Elementary Research. Attendance is mandatory for all Aides and other sub-professional employees of the Station.

Classes in General Agriculture are held every Tuesday from 1:00 to 3:00 p.m. to make it possible to carry instruction out in the field where actual practices can be observed and studied. Instruction is handled by various technicians in the different fields of specialization.

The course in Elementary Research is designed to acquaint the Aides more fully with the objectives of the agricultural phases of the over all Joint Development Program and of the Central Agricultural Experiment Station's role in this program. More specifically this course will give the students a better insight into the objectives of research and the desirable attributes of a research worker, and acquaint him with some of the basic tools and techniques of the agricultural research worker.

#### Swamp Rice Production

Rice is the staple food of the people of Liberia but production still is not sufficient to meet the needs of the country. In fiscal year '55 it was necessary to import nearly 19,500,000 pounds of rice to cover the production deficit. This is about 27 per cent less than the 26,000,000 pounds imported the previous years. In attempting to bring local production up



Above: Gbedin Swamp in August 1956

Below: Gbedin Swamp being cleared in March 1954

sufficiently high, at least to fully meet local requirements, the Departments of Interior and Agriculture and Commerce redoubled their efforts in fiscal year '56 to increase both high land and swamp rice production. To date progress has been noted particularly in the field of swamp rice production. The increase of interest in the latter approach is based on data collected over a two-year period indicating that swamp rice production is the logical approach to increase rice production in and for Liberia (see Station Note #1, "Studies to Determine the Most Economical System of Rice Production for Liberia

Base on data collected in connection with Station Note #1, Gbedin Swamp Project, which harvested a total of 144,565 pounds of paddy rice on approximately 64 acres of land for an average yield of 2,260 pounds per acre in fiscal year '56, was put on a commercial basis by the GOL. Fiscal year '57 plantings are expected to approximate 240-250 acres.

In addition to the Gbedin Project, to further demonstrate the feasibility of swamp rice production in Liberia and to study the methods to be used and the economics of such operations, demonstration farms and extension centers are now being operated at Gbarnga and Salala. In addition, experimental projects on both upland and swamp rice cultural practices are conducted at the Central Experiment Station. Due to an inadequate labor supply, the swamp rice project at Tapita was discontinued on January 8, 1956, with the Technical Aide in charge being transferred to Gbedin.

At the above demonstration centers, the following varieties were planted either by direct seeding or transplanting:

G.E.B. 24	Radin Kling	Toma 112
Pananella	Radin Siax	India Pahli
D 99	Radin Goi	Lead
N'Gasein 57	Achen Puteh	Gissi
Rexark	Daren	Liberian Local

Pananella was found to be the earliest maturing variety.

Experimental Projects

1

The fiscal year '56 marks two full years of work on experimental projects conducted at the Central Experiment Station according to previously outlined project plans. Previously experimental projects were operated whenever possible under the conditions of supplies, personnel and facilities existent. These variables have now become sufficiently stabilized to permit advanced planning and to give reasonable assurance that such plans can be followed. Attention has been given to all 42 experimental projects recommended to and approved by the Department of Agriculture and Commerce.

A few short-term projects have been completed and others have progressed far enough to permit the drawing of certain conclusions. Such results have been disseminated through the monthly reports and, when information of sufficient significance and reliability become available, by publication of Station Notes. Many other projects are nearing completion and still others will be forthcoming. As fast as any project is completed, it will be reported on in detail in a specific publication. It must be fully realized and appreciated, however, that many projects are of necessity of several years duration (studies of tree crops can be made in no other way) and concrete results cannot be obtained earlier. Since tree crops are of primary importance to the economy of Liberia, the hope is expressed that sufficient foresight and faith can be demonstrated to make it possible to continue such projects over the apparently unfruitful years.

It is proposed to submit a detailed experimental project summary report at the end of fiscal year '56. This current report on the experimental work of the Central Experiment Station will therefore be devoted to an exposition of the projects under way and their current status of progress.

Animal Husbandry

Five projects have been approved for work in this field:

1. Developing a strain of disease resistant chickens resulting from crossing indigenous with imported breeds.
2. A comparison of feed responses of N'Dama, Brahma, and N'Dama-Brahma cross cattle.
3. A comparison of purebred New Hampshire Red, Native, and first-cross New Hampshire Red native chickens raised under conditions which could be provided by the average Liberian farmer.
4. Feed trials with poultry rations suggested for Liberia.
5. Building a station herd of superior N'Dama Cattle.

None of the first four projects have been activated because of either lack of facilities or inability to be assured of continuous and adequate feed supplies. The necessary facilities are becoming available and the feed situation is being solved (see section on Farm Management) so these projects are still being carried and will be activated as rapidly as possible.

Definite progress has been made toward building up a herd of N'Dama Cattle. This is a native breed of fine conformation, though small and possessing demonstrated resistance to existing climatic conditions and enzootic diseases.

At the beginning of fiscal year '56, there were 33 animals in the Station cattle herd and at the close 40.

Due to an undetermined disease the Station chicken flock has been reduced to 51 comprising mostly New Hampshire, Barred Plymouth Rock and White Leghorn birds. Scarcity of birds curtailed the distribution program started the previous year. At the writing of this report, the COL had arranged to import several thousand pedigreed baby chicks of the above breeds from the USA.

The swine herd has been maintained to provide better breeding stock for distribution to sub-stations and to private farmers. There were 41 animals in the herd at the beginning of fiscal year '56. Except for the necessary mineral and vitamin supplements, the hogs were maintained almost entirely on locally grown ration or locally produced foodstuffs.

### Bananas

In order to observe the effect of varying rates and ratios of fertilizer elements on growth and yield of bananas (Gros Michel) grown on Sukoko soils, a five-acre planting of bananas was made and the following treatments given in three replications: 8-8-8, 10-10-0, 5-10-5, 4-12-8, 10-5-10, 4-8-12, and ammonium sulphate, each applied at rates of  $\frac{1}{2}$ ,  $\frac{1}{2}$ , 1 and 2 lbs. per tree during the first two weeks in January, April, July and October 1955.

At two years after planting most of the plants in the guard rows have not produced fruits, while bunches weighing up to 90 lbs. were harvested from fertilized blocks ten months after planting.

Though there was much variation between treatments, the differences were not statistically significant. Very significant, however, was the difference between check plots and fertilized plots. The treatments, in a decreasing order of yield, were as follows: 4-12-8, 8-8-8, 10-5-10, 4-8-14, 4-10-5, 10-10-0 and ammonium sulphate. Differences between rate of application were not significant.

The prevalence of foliage disease after 18 months have obscured differences between treatments and rates of treatments. In any case, however, it was shown that on the particular soil very little success in growing

bananas could be expected without fertilizer. The experiment should be continued with such modification in design to take care of any future contamination from disease. The means of controlling the disease are known but proper equipment and adequate manpower have not been available.

### Cacao

This tree produces one of the potentially most important export crops of Liberia and hence the following projects have been set up for study:

Experimental control of insects attacking cacao plants.

Cacao Variety Trial.

Identification of physical and chemical properties of coffee, cacao, and banana producing soils of Liberia.

Growth relationship of cacao grown on Suakoko soils series in response to major and minor element fertilization.

All of these projects have been activated and appreciable progress has been made on all of them. Obviously, however, these are of necessity long term projects in every case.

The variety planting established in fiscal year '55 from selected seed originally obtained from the Gold Coast was maintained as required. During July of fiscal year '56 seeds of local varieties were planted in the holes where the original transplants failed to survive. Three seeds were planted in each spot and the surplus seedlings were transplanted into the holes where no plants survived. Only eight of those plants surviving the original transplanting died during the ensuing dry season.

Many of these trees are making excellent growth and when productivity and quality of crop can be determined, the most desirable will be used as a source of seed and budwood for further multiplication and distribution.

Field checks are constantly being made to determine the presence of potential insect enemies of cacao. To date capsids and stem borers (Scolytid beetles) continue to be the primary insect enemies of cacao in Liberia and research is being done on means of controlling these.

A scolytid beetle control experiment was continued in cooperation with the Liberia Company on their plantation near Flumpa. About 3,000 young trees are included in this study in an area where these beetles (and drouth) had necessitated replanting the original stand. Aldrin, DDT, and dieldrin are being tested for effectiveness in control at four rates of application, at four intervals of application and with six replications of each treatment. The required periodic applications have been made all through 1955 and the first four months in 1956.

During fiscal year '56 a new cacao planting of 4,410 seedlings was made adjacent to the original area on the Station to study the damage from the scolytid beetle to newly planted seedlings. Between the time transplanting was started and its completion on August 17, the beetles had already attacked 15 of the new trees.

During August a fertilizer study was started on one year old cacao trees, again in cooperation with the Liberia Company in their plantations near Flumpa and on trees obviously in poor condition. A fractional replicated design was used in order to study possible interactions of the following elements: nitrogen, phosphorous, potash, lime, boron, and manganese. The experiment is intended not only to study the effects of fertilizer per se but to see if the application of fertilizers will sufficiently increase the vigor of the plants to enable them more effectively to resist damage from scolytid beetles.

In preparation for a study of the effects of commercial fertilizer on the growth of cacao, 1,200 banana suckers were planted in 1954 to provide temporary shade for the young cacao seedlings. Under proper care and with some fertilization these banana plants have made excellent growth. During August 1955 planting of the cacao seedlings under the shade of these bananas was completed. A total of 1,155 cacao seedlings were set out, 835 basket-grown and 320 dug barerooted for nursery beds. The seed source was a local selection from pods collected from only three trees to insure as homogenous a population as possible. A randomized split plot design is being used in a complete factorial trial that will include both major and minor elements.

Intensive surveying and sampling of soils throughout the cacao growing areas of Liberia is called for to provide information that can be given to the farmers to show them how to recognize soils best suited for the growing of cacao and where these soils are located.

### Citrus

Increased production of citrus fruits would make more readily available to the people of Liberia a valuable item of diet and promote a crop of potential export value in one form or another. One of the greatest hazards to citrus production in Liberia is insect damage at all stages of the plants' development and the following project has been set up to study these problems:

#### Control of Insects Affecting Citrus Production

A rather extensive citrus orchard is one of the oldest plantings on the Central Experiment Station and this has received constant care; replacements have been made as required and additions made from time to time to keep the area in the best possible condition for study purposes. Regular periodic

checks are made of this orchard to determine insects doing damage, their seasonal prevalence and the occurrence of their various life stages. Such information is of value in knowing when to apply control measures and what to use. Several of the commercial insecticides as well as locally compounded materials are showing promise in the control of grasshoppers, papilio, and scale insects, the most important insect enemies of local citrus.

A fertilizer experiment has also been set up in this area to see if the resultant increase in vigor has a significant effect on the trees' ability to withstand or recover from insect damage.

### Coffee

With the revival of the planting of coffee in Liberia, the Central Experiment Station deems it advisable to give the farmers of Liberia every possible assistance and advice in the planting and care of this crop. To meet this obligation the following experimental projects have been approved:

Identification of physical and chemical properties of coffee, cacao and banana producing soils of Liberia.

Preliminary investigations on the control of insects attacking coffee.

Coffee spacing and variety trials.

Coffee variety observation trial.

Coffee seed production.

Cultural practices for coffee.

Except for the first listed project, all other projects are active and some have already yielded results of sufficient value to warrant publication of results as Station Notes.

The bean borer is still one of the more serious insect pests of coffee in Liberia. Based on studies made of old plantings near Ganta, it appears the borer infestation is more prevalent during certain seasons of the year. A stem borer is also prevalent. A control experiment was continued using four rates of Dowfume 75 and gasoline as fumigants to six replications on ten sites of active infestation. The fumigant was injected into the holes with a syringe and the opening closed with mud.

A waxy scale insect has commonly been found on trees in the Station plantings and control experiments have been started. A trial using scale oil was considered a failure even when applied at twice the normal rate. This was repeated using a locally compounded palm oil-soap emulsion with considerable success. Previous trials with Parathion at  $\frac{1}{2}x$ ,  $1x$ , and  $2x$  normal strength had also proved ineffective.

Trials at the Central Station demonstrated that treatment with 0.1% aldrin solution effectively controlled damage from grasshoppers, crickets and sphingid larvae in coffee nursery beds.

Prior to fiscal year '56 about 50 different coffee varieties had been introduced into the Station for study and evaluation. These have been maintained as required; some are making excellent growth and seeds were produced for the first time in 1955. When these plantings are sufficiently mature for complete evaluation of their characteristics, the selected plants will provide the seed source for further multiplication and distribution of the proven varieties. Because of obvious expression of nutritional deficiencies, a fertilizer trial has been superimposed upon the spacing and variety trials. Records taken on heights and diameters of the plants show no significant



The center cow was bred at Central Experiment Station  
from the Brahma bull at far right and N'Dana cow at left.

differences as yet. It was noted, however, that the values for NPK were highest and may later become significant.

Nutritional deficiencies have also been expressed in seedling nursery stocks and experimental trials are under way to correct these conditions. Preliminary trials with various weed control chemicals have shown certain of them to be effective without interfering with the germination and development of coffee in the nursery beds. The use of such chemicals will materially lower the cost of producing nursery stock for distribution to farmers. Trials are being continued both with fertilizers and weed killers to determine the most effective dates and rates of application.

Through the Station's nursery located at Sanaquelli, the Agricultural Aide distributed 1,134 pounds of robusta coffee seeds to farmers which is enough to plant 1,134 acres in Liberia. In addition to these seeds, 56,766 seedlings have also been distributed to farmers. Here a total of 4,376 pounds of coffee seed and 139,940 coffee seedlings have been distributed to farmers free of charge during the past two years. The total distribution should plant 6,142 acres of land to coffee.

The Station maintained the experiment in the hedge row system of planting coffee as required.

After careful observation, the coffee leaf rust (Hemileia Vastatrix) was confirmed in several plantings at the Central Station. Control measures were immediately undertaken in addition to making wide distribution to farmers of Station Note #7 which indicated measures to be followed in the control of "Coffee leaf Rust in Liberia."

## Field Crops

Research work on these crops is being conducted primarily to increase the production of livestock feed although the need for increased production of human food has not been neglected. The need for increased animal protein in the diet of the average Liberian is recognized. It naturally follows that livestock production should be increased but this cannot be done until the problems of their feeding have been solved. The following approved projects relate to these problems:

Yields of three varieties of yams as affected by frequency of application of commercial fertilizer on manured or unmanured plots.

The effect of nitrogen, phosphorus and potassium alone and in various combinations on the yield of Chinese Yams.

Testing of grasses and legumes that show promise in Liberia.

Developing a high yielding mosaic disease resistant strain of cassava for planting in Liberia.

Research on yams began in fiscal year '55. Five experiments were conducted in 1955 and two in fiscal year '56. A detailed discussion of results will be found in Station Note #9 ("Planting and Fertilization Experiment with Yams").

At the close of the fiscal year '55 experiments, it was decided that the Chinese species was the most suitable for food so the fiscal year '56 experiments were confined to this species.

Either 2, 4, or 6 applications of 5-10-10 fertilizer at a total rate of 500 lbs. per acre to Chinese yams gave a significant increase in yield over no application, but there was no significant difference in favor of 6 or 4 applications over 2 applications.

There was also no significant difference between 2, 4, or 6 applications on African Yams, either on manured or unmanured soil. Commercial fertilizer

and manure alone as a class produced significant increases in yield over on treatment, and the addition of animal manure to commercial fertilizer at the rate of  $7\frac{1}{2}$  tons per acre produced a significant increase over the class containing commercial fertilizer alone and manure alone. Application of fertilizer to the snake species produced greater increases in yield than on the African, but the results were not statistically significant due to a great amount of variation on yield, probably caused by disease. Two and four applications of commercial fertilizer on manured plots produced significantly higher yields of aerial tubers of African yams than no treatment.

Twenty-five pounds of nitrogen, 50 lbs. of phosphate, and 50 lbs. of potash applied in 4 applications alone and in all possible combinations produced no significant increase in yield of Chinese yams in the experiment conducted in fiscal year '55. Lack of significant results were again attributed largely to the effects of disease. The same experiment was repeated in fiscal year '56 with increased amounts of the same fertilizers and the addition of lime. Application of either 1,000 lbs. per acre of 0-10-10, 0-0-10 plus  $\frac{1}{2}$  ton of lime, 5-0-10 plus  $\frac{1}{2}$  ton of lime, or 5-10-10 plus  $\frac{1}{2}$  ton gave significantly higher yields than no fertilizer.

Small tubers used for seed produced yields which were only about one-fifth that produced by medium-sized tubers. Tubers weighing in the neighborhood of 50 grams should be used for seed. Results obtained indicate that Chinese yams are an excellent crop for Liberia, giving yields up to 12-15 tons per acre even without fertilization. Seed stock of species and varieties other than those already tested should also be obtained for trial.

While not the subject of specific research, the Station planted 30 acres to Cuban M18 corn that was imported from the U.S.A., which yielded approximately 4 tons of green corn. The corn is doing magnificently well and at the writ-

ing of this report, a portion planted for silage had matured sufficiently to enable storage of some 15 tons in pit silos conveniently located near live-stock compound. Indications are that the remaining portion, not fully matured, to be used for grain, will give significant yields. Corn rust did not affect the fiscal year '56 crop which may be attributed to early planting.

### Oil Palms

The oil palm not only provides an important item of diet but also an important product of export. Then, too, the oil palm has dozens of uses in the daily lives of the native man other than its food value. The oil palm has therefore received attention under the following projects:

Economic plant introductions and trials.  
Cultural practices for tree crops.

In September 146 plants made available from selected parentage were moved from nursery beds into the field on the Station at 25' x 25' spacing. These trees will eventually become the source of high quality seed for distribution to the farmers of Liberia.

### Rubber

The five-acre planting of BD 5 and TJ 116 rubber stumps established in 1954 has been maintained as required with good survival and growth. Design of an experiment to best make use of this planting will be worked out and executed.

### Grasses

Grasses and legumes were secured locally and from several foreign countries and established in individual plots. Records were kept of seeding rates, row spacing, rate and characteristics of growth, forage, and in some cases seed production. Observations were made monthly. During fiscal year '55 and fiscal year '56 these tests were conducted; 87 different plantings were made, testing 29 legumes and 19 grasses alone and in various combinations.

20K



Cover crop test plot at Central Experiment Station is inspected by ICA technician and aides.

Velvet beans were found to be the best annual, and Pueraria villosa is the best perennial green manure crop. Deep-rooted legumes may well be planted with Pueraria for long time soil restoration. Desmodium gyroides and Indigofera arrecta are recommended as being best for this purpose.

Elephant grass (Pennisetum purpureum) is recommended to be grown on fertile bottomland as a soiling crop, with Pueraria phaseoloides as a companion crop. Elephant grass is also recommended on better upland sites, probably with addition of commercial nitrogen fertilizer, for pasture and forage. Any of the following legumes are recommended to be grown with it: (1) Stylo, (2) Pueraria phaseoloides, and (3) Centrosama pubescens.

It appears that stylo, a desirable forage legume may be introduced into indigenous grass pastures by scattering seed. Whether or not it will persist under grazing has not yet been determined.

Guinea corn or one of the other adapted sorghums is recommended for an annual silage or soilage crop. Velvet beans should be grown with the sorghum.

Guinea grass is recommended only for sites recommended for elephant grass and the same cultural practices are recommended for the latter.

Andropogon tectorum shows promise for the same uses under the same conditions as the other two grasses.

### Vegetables

Increased vegetable production for local consumption in Liberia is desirable as a means of adding variety and essential vitamins and minerals to the diet of the people. The following projects have been set up at the Central Station to assist in solving some of the problems inherent in such a program:

Cultural methods for growth of vegetables.

Corn and tomato breeding to develop disease resistant, high yielding strains.

A simple performance comparison of different vegetable varieties grown under Liberian conditions.

Plots designed to test various tomato varieties for resistance to Fusarium wilt were vitiated by the depredations of nematodes. It is obvious that these two causes of wilt are the most important problems of tomato production in Liberia. Seeds of dozens of varieties of tomatoes have been collected from various countries and are now being tested for resistance under local conditions. These two factors will receive attention in the tomato breeding program.

Seeds received from three commercial firms in the U.S.A. and from various experiment stations made it possible to begin vegetable variety trials in fiscal year '55 to fiscal year '56, using 34 different vegetables consisting of 207 different varieties and strains. The results of these trials have been published in a special report edited by Dr. Ervin T. Bullard, Horticulturist. To date the following varieties look promising:

Radish	- Crimson Giant Globe - Burpee Seed Company
Bush Bean	- Contender - Kilgore Seed Company
	- Tenderlong 15 - Kilgore Seed Company
Okra	- Perkins Long Green - Kilgore Seed Company
	- Perkins Early Mammoth - Kilgore Seed Company
Cucumber	- Burpee Hybrid - Burpee Seed Company
Watermelon	- Black Diamond - Kilgore Seed Company
Endive	- Green Curled - Kilgore Seed Company
Kale	- Dwarf Siberian - Burpee Seed Company
Lettuce	- New York 515 - Burpee Seed Company
Pole Beans	- U.S. No. 4 - Kilgore Seed Company
	- McCascan - Kilgore Seed Company

Observations and studies in the production and experimental gardens have shown the following insects to be a problem in the production of the specific vegetable crop shown:

Any vegetable	- grasshoppers
Cabbage	- cabbage worm, cabbage budworm, leaf beetles, cutworms, crickets, webworms
Cucumber	- leaf beetles
Okra	- flea beetles
Corn	- flea beetles, termites
Beans	- flea beetles
Watermelon	- fruit fly
Tomatoes	- crickets, termites

Trials in the production gardens have shown that most of these insects can be controlled by the use of the appropriate insecticides applied at the proper time and frequently. Studies are being continued to work such schedules.

#### Insect Collection and Survey

This work is in a continuing effort generally being conducted in conjunction with other projects and travel. There are now about 299 insects in the collection that have been identified authoritatively. Life history studies are under way on 18 species of destructive insects.

#### Publications

##### Reports:

- Bullard, Ervin T., Horticultural Report in the Republic of Liberia, July 3, 1954-July 3, 1956. 71 pp. Typed July 3, 1956.
- Franklin, Woodrow W., Report of Entomological Research in the Republic of Liberia, December 24, 1953-April 1, 1956. 146 pp. Typed April 6, 1956.
- Girardot, Leroy V., Final Report IOA Agronomist, April 1954-January 1956. 25 pp. Typed February 5, 1956.
- Jones, James F., Final Report Farm Management Adviser; March 26, 1954-April 25, 1956. 9 pp. Typed May 1, 1956.
- Meacham, Clinton M., Report on the Animal Husbandry Division, 54 pp. Typed August 1, 1955.
- Prejean, Harold, Report on Swamp Rice Production in Upper Central Province. Typed March 1956.
- Buchanan, Thomas S., Prejean, Harold, Girardot, Leroy V., and Harris, M. T., Studies to Determine the Most Economical System of Rice Production in Liberia. 36 pp. Typed April 15, 1956.

Station Notes:

- Bullard, Ervin T., Making a Coffee Nursery. 27 pp.  
Multilithed May, 1956.
- Buchanan, Thomas S., Coffee Leaf Rust in Liberia. Station Note  
No. 7. 13 pp. Mimeographed December 15, 1955.
- Girardot, Leroy V., The Effect of Plant Spacing on the Yield  
of Rice. 10 pp. Typed February 5, 1956.
- Girardot, Leroy V., Planting and Fertilization Experiments  
with Yams. 18 pp. Typed February 5, 1956.
- Girardot, Leroy V., Effect of a Complete Commercial Fertilizer  
on the Yields of Upland Rice. 10 pp. Typed Feb. 5, 1956.
- Girardot, Leroy V., Grasses and Legumes and Problems Associated  
with Their Use in the Tropics. 12 pp. Typed Feb. 5, 1956.
- Girardot, Leroy V., Report on Grass and Legume Testing Program.  
35 pp. Typed February 5, 1956.
- Bullard, Ervin T., Increase Sorghum Yields with Nitrogen. 6 pp.  
Typed April 1956.

Public Relations

Continued interest in the work on the Station was evidenced by visits from distinguished persons not immediately concerned with the direct operation of the program. Visitors represented the following countries: U.S.A., Germany, Italy, France, Nigeria, Gold Coast, Sierra Leone, Southern Rhodesia and French Guinea. Several hundred local farmers visited the Station for the purpose of obtaining superior planting materials and improved livestock.

## Chapter 2

### AGRICULTURAL EXTENSION

Through the distribution of superior planting materials (cocoa, coffee, rubber, citrus, oil palms, rice, kola, etc.), improved livestock, poultry, swine and farmers' organizations, the Agricultural Extension Program, serving the five counties (Montserrado, Cape Mount, Sinoe, Bassa and Maryland) and three provinces (Central, Eastern and Western) rendered invaluable service to the farm population of Liberia. During fiscal year '56 emphasis was placed on the following: a) expanded food production; b) in-service training; c) expanded export crops; d) swamp rice production; and e) management and care of nurseries and demonstration farms.

In this chapter it will be noted that accomplishments for fiscal year '56 are listed separately for each area worked, together with appropriate sub-headings indicating the magnitude of the job performed by the Extension Service.

#### Section 1. Montserrado and Cape Mount Counties, Salala and Bopolu Districts

##### Areas Covered

These areas, constitute the Southwest Section. With Monrovia as headquarters, activities extend to Kakata, Salala, and Totota, then across to Bopolu, Suehn, Bomi and Klay, and over to the total area of Cape Mount County — Bendaja, Balama, Bendu, Tienni, Jene Wunde, Momba, Dieh and Robertsport. The total area of activity covers approximately 3,600 sq. miles of territory with an estimated population of 175,000 people, consisting mostly of farmers who are given direct or indirect assistance through the program.

Visits to the areas of operation were made by motor trucks, airplanes, canoes and by foot. Most of the work in Grand Cape Mount County has to be done on foot. An attempt was made to cover all areas about once per month, except Grand Cape Mount County (covered only once per quarter).

#### Nurseries and Demonstration Projects

Under the program, there are 12 pilot stations which include nurseries and demonstration projects, the purposes of which are to furnish superior planting materials and improved livestock and poultry to interested farmers. Each of these stations has one Agricultural Aide and several trainees.

The names of the Agricultural Aides, the number of trainees, and the location of the stations, are given below.

<u>Name of Aide</u>	<u>No. of Trainees</u>	<u>Location</u>
Montserrat County		
1. S. Daniel Coleman	15	Blamatown
2. Johnny Morris	4	Clay-Ashland
3. Taylor Lee	2	Amina
4. A. Deker	6	Royesville
Grand Cape Mount County		
5. Elijah Johnson	4	Balama
6. Kdepoh Baysah	8	Robertsport
7. Bankole Allen	3	Jene Wunde
8. Robert Sargent	6	Gomboja
Central Province		
9. Thomas Martin	20	Salala
10. Samuel Barclay	6	Wearla
Western Province		
11. James Varmah	3	Bopolu Western
12. Henry Sherman	4	Bombma

### Training Program

The Agricultural Extension training program was usually carried out at the pilot stations. Although the men who operated each station were paid for their labor they were considered as trainees and were kept in training from one to three years before they were transferred to areas where they could give extended service.

They were taken in at the several stations as students in the field of agriculture. Some specialized in poultry raising, preparing chicken feed from locally grown produces and vegetable growing, while others were interested in producing good tree crops, such as citrus fruit, cocoa, coffee and oil palms. At each station, the Agricultural Aide who worked under the supervision of the Agricultural Extension Advisor supervised and kept records on the work of each trainee. The trainee was given basic and practical training in the agricultural activity in which he was interested. When he had performed the activity to the extent that he could do it efficiently without supervision, he was then given a transfer to a private concession or to an institution where he could render larger service.

In a number of cases the trainee retired to his own farm and started producing crops by improved methods as well as using improved varieties. During the past year twelve trainees were turned out from the stations in the four areas of operation. Six of them went to their private farms while the others went to work for private organizations. One was a poultry raiser and two were tractor operators. The other three were interested in producing tree crops.

Ten more are nearly ready to go into broader fields of service. Most of the absentee farmers are beginning to turn their attention toward the Government Training Centers (nurseries and demonstration projects) for men who can oversee their farms. Some farmers and institutions have sent their own men to these Government training centers and paid their expenses in order to give them special training for the jobs that they are to do. The training program at the nursery and demonstration projects have proved to be one of the most worthwhile efforts in the whole Agricultural Extension Program.

### Rice Production

Not until about one year ago did the rice production program get into full swing in the southwest section of Liberia. One year ago, over 5,000 lbs. of swamp rice seeds were distributed to about 100 farmers who found it hard to secure swamp rice seed. The production was slightly increased over previous years. Seed, from the quantity distributed, was saved and larger swamps were planted this year. Fewer farmers came in this year for free swamp rice seed distributions.

More than 15% of all the rice planters have gone into swamp rice culture. This type of rice culture was recommended under the program and is practiced by the farmers for the purpose of increasing production, saving timber, labor and utilizing top soil which has been washed into the swamps.

The farmers, in general, have grasped the idea of swamp rice culture and are finding it more economical to grow as well as increasing the much needed production of the country. For the first time, a number of farmers have attempted to stick to one area for the purpose of planting and cultivating two crops of rice per year.

Rice is being grown throughout the four areas. In the past year, encouragement has been given to each farmer to plant at least one acre of swamp rice.

Upland rice culture has also been encouraged, but in areas where the farmers did not have to cut down valuable timber. Rice culture has been encouraged, not only as the basic food crop but also as a means of increasing the production of livestock feeds (particularly poultry).

### Coffee Production

Probably the second most expanded crop during the past year (rice being the first) was coffee. Because of the sudden rise in the price of coffee (from 10¢ to about 35¢ per pound), the increased acreage of newly planted coffee was unexcelled by any other crop except rice and rubber. But for the lack of a sufficient quantity of seedlings available to farmers, the increased acreage of coffee might have surpassed all other crops during the past year. Up until two years ago the farmers living in the areas covered by the Extension Specialist have paid little attention to any variety of coffee except Liberica. Now, much attention has been turned toward Robusta coffee. In addition to market demands the Robusta coffee produces earlier than the Liberica. Thus, there has been a big increase in the planting of this variety of coffee.

The demand for seeds and seedlings for expanding coffee farms became so great that all government nursery projects had to be stepped up. Many farmers had put in their own private nursery plots. The several government nurseries located in the southwestern section were stepped up to about 1,500,000 beans during the past year. Over 80,000 coffee seedlings were distributed to about 200 coffee planters during the year. Some 200 odd

coffee projects, which had been abandoned, were reclaimed during the year.

The preparation of coffee for market was greatly improved. About one dozen new coffee pulpers were brought into the southwest section of the country. Hullers and fanners were also brought in.

Through periodic visits the farmers have been encouraged to give more attention to the proper fermentation and drying of coffee beans. Coffee grows well and is being produced throughout the southwest section.

#### Oil Palm Production

The production of oil palms over the past year period has been greatly increased. The nurseries in every section were expanded and over 40,000 seedlings distributed to about 100 farmers.

All government and privately-owned nurseries included the improved Nigerian variety of oil palm. When oil palm production was first being encouraged the farmers paid very little attention to the idea. They felt that because of the multiplicity of palms already growing all over the country it was useless to plant more. But when they visited the demonstration farms and saw the 3½ and 4-year old palms in production with ten and twelve bunches of palm nuts growing down close to the ground, they immediately realized the advantage of planting improved stock.

#### Advantages of Improved Palms

1. Started bearing four years earlier than local variety;
2. Produced more bunches of nuts per tree;
3. Produced a higher percentage of oil;
4. Produced more nuts per bunch;
5. Produced nuts close to the ground for many years.

301



Improved oil press increases production of palmoil by village farmers.

After the farmers learned of these advantages of the improved oil palms, they began applying for seedlings and nuts. Since oil palm nuts and seedlings have been so greatly increased, oil palms became one among the most widely planted crops during the past year.

A future boost to the oil palm industry in the year will be the introduction of a pioneer oil mill in Montsenado County, by the Limpex Palm Oil Company, and the introduction of several hand presses and nut cracking machines for processing palm nuts for oil and kernels. The pioneer oil mill will not only stimulate the improved and increased production of oil and kernels, but will bring about a substantial increase in the collection of nuts from indigenous palms thereby creating a source of cash income for the surrounding farmers and villages.

Because of the wide use of palm oil in the diet and the great need for oil palm products in the production of livestock feed compounds, oil palm production was vigorously promoted under the program.

#### Citrus Fruit Culture

The cultivation of citrus fruit projects was on the increase a year ago. All the pilot stations throughout the southwest' area of the country expanded their orange, grapefruit, tangerine, lemon and lime nurseries. The biggest increase in the planting of fruit seed was done with oranges. Tangerines came second and grapefruit fell in third place.

The expansion of citrus fruit projects has been largely dependent upon transportation facilities. The farmers were very reluctant about developing large fruit orchards unless they saw ways of getting the fruit to the market. Since there has been an expansion in the road building program, an

increase in the planting and cultivation of fruit trees have followed. Many nurseries were established by private fruit growers. A fairly good supply of citrus fruit was on the market over the year, although there was a heavy attack on grapefruit and oranges by fruit flies. Because of this damage the quantity of fruit on the market last year was lower than in previous years. When the farmers noted that large quantities of their fruit were dropping off the trees they began to pick it for the market before it was thoroughly ripe.

During the year, insecticides and spraying equipment were not available to the majority of fruit growers. Another thing which hampered the fruit growers was the lack of ways and means for conserving fruit products. Citrus fruit canning plants have been recommended and planned but none have actually been established. The farmers have large quantities of fruit seedlings now, with the hope that a citrus fruit canning industry or an export market will be available by the time there is an appreciable surplus of citrus for marketing.

There were no citrus fruit seedlings left in any nurseries throughout the areas under review over the past year. In fact, the planting would have been much heavier if farmers could have found the seedlings.

The four areas mentioned above planted an estimated total of:

100,000	orange seedlings
25,000	grapefruit seedlings
40,000	tangerine seedlings
5,000	lime seedlings
10,000	lemon seedlings

There was absolutely no trouble in getting any of the farmers to plant sizable quantities of citrus fruit trees if they could not the seedlings. This was one crop for which they were ready and willing to pay for the nursery stock.

Some improvement in the production of citrus fruit was started during the year by budgrafting and selection. About 100 budded trees were put out in demonstration plots while another 100 were kept in the nursery. The development of citrus fruit projects was a very encouraging step toward economic development.

#### Cocoa Projects

Probably the slowest moving farm activity was that of cocoa planting. There were several reasons for the reluctance on the part of farmers for planting cocoa. First, cocoa had not done well in previous years because of unsuitable soil conditions. Secondly, they did not understand the proper methods of cocoa culture. Since the establishment of the two cocoa plantations in the Central and Eastern Provinces together with the advice and incentive given under the program, the farmers have shown more interest in the cultivation of this crop.

Last year, the farmers were discouraged from undertaking large plantings of cocoa since such practices incorporated soil types not given to cocoa growth. Thus the new slant on cocoa production was the selection of suitable soils in and around the villages where the full use could be made of rubbish piles and more close attention could be paid by the inhabitants of the villages. This necessitated each farmer having a small

plot of one or probably one-half acre of cocoa. Whenever the village area was not sufficiently rich and properly shaded, great care was used in advising the selection of other areas which were suitable. In very few cases were farmers able to plant more than one acre in any single plot. With these adjustments made, the number of farmers planting cocoa began to increase. During the past year more than 25,000 cocoa seedlings were distributed to farmers and transplanted into village field plots.

Several abandoned stands of cocoa were reclaimed. Farmers began fermenting and drying according to standards set up by the Extension Service. The price received for cocoa went up to 35¢ per pound. The flow of cocoa to the market increased and production showed an incline.

#### Mango Production

Little attention had been given to the planting and cultivation of mangoes until recently. There was a poor market for mangoes, thus the farmers did not manifest interest in their cultivation. The selection of improved trees of mangoes, promoted by the Extension Service, and the budgrafting of native varieties with buds from improved trees created a greater interest in the production of this crop. During the year, about 800 selected seedlings from improved trees were distributed to farmers. Because of the limited quantity of improved planting stock budgrafting operations were introduced to speed up production.

#### Avocado Pear Production

Like mangoes, commercial production of avocados began in recent years.

Experiments with several varieties of avocado pears have been undertaken in an attempt to establish conomic varieties for distribution to farmers. Since avocados are of such high food value, farmers are being encouraged to plant at least five trees per hut. During the period sizable nurseries were established at Gombaja Valley and Blamata with selected varieties collected from various parts of the country.

#### Papaya

The papaya is finding its way into the diet of the area people much more than in the past. It thrives well in the area and may be consumed when cooked green as a vegetable or eaten raw when ripe or cut into slices with lime juices added to improve the flavor. Plans call for introducing selected varieties into nursery plots for distribution to farmers.

#### Rubber Plantting

Rubber remains the leading crop and because of the extreme fluctuations of rubber prices, farmers have been advised to use only high yielding clonal material. To this end, five thousand rubber seedlings were distributed to farmers and ten thousand seeds were planted in two nurseries for future distribution as budding stock.

During the year, one rubber plantation (B. F. Goodrich) and one rubber buying and processing company (German firm) were established in the Country. As a reslut of the activities of these two companies, the production of rubber by small farmers has been stimulated. The purchasing of rubber on the farm has served as an encouragement to the farmer by relieving him of time and transportation cost that he would otherwise have to expend in effecting sales for his product.

The scarcity of labor remains an acute problem not only where the production of rubber is concerned, but in agricultural production generally.

### Banana Culture

Bananas, like cocoa are adapted to very rich soil. The farmers in the areas covered in southwest Liberia have been disappointed and discouraged in former years because they know not the proper steps and procedures to take to produce high grade bananas.

Because of the sharp variations of soil conditions, banana growing had to be carefully studied and bananas had to be planted in very small plots of deep rich ~~rich~~ soil with excessive mulching. The farmers were encouraged to stick to about 10 to 15 trees per hut. The selection of improved varieties like the "Gros Michel" and the "Canary" were encouraged. Most of the bananas were produced in the dump piles around the villages. Since the type of soil for bananas and cocoa is practically the same and bananas supply a good shade for cocoa, the farmers have started the practice of planting bananas and cocoa together. More and better bananas have reached the market though the past year did not show full scale production. The farmers were interested only in what they could market locally.

### Vegetable Production

One of the major activities was the production of vegetables. All of the small farmers wanted gardens. Vegetables grew swiftly, sold readily and brought in needed cash. The opening of an Agricultural Store in Monrovia boosted the vegetable production efforts.

Aside from the foreign population there were several other factors which had a big influence on the increased production of vegetables. For example, the advice given through conferences and personal interviews assisted the farmers in selecting the proper types of soils and locations. They were also assisted in selecting suitable varieties for the area, where the gardens were established. Other aids given were advice on methods of soil preparation, planting of crops, soil erosion and crop rotation. The farmers found it advantageous to schedule their planting periods for the different vegetable crops. It was found useless to plant any type of vegetable crop in June, July or August at the time when the heaviest rains were falling. They planted vegetable crops in March or April to catch the early rains, and again in September and October to catch the end of the wet season. The vegetable farming was moved down in the swamps during the months of November, December, January and February where dry season farming took place. In most of the swamps the farmers had controlled irrigation from running creeks. This sometimes proved more successful than the practices which were carried out during the wet season.

The importation of garden tools by the Agricultural Store and by several of the local merchants gave an added advantage toward increasing the production of vegetables. On the markets were found more and better cabbage, string beans, okra, sweet pepper, collard greens, and endive. Every farmer was encouraged to plant at least one half acre of several varieties of vegetables. The pilot projects, carried out testing

practices to determine which variety of vegetables did best under various soils and other conditions. When a farmer received his seeds from the store he was given guidance on how to prepare the soil, plant and cultivate them. Imported fertilizers were found to be too expensive. Thus, the farmers were encouraged to build compost piles as a source of fertilizer for their vegetable plots.

### Cassava

Cassava, being the second most important food crop was given some attention under the program. Cassava was tested on better types of soil and it produced a surprisingly heavy crop. The Department brought in new varieties which were tested against the "two cents" and the "fufu" types. This crop was also cultivated in accordance with recommended practices. It was found advantageous in improving and increasing production. Though production of cassava was increased, the farmers did not bring as much to market as in previous years because of the increase in the production of rice. Therefore, much of the cassava had to be made into "fufu" and "farina" patties in order to be sold.

### The Production of Plantain

Though plantain makes a delicious breakfast food, production was not given great attention until recently. The increase in population in the metropolitan area caused the price of plantain to go up. As a result, more plantain started flowing to market. Because plantain grows with a little less effort than bananas, the farmers gave more attention to the

production of this crop last year. Efforts were made to get each farmer to plant at least 10-15 plantain trees per hut. Because of the type of soil needed, only one nursery has been producing plantain stumps for distribution.

#### Cocconut Production

The crop which received the least attention during the year was the cocconut. Most farmers were interested in quick crops. They were also more interested in crops which were certain to sell on the market. There was almost no market for cocconuts. Cocconut farming was tried by several farmers who were not very successful. Most of the trouble came from fires. Until some foreign market is in sight the farmers will probably be content to produce a few cocconuts for local consumption.

#### Pineapple Production

Pineapple culture was not a planned farm practice until recently. The farmers, in general, had a few pineapples planted near the villages but no special attempts were made to produce them for market because opportunities for marketing were limited. The increased consumption together with the introduction of improved varieties created a new interest in the development and production of this crop. Last year, at least 100 farmers planted (each) from 1000 to 5,000 improved pineapple scions. A company (Liberian) was organized to start a pineapple plantation. This company has already planted over 25,000 pineapple scions in its nursery. A large quantity of these scions was secured for the company through the Agricultural Extension Service. Many private farmers have put in sizable areas (1,000 to

5,000 scions) of Hawaiian and Nigerian (sugar loaf) pineapples. The bringing in of a pineapple canning factory (which has already been planned) is destined to stimulate the production (which was started last year) to a high level. At least five farmers had as many as 10,000 to 20,000 pineapple scions planted out in the field last year. All the nurseries and demonstration projects have been specializing in producing improved varieties of pineapples for distribution in the several areas.

#### Yam Cultivation

The past year was the first time in recent years that any appreciable amount of emphasis was put on the production of yams. It was decided to promote an increased production of yams by starting an improved variety (the Chinese) in the area. These Chinese yams were started in nurseries at several of the stations. About two hundred were distributed to farmers in the vicinity of the stations. It takes a fairly long period (9-12 months) for Chinese yams to mature. For this reason the distribution, last year, was limited. Efforts have been made to assist farmers in securing enough yams (Chinese) to start a project. Of course there has been very little trouble in getting a good quantity of seed yams from the African variety. This type has also been encouraged among farmers because of its value as a food crop as well as for feeding livestock.

#### Sweet Potato Production

Sweet potatoes have been in production throughout the area. However, the production of improved varieties has been very limited.

Sweet potatoes have been produced more as a source for potato greens than for the potatoes themselves. This is one of the reasons that very little thought had been given to improved varieties until recently. In the area it was noticed that one of the improved varieties (the Puerto Rican Red Skin) was found in many different sections. The farmers did not pay much attention to the difference in quality or in production of this variety from any other variety. They were advised to select this variety from among the other varieties simply by noticing the difference in the shape and texture of the leaves. After learning this art the farmers selected enough to start sizable plots and then ceased planting the other (8 or 10) varieties. This was practiced more in the Cape Mount area than in other areas. Requests came in all through the year for vines from the Puerto Rican Red Skin sweet potatoes. This was particularly true after several demonstrations had been given on the growth and production of the potato, and its improved quality as a food. More than 100,000 slips were distributed in the several areas. The production of sweet potatoes as livestock feed was also encouraged. Sweet potatoes were on the market in greater quantities and in better quality during the year. There was not much trouble in producing sweet potatoes except in areas where the laterite was very extensive. A farmer could usually find a small area for sweet potatoes where this was not the case.

#### Peanut Production

Because of the large quantities of peanuts consumed, it was found necessary to place the production of peanuts high on the program of agricultural activities. Various varieties of peanuts were tried in demonstration plots. The rains damaged them in the mid rainy

season. When planted in the dry season they made many pods. It was found that peanuts grow best from March to June and from September to the end of November. The Spanish (two crop) peanuts showed the best results. The Virginia runners did fairly well but took a little too long to mature. The most discouraging factor in trying to produce peanuts was the way in which they were destroyed by ground hogs, rats and guinea fowl. It seems that some measure will have to be taken to combat these animals before the production of peanuts can be greatly increased. Of course, when a farmer puts in ten or twenty acres of peanuts the damage is not so outstanding. Since most of the peanut growers plant from one to one and one-half acres, any small amount of damage can be discouraging. Even with all the drawbacks the production of peanuts has increased approximately 50% during the past year. The increased demand for local livestock feeds as well as the increased consumption of peanuts the price of locally grown peanuts has remained high enough to keep the farmers encouraged to grow more each year.

#### Sugar Cane Growing

The growing of sugar cane is noted throughout the area, however, there are very few plots that include more than ten acres. The bulk of the sugar cane produced last year was in the St. Palu River District.

Oddly enough, sugar cane is not being produced for sugar or syrup but for rum. There are probably less than a dozen sugar cane growers who process the cane juice into syrup. The difference between the price of rum and the price of syrup is the factor which keeps sugar cane growers in the rum rather than the syrup business. Farmers are being encouraged to produce sugar cane for syrup.

47a



Bundles of rice being harvested  
at the Gbedin Swamp Rice Project.

Only about three of the varieties of cane imported from Florida several years ago did well in the areas where they were tested. The suzar cane which is already growing in Liberia is probably more adaptable and more pest and disease resistant than any of the varieties that have been imported.

It seems that the establishment of sugar and syrup industries, along the areas where large quantities of sugar cane are grown, will be the only hope for getting syrup and sugar produced. It is almost useless to encourage sugar cane growing for syrup and sugar until the industries can be established or until the farmers can have a guaranteed price for syrup. The increased and improved production of sugar cane will have to be a long range program.

#### Miscellaneous Crops

Many of the miscellaneous crops, such as guavas, kola nuts, cashew nuts, almonds, bread fruit and bread nuts, are important. The kola nuts, in particular, have been produced and used throughout the area. Except for kola, these miscellaneous crops are produced entirely for local consumption. Because of the great export possibilities that the crops have kola nuts and almonds have been added to the nursery stock at the several pilot stations. Last year, about 100 kola seedlings and 1,000 almond seedlings were distributed. The four other tree crops mentioned above are carried. Although in limited numbers in station nurseries, however the farmers are encouraged to plant them.

#### Poultry Raising

The most popular activity that was carried out by the farmers during

the year was poultry raising. Although a number of farmers have raised many thousands of birds during the past one year period, only a few of them have taken time out to develop a sound and basic plan for raising chickens.

The basic plan which has been promoted includes: the building of poultry houses of native Liberian materials; using Liberian grown products for feed; cross breeding; and, using caretaking personnel which has had previous training in poultry raising. Most of these requirements have been neglected by the majority of the farmers who have branched into poultry raising. They have made considerable money, but they have also had losses which have been unnecessary and far too great. Very few poultry farmers have wanted to start in a small way and grow into the business over a period of years.

The Extension Service has attempted to guide the poultry raisers by producing feed compounds from Liberian grown products and by teaching them to make drinking fountains and feed hoppers from local reed cane. The fences and brooder coops can also be built from reed cane and other materials such as bamboo mats. Some of the farmers have adopted these methods.

During the year more than 5,000 pounds of poultry feed from Liberian grown products was produced and distributed to farmers. The poultry raisers were assisted in planning and constructing over fifty brooder coops and over 40 laying houses. A poultry exchange program was also carried on by the Extension Service. This poultry exchange program gave the farmers the opportunity to bring a native cock to the demonstration

farm and receive a pure bred cock in exchange.

Nearly three hundred cocks were exchanged in this manner for the purpose of getting the improved blood among the flocks in the towns and villages. This poultry exchange program gave considerable encouragement to the villages. Last year, there were more chickens in villages than at any time in recent years. More eggs were on the general market. Eggs were selling at a lower price than ever before (75 cents to \$1.00 per dozen).

Imported eggs were moving very slowly because of the increased supply of locally produced eggs. More corn has been distributed to farmers in order to continue to increase the production of feed products.

The new fishing companies which have been established in Montserrado County will definitely give rise to the production of balance poultry rations. The palm oil processing unit which is soon to begin operation in the same area will also give a boost to the production of chicken feed. The program includes the selection of better locations for chickens, and training more personnel for handling poultry projects.

Although many of the farmers have secured their private incubators, the Extension Service has incubated over one hundred dozen eggs for farmers during the past year. Other farmers secured eggs from improved flocks and hatched them by their native hens. While the poultry industry has jumped by leaps and bounds efforts have been made to get the poultry farmer settled down on a more substantial and sound footing. More than five thousands locally produced fryers and broilers were sold last year, but the fact that most of them were raised on imported feeds creates much as

concern.

#### Other Live Animals

Oddly enough, the religious belief (Moslem) which is followed in a portion of the area makes it difficult to promote a swine production program. These people do not want swine on their premises. They raise sheep, goats and cows. These are the three types of animals which are encouraged in the program. Although there has been a small increase in the raising of these animals, they will not be increased to any appreciable quantity until more and better pastures can be developed. The pilot stations have been busy trying to develop good grasses and cover crops to recommend and distribute. More emphasis has also been placed on fencing pastures for livestock as well as fencing other crops. In many areas the problem of fencing would be comparatively cheap because fencing materials are plentiful.

#### Village Work

One very active phase of the work was the village program. The Extension workers, toured the villages and towns throughout the clans and chiefdoms and held conferences with the village people. The purpose of these conferences was to encourage the village people to dig wells; build toilets (pit); screen windows or sleep under mosquito nets; hang clothes on lines above the ground instead of spreading them on the ground; build better houses; keep the village clean; plant home gardens; build poultry houses and to use the local health units for medical service. The village program has become a very important unit in the agricultural extension

service.

### Farmers' Councils

The organization of Farmers' Councils is an activity which was recently started in this section. Until a year ago the Council in Grand Cape Mount County was the only one that had been organized. This organization had a membership of over one thousand five hundred farmers. During the year another council was organized in the Central Province with a membership of nearly one thousand and one in Montserrado County with better than two thousand five hundred members. It was found that the program could be conducted more successfully through Farmers' Councils. The four farmers' organizations, including the one in the Western Province, have a membership of nearly five thousand farmers who have pledged to pool their efforts and cooperate with the Department of Agriculture in putting over a better agricultural development program. Some of the activities which are included in the program of the Farmers' Councils are as follows:

1. Encourage a more diversified farm program.
2. Standardize the preparation of farm products for market.
3. Improve and increase the production of all crops and livestock.
4. Encourage cooperative buying.
5. Encourage cooperative marketing.
6. Produce farm crops cooperatively.
7. Cooperate with the farm program that is promoted by the Department of Agriculture and Commerce.
8. Cooperate with the soil and timber conservation plan.
9. Practice improved health habits.
10. Make use of all the resources at their disposal to improve the living conditions through the farming centers.

### Field Trips

In order to do theirs work effectively, the Agricultural Extension Service made trips periodically to the field. Several different modes of transportation had to be used. In some areas motor vehicles were used. In other areas airplanes were used while in many of the areas it was necessary to travel by canoe and by foot. Most of the canoe and foot travel took place in lowland areas like Grand Cape Mount County (extreme southwest corner) where there are many rivers and creeks. Entire travels covered about 3,600 square miles. of territory. Within these 3,600 square miles there were nearly 175,000 people. About three-fourths of these people are farmers. The majority of the dwelling places are huts. These huts and houses are located in about 11,000 towns and villages the majority being native villages. The Agricultural Extension Service comprising one technician, twelve Aides and 100 trainees, attempted to cover these areas, either directly or indirectly, at least three or four times per year. Many of the areas were visited monthly. The visits were for the purpose of giving technical assistance to farmers.

### Cooperating With Private Enterprises

In addition to activities mentioned above, the Extension Service cooperated with private enterprises by 1) advising on crop production, 2) advising on the selection of sites for processing plants, 3) assisting to select local varieties of crops, 4) assisting with selection of trained personnel, 5) advising on the proper time to start various types of projects, 6) assisting with orientating them into the country, and 7) assisting them with the purchase of agricultural supplies.

Some of the private interest groups which have received assistance from the Agricultural Extension Service Are:

1. Goodrich (rubber) Company
2. Society for Utilization of Vegetal Raw Materials (palm oil) Company
3. Moller and Company (for purchasing rubber)
4. LAMCO (mining company - iron ore)

Many smaller companies and societies were also given assistance.

#### Insects and Insecticides

The problem of insects has been almost uncontrollable although there were enough insecticides in some areas. The insects usually come in waves. When they come there are so many (especially grasshoppers and army worms) coming wave after wave that though many are killed, the damage is done before they can be controlled. The grasshopper attack comes especially during the dry season. They come so plentifully and cover such a wide area that there is not much that a farmer can do with them except try to stay in swampy areas where they are not so numerous. The grasshoppers and worms that attack during the wet season are also hard to control because the rain washes the insecticides away as fast as they are put on the crops. The worst rodent with which the farmers had to contend was the ground hog. The farmers hate these animals because they only attack at night. They are very destructive and are very hard to control. Although the insects and rodents are practically uncontrollable because of their seasonal attack the

farmers do better in this area than in some other areas of the country. As in other parts of the world, the insect attacks have been greatest in new land areas.

### Grasses and Cover Crops

The production of animals had been quite limited. For this reason not too much attention has been given to grass culture; however, the production of cover crops has been extended. A few grasses like Johnson grass, Dallas grass, and Guiniagrass have been tried at some of the nurseries and demonstration projects. Most of the grasses tried gave excellent results throughout this section. The production of pasture grasses for cows, goats, and sheep has been encouraged. Not much progress has been made but the introduction of improved varieties of grasses is certain to bring about a new interest in pasture development. Cover crops have been grown fairly extensively for the purpose of improving soil, keeping down erosion and producing poultry feed. The outstanding cover crop for the area has been the velvet bean.

### Fertilizers

Commercial fertilizers have not been encouraged too much; they are too expensive for the average farmer. They have been used more or less for testing purposes. In most areas where tested, the soil has been very short of phosphorus and nitrogen. When these two elements were added the crops in general grew profusely. The farmers were encouraged to make compost piles. The compost lasts much longer, particularly during the rainy season. Commercial fertilizers had to be used in the months when the rains were

light (March, April and May, and October and November). Little, if any, results were obtained during the heavy rains or the dry season. The moving to the swamps for vegetable and rice farming was very helpful to the small farmers because they were not able to buy the fertilizers. The swamps produce good crops without the use of commercial fertilizers.

#### Transportation Facilities

Transportation is the greatest asset to farming in this section. The extension of the road program into the Western Province and into some sections of Grand Cape Mount County has given a boost to increased crop production. The farmers were reluctant to increase the production of crops when they saw no way of getting them to the market. As soon as the roads were extended the crop production increased. Crop production has increased more than 50% because of improved and extended roads.

#### How Weather Conditions Influenced Agricultural Production

The weather condition has always influenced crop production. This area has the heaviest rainfall of any section in the country. Weather charts published monthly by the Weather Bureau of the Department of Public Works and Utilities indicate this to be true. Since this area is noted for its rainfall it grows more tree crops and less vegetables (tender crops) than other areas. Because of the heavy rainfall, vegetable production (especially tender growing crops) is almost at a standstill in August and September. The same thing is true because of the extreme heat in December, January, and February. Before sound recommendations could be made to farmers, the Extension Service had to make regular and close observations of the weather for several years. It was found that farmers had to stick pretty closely to the recommended planting dates if they were to be successful.

### Food Conservation

Food conservation practices had to be introduced because of the great losses suffered with crops that ripen fast. In former years the farmers have suffered heavy losses with crops such as pineapples, mangoes and guavas. The Extension Service introduced food conservation equipment (pressure cookers and jars) for the purpose of helping and teaching farmers to conserve some of the food crops that they had been losing. Community Food canning plants are planned for this area. Because there is no way to sell perishables except on the local market, great losses are suffered where there is no food conservation machinery.

### The National Agricultural Fair

Some of the many agricultural projects connected with the National Agricultural Fair, were those brought in from this area. Included in the exhibit from this area were not only farm products but also locally produced handicrafts such as fibre products, wood carvings and textiles. Efforts are being made to stimulate interest in the development of these skills among the local people. Considerable interest in handicraft products was shown by the visitors to the Fair.

After having made plans and arrangements for setting up exhibits and demonstrations, a committee composed of fifty women was organized to undertake the voluntary responsibility of decorating booths and arranging and supervising exhibits. This committee arranged three booths: one for Montserrado County and the Central Province, which included 325 feet of space; one for Grand Cape Mount County, which included 160 square feet of space;

and one for the Western Province, which included 160 square feet of space. Aside from these booths, which were completely filled with vegetables and food crops such as fruits, rice, and potatoes, 30 coops which included ducks, guineas, turkeys, and chickens were exhibited. In addition, there were five pens of cattle from the various sections.

Other activities which were undertaken by the Extension Service were as follows:

1. Demonstration of poultry feed processing from Liberian grown products.
2. Demonstration of improved method of processing palm oil in hand mills.
3. Demonstration of improved method of processing coffee in hand and electrically operated mills.
4. Seed drying operation.

During the Fair, the Farmers' Council operated a booth in which free Liberian coffee was served and music for the fairground was provided. Throughout the Fair, voices were heard from the Farmers' Council booth urging members to join. The slogan for the Council: "Plant More, Live Better," was also heard over the loud speaker. Thus far the Council has received nearly fifty paid members, some of whom paid their life membership of \$60.00. It is felt that the success which was realized at the Agricultural Fair by this section was in a large measure due to the interest manifested by the farmers of the area.

Because of the cooperation and interest manifested by the Extension Service together with the local farmers and volunteers, the Montserrado County and Central Province exhibits took first prizes in the County and Provincial

exhibits.

Summary of Work of Extension Service

1. Montserrado County and the Central Province won first prizes in the County and Provincial exhibits at the National Agricultural Fair.
2. Under the program, the Agricultural Aides increased from six to twelve.
3. The program also increased the number of nurseries and demonstration projects from six to twelve.
4. The Agricultural Extension Service held four Agricultural Council meetings where more than 3,000 members attended.
5. Over 6,000 lbs. of seed rice were distributed to farmers for increasing swamp rice production.
6. Aided approximately one dozen farmers in establishing poultry flocks which has produced nearly 10,000 chickens.
7. Distributed more than 50,000 coffee seedlings to farmers.
8. Distributed more than 20,000 oil palm seedlings to farmers.
9. Distributed over 10,000 citrus fruit seedlings to farmers.
10. Exchanged nearly 300 pure bred cocks with farmers for native cocks.
11. Assisted a pineapple company in securing approximately 20,000 pineapple scions.
12. Processed over 5,000 lbs. of Liberian grown products into chicken feed compounds in a hammer mill for distribution to farmers.
13. Incubated approximately 2,000 eggs for local farmers.
14. Traveled over 500 miles with private interest groups.
15. Distributed over 2,000 lbs. of vegetable and field crop seeds.
16. Held over fifty town meetings with about 10,000 farmers and town people.
17. Distributed several tons of sugar cane, sweet potatoes, sweet potato vines, and yams to local farmers.

18. Distributed 10,000 cocoa seedlings to local farmers.
19. Distributed six coffee hullers and 12 palm nut crackers to farmers.
20. Assisted farmers in preparing their farm products for market.
21. Planted 200,000 coffee beans in several nursery plots.
22. Planted 150,000 palm nuts and 25,000 citrus fruit seeds.
23. Distributed tools, fertilizers, insecticides and spraying equipment to farmers.
24. Assisted many farmers with budgrafting their citrus fruit trees, planting cocoa trees and building brooder coops and laying houses.
25. Trained twenty-five men to carry out improved farm practices.

## Section 2. Western Province

### Location, Agriculture, and Organization

The Western Province is located in the northwest end of the Republic and is divided into three districts: Kolahun, Zorzor, and Voinjama, with provincial headquarters at Voinjama. The area is rolling and suited to the production of coffee, cocoa, kola nuts, citrus crops, rice, and a variety of vegetables. The rainfall is somewhat less than on the coast --- 90 inches. The Kolahun district is the largest of the three and is divided into three Chiefdoms: Gbande, Gossi and Mende-Gumba. The three Chiefdoms are subdivided into ten Clans. The Zorzor District, second in size, is divided into two Chiefdoms: Gayema-Guicoma and Vavilah-Gbaly. The Chiefdoms are divided into six Clans.

The Voinjama District is divided into two Chiefdoms: Loma and Mandingo. The Loma Chiefdom is divided into Upper-Walker, Lower-Walker, and Bonda Clans, and the Mandingo Chiefdom into one Clan. The three districts are divided into seven Chiefdoms and twenty Clans. Seven Paramount and twenty Clan Chiefs

550



Agricultural filmstrip showing in village introduces new methods and improved ways of farming.

head the Tribal Government. The Central Government is represented by three District Commissioners: Commissioner Liberty at Voinjama, Commissioner Walters at Zorzor, and Commissioner Mason at Kolahun.

Agriculturally the Province is divided into twenty areas with each Clan employing a Clan Agricultural Aide assisted by two workers furnished weekly by the respective Clan. The Activities of the Clan Aides and workers are supervised by three trained Liberian Agricultural Aides employed by the Department of Agriculture. These Aides are Mr. Sorie Tamba at Kolahun, Mr. J. B. Dukuly at Zorzor, and Mr. Kekala Dogba at Voinjama. All agricultural activities of the Province are given general supervision by the Agricultural Production Specialist.

#### Seedling Distribution

Planting seeds for the production of coffee, cocoa, kola-nuts and citrus seedlings are furnished by the Department of Agriculture and distributed without cost to farmers and interested persons for setting to the fields. The seeds are planted to nursery beds during the dry season and seedlings distributed during the rainy season -- July, August and September. Farmers are aided and directed by trained Clan Aides in setting the young plants properly to the fields followed by periodic visits by Clan Aides, Agricultural Aides and the Agricultural Production Specialist.

During the period June 1955 to June 1956, the following seedlings were distributed and set to the fields from the Department of Agriculture supported nurseries:

	<u>Cocoa</u>	<u>Coffee</u>	<u>Citrus</u>	<u>Kola-nuts</u>
Voinjama District	52,070	110,869	11,122	9,875
Zorzor District	56,000	98,875	9,000	8,000
Kolahun District	177,909	436,793	178,537	17,240
Totals	291,979	646,537	198,659	35,115

Many persons planted cocoa from pods and set seedlings (robusta coffee) from personally owned nurseries estimated to be one-half as many as are produced and distributed through Government supported nurseries.

#### Vegetable Production

Vegetable seeds -- tomato, collard, and cabbage plants -- were distributed to approximately 1,000 farmers and interested persons in the Voinjama and Kolahun Districts through Agricultural Aides Dogba and Tamba with emphasis placed on the increased production of beans and field corn. Excellent results were obtained from the hospital garden at Voinjama and school gardens at Voinjama and Kolahun. Puerto Rico sweet potato vines were secured from the Liberian Government Experiment Station at Suakoko. These were planted at Voinjama and distributed to approximately seventy-five families in the Voinjama and Kolahun Districts. One hundred pounds of Cuban flint M-18 (field corn) was distributed to one hundred fifteen farmers in the Voinjama, Kolahun and Zorzor districts, with splendid results.

#### Rice Production

The rice acreage has been increased throughout the Western Province, some 20 per cent with emphasis placed on the increased production of swamp rice. A small amount of swamp rice seed was distributed through Clan Chiefs.

#### National Agricultural Fair

The Western Province exhibited its agricultural products and handicraft at the first Annual Fair and Exposition at Monrovia, January 1956. During the same period the local farm produce marketing facilities were being increased and improved in the Voinjama and Kolahun Districts. A spacious marketing shed, zinc covered, at Voinjama was completed with the sanitary inspector keeping a close check on the over all conditions.

### Field Visits

Periodic visits were made within the three Districts inspecting agricultural activities, conferring with Elders, Town, Clan and Paramount Chiefs, and District and Provincial Commissioners, in an effort to increase the over all interest in the agricultural development and general improvement of the Western Province. The Extension Service cooperated with health, hospital, road improvement, civic and educational programs, and with Commissioners Liberty and Mason at Voinjama and Kolahn, respectively, in organizing Community Advisory Councils. At the writing of this report a movement is on within the village of Voinjama to provide public lavatories, or W.C.'s, and a water system.

The Extension Service has had, and appreciates, the splendid cooperation received from the Central Government and Hinterland authorities.

The agricultural program and the general improvement throughout the Province is gratifying and the outlook for its citizens is bright and encouraging.

### Section 3. Sinse County

The Agricultural Production Specialist arrived in Monrovia, Liberia, October 2, 1955. The remainder of October was spent visiting other work projects, demonstration farms and nurseries in Montserrado, Grand Cape Mount County, and the Central Experiment Station, Susseko. These visits and observations were much help to him in learning what to do and how, plus, it gave him something to measure his progress by.

He arrived at Greenville, his post of assignment, November 2. The month of November was devoted to getting acquainted and studying the situation

to be dealt with. The people were slow, as may be expected, to accept him. They were met more than half way and soon they began to warm up. As they talked, their problems were revealed. Questions were asked to stimulate conversation and get answers as to what approach to these problems should be taken. The answers and interest could roughly be grouped according to income, education, and source of income.

December was spent continuing to get acquainted, and general hut-to-hut and farm-to-farm visits made, with interest directed toward selecting exhibits for the National Fair. From these visits and observations, it was learned that the greatest problem was the lack of family food supply and initiative, especially among the indigenous population. It was learned that rice and cassava are the main foods, supplemented with meats (wild game), fish and fruits, when they could get them. Meats, fish and fruits are rarely adequate for a normal protein, mineral and vitamin diet, according to standards set by nutritionists. An adult indigenous farmer's constitution and strength would defy all that one thinks he knows about the seven basic foods for good health and strong bodies.

Since County put up a booth at the National Fair, attempting to depict what seemed to be the major problem and where program emphasis should be placed for the next two years in this area. The theme of the booth was "First Things First": grow the family food supply, then grow cash crops, and do not let that great natural art-craft die. Pass it down -- down to your children; it is a part of your cultural contribution to the world.

### Expansion Program

The planning and laying out of Butaw Station was the first job. Plots were laid off for each demonstration and gone over with the trainees. When it was noted that the station must be expanded, part of the workers began to cut bush, getting new land ready. Three and four-tenths acres were added. While this was going on, the other group was putting in demonstrations and repairing huts. Two rooms were added to the Assembly Hall and all buildings were given a general repair to bring them up to standard.

### Cacao

Many farmers were interested in cacao and wanted seedlings, so the trainees began to plant more cacao until seeds were no longer available. Approximately 40,000 seeds were planted. It is estimated that 30,000 seedlings came through for distribution. To date, 9,000 of these seedlings have been given out to farmers and villages for planting. Four hundred seedlings were planted at the station for demonstration. The mid-dry spell started the last week in July and farmers were advised to wait until about the fifteenth of August before planting the other seedlings available at the station. With the interest aroused in cacao production, the outlook for 1957 favors having 80,000 seedlings for the Butaw Chiefdom.

### Cassava

Much emphasis is placed on this crop because it is one of the chief food. The demonstration at the station will show this, for over an acre is planted to cassava alone. Two result demonstrations are under way in spacing and weeding cassava. This cassava, when matured, is given to the trainees and the hospital. There are three plantings, staggered so that the cassava will at all times be young and mealy for good eating.

Pineapples

A demonstration in pineapple production was at the station when the Production Specialist arrived. The area devoted to this crop has been more than doubled. Over 600 scions were given out to villages and farmers, but no one was allowed more than 50 each. Pineapples do exceptionally well in this area. More emphasis should be put on this crop for food and for market.

Rice

Great strides were made in rice production in Sinoe County this year. The Department of Agriculture and Commerce and the President asked that more rice be produced. The station, too, encouraged this program to the fullest. From all indications, everyone did his best to increase rice production. Interviews revealed there was no one who felt that his farm did not produce more rice this year than last. This is a good sign that rice production may be on the way up and that the rice money can stay at home to be used for the things which cannot be raised on the farm.

Rice is grown in Sinoe County on land cleared each year from secondary and high bush. This is a waste of labor and soil fertility, to say nothing about the valuable timber. The stations in this county hope to begin the trend to second bottom and swamp land for rice production. Each station will grow a rice result demonstration in second bottom or swamp land, and one as the native does on the hill side. The Technician should like to see this done for several years and records kept on production and man hours. The indigenous farmer is only convinced by what he sees. Telling him will not get the idea over. That is true to a large extent with all of us.

### Coffee

Coffee is highly recommended as one of the cash crops. Any farmer who grows cacao should have coffee in his diversified farming program. Usually, when the price of one is down, the other is up. In this way, all the eggs are not in one basket. People in Sinoe are not interested in coffee growing. Two reasons are given why so few are requesting seedlings: 1) coffee requires too much labor, and 2) the price of coffee is too low and unsteady. It is hoped that it will be possible to learn more about these two objections so that the farmers may be helped and in the hope that the coffee program can be speeded up to take advantage of this source of income. The few requests that come to the station for coffee seedlings are for Robusta only.

About 80,000 Robusta coffee beans were planted at the Butaw Station in March and April. Very few of the beans have germinated to date. It now looks as if the station is not going to get a stand. If they are not up by the next rainy season, the beds will be replanted.

A coffee demonstration containing 400 plants was planted at the Butaw Station June 12. This was done in secondary bush or old field. A path four feet wide was cut through the bush and the sticks (small trees) were left for shade. This is the land preparation recommended for planting coffee in this area.

### Rubber

Rubber is the largest source of income for farming in Sinoe County. The production is confined to a few large land owners. The Department should like to see this program expanded. To help more farmers get into

rubber growing the stations will grow large rubber nurseries from seed furnished by the Department. The station personnel will give demonstrations in budgrafting seedling rubber. They hope to encourage the planting of all old and new fields to rubber or some tree crop. These fields must not go back to bush.

### Bananas

Banana is a good crop for Sinoe. The Extension Service is recommending that bananas be planted behind rice, and cacao between the bananas. This is one of the main crops and should be given more attention. Bananas are a big item in the local diet.

The African Fruit Company (German) located in Sinoe County, is doing much to show the importance of bananas as a crop. They have 1,200 acres planted to bananas and another 1,200 acres ready for planting. Ten tons of dried bananas were shipped from Sinoe to Germany in July by the African Fruit Company.

A harbor is under construction in Sinoe County. When this port is completed, Sinoe will come into its own. This will give an outlet to the agricultural products of the county. Fresh bananas will be the first commodity for export. Farmers are being advised not to overlook this new market and income.

### Vegetables

With emphasis on home production of food, a three-quarter acre plot was planted to twenty-one varieties of vegetables at the Butaw Station. This land was cleared in the expansion program. Eight varieties of vegetables were grown in result demonstrations. These tests were to show the most adapted varieties and the rate and kind of fertilizers needed.

The station personnel are sorry that this project did not turn out well. Many of the seeds did not germinate. Of the varieties that did, many were

cut down by the bug-a-bug, and the land was too sandy. Although the workers were disappointed with the production results, this project was the most interesting to the visitors. They had never seen so many vegetables and varieties before. The vegetables that grew were given to the hospital and people who visited the station. Many visitors came to the station to see the garden who otherwise would not have stopped.

Although the demonstration did not set a production record, it taught the workers many things that will stand them in good stead when they plant the next garden. Vegetables can not be grown in the Butaw area profitably. A garden must be started early and off before the heavy rains. Bug-a-bug hills and trash piles must be gotten rid of to control the bugs. Care must be taken to select varieties that are resistant to wilt.

The Department of Agriculture and Commerce gave seeds in ample amount for the station and distribution to farmers and villages. Forty-two land-owners and thirty-eight villages were given five varieties of seeds each. This was a good gesture on the part of the Department. All appreciated the seeds, and it gave the Extension Workers an opportunity to know the people better and to work directly with them from the very beginning. The people were told how to plant and the care to give the growing plants, and in many cases how to prepare them for food. It is not surprising that several farmers made better production than the station. It does them much good to bring the station tomatoes, knowing that the station did not get a tomato from its garden. This is the kind of spirit we want to encourage.

The giving of these seeds again helped, for it does not do much good to conduct demonstrations when farmers cannot carry out the practice. That is why the station personnel are not putting too much emphasis on the increased production from the use of fertilizers.

### Canning

Two canning demonstrations were held at Butaw with the local farmers, in canning non-acid vegetables and fruit juices. This demonstration was held after a church service. Over two hundred adults and children were present. Even if they did want to follow the practice, none of the equipment is available for sale. The demonstration was given to acquaint the people with an opportunity for a new source of income should they grow oranges, grapefruits and pineapples in quantities and to encourage establishing a small canning factory in the area.

### Citrus Fruit

A fairly large citrus nursery was put in at the station. To date the station has planted in nursery beds over 1,000 oranges, 500 grapefruit, 200 limes, and 55 tangerine seedlings. Most of these seeds are up now. The seedlings will be given out to farmers. The station has also 100 avocado, 50 guava, and a few mango seedlings in the nursery.

### Nigerian Oil Palms

Palm oil is the main fat in the diet of the indigenous population. The extension workers are pushing the Nigerian palm for this source of oil. They found at the station over three hundred plants almost large enough to transplant to the field. The plan calls for keeping all these seedlings to be grown in demonstration plots as a source of seeds for distribution to

every farm. Last month the station received 257 seeds which were planted. The kernels of this plant are in great demand for export. This is a big source of income for the local farmers. The Nigerian oil palm is in for a large part of our attention for food and cash income.

#### Demonstration Farms and Nurseries

The plans are to open four new demonstration farms and nurseries before the year is out. The Juarzon Station was opened June 1. A new ten-room mat hut is completed. This hut houses the ten trainees and one room is used for a tool room. About five acres are brushed, sticks cut and waiting to be burned with a few more days of sun. The plan is to get in ten acres by December. A six acre swamp land area is planned to be cleared for rice. This station is well located for farmers in the Juarzon District. The land looks good and hopes are high for a fine demonstration farm and nursery.

Two trainees are in training to head the two stations planned for the upper part of the county -- one at the Juarzon headquarters and the other at Medjah. These are very fine young men. The program should move if they get any kind of cooperation from the tribe.

The Production Specialist plans to visit soon the Kpyan District and get a station started there. This will conclude the expansion plan for the present. . . . Aside from producing nursery stock from which farmers can draw, these stations will be demonstration farms where farmers can see improved methods and results.

#### Farmers' Councils

Two Farmers' Councils were organized -- one in the Juarzon District and the other in the Butaw District. The attendance was good and the spirit of cooperation was wonderful. These organizations have members of all groups

working for the same goal. The fellowship should make for a stronger Liberia.

The purpose of the Council can be stated simply as a group of people interested in agriculture to the extent that they are willing to work together to improve it. They know that by working together more can be done and faster. The Council works to improve the crops they are now growing, to find new and better crops, and to encourage all farmers to produce more for food and income. To fit this production to improve standards, nutritional standards, and living standards, if you please, all over the great country of Liberia, would mean a steady improvement in response to effective demand. This sort of improvement would not only give consumers what they want but would be a firm basis for improving standards in agriculture based on actual earning of farmers. To make the kind of improvement this organization has set out to make, this information must get out into every village at the grass roots. It is the job of the Farmers' Council to supply this general information. Without the general spread of the work done at the stations and findings of the Councils, the farmers at the grass roots can not be helped. Liberia shall progress in agriculture in proportion as all its farmers progress. The organization shall teach the independence and dignity of farming, encourage the best brains of their youth to find their way into agriculture and conservation of the natural resources.

#### Section 4. Maryland County and Eastern Province

##### Scope of Assignment

The scope of the assignment of the Provincial Agricultural Extension Adviser covers Maryland County and the Wejbe District of the Eastern Province, Liberian Hinterland jurisdiction. This area is further divided into six

districts, forty-two chiefdoms, and, in round numbers, there are 20,000 farm units in the area.

The Agricultural Extension staff consists of the following personnel:

a. Trainees	30*
b. District and Tribal Agricultural Extension Aides	10**
c. Technical Agricultural Extension Aides	5*
d. The Provincial Agricultural Extension Adviser	1

The Department of Agriculture maintains four sub-agricultural stations in this area, while the local tribes maintain three district, three sectional, and twelve clan nurseries. All work on these stations and nurseries is performed by hand.

---

\*Paid by Government.

\*\*Paid by the tribes.

#### The Agricultural Extension Program

The agricultural extension program in Maryland County and the Eastern Province has the following broad objectives in view:

- To increase crop production for both domestic consumption and export.
- To train local nationals in the science of agricultural extension methods and techniques.
- To concentrate on improving methods for processing all crops with specific reference to export crops.

The Department of Agriculture maintains four sub-agricultural stations in this area for the purpose of implementing these objectives. These stations are located on the basis of the distribution of the farm population at the community level. Their functions have been specifically designed to increase the production of all crops by maintaining demonstrations of the major and

minor crops grown in this area. These crops are used as teaching aides for farmers who visit these stations in search of improved practices to be utilized on their farm.

These demonstration crops include rice, cassava, a variety of vegetables, citrus fruit, avocado pear, cocoa, coconut, Nigerian oil palms, kola-nut, peanuts, corn, coffee, pineapples, etc. Land area devoted to demonstration crops on these stations was increased from thirty to fifty acres this year.

Nursery beds on these stations and nurseries were increased from 3,900 to 5,800 planted. Seedling distribution from these nurseries was as follows:

<u>Crops</u>	<u>No. Distributed</u>	<u>No. in Nurseries</u>
Cacao	900,000	1,000,000
Coffee	500,000	500,000
Rubber	180,000	160,000*
Oil palm	18,000	60,000
Sweet potato	80,000	Supply unlimited
Vegetable	170,000	100,000
Citrus fruit	3,000	6,000
Avocado pear	500	1,000
Coconut	5,000	5,000
Kola-nut and others	2,500	3,000

\*Nurseries are maintained by Firestone and individual planters. Rubber will be included in our nursery program hereafter.

The Department further attempts to implement its planned program by maintaining a course in Nursery Management and Practice at the Bonake sub-station. This course is conducted on a do-and-learn basis. Four trainees earned their certificates this year, making a total of fifteen who have completed this course and received appointments in the field as tribal and/or district agricultural extension aides. The educational level attained by these men ranges between the seventh grade and high school. Their dedication

to duty goes a long way toward making up for their deficiencies along the educational line.

The nature of the duties which these men perform on the job includes serving as superintendents of sub-stations and nurseries. They must also visit the farmers in their area of assignment and assist them with the selection of farm locations and the planning of their farm operations. They must plan and provide planting stock for their clients and encourage them to establish individual farm nurseries, participate in community civic projects, keep their clients informed on improved methods of processing their crops, and make progress reports on their program activity from time to time. They are also required to prepare and submit work plans.

The training of local leaders and agricultural extension workers has been further emphasized by the use of 1) agricultural conventions, 2) conferences, 3) workshops, 4) field tours, 5) demonstrations and 6) community organization.

#### The Maryland County Agricultural Council (Community Organization)

The Maryland County Agricultural Council conducted twenty-seven meetings this year. Major subjects covered in these meetings were methods and means of stimulating greater interest in home gardening activities, poultry flock improvement, methods of stimulating greater rice production for local consumption, village and community health problems, methods of improving the processing of cacao and coffee for export, program planning for the Third Annual Convention of the Council, plans for participation in the National Agricultural Fair, and plans for the agricultural workshop.

This council provides a basis for community participation in search of more effective means of utilizing the available human and natural resources of the community to the end that maximum development of these resources will be obtained. It provides a medium for maintaining effective community relations by keeping the people informed about the aims, objectives and accomplishments of the agricultural program in this area. A total of 960 community leaders participated in the above series of meetings.

#### Agricultural Convention

The Maryland County Agricultural Council held its Third Annual Agricultural Convention between August 31 and September 2, 1955. The theme of the convention was "Attacking Farm, Home and Community Problems." Some of the major topics discussed were: Health, increased agricultural production, trends in farm labor, education, etc. Participants included the American Ambassador, Director, USOM/L, Secretary of Agriculture and Commerce, Agricultural Adviser, and a host of distinguished officials. A total of 1,500 community leaders, farmers, etc., attended the convention.

#### Farmers' Conferences

After the closing of the Third Annual Convention of the Maryland County Agricultural Council, September 2, 1955, follow-up agricultural conferences were held in the field as previously planned at the following sub-stations and headquarters:

<u>Place</u>	<u>Attendance</u>
Behwan, Headquarters, Lower Kru Coast, Maryland County	52
Barchyville Sub-Station, Upper Kru Coast, Md. County	76
Buah Sub-District Headquarters, Webbo District, Eastern Province	80
Groboka Sub-station, Barrobo Chiefdom, Webbo Eastern Province	100
Haweke Sub-station, Codebo Chiefdom, Webbo District, Eastern Province	58
Total	<del>500</del>

This series of conferences, were largely attended by Paramount, Clan and Town Chiefs, County and District Commissioners, and agricultural aides located in each respective area. A few farmers were also present at each meeting. Some of the major subjects covered in this series of conferences included: plans for participating in the National Agricultural Fair, the dwindling price of cacao at the farm level, the planting of rice, cacao, coffee, citrus fruit, vegetable production, etc. Tours of each station were made where pointers were given to these leaders on nursery management practices. Housing for resident station personnel was also discussed, and a number of farm visits were made in each respective area for the purpose of evaluating the progress of the work being done in these sections.

#### Workshop

The Maryland County Agricultural Council conducted its first Agricultural Workshop in cooperation with the Department of Agriculture, February 20-24, 1956. This workshop was conducted on the Boneke Sub-agricultural Station with one session each being held at Pleebo, and Webbe, Nyaske, respectively.

The objective of this workshop was to give the In-Service Agricultural Aides, trainees, and farmers an opportunity to evaluate program activities in relation to objectives sought with respect to efforts, means, approaches, and results obtained, and to plan and redefine the objectives in this premise if the findings so warrant. Participants included the First Secretary of the American Embassy, Secretary of Agriculture and Commerce, Agricultural Adviser, etc.

The United Nations Commission on Community Development

The United Nations Commission on Community Development for West Africa visited Maryland County and the Eastern Province from March 7 to 9, 1956. The objective of this Commission was to make a brief survey of the progress being made under the Joint Liberian-United States Economic Development Program in Community Development. Information gained from this survey was supposed to be utilized by this Commission in establishing their community development project in the Webbo District of the Eastern Province.

The following points were covered in this survey:

- a. Harper
- b. Soloko District Nursery
- c. Boncke Sub-Agricultural Station
- d. Webbo

The Harper session was devoted to an exploratory discussion covering the status of community development in Maryland County and in the Webbo District of the Eastern Province. At the conclusion of the survey, the Chairman of the Study Group stated that this was the most effective contacts the group had witnessed in Liberia.

Coffee Processing Demonstration Units

Coffee processing demonstration units were set up on three different farms. These units consist of a hand powered coffee pulping machine, fermentation vats, and drying platforms.

Farmers who had an opportunity to observe these processing demonstrations were impressed with the labor saving feature and the vast improvement made on the final product, as compared to the results obtained by using the mortar and pestle for this operation. In effect, one man can de-pulp as much coffee in two hours with a hand powered machine as it will take 25 men in a day by the mortar and pestle method.

73W



Coffee beans are distributed to farmers in Eastern Province by ICA Agricultural Extension Specialist through the District Commissioner.

Traders pay a better price for coffee which has been prepared by the above described method, and one agency has agreed to handle hand powered coffee de-pulpers for sale.

### Cacao Processing

Progress is still being made with the cacao processing demonstration unit at Boneke. Several farmers have made request for assistance toward constructing small units on their farms. These requests will receive prompt attention from the Provincial Agricultural Extension Service.

### Vegetable Production

The testing of several varieties of cabbage, collard, radish, green beans, cucumbers, pepper, eggplant, tomatoes, etc., was continued at Boneke. Local as well as foreign varieties were included in the above test. This project has been in operation since 1952. The object is to delineate and classify these vegetables according to yield, quality, tolerance to rainfall, and resistance to diseases and insects. A home garden guide for this area will be compiled on the basis of information which may be gained from this project.

### Sweet Potato Project

The Improved Louisiana Puerto Rican sweet potato was preferred to eight other varieties in a consumer test project. Four local and five foreign varieties were included in this test. However, it has also been noted that the Liberian Red Bliss excelled all of these varieties in vine production. This factor alone would make this variety of potatoes preferred in certain segments of the population where sweet potato leaves are consumed as greens. Eighty thousand sweet potato vine cuttings were distributed among local farmers.

### Garden Committees

The garden program in this area is being handled through locally elected garden committees. These committees meet and plan their work, canvass their village and/or community, compile and submit orders for seeds, plants, etc. These orders are processed in the office of the Provincial Agricultural Extension Adviser, and distributions are made to the chairmen of these garden committees by the agricultural extension worker in each respective locality. Twenty-seven committees are now participating in this work. One hundred and ninety pounds of garden seeds were distributed through this system, and more than 10,000 vegetable plants. There was a surplus of vegetables in several local communities.

### School Garden Project

Sixty-five schools are participating in this project this year. 4-H clubs will be organized in several of these schools.

### Soil Conservation

Soil conservation still constitutes a major problem for open cultivated land in this area. Therefore, farmers are urged to plant coffee, cacao, oil palms, rubber, or cassava, behind rice, rather than to permit the bush to return to this land. This practice tends to keep such land in economic production, and provide ample protection against erosion at the same time.

### Velvet Beans

Velvet beans are still being used as a soil building cover crop in open cultivated nurseries on all projects. These beans provide protective cover after the crops are removed. The vines from these beans are chopped and incorporated into the soil several days before the new crops are planted. This

practice plays an important role in controlling erosion and increases the water holding capacity of the soil. It improves aeration around the roots of the plants, and aids in maintaining and improving the fertility of the soil.

Fucraria is used as a cover crop to aid in controlling weeds and bushes on all tree crop demonstrations at Boneke.

### Corn Project

One-tenth acre each of Cuba M-11, Cuban Yellow Dent, and San Francisco Flint corn variety demonstrations were conducted at Boneke. The yield was forty-eight, thirty-nine, and seventeen bushels per acre, respectively. One hundred pounds of seed corn was distributed from this project along with an additional hundred pounds of Cuban Flint corn, which was supplied by the Department of Agriculture and Commerce.

Corn demonstrations have been conducted at Boneke since 1952, and these demonstrations have played an important role in stimulating interest among farmers in this crop.

### Poultry Flock

A small flock consisting of fifteen hens and two cockerels of the Rhode Island Red breed of chickens are maintained at Boneke for the purpose of supplying hatching eggs to local planters. A total of sixty dozen eggs has been distributed this year. These eggs were distributed at the rate of a half dozen per farmer, for hatching purposes only. The object was to secure the widest practical distribution toward spreading new and improved blood among poultry flocks in this area.

The Boneke flock is about three years old, and is scheduled to be replaced within the near future.

76a



Visitors to the Boneke sub-station in Maryland County inspect garden vegetables grown there as demonstration.

Two Rhode Island cockerels were exchanged for scrub roosters in the Geddebo Chiefdom. The Department has informed the Extension Service that a substantial shipment of Rhode Island Red cockerels has been ordered for distribution in this section. Approximately three hundred and fifty cockerels have already been distributed on this project. Many fine cross-bred birds have been obtained by local farmers as a result of this project. In effect, this cross-breeding venture will mean larger birds, larger eggs, and more protein in the family diet for more people.

The lack of an ample amount of local compounded-standardized feed rations for poultry still constitutes one of the greatest limiting factors to expanding poultry production in this area. But efforts are being made to overcome this handicap through compounding corn, rice, cassava, coconut, oil palm kernels and oyster shells, and by encouraging farmers to plant more high protein content corn.

#### Poultry Yard

A one-acre poultry yard was constructed at Boneke. However, the poultry flock is permitted to run at large about 90% of the time, because these birds do such an effective job toward controlling many species of insects on the station.

#### Livestock and Hog Pasture

A five-acre livestock and hog pasture was built at Boneke, and this pasture has been stocked with one bull, a cow and a calf. These animals were exhibited at the Liberian National Agricultural Fair, which was held in Monrovia last January. They represent the first step toward hard selection and development for community breeding at Boneke.

### National Agricultural Fair

Maryland County and the Eastern Province sponsored two booths at this event. Native arts and crafts occupied one booth, while agricultural produce occupied the other one. Other exhibits from this area included a bull, cow, calf, a Rhode Island Red Cockerel, a native hen, and a cross, which resulted from this cockerel and hen.

### Rice

Major emphasis was placed on the necessity for increasing rice production this year. Many meetings were held with Commissioners, Paramount, Clan and Town Chiefs, farmers, and the extension staff in this area. Methods of approach were agreed upon, which have already been stated in this report. The prospects are that this year's rice production will be substantially higher than the 1955 crop. Farmers are just beginning to harvest this year's crop.

### Buildings

Three buildings were repaired at the Boncke Station, and one each has almost been completed on the Haweke and Groboka Stations.

### The R. G. LeTourneau Road Construction Company of Liberia

This Company has made rapid strides toward completing the new Harper-Webbo road. The completion of this road will facilitate the transporting of agricultural produce from Webbo to the port of Harper at a great economic saving to farmers and traders. It is further expected to stimulate increased tonnage, more efficient processing, and an increase in the planting of all crops.

### Summary

1. No. Chinese yams distributed	1,000
2. No. acres of casseva planted on stations	23
3. No. acres of peanuts planted	1
4. No. pounds of peanuts distributed	130

5.	No. distinguished visitors at post	65
6.	No. method demonstrations given	603
7.	No. farm visits made	3,100
8.	No. station visits made by farmers	1,269
9.	No. circular letters written	2
10.	No. copies distributed	3,000
11.	No. corresponding letters written	312
12.	No. news articles published	4
13.	No. radio broadcasts pertaining to program	3
14.	Literature distributed, pieces	300

## Chapter III

### Vocational Agriculture

The work in Vocational Agriculture was officially begun in 1952 under the Point Four Program as a segment of the Joint Development Program. It was planned and launched under the sponsorship of the Department of Agriculture and Commerce, in cooperation with the Department of Public Instruction.

The objectives of the program were written out in seven or more closely related sentences followed by a plan of operation, all of which centered around the development of the rural youth and his environment. The big job was to train rural leaders and workers, and to encourage them to play active parts in the development scheme.

The level of approach was through the schools, where the attack was organized in terms of scientific studies in agriculture and rural living, with emphasis on doing something about it. The well known slogan followed was "We learn to do by doing". As a result much activity to improve understanding the job and knowing how it fits into the picture of better rural living was undertaken.

For the beginning subjects there were two major enterprises for project work: Vegetable Production and Poultry Production. For closer ties with the young minds, local clubs were organized at each school under the name "Future Farmers of Liberia." Through this organization, an attempt was made to protect all the program plans.

According to the program, the instructor was to deal with students enrolled in the high schools who had not passed the maximum age of thirty years. Even though there were sixteen or more government supported

high schools in the country, it was soon found necessary to lower these standards and make the program available to all students enrolled in school from the sixth grade through high school. This was done without regarding a maximum age level, and all persons were classified as active members upon joining the club.

Collegiate membership was made available to agricultural students above the secondary school level on the same basis of participation in club work. However, the teaching of subject matter to such students was to be independent of the regular plan for active members, and the program was to concern itself only with the project work of the group.

Another provision was made for Associate Membership, which included the continuation of either of the previous types of membership after graduation. Under the circumstances, it will probably be a long time before this type of membership becomes effective. The major reason will probably be that it will take a long time to get a sufficient number of such persons in a particular area to form such a group. At any rate, it is felt that if the youth work is well established, many of the proposals that extend beyond the present situation will come to pass.

Still another type of membership designed to get cooperation from persons not necessarily connected with the program is called Honorary Membership. These persons are elected by the chapters on the basis of their interest in the youth program.

A plan is under way to federate all the local groups into a national body. First a number of clubs within a designated geographical location will form an Area Association. There will be three of such associations headed by area

officers elected by the local clubs of the particular area. From the three areas the officials of the national club for the Future Farmers of Liberia will be elected.

The main emphasis stressed in the clubs is leadership through participation. Each teacher works with his group in formulating a program pointing up leadership training which provides for student growth in leadership, as well as a good type of recreation for themselves and the community. It is also a medium through which the clubs publicize the program.

In the beginning phase of the program, it was mentioned that the teaching of subject matter was centered on two enterprises: poultry and vegetables. This was done because the Department was convinced that the country was definitely in need of these food items, and that they could be produced here easily if more people used the correct methods of production. So, along with a few other enterprises, the Vo-Ag. instructors made the two specified projects their majors.

Under the stated provisions and conditions the Vo-Ag. program passed through the first two years with many fluctuations in enrollment of students and the tenure of teachers for many reasons. Near the close of the two-year period, the Department was holding fast to the results achieved to date. Two schools were going strong, and one had been lost. About eighty-five students were on roll, which was less than one-half the highest number that had been on roll during the period.

However, just before the 1953-54 semester ended, the Department made funds available to train four additional teachers. These teachers were recruited and put into immediate training by the office with the idea of getting

them prepared for the first semester of the next school term. Their progress in training was not too rapid, and due to the fact that the Instructor was due for home leave in April, 1954, some changes had to be made. It was suggested that the recruits be left in training under the best Vo-Ag. teacher until the Instructor returned from home leave.

After the training program had been handled in this manner for about six weeks, such an arrangement was made and the recruits were stationed at one of the centers to do observation and participation in the program according to plans drawn up by the teacher in charge. All such persons recruited had to qualify in the first instance by being a high school graduate, and in the second by demonstrating their ability during the training, and by final evaluation at the end of the course.

#### Program Operations

Returning from the USA in July, 1954, the Instructor's first job was to sample the progress made in the work by the prospective teachers to determine their readiness for employment. He observed that only one trainee presented a doubtful picture. Later, that same trainee was doing better work with an elementary group of students than either of the other three were doing with high school groups.

The first step in getting the program established in a county involves a letter from the Department of Agriculture and Commerce to the County officials stating that the Vo-Ag. Adviser is scheduled to visit the County to help get the program started. Persons concerned with the business at hand are usually summoned to the Superintendent's office on the following day for a discussion of the plans. The program is explained and questions answered about

it. The balance of the routine is usually worked out with the Principal of the school or with a committee. When the program is accepted, the Adviser promises to have a teacher on the job at a certain time.

When a visit is made to the school to inspect and give the necessary aid to a teacher, the Voc. Adviser usually does the following things:

- a. Checks the work covered by the teacher (lesson plans);
- b. Inspects the laboratory area;
- c. Holds class discussions (oral examination);
- d. Observes his handling of the classes;
- e. Points out weaknesses and makes suggestions;
- f. Does sample teaching while he observes;
- g. Records all information in the teacher's folder for the Office's file.

### Teaching Classes

The enterprises now being taught in the schools include: Vegetable Production, Poultry Production, citrus and other fruits, cash tree crops, rice, field crops, and livestock. Field laboratory work is carried out in connection with all enterprises except poultry and livestock. In these areas the teachers have had some very good poultry projects, but were forced to discontinue them after all birds disappeared on three different occasions.

Since one of the requirements of each school is that a reasonable amount of land must be provided for laboratory work in school gardening, the land problem is usually solved. Therefore, each teacher must maintain a tree crop nursery in addition to the regular garden so that his classes can learn the methods of producing and handling the different crops. Under this plan the teacher can easily transfer classroom theory into practical experience for any of the crops. However, the teachers can only give theory in the animal husbandary area at present.



Future Farmers of Liberia students with their harvest of potatoes grown in a school project.

The amount of time allotted for the work at the different schools varies, but with a minimum of three hours per week per group. In some places the teachers get as much as ten hours per week. The matter of how the time will be used is determined by the teacher in charge. He divides it between classroom, field, and club activities.

Each teacher is instructed to prepare teaching plans for his regular activities, using the approved job analysis method. Sometimes the Adviser makes up a few lesson plans for distribution to teachers with explanations to cover each step. This helps to keep the teacher from becoming lax in his preparations. Even with all the possible stress that can be placed on lesson preparation, it has not been unusual to drop in to visit a center and find the teacher not properly prepared for the job at hand. Later the teacher states that he was only doing review, which did not necessarily require a plan.

In the absence of school libraries and other sources of reference material, the teacher has to do a lot of planning for his program by using whatever materials he can get from the Adviser. This year the program received one hundred copies of a textbook on West African Agriculture for distribution to the schools. These books had been requested by the program in August, 1955, and were received in June, 1956. In the meantime, the Central Agricultural Experiment Station had begun to release a few technical bulletins on Liberian agriculture. Through the Department ten copies of each bulletin released were supplied for distribution in the Vo-Ag. work. The teachers were asked to study the bulletins and draft lesson plans from them.

### Future Farmers of Liberia

As soon as the teacher gets his work moving along, he is instructed to organize his group as a chapter in the youth program. When this is done the Secretary of the group supplies the Office with a list of the officers and members of the local club, indicating their ages. This information is kept in the Office's file for reference.

By using the Future Farmers of Liberia Guide, which was prepared by the Office the teacher follows through on the club activities. He reports his progress in narrative form on the back of his monthly report. Once during each school year, each chapter is requested to render a program for the community. In some cases, certain chapters are always able to get the job done, while some others always have excuses for their failure.

Whenever the adult farm group holds its annual meetings, the young farm group is represented on the program by the teacher and a selected group of the Future Farmers. They usually tell the people about their work and render musical selections for entertainment.

Schools located within reasonable distances of government farms or farming concessions take advantage of field trips to such places where they observe and ask questions about the production of the crops and animals. The teachers only regret that it is not possible for every group to get such first-hand information on what is going on in the country. Many of our boys have not even seen any large farms other than rubber plantations. Therefore, they are quite inspired to see a field of crops planted in rows according to the latest practices.

Up to the present time, the chapters have not been federated into a national body. This is the problem now facing the Future Farmers Club. With

a school in each county, and others located at points as far as over two-hundred miles into the interior, the matter of getting representatives from these areas transported to a local center for organizing the national show is a financial problem.

Since last year each chapter was supposed to have been carrying out various kinds of money making schemes to finance the effort, such as 1) selling the produce from the garden, 2) giving special programs and charging admission fees, 3) giving church programs and asking for collection, 4) asking for donations from community people, etc. The result of all this has been that only one school has accumulated over one hundred dollars. The others range from three dollars up to eight dollars. The plan is still in operation, and the teachers are hoping that the situation will improve.

The Department of Agriculture and Commerce is very eager to have this group make a good showing, and the teachers mean to keep pushing the idea. The Office knows that if the teachers put forth enough effort with their groups, they can have a convention. By demonstration the Adviser and a local teacher took a single class in gardening and sold forty dollars worth of vegetables during the season. Those funds were deposited in the Bank of Monrovia in the name of the Future Farmers of Liberia. There has been very little added to the account since then.

Of course over fifty per cent of the chapters have raised enough money to purchase regulation "T" shirts that are made up by the chapter supply company in Danville, Illinois, USA. They are worn by the members on special occasions and as they see fit, but to get funds for any other purpose is not an easy matter.

### Schools and Enrollments

There are eight teachers in the program who receive government pay. One of these teachers conducts the program in two schools in his county. This gives a total of nine full-time centers with the eight teachers, plus club work in two independent schools, making a total of eleven schools involving over five hundred club members as follows:

<u>School</u>	<u>Location</u>	<u>Enrollment</u>
1. Robertsport High School	Cape Mount County	38
2. Lott Carey Baptist Mission	Montserrat County	47
3. Booker Washington Institute	Kakaba District	45
4. Martha T. Swan Memorial	Central Province	33
5. Grand Bassa High School	Grand Bassa County	29
6. Martha T. Swan Memorial	Central Province	82
7. Sinee High School	Sinee County	86
8. Lady Fatima College	Maryland County	30
9. Cape Palmas High School	Maryland County	51
10. Suhon Baptist Mission	Montserrat County	35
11. Cuttington College	Obangpa District	26
	Total	504

### In-Service Training for Teachers

At the close of each school year the Vo-Ag. teachers are brought together at one of the local centers for training. The work is planned and conducted by this Office for a period of three to four weeks. A copy of the scheduled work to be covered is mailed to each teacher about two weeks before the classes begin. This gives him a chance to prepare for certain phases of the work that will be in his charge during the course. The training is arranged to cover all parts of the program, with emphasis on the teaching of agriculture in the schools.

### Agriculture for Regular School Teachers

Each time the Annual Workshop is held, this Office cooperates with the Department of Public Instruction by conducting a course in agriculture. By doing this, we get a chance to further introduce the objectives and methods

used in the regular Vo-Ag. work.

Giving a course in agriculture to public school teachers is a matter of acquainting them with some of its elementary principles and demonstrating how they can be correlated with other subjects in the teaching process. In this light, the Vo-Ag. Office tries to point out to elementary school teachers how they can do little agricultural projects of nature study, inside and outside the classroom. Such training can be of great help in fostering the continuity of the program.

#### Recruiting and Training Teachers

The number of persons having training in the field of agriculture are very few indeed. Consequently, the program has had to perpetuate itself by recruiting and training workers. In all instances the Vo-Ag. Office has selected persons that were high school graduates, particularly those from Booker Washington Institute. Because of its expanded program in the field of agriculture, this makes this Institute a natural for preparing future Vo-Ag. teachers and County Agents.

After these persons are recruited, the first step in beginning their three months of training is to test their knowledge of agriculture, after which they are taught some agriculture in line with the work. This is followed by the second step, which has to do with teaching agriculture to students. The second step takes major place in the training program and consumes much of the training time.

The third step is also an important phase. It has to do with converting subject matter and formulating it into lesson plans for teaching. Following this, the trainees are given practice teaching which is assigned daily. They use the teacher group as a class and conduct the day's work as they would do it on the job.

Discussions and criticisms by the group conclude each teacher's assignment. He is then graded on his performance.

By the time all the work is covered the prospective teacher, provided he has made a good impression, is recommended to the Department of Agriculture and Commerce for employment. He is then placed according to the method described in this chapter.

### Summary

Realizing that the youth program has a long way to go, the teachers feel that the progress has been very reasonable. However, they admit that in the outset they were a little disappointed in terms of the anticipation of how rapidly they would expand the program. When they faced the facts that funds for expansion were not made available according to their plans, and that the program had to generate its workers, it was understandable that the progress was in line with the possibilities.

The program took a turn for expansion in 1954, and has since shown continued progress annually. During this time funds were made available and a training program was effected, making expansion an easy matter. Now the Vo-Ag Office is thinking of centralizing the in-service training program at Booker Washington Institute where, under the present administration, the school is to be reorganized and equipped as the Nation's Trade and Industrial School. If this is done, a standard curriculum will be set up so that the teachers can qualify for academic advancement in their field while doing in-service training.

It is through this process that the Vo-Ag Office believes Liberia can best fill the gap for needed teachers in the field of agriculture that presently exists. As it now stands, it will be three more years before Cuttington

College produces her first class of graduates in agriculture. When this takes place, the Vo-Ag. program will then become the channel through which the College will get most of its students who will be better prepared for college agriculture.

The Vo-Ag. Office feels that the high school graduate who has had three or four years of agricultural training in high school will be in demand for some years to come. Such persons are not only in demand by the Government but are needed by foreign operators who have agricultural enterprises in the country. Then there is the great opportunity for them to do some farming for themselves.

The Department is also looking forward to having each school that has available land establish a tree crop farm. Through the cooperation of the general Agricultural Extension Program the teachers have already made some progress in this direction. The students have put out over five hundred citrus seedlings this season as a beginning toward having a variety of fruits around the school for eating and selling. Following the idea, each teacher is to maintain a tree crop nursery for producing the seedlings needed. Where they fall short, they can still receive a quantity of seedlings from the local agricultural stations, but the Vo-Ag. Adviser is stressing the production of seedlings as a job to be done at the school centers.

The outlook for such a program in Liberia is bright. The population is mainly rural and agricultural development is in its infancy, but is rapidly developing in terms of improved farm methods, farm land purchases, etc. All of these changes should be an incentive to the young people.

What the program needs at this stage of its development is a field technician to help develop the club work throughout the country. The lack of sufficient contacts with these young people will lessen their spirits for club work and the program will fade out much faster than it grew to its present size. Such a worker could be valuable in helping to work up club ideas, and literature peculiar to the country. Under the circumstances one worker can not do all of the necessary training with groups scattered as they are here. Therefore, to safeguard what has been done, and for the continued advancement of it, the Department recommends that a total of two persons should work with the youth program in Liberia.

## Chapter IV

### Forest Conservation

This chapter is the projection as well as the result of the combined efforts of all USOM/L Forestry technicians and Liberian members of the Bureau of Forest Conservation for the year of 1956. It contains results of previous years' accomplishments and their effect upon present conditions, an analysis of the status, progress, and problems of this year's completed or initiated projects, and the expected events that will take place during the latter part of the year.

The facts contained in this chapter indicate an obvious trend towards the growth of interest in Liberia's forests. Many more people have been brought in contact with the work of this office. Varied interests include the common man of Liberia, Liberian entrepreneurs, and foreign concerns. The Forester's work has developed from the simpler initial ground work to the more complex details necessary for economical development of the forest potential.

#### Personnel

Departure of USOM/L Foresters from Liberia began in April with Mr. Eugene Fobes returning to the United States. During July, Mr. Frank Lara left, and finally, Mr. Robert Schirck and Mr. James White left in August. It is expected that the team of two American Foresters will be maintained with the return of Mr. Torkel Holsoe and Mr. James White to Liberia in August and November of 1956.

Mr. Anthony Sayeh, formerly Supervisor of the Bureau of Forest Conservation, was commissioned by President Tubman through the Department of Agriculture and Commerce, June 25, as Chief, Bureau of Forest Conservation. This was an important step in the administration of the Bureau, for the present status of

the Bureau's head is now on a par with that of other bureaus within the department. Mr. Sayeh has been active in Liberian forestry activities since 1953 when he began working with Mr. Torkel Molsoe, USOM/L Forestry Adviser. With the establishment of the Bureau in 1955, he was given the position of Forest Supervisor, senior officer within the Bureau. Since that time, Mr. Sayeh has been in charge of the work of forest rangers, technical aides, guards, and patrolmen.

During 1956, two technical aides were promoted to senior forest ranger positions and two other aides were promoted to junior forest ranger position. Three forestry aides and three student assistants complete the Chief's staff. In general, the number of Liberian foresters remained the same from late 1955 to the first part of 1956. There are at this time two forest guards and twenty forest patrolmen protecting the national forests.

#### Training and Education

Training of Liberian forestry aides continued during the first half of 1956 with much the same training plan as during the previous year. Except for the addition of three student assistants, no new forestry personnel were added to the Bureau. The training program carried on by the forestry assistants consisted of instruction in map making, use of survey instruments, interpretation of aerial photographs, taking of tree measurements, construction of volume tables, use of radiophones in communication and the identification of Liberian forest tree species. "Learning by doing" has been the most effective training method. As the aides and rangers have progressed to the point that they have begun to specialize in certain fields this method has been encouraged by all USOM/L foresters. However, proficiency in the management of survey crews has been stressed. That considerable success has been achieved in this

objective can be measured by the fact that these crews are directed entirely by Liberian Chiefs-of-Party. However, on the ground inspection by USOM/L was maintained from time to time during the field season.

One of the Liberian foresters was trained in type mapping methods from aerial photographs during the preparation of a timber type map for the Yoma District of the Gola National Forest at Bomi Hills. This technique will be of increasing importance as the need for information prior to the preparation of management plans on the individual forests arises. The growing demand for timber sale agreements on the national forests is making accurate volume estimates of merchantable timber very imperative.

During the latter part of 1956 additional training will be given to the Liberian foresters in the inventory of forest volumes. This particular type of inventory will be of a higher form than that which they have previously been exposed to. The inventory will be based upon the acreages of the various timber types as indicated upon the type map from aerial photo interpretation. The inventory should have a high statistical accuracy and will be the basis for a forest management plan.

Plans for the training of the Liberian personnel in the technique of log scaling have been drawn up. This is a very important phase in the administration of timber sales on the national forests. It is expected that considerable proficiency in the estimation of net log scale will be achieved by the Liberian foresters by the end of 1956.

Two of the student assistants are summarizing characteristics of Liberian forest tree species from many sources of information into one form. This effort is giving these men considerable training in independent work at the research level. Having such information readily available in one handy pamphlet

will aid the field men in correct naming of many species during inventory work which are now placed into "unknown" or "miscellaneous" volume.

One of the technical aides has been introduced to maintenance of radio communication equipment. It has become very important that some one within the Bureau know how to service and make minor repairs to the communication equipment now in use by the Bureau. During the past field season in the first half of 1956, each one of the field crews kept in touch with Monrovia via radio. This very fact proved an important element in the morale and administration of crews in the field.

Dr. Querengasser of the Food and Agriculture Organization of the United Nations arrived in the latter part of May to guide the education of foresters at the University of Liberia. Prior to the arrival of Dr. Querengasser, the School of Forestry had been led by USOM/L foresters with Honorable Stephen Tdbert of the Department of Agriculture and Commerce as Director. Four courses were taught during the first semester of 1956. These were: Introduction to Forestry and Mechanical Drawing for the freshmen; Forest Engineering and Forest Botany were taught to the sophomores. The first ended in July with 15 students registered in the School; 10 freshmen and 2 sophomores at the University; and, 3 student assistants working with the Bureau.

Leadership within the School has been completely taken over by Dr. Querengasser who is now Director. During the second semester, no personnel are involved at the University in forestry instruction. A very thorough curriculum has been worked out by Dr. Querengasser with University approval. The academic year of 1957 should show considerable increase in the enrollment of forestry students who are interested both in industrial and government employment.

During the between-year vacation, November to January, all of the students will be available for employment in industry and with the Bureau. The employment of student assistants is encouraged as a direct benefit to the student and Bureau alike. However, it is the opinion of the Director that no student should be kept out of the School for other than vacation periods which occur twice each year, i.e., between semesters and between academic years. This reasoning is based on the premise that prolonged absence from classroom will act as a retardant to the growth of the student in the long run. There are arguments in support of maintaining a full four-year course without a "break" of one year for practical experience. Unlike the original plan at the University, the effect of the present curriculum will be to limit the employment of student assistants with the Bureau to vacation periods instead of for a one-year period.

One forest ranger from the Bureau and one student from the University were recommended by the USOM/L forestry staff to the Department of Agriculture and Commerce for scholarships in forestry to the United States. Favorable consideration was given by the Department and the names of these men were submitted to the Joint Commission for the Economic Development of Liberia upon approval by the Department of Agriculture. It is hoped that these scholarships will be forthcoming soon enough for the students to enter the fall semester.

With the possibility that at least one Liberian forester will leave on a foreign scholarship and that the three student assistants are certain to return to the University of Liberia for the 1957 academic year beginning in February, the number of trainees within the Bureau must be increased before the end of the year. It is anticipated that three forest rangers and three technical

aides will be the sum total of the Liberian foresters under the Chief of the Bureau at the end of January 1957, unless the staff is augmented.

It is planned, at this time, to give the third consecutive annual examination for filling the list of aspirants to the position of forestry aide in September. From this list the top men will be asked to apply to the Bureau for positions as they become available.

#### The Liberian National Forest System

The Kpelle National Forest boundary survey was completed in March and added 432,000 acres to the national forest system. Immediately, two crews were shifted to the Gola Forest in the Western Province and one to the Gbi Forest in the vicinity of Tappita. Beginning in April two crews were in operation running the boundary of Gbi Forest. Until the end of the field season in June, four crews pushed the boundaries of these two forests well to completion. It is expected that the Gola Forest will be completed well before the end of the year and that the Gbi Forest will be finished shortly afterward. These two forests will add 662,000 acres to the present 648,000 acres within the national forest system by the end of the calendar year.

In March, the mapping of the entire national forest system under the direction of USOM/L foresters was completed. Maps in the scale of 1:25,000 have been prepared from aerial photographs. Total acreage involved amounts to 4,178,000 acres, approximately. It is estimated that a total of 1,040 miles of survey line will have to be run to enclose this acreage. During the 1956 field season, November to June, 180 miles of boundary line were completed. This brings the total of lines complete to approximately 375 miles. It is hoped that the total job will be almost half completed by the end of the 1956 calendar year. However, several villages are now found inside the boundaries

9/10



Forest reserves throughout Liberia are plotted by ICA and Liberian forestry technicians.

of the forests. These villages will have to be eliminated by either individual surveys or requests by the Bureau for the people to move. Since some of the towns are relatively large it is quite probable that the total mileage of boundaries will increase as these villages are eliminated.

Metes and bounds records have been completed on all of the surveyed forests to date: Gio, Loma, Yoma District of the Gola, Kpelle, and Mano Experimental Forest. These will be turned over to the Chief of the Bureau as soon as final checking is done. Through the Department of Agriculture the final step in the establishment of the National Forests will be their proclamation as national forests by the President of Liberia.

During the boundary survey of the Kpelle National Forest, fifth-acre sample plots were taken. Diameters of the trees were measured either by diameter tape or Biltmore stick as well as the number of 16-foot logs per tree estimated. It must be pointed out that the information obtained as to timber volume for the Kpelle Forest is indicative only since the sampling was confined to the periphery of the forest. Furthermore, the merchantable volume listed below is merchantable in the sense that the trees are greater than 20 inches in diameter. Possibly one-third of this total is in the unknown species of little commercial importance at the present time:

Average volume per acre	11,070 board feet (international $\frac{1}{4}$ in.)
Average merchantable volume (Trees 20" and up) per acre	6,356 board feet
Total area of the Forest	4,32,000 acres
Gross volume per acre	4,782,240 M board feet
Merchantable volume	2,961,792 M board feet
Average volume per tree	345 board feet
Average DBH (all trees 10" and up )	16.43 inches

Similar information was compiled from the boundary survey of the Loma National Forest. This information is given as follows:

Average volume per acre	8,528 board feet (Internat'l. $\frac{1}{2}$ in.)
Average merchantable volume (Trees 18" and up) per acre	6,092 board feet ( " " " )
Total area of the Forest	116,000 feet
Gross volume per acre	1,000,848 M board feet
Merchantable volume	706,672 M board feet
Average volume per tree	332 board feet
Average DBH (All trees 10" and up)	16.37 inches

It is to be pointed out that a very close similarity exists in the volume information from the boundaries of these two forests. These are not to be taken as accurate figures for the forests as a whole. Such information will have to be obtained in the future from a more intensive inventory. Such a cruise might be in the form of the one proposed for the Yoma District of the Gola National Forest at Bomi Hills mentioned under Training & Education.  
National Forest Administration

Problems have come to the attention of the Bureau in the administration of national forests. These are largely centered about the work of the forest patrolmen. At the present time, the 20 patrolmen have approximately 20 miles each as their sector of responsibility. Since two forest guards have been hired, one for the Gio and one for the Kpelle Forest, close contact with the patrolmen has been improved. It is extremely important that a capable person be selected as a forest guard for each of the national forests as soon as the boundary lines are completed. There is need for one additional guard to be assigned to the Loma National Forest.

During April, an inspection of the Gio forest was made by one of the rangers in company with the forest patrolmen. The inspection indicated that the patrolmen had been negligent in the performance of one of their duties,

that is, the cleaning of subsequent growth from the boundary line. This failing was not entirely of their own cause, however. The Gio forest was the first surveyed in Liberia, serving as a training ground for the first aides employed by the Bureau. In addition, preliminary maps of the area were incomplete due to lack of aerial photographs, mosaics, and other pertinent information. Consequently this forest contains many miles of "low bush" which will continue to be a problem until the adjacent areas have grown into an intermediate stand of timber. As a result of the inspection a special crew was hired to clean the overgrown portions and to establish concrete corner posts at all of the boundary line corners.

These patrolmen are chosen from the natives in the vicinity of the forest. Usually, they have served on the boundary survey crew and have proven themselves capable beyond the average laborer. In spite of this familiarity with the locality, difficulty has been experienced in getting the patrolmen to walk the line alone. Fear is still apparent among the natives of the interior to be alone in the "bush" without weapons. Furthermore, patrol of some sectors necessitates night travel or sleeping in the forest, an additional deterrent to patrol. Suggestions for overcoming these problems have been made within the Bureau. Day shelters could be constructed. Extra patrolmen might be hired at a slightly lower grade to accompany the head patrolman for each sector, allowing travel to be made in pairs. The Bureau is encouraging each patrolman to purchase a shotgun as an additional help to boosting morale among the patrolmen.

Good results have been achieved in retarding agricultural movement into the national forests. The District Commissioners have been very helpful in supporting the forest rangers who have had to arrest trespassers.

reported by the patrolmen. There is an increasing awareness among the native farmers that the boundary lines are not to be crossed over. It is hoped that it will soon be necessary to send rangers only on rare occasions to the forests to enforce the laws. A complaint was made by the Paramount Chief of the Sonoyie Chiefdom against the Bureau in regard to the Bureau's surveying practices and removal of land from the chiefdom's agricultural domain to national forests. The complaint was presented to the President of Liberia at the Salala conference in June. The Department of Agriculture and Commerce was asked to send a representative to the conference for explanation. The Chief of the Bureau accompanied the Secretary to the conference and presented the objectives of the Bureau in establishment of the national forests. Afterward, the President brought to the attention of the group his statement made at Tapota two years before just before the start of the boundary survey to the Gio National Forest. It is evident that the President stands behind the delineation of the national forests from farming activities by the natives, and the preservation of the timber resources for their highest values.

Plans for the establishment of a permanent ranger station on the Yoma District of the Gio National Forest at Boni Hills have been made. One ranger is there now in charge of the projects being conducted during the rainy season and representing the Bureau to the Liberia Mining Company. It is anticipated that plans for a dwelling and warehouse installation will be drawn up during the month of August. Duties of ranger personnel assigned to permanent stations on the national forests are as follows:

1. Enforcement of the Forest and Wildlife Regulations of 1954, and representation of the Chief of the Bureau at the forest level. Duties of the ranger are covered under "Forest Officers Duties and Responsibilities," Sections 47 through 52, of the Forest and Wildlife Rules and Regulations, 1954, pertaining to this enforcement.

2. Supervision of forest guards and patrolmen.
3. Administration of timber sale contracts between the Liberian Government and private enterprise.

### Cooperation With the Industry

Inquiries into the requirements of a timber sale agreement came from several individuals during the first half of 1956. It is anticipated that this form of stumpage purchase from the Liberian Government will become more popular as the industry learns of the advantages of timber purchase through the Bureau.

During the latter part of July, Mr. Hearn of the Liberia Lumber Company, just recently arrived from the United States sought information relative to the establishment of several small mills of the portable type which could possibly operate on one of the established national forests under a timber sale agreement. This firm has a timber concession in the Eastern Province which it wishes to retain for the present time at least. It is quite definite that the company plans to investigate the availability of timber volumes in merchantable quantity before entering any area on an operating basis.

Mr. Cooper, a Liberian, in the sawmill business just north of Gre on the Ganta-Tappita highway, has inquired about a timber sale agreement for logging on the Gio National Forest. The present rainy season has caused a temporary delay in answering his questions. The coming dry season should make possible a survey which will enable us to make a sale suitable to his needs.

In March, an agreement was formulated between the Ganta Methodist Mission and the Liberian Government for the establishment of the Mano Experimental Forest situated within the grant given the Mission by the Government. This agreement will make it possible to establish forest research on a location

which will be watched by forest patrolmen and at the same time draw upon the vast knowledge of Dr. George W. Harley in tropical dendrology for Liberia.

In January during the exposition at the Agricultural Fair in Monrovia, all possible assistance was given to the Bureau on a large exhibit of forest development in Liberia. This was made as part of the combined effort within the Department to show the Liberian people and industrial groups in the country the work of the Department of Agriculture and Commerce. The forestry exhibit consisted of six panels, two of which had 12 wood samples each, one showing a map of Liberia with the national forests under the following classification: Mapped and Surveyed; Mapped and Being Surveyed; and Mapped and Unsurveyed; one with an organizational chart of the Bureau and, finally, a panel showing the logging operation at the Liberia Mining Company's saw mill at Boni Hills. Considerable literature was distributed on the work of the Bureau, information about the formation of timber sale agreements, and the various forestry opportunities in Liberia.

During the latter part of January, the two panels of 12 large wood samples each of Liberian wood were made ready for shipment to the International Exposition in Cologne, Germany, to be part of the international exhibit made by furniture manufacturers from all over Europe. After the exhibition in February, the panels were shipped to the Liberian Embassy in Bonn where they are on permanent exhibit.

#### Objectives for the First Half of 1956

The following objectives can be summarized for the Department's Forestry Advisory Staff for the remainder of 1956:

1. Guide the Chief of the Bureau and his staff in the formation of project plans to best utilize available personnel for the period July 1 to October 31 (the rainy season period).

2. Make preparations for boundary surveys which will begin during the first week of November. The staff of the Bureau can be considerably augmented through December 31 by the addition of student assistants from the University.
3. Administer the test in September from which the list will be compiled of possible candidates for technical aide positions within the Bureau.
4. Assist Mr. Hearn of the Liberia Lumber Company in finding a suitable area for a timber sale between his company and the Republic of Liberia. Other data or information that he may require.
5. Make available data or other information to all interested persons and companies.

## Chapter V

### Fresh Water Fisheries

The contents of this chapter are a consolidation and summarization of the monthly reports submitted from November 1955 through June 1956. During this period of time noteworthy strides have been made in the Inland Fisheries Program in Liberia which give indication of a progressing future. The progress made thus far has been made through the efforts of no one individual but through the efforts of the Liberian people in the acceptance of a program which supplies a common need. Examination and observation of streams in the vicinity of the Central Experimental Station have shown the lack of an adequate supply of fish (protein) to meet the demand. This inadequacy is due in part to the means of capture of the fish available; however, there are certain periods of the year (during and shortly after the rainy season) that no fish can be harvested even though they have been replenished. Controlled fish ponds will help provide fish on a year-round basis.

#### Purpose and Scope of Program

The purpose of the Freshwater Fisheries Program is to increase the supply of fish in the inland areas mainly through the construction of farm fish ponds. Other means of accomplishing this purpose include: 1) introduction of new methods of harvesting fish, and 2) conservation of the existing fisheries resources.

From the Central Experiment Station advisory services in construction, stocking, and maintenance of ponds may be requested.

#### Pond Construction

With the completion of a brood pond now in construction, a total of 27 ponds will be on the station. Although all ponds have not as yet been surveyed, approximately 8 acres are now in water. Six of the ponds are being used

as brood ponds, four for holding ponds, five for production ponds, and twelve for feeding experiments. The six which are being used for brood ponds were the original ponds on the Station and have been enlarged to provide for the production of more fish for stocking purposes.

Twelve feeding ponds (1/363 of an acre each) were constructed to be used in feeding experiments. This is the first case in which galvanized pipe has been used for the inlets and outlets in the ponds on the Station. Concrete drain boxes have been constructed in the other ponds.

Concrete overflow drains were placed in two of the production ponds to provide for excessive overflow of water during the rainy seasons. Diversion ditches, to put the pond completely under control, were dug around one pond. New screens have been installed in all drain boxes.

### Fish

Three species of Tilapia, T. melanopleura, T. macrochir, and one unknown species are being raised on the Station. T. macrochir was recently received from the Belgian Congo, but only two survived. Another shipment is to be attempted in the future. It is believed that the importation of these fish will greatly increase production.

### Results of Pond Drainage

Two ponds were drained during the year giving a total of 43,134 fish weighing 1,546.3 pounds. A 0.5 acre pond produced 277.4 pounds per acre of Tilapia, while a 2.4 acre pond produced 504.1 pounds per acre. The difference in the total production was due to the entrance of a carnivorous fish, Pelmatochromis sp. into the smaller pond. Another pond, 1.2 acres, which had not been stocked was drained. A total of 58.9 pounds of Tilapia, Pelmatochromis, and catfish was recorded.



Fish from breeding ponds at Central Experiment Station are stocked in student-made fishpond at Sanniquellie.

Stocking

Five production ponds were stocked with different ratios and sizes of Tilapia melanopleura. These are presented in the following table:

Pond Number	Size in Acres	Date Stocking Completed	Number per Acre	Number per Acre
3	0.5	March 3, 1956	6,000	64.0
9	2.4	May 28, 1956	370	28.3
10	1.2	April 25, 1956	100	14.0
11	1.0	April 25, 1956	4,000	60.0
13	0.7	June 2, 1956	455	54.5

Feeding

A total of 733 pounds of rice bran was fed in the production ponds during the months of March and April. The fish were fed at the rate of 10 pounds per acre every other day until the supply was exhausted. Sweet potato, cassave, and passiflora leaves were placed in the ponds every other day. Feeding experiments were begun in 10 feeding ponds to determine the effect of the feeding of three types of vegetation on the growth of Tilapia melanopleura.

Fertilization

Chicken compost was placed in two small ponds (0.5 acre) producing an algae growth within a few days. Fertilization of one pond (0.5 acre) was begun June 12 with an application of 50 pounds of 6-8-4. The pond was fertilized at the rate of 100 pounds per acre at weekly intervals. A plankton algae growth was observed after the third application.

Cow manure has been added daily to a 0.7 acre production pond since July 7. A pond scum was observed but no plankton growth has developed.

Water Analysis

Ten ponds on the station were analyzed for dissolved oxygen, free carbon dioxide, ammonia (as ammonia N) and pH during the month of November. Desirable

concentrations were recorded for oxygen, carbon dioxide, and ammonia. pH readings were taken for 4 other months, the range being between 5.0 and 6.4. Chemicals have been received and monthly water analysis will be taken during the coming year. One "fish kill" was noted in a small holding pond. This was caused by a complete depletion of the dissolved oxygen in the water from the addition of chicken compost.

### Stream Surveys

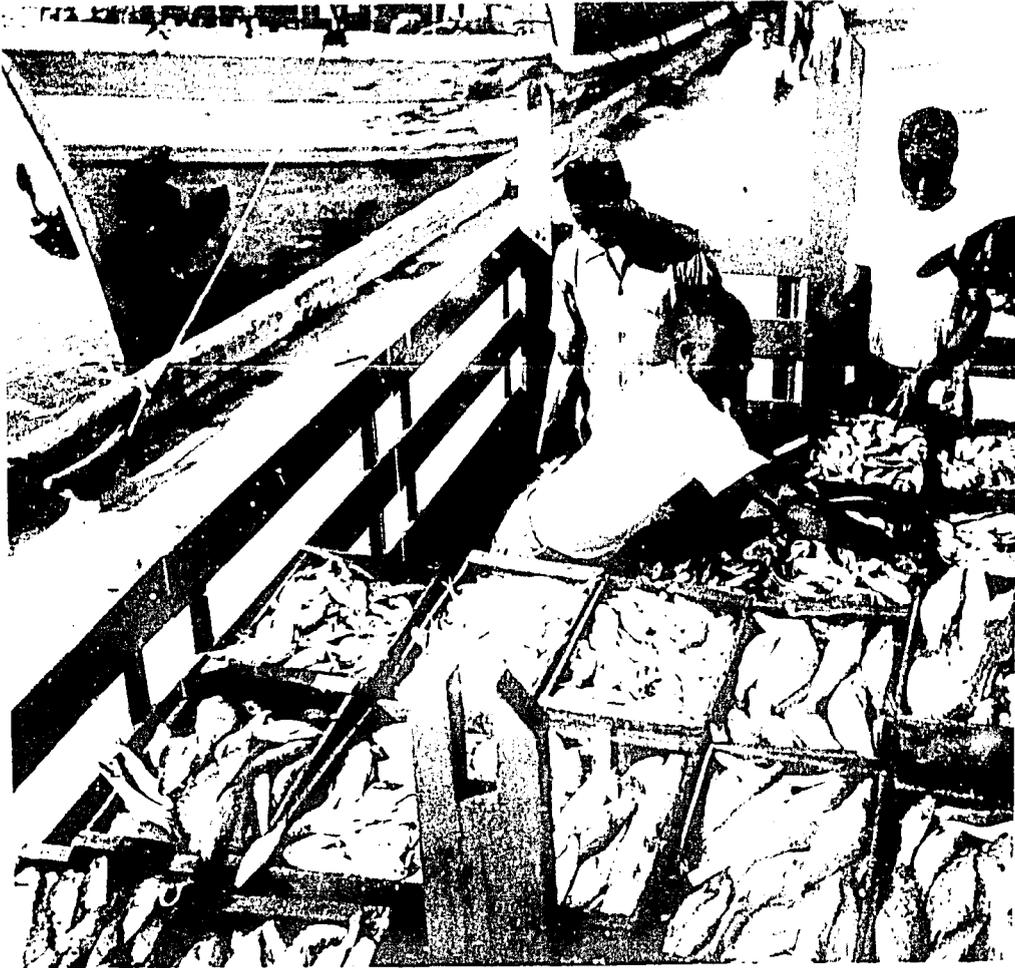
Three streams were surveyed during the months of March, April, and May. Five per cent rotenone was used as the method of capture while ten per cent formalin was used as the original preservative. Data were recorded on the different aspects of the stream. This included such things as water temperature, rate of flow, turbidity, vegetation, type bottom, and fish food available. The application of scientific methods may be a means of increasing the supply of fish in the streams.

The number of fish taken over a 600-foot section of stream was very low. These included the electric catfish, Malapterurus electricus (29), Climbing perch, Ctenopoma sp. (16), red bellies, Pelmatochromis sp. (11), spiny eel, Mastacembelus nigromarginatus (5), unknown minnow A (2), unknown minnow B (116) and unknown minnow C (48).

### Extension

The following people were contacted and advised on the construction of fish ponds:

<u>Name</u>	<u>Place</u>
Dr. Togba	Congo Town
M. Mae Davis (x)	Suchn Industrial Mission
Rev. Luyban	Mid-Liberian Mission, Suakok
Rev. U.S. Gray	Gbarnga Methodist Mission
Father Parcell	Bolahun
Chief Wato Mongrue	Karnplay



Pioneering work in marine fishing under Point 4 has brought a brisk trade by new fishing enterprises.

<u>Name</u>	<u>Place</u>
Town Chief	Markirpa
Town Chief	Zor Gowee
Mr. Marsh (x)	Saniqueellie
Commissioner Williams	Kpain
Commissioner Wilson (x)	Weinzue
Rev. Milish	Tappita
Town Chief	Bephplay
Clan Chief	Garplay
Town Chief	Kpairoplay
Secretary Buchanan	Konola
Dr. Harley	Ganta
Mr. Phillip Crawford	Flumpa
Dr. Sands (x)	Cuttington
Rev. Holloway	Liberian Inland Mission, Garplay

(x) - Pond either completed or nearing completion.

The following people have requested advisory services in connection with the construction of fish ponds:

<u>Name</u>	<u>Place</u>
Mr. Thomas	Suakoko
Mr. Elliott	Suakoko
Missionaries	Liberian Midland Mission, Yila
Mrs. Miller	Lutheran Mission, Dobi Island
Mr. Bigson	Suakoko
Mr. Harris	Suakoko
Mr. Marsh	Kakata

### Miscellaneous

Seven work plan outlines were written for experiments to be carried out during the coming year. One experiment on feeding is now in progress.

Worms and crickets are now being raised on the Station. Fishing poles have been cut and are now drying. These are to be furnished Station personnel when the ponds are opened for fishing to test the effect of periodic harvest on the production of T. melanopleura.