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Report of Staff

Imperial Ethiopian College of Agriculture and Mechanical Arts, Agricultural Technical School, Jimma; and Other Parts of the USOM/Eth. Agriculture/Program, 1950 E. C.
THE AGRICULTURE OF ETHIOPIA

VOLUME V

Edited by

Ewing Canaday, Information Specialist
Imperial Ethiopian College of A & M Arts
His Excellency
Lij Mikael Imru
Vice Minister of Agriculture
Imperial Ethiopian Government
Addis Ababa, Ethiopia

Your Excellency:

Herewith is transmitted the fifth annual report on the progress of work at the Imperial Ethiopian College of Agriculture and Mechanical Arts, the Jimma Agricultural Technical School and other projects in the Agricultural Programs of the United States Operations Mission to Ethiopia. We trust that this volume, which includes brief summaries of research developments at the College, the Central Experiment Station, and the Agricultural Technical School, will be a worthwhile supplement to the first four volumes of "Agriculture in Ethiopia", all of which were published in the interest of agricultural development in Ethiopia.

We wish to acknowledge with greatful appreciation the continued wholehearted cooperation of the Ministry of Agriculture and other officials of the Imperial Ethiopian Government.

Sincerely,

Albin D. Molohon
Chief, Agriculture Program
U. S. O. M./Ethiopia

Bonnie Nicholson
Principal Representative
Oklahoma State University Contract
The Agricultural Education Program in Ethiopia was conceived and brought into being through the vision and leadership of His Imperial Majesty Haile Selassie I, Emperor of Ethiopia, with the inspiration and advisement of the Late Dr. Henry G. Bennett, former President of Oklahoma State University, and first Director of the Point Four Program for the United States of America.
An aerial view of the campus of the Imperial Ethiopian College of Agriculture and Mechanical arts showing the educational buildings and staff residential area.
CONTRIBUTIONS

Imperial Ethiopian College of Agriculture and Mechanical Arts

Dr. L. A. Parcher, President
Dr. K. K. Keahey, Dean, Veterinarian
B. R. Jackson, Vice Dean, Agronomist
Dr. H. F. Murphy, Director of Research, Soils Scientist
O. S. Adams, Poultryman
Dr. Dean Elliott, Agricultural Engineering
H. K. Hedger, Horticulture
B. G. Hill, Biological Science
D. Whitenack, Animal Husbandry
F. Kubicek, Farm Manager
J. L. Searce, Architect
Lee. C. Craig, Director, Agricultural Extension Service
James H. Champion, Ass't. Director, Agricultural Extension Service
Bill Webb, Manager, Central Experiment Station

Jimma Agricultural Technical School

Hugh F. Rouk, Director
I. E. Siegenthaler, Agronomy
C. A. Wilson, Soils Scientist
Louis A. Meissner, Horticulture
A. W. Vance, Physical Education Director
Lloyd L. Wiggins, Poultry & Livestock
W. Dick Turner, Farm Mechanics
Conrad L. Evans, Farm Mechanics

Agriculture Program

Dr. Arthur W. Bechtel, Coffee Production
Dr. Donald V. Shuhart, Coffee Processing
Michael Galli, Livestock Development
Dr. James W. Allen, Animal Disease Control
Dr. Clifton N. Murphy, Animal Disease Control
Gordon Brand, Farm Machinery Project
Elbert Bowen, Farm Machinery Project
W. C. Kurtz, Entomologist
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Front Cover Photograph: Two students at the Imperial Ethiopian College of Agriculture and Mechanical Arts inspect samples of Kenya 5 wheat growing in an increase plot on the College Farm. Back Cover Photograph: A harvest scene in Harar Province.
THE IMPERIAL ETHIOPIAN COLLEGE OF AGRICULTURE AND MECHANICAL ARTS

The Imperial Ethiopian College of Agriculture and Mechanical Arts is the institution of higher learning in the Cooperative Agricultural Education program established in Ethiopia by Oklahoma State University under an agreement between the Imperial Ethiopian Government and the United States International Cooperation Administration. A four year institution, the College grants the Bachelor of Science Degree in General Agriculture to those who complete the prescribed course of study.

The Imperial Ethiopian College of A & M Arts is located on a site of approximately 422 hectares adjacent to Lake Alemaya, between Dire Dawa and Harar, in Harar Province. Classes were first held on the newly completed campus in November, 1956. The college plant now includes a modern dormitory, cafeteria, classroom building, administration building, clinic, poultry building and farm shop in addition to two staff dwelling houses.

HIS IMPERIAL MAJESTY HAILE SELASSIE I DEDICATES COLLEGE

His Imperial Majesty Haile Selassie I, Emperor of Ethiopia, formally dedicated the College in ceremonies held on the campus on January 18, 1958. The ceremony was attended by numerous officials of the local, provincial and national government as well as representatives of several foreign governments stationed in Ethiopia.

The following is a copy of His Imperial Majesty's dedication address:

"It gives Us great pleasure to be present here to inaugurate the College of Agriculture and Mechanical Arts, an occasion which marks a great and far-reaching advance in Our program for the promotion of agricultural education. This institution will serve as a source of inspiration in carrying out the agricultural program which We have laid down for the future.

In establishing this college for the development of the natural wealth of Our country, agriculture and animal husbandry, on modern and scientific lines, Our main purpose has not been merely to develop and utilize those basic resources to supply the daily needs of Our people, but, in addition, to produce a surplus to be shared with other countries of the world. Ethiopia, to some degree, has done this in the past. For example, when the world was sorely distressed by lack of food immediately after the second world war, Our country, although she herself had for five long years been struggling to recover from the terrible damage inflicted upon her during the war, was yet able to perform a significant service in supplying foodstuffs to the countries of the middle east. And We have been pleased to observe how, since then, Our people have increasingly devoted themselves to improving the agriculture of Our country."
A country and a people that become self-sufficient by the development of agriculture can look forward with confidence to the future.

Agriculture is not only the chief among these fundamental and ancient tasks which have been essential to the survival of mankind, but also ranks first among the prerequisites to industrial and other development.

History affords Us ample evidence that mankind abandoned its nomadic way of life and developed a settled, communal economy only when man became skilled and competent in agricultural techniques. From the beginning of recorded history, right up to the middle ages, and even as late as the beginning of the industrial age in which We now live, agriculture has always constituted the fundamental source of wealth for the human race.

Only when a solid agricultural base has been laid for Our country's commercial and industrial growth can We ensure the attainment of the ultimate goal of Our development programme, namely, a high standard of living for Our people. Commerce and industry, being concerned in the main with development and distribution, can only develop and profit from existing resources, but cannot actually create things which did not exist before.

Most of the districts of Our Harar Province are populated mainly by nomadic peoples. Now that We are in a position to anticipate an adequate water supply from the rivers and wells in the region, the area will flourish and land will no longer lie fallow in the Province, if only the people of the Ogaden, Essa and Adal could be educated in agricultural techniques. All this can be attained only by means of the wisdom which flows from the foundation of education, and while this college will serve the whole of Our country, its being established in the Province of Harar is the result of careful planning and consideration on Our part.

Even in this nuclear age, in spite of the revolutionary changes in man's way of life, which science has brought about, the problem of further improving and perfecting agricultural methods continues to hold a position of high priority for the human race. It is hard to believe that a substitute can ever be found for the occupation of agriculture - a sacred task graciously conferred upon man by God to serve as the source of his well-being and the basis of his wealth.

Our country, Ethiopia, being blessed with an abundance of natural resources, need not be anxious about her own needs. However, it is Our constant endeavor and Our firm desire that Our people will produce not only enough to meet their own requirements, but that their production will enable them to share and exchange the fruits of their labour with other countries.

If only Ethiopia, with an assured wealth of natural resources, would
During the dedication ceremonies at the Imperial Ethiopian College of Agriculture and Mechanical Arts, His Imperial Majesty Haile Selassie I unveiled a plaque dedicating the College to the welfare of the Ethiopian People.

His Imperial Majesty Haile Selassie I presented diplomas awarding the Bachelor of Science Degree in General Agriculture to the eleven members of the first graduating class from the Imperial Ethiopian College of Agriculture and Mechanical Arts.
look at what the barren Sahara Desert has been made to produce by the endeavors of trained scientists, she would realize that science is the source of wealth. We would, therefore, have Our students and scholars accept as their primary duty the attainment of scientific knowledge through education.

We have placed Our trust in this college to be the chief instrument for the attainment of this high goal, and We are confident that the students who have today received their diplomas from Our hands, as well as those who follow them in the future, will, through their achievements furnish Us with tangible evidence of the fulfillment of Our purpose and Our desire.

Agriculture and industry are indispensable one to the other. Only close cooperation between these two branches of knowledge can guarantee the fulfillment of Our program of economic development of Our country.

This college, which holds prominent place in the plans We have laid down for the prosperity and welfare of Our beloved people and country, can look forward to receiving the same constant support which We have shown in the past.

It is with pleasure that We express on this occasion Our gratitude to our great friend, the United States of America, for the generous and significant assistance they have given this institution as part of their great effort for the development of the spirit of cooperation and understanding among the nations of the world. We would request His Excellency the Ambassador to convey our thanks to his government.

If the late Dr. Henry G. Bennett, who laid the plans for this institution and whose great desire and tireless efforts to achieve the establishment of an Agricultural and Mechanical College in this country are well known to Us, were with Us today to see the fulfillment of his plans, how happy he would have been. With deep sorrow in Our heart, remembering the words, "Man proposes, God disposes", we pay a tribute to his memory in this hour.

We would like to express our sincere thanks to the Director of the Point Four Program in this country, the President and Staff of this college, and all of Our officials who have laboured to bring this institution into being.

It is not enough for the children of Ethiopia to be recipients of education. They should never forget that the responsibility for passing on this knowledge to others and of handing it over to the next generation rests on them."

Immediately after his dedication address, His Imperial Majesty unveiled a plaque on the patio of the Administration Building which dedicated the
Imperial Ethiopian College of Agricultural and Mechanical Arts to the welfare of the people of Ethiopia. He then cut a ribbon symbolically opening the doors of the institution to those desiring a greater knowledge of the science of Agriculture and the Mechanical Arts. His Imperial Majesty was accompanied on a tour of the College campus and buildings by Dr. L. A. Parcher, President, and later presented diplomas awarding the Bachelor of Science Degree to the eleven members of the first graduating class of the College who had completed their studies in July, 1957.

MINISTER OF AGRICULTURE AND U.S. AMBASSADOR SPEAK AT DEDICATION

Others who participated in the dedication ceremonies of the Imperial Ethiopian College of A & M Arts on January 16, 1958, included His Excellency Balambaras Mahteme Selassie Wolde Maskal, Minister of Agriculture; Don C. Bliss, U. S. Ambassador to Ethiopia; and Dr. L. A. Parcher, President of the College.

The following are copies of their addresses:

HIS EXCELLENCY THE MINISTER OF AGRICULTURE

Your Imperial Majesty:

In condescending to inaugurate the first superior institution of learning in Ethiopia, Your Imperial Majesty has given us all great honor and heightens by His August Presence the splendor of this ceremony bringing it all its significance and importance.

Another stage has been passed on the road of progress, wisely outlined by Your Majesty, on which numerous achievements already figure, representing, indisputable and indestructable proof of the grandeur of Your Majesty's Reign.

The Imperial Agricultural College of Alem-May is already functioning. Its opening, which Your Majesty wishes to make official today, has marked a memorable date in the history of our National Education.

Last year a good number of young agriculturalists finished their courses in this College - the first of its kind in our country and they are awaiting the honor of receiving their diplomas from Your Majesty's hand. And it is just the importance of this fact I would like to underline by giving briefly a glimpse of its happy consequences.

Our young graduates from agricultural or secondary schools can henceforth continue their studies in the country. And from now on, we shall be training, in sufficient number, our own young agriculturalists, who are indispensable to our development. In the field of Agricultural Education this is one of the greatest achievements made to date, and from the point of view of Agriculture, the Imperial College of Agriculture is the greatest event of His Majesty's Reign!
His Excellency Balambaras Mahteme Selassie Wolde Maskal, Minister of Agriculture, as he spoke during the dedication ceremonies of the Imperial Ethiopian College of Agriculture and Mechanical Arts.
If we cast a glance behind, we see that for a number of years we have had only a limited number of agriculturalists. Developing by stages, our agricultural education has now reached quite a high level, considering the short time passed.

In connection with this I would like to name the late Dr. Bennett who was one of the most active agents and whose name will always be mentioned in the annals of this college. Unfortunately, I cannot name all our helpers, past and present; therefore I address myself to Dr. Kleine, Director of the United States Operations Mission to Ethiopia, and ask him to accept our sincerest thanks for their valuable assistance, past and present. I hope most sincerely that this happy cooperation will continue and that it will always be as fruitful. It can still give us results as concrete and as important so that we shall advance in the path of progress.

Neither do I forget our own compatriots who have participated and are participating in this great venture, and in particular His Excellency Col. Kifle, Vice-Governor-General of Harar, as well as the Ministry of Education which was most active during the preparatory phases of the College’s development.

Ethiopia, thanks to its diversity of climate and innumerable natural resources is essentially an agricultural country. In such a country the development of crop and animal husbandry must hold the first place, and that is why the Imperial Agricultural College is so important. In order to exploit our natural potentialities we have need of a great number of technicians, whose activities would be spread over the whole country. Our agricultural secondary schools and the College of Agriculture shall fulfill this function by training these indispensable technicians. Thus the importance of the agricultural education program, instituted in our country, can be fully appreciated.

I shall not enter into details but would only mention that the Imperial Government of Your Majesty as well as the USOM to Ethiopia, respectively made a contribution amounting to Eth.$2,651,750.00 and Eth.$2,006,250.00, thus giving a total of Eth.$4,658,000.00

The Imperial College, having under its direct supervision, two organizations, namely; Bishoftu Agricultural Research Station and Agricultural Extension Service, the expenditure incurred up to now has been allocated as follows:

1. The Imperial College -
   (a) Construction $2,290,000.00
   (b) Equipment 400,000.00
   (c) Operation cost 150,000.00
   Total 2,840,000.00
2. Bishoftu Research Station

(a) Construction  $75,000.00
(b) Equipment  45,000.00
(c) Operation cost  150,000.00

Total  $170,000.00

3. Extension Service

(a) Construction  2,500.00
(b) Equipment  170,000.00
(c) Operation cost  386,189.95

Total  $558,689.95

The College of Alem-Maya can take this year 200 students, and plans for the next year have been approved to bring its capacity to nearly 400 students, by increasing dormitories, staff accommodations and classrooms. Its development will not stop at this figure, for in the distant future, it shall accommodate even thousands of students. This development shall take place gradually, without any haste.

The College has been conceived following the most modern techniques and it fulfills the most exacting requirements of this type of institution. It is situated in one of the richest areas of Ethiopia, the Province of Harar. The program of teaching, both theoretical and practical, has been the subject of long preliminary studies and the much appreciated cooperation of Oklahoma State University whose President, Dr. Willham, has recently paid us a visit to see for himself the progress made. The College of Agriculture is in direct contact with some foreign Universities. The National Board of Agricultural Education and the Board of Trustees ensure that its curriculum is of a high standard and that the teaching staff is fully qualified. It is essential that its educational level be kept high and admission restricted to really capable students. With this in mind only the best students from secondary schools will be admitted on a competitive basis. As to the students from the agricultural secondary schools, at Ambo and Jimma, their admission will depend upon their record, which must be of high standard.

In having an agricultural institution of this educational level and importance, candidates from neighboring countries would also desire admission. Such of those as fulfill all the entrance requirements can be admitted, thus conferring over a wide field the benefits of higher education in this important and rich sphere.

Graduates from the College can become Government Officials, enter private employment, or start agricultural schemes on their own account, aided by the Development Bank of Ethiopia.
Your Majesty condescends to dedicate an event on which depends the future of the country and I, representing the Ministry of Agriculture, feel most honored and happy. Parallel with the development of agricultural education, I would like to intensify the work of my Ministry, in all its branches. Of these, agricultural Extension service, just starting at present, has an important part to play. In this, I would like to be assisted by these young men, to whom Your Majesty has given every facility, in His Wisdom and Benevolence. By pooling their efforts, their good will, their youthful enthusiasm, their interests and their individual capacities to follow the common air, they will contribute jointly with all their strength to the development of our country in general, and its agricultural development in particular. May their understanding be friendly, their mutual aid fraternal, thus will they soon realize the goal of us all to assist to our utmost the systematic and humanitarian plans of Your Majesty, of which the final aims are the well being of Your People, the prosperity of Your Country and the Mightiness of the Nation.

Long Live His Imperial Majesty the Emperor,

Long Live Her Imperial Majesty the Empress,

Long Live The Imperial Family,

Long Live Ethiopia!

DON C. BLISS, U. S. AMBASSADOR TO ETHIOPIA

Your Imperial Majesty:

It is a great pleasure and an honor to be present today at this important occasion marking formal recognition of the establishment of the Imperial Ethiopian College of Agriculture and Mechanical Arts.

All countries are dependent, to some degree, upon agricultural production for economic progress. This is particularly applicable to Ethiopia where a very large part of the population is engaged in agricultural endeavors and where the agricultural potential is so great. Further progress in this field can only be achieved through education and the dissemination of this knowledge to others.

The importance of this new institution, as a vital part of the agricultural development of Ethiopia, lies in the young men who attend this college and who in turn will join in the great striving for economic progress of the Ethiopian people in which Your Majesty leads the nation. Because of Ethiopia's vast agricultural resources and the considerable potential for development, these trained young men will carry a major burden of responsibility in ensuring the continued successful economic
growth of this country. As they graduate from this College, some of these men will no doubt enter into the service of their Government and others will enter into private endeavors. It is my sincere desire that a selected number of the graduates will continue with advanced studies and also obtain the necessary practical experience to equip them to become the instructors and administrators of this fine institution.

I, personally, look forward to another milestone in the development of this institution - the time when the Imperial Ethiopian Agricultural College will be entirely staffed by competent, well-trained Ethiopian agriculturalists and educators.

Today, it is indeed a privilege for me to be representing the people of the United States who have cooperated with the Imperial Ethiopian Government in creating this College from a vision seen by His Imperial Majesty into an auspicious reality.

The people of the United States genuinely desire to work with others in overcoming the obstacles to economic progress and well-being. The establishment of the College and the significant role it will play in the development of this nation is a distinguished example of the cooperation that we shall see progress not only in the field of agriculture but in other fields of endeavor. My best wishes for continued success.

DR. L. A. PARCHER, PRESIDENT OF THE IMPERIAL ETHIOPIAN COLLEGE OF A & M ARTS.

Your Imperial Majesty:

The staff and students of the Imperial Ethiopian College of Agriculture and Mechanical Arts are highly honored that Your Majesty has graciously consented to personally dedicate this institution of higher learning in the science and craft of agriculture and mechanical arts.

It has been just a little more than five years since the agreement was made between the Imperial Ethiopian Government and the United States Government to establish a college of agriculture and mechanical arts. Tribute should today be given to those whose diligence was responsible for the completion less than a year ago of these buildings you see here.

The list of those to whom tribute should be given is long, and I am sure injustice would be done if I should attempt to enumerate all who made significant contributions to the establishment of this college. I cannot refrain, however, from mentioning that His Imperial Majesty should be paid a tribute for his far-sighted vision which enabled Him to see the benefits to be derived from an institution of this kind. I would also be remiss if I did not mention those of His Majesty's ministers and officers with whom I have worked and whose untiring efforts have made this college possible. His Excellency Balambaras
Mahteme Selassie Wolde Maskal, His Excellency Ato Akala Worq Habtewold, Ato Kebede Michael and His Excellency Colonel Kefle Erguetu and his staff were among these.

Our present fourth year class of 17 boys will, at the end of this school year, be a fine addition to the body of trained men upon whom Ethiopia must depend.

With a college enrollment now of nearly one hundred, and in view of the expected enrollment next year of about 175, this institution will soon be able to supply the most essential needs including that for trained civil servants in agriculture.

It is of importance to note that agriculture is by far the most prevalent industry of this favored land, but even if, as time goes on, other industries gain in importance, the basic economic foundation of Ethiopia's well-being will lie in its agricultural resources. It is our fondest hope and expectation that this institution will furnish a continuing flow of young people trained not only in the art of agriculture, but in the basic sciences so necessary for the proper development and utilization of the rich resources which lie at hand.

We do not propose, however, to neglect studies in the liberal arts. We envision rather that our graduates shall be well rounded individuals not only trained to work with their hands and with their brains, but also with a meaning by making them conscious of the world about them and how their country can best adjust its endeavors to fit in with developments in other countries. We can produce scientists who might well be able to increase the production of any given crop, but a scientist who is unable to envision how his activities fit into the world wide scheme of things is far less likely to benefit his fellow man than the scientist who through attainment of social consciousness works deliberately toward such benefits. We propose, then, to dedicate our efforts toward developing the individual who can be of maximum service to Your Majesty's people.

This college, which Your Majesty will dedicate today, is, I believe, more than a group of buildings. Rather, we hope that that which is dedicated here today will be an institution composed, not only of material goods, but of a spirit devoted to the betterment of this great nation.

INSTRUCTIONAL PROGRAM

IMPERIAL ETHIOPIAN COLLEGE OF AGRICULTURE AND MECHANICAL ARTS

Classroom instruction at the Imperial Ethiopian College of A & M Arts begins each year on the first Monday of October. The school year continues for approximately nine months, and is divided into two semesters.
Students at the Imperial Ethiopian College of Agriculture and Mechanical Arts receive instruction in modern classrooms. The photograph shows Dr. K. K. Keahey instructing a biology class.

Students at the Imperial Ethiopian College of Agriculture and Mechanical Arts are served their meals in a modern cafeteria on the campus.
In January, 1957, the school was in the midst of its first semester of operation with the following enrollment: 33 first year secondary students, 26 second year secondary students, 18 junior college students, and 11 senior college students. The first semester was completed on March 8 and the second semester began March 11. There was no loss in numbers among the college students, but two high school students were dropped from the rolls because of faulty grades and illness.

The 1956-57 school year officially closed July 5, 1957. A simple exercise was held the afternoon of that date, and eleven senior college students received certificates of completion of work for the Bachelor of Science Degree in Agriculture. This was the first graduating class of the Imperial Ethiopian College of Agriculture and Mechanical Arts. Officials attending this ceremony included His Excellency Colonel Kifle Erguetu, Deputy Governor General, Harar Province; Dr. Oliver S. Willham, President, Oklahoma State University; staff members and students. Certificates were presented to the graduating seniors by His Excellency Colonel Kifle.

Fifty-seven students were employed by the college during the summer vacation period, engaged in farm and research work.

Four staff members and families departed from the campus for home leave in the United States, thus leaving five staff members on the campus to supervise the research and farm work during the vacation period.

Prior to the opening of the new school term, arrangements were made whereby the ninth and tenth grade high school students were transferred from the college to the Agricultural Technical School, Jimma. Further arrangements were made whereby the entire college sophomore class, one-half of the college freshman class and one-half of the twelfth grade high school class were transferred from the Agricultural Technical School to the college at Alemaya. Records of our students were transferred to the Agricultural Technical School, with a copy being retained at the college as a permanent record.

The 1957-58 school year officially opened October 7, 1957. The first day of school consisted of enrollment of students and an assembly of students in the cafeteria building for general orientation of new students and the introduction of staff members. The school year began with 39 freshmen, 15 sophomores, 24 juniors and 17 senior college students. The school year began with the following staff members:

L. A. Parcher, President, agricultural economist
K. K. Keahey, Dean, veterinarian
B. R. Jackson, Vice Dean, agronomist
H. F. Murphy, Director of Research, soils scientist
Abraham Demere, Director of Administration
J. Adams, English Instructor
The teaching staff of the Imperial Ethiopian College of Agriculture and Mechanical Arts. Left to right, back row: Dr. L. A. Parcher, Prof. Delbert Whitenack, Prof. Hugh Hedger, Dr. K. K. Keahey, Prof. B. G. Hill, Prof. O. S. Adams, Dr. D. Elliott, Ato Abraham Demere. Front row: Prof. B. R. Jackson, Mr. F. Kubicek, Mrs. J. Adams, Mr. J. L. Seearce, Dr. H. F. Murphy, Prof. R. O. Proctor.

A new curriculum of courses was developed to include four years of college instruction leading to a Bachelor of Science Degree in General Agriculture. This curriculum was instigated for the 1957-58 school year and is presently resting with the Board of Trustees awaiting their official approval. The curriculum for the first semester includes:

Freshman College Course: Botany, general chemistry, introductory animal husbandry, English, agricultural geography, physical education.

Sophomore College Course: English, agricultural engineering, physics, poultry management, pasture and forage crops, driving, and physical education.

Junior College Course: General bacteriology, general genetics, physics, entomology, and vegetable production.

Senior College Course: Animal physiology, soil and plant nutrition, plant seminar, soils seminar, woodworking, welding, animal nutrition, livestock judging, and farm machinery.

The students carried on an average of sixteen semester college hours.

All laboratories connected with classroom instruction are fully equipped and in full operation.

In addition to classroom instruction, all students are required to work a specified number of hours per week in various tasks on the campus and farm. This work requirement was instituted to give the student practical experience in agricultural work, and to give them a small stipend to cover incidental expenses.
PHYSICAL EDUCATION PROGRAM

Freshman and sophomore students at the college are required to take physical education courses. These courses are set up on a semester basis and at the end of the sophomore year the students will have obtained four semesters of physical education.

The courses are set up to teach the students the rules, the description, and the basic fundamentals, skills and techniques of the following sports:

1. Basketball
2. Softball
3. Tennis
4. Volleyball
5. Track and field events
6. Archery
7. Horseshoe pitching
8. Croquet
9. Soccer football

At the beginning of the 1957-58 school year the college joined the Harar Federation of Football and participated in competitive games with the following federation teams: The Imperial Ethiopian Cement team, Cotton Factory team, Army team, and French team. The college also competed with the secondary school and the Teachers Training School of Harar in volleyball, basketball and football.

The college team placed third in the federation and won the sportsmanship trophy for good conduct.

CONSTRUCTION PROGRESS

The year 1957 was one of many accomplishments in the construction program of the Imperial Ethiopian College of A & M Arts. Additional land on the college site was cleared, drained and leveled for cultivation, and some 200 hectares will be planted in research crops during 1958.

Construction was completed on the original group of buildings including one classroom building, an administration building, clinic building, cafeteria building, one dormitory building and ten staff dwelling houses. The contract for these buildings with a covered passageway and site grading and retaining walls totaled Eth.$1,195,965.38.

Construction was also completed on the following projects for which contracts were let in 1956:

Water and sewage system consisting of water supply system, water distribution system, sewage collection system and sewage lagoons. Contract amount Eth.$164,714.99.
Power plant building, contract amount Eth.$9,580.15

Supply and installation of a 258 KW diesel generating plant, contract amount Eth.$12,410.00.

Supply and erection of electrical distribution poles, contract amount Eth.$10,350.00.

Electrical distribution system, contract amount, Eth.$52,515.24.

Installation of a telephone line from the village of Alemaya to the college site, contract amount Eth.$5,000.00; installation of phone Eth.$115.00; purchase of poles Eth.$402.00.

Roads and parking areas within the college compound, contract amount Eth.$119,272.02.

A rigid frame building used during the Jubilee Exposition in Addis Ababa was purchased at a cost of Eth.$30,000.00. Contract was let for dismantling, transporting and reerection of the building on the college site, contract amount Eth.$32,600.00.

Contracts were let and construction completed on three other projects as follows:

A road and bridges between the village of Alemaya and the college site, contract amount Eth.$262,090.64.

A poultry laying house, contract amount Eth.$15,072.00.

General construction of stone pathways on the college campus, contract amount Eth.$25,300.00.

All of the above mentioned projects were let through competitive bidding among local contractors, except for the installation of the telephone line to Alemaya which was negotiated.

The total cost of all contract construction to date, including contract for construction of a farm shops building for Eth.$179,997.30, is Eth.$2,233,600.30, of which the Imperial Ethiopian Government has contributed approximately fifty percent, the remainder being paid from United States Mutual Assistance funds.

Plans and specifications have been prepared and bids tendered for an additional dormitory building, classroom building and five staff dwelling houses, and it is contemplated that this contract will be signed in early 1958. In addition to this, several other projects are in the preliminary planning stages and as soon as money is available these projects will be initiated.
The new poultry building completed at the Imperial Ethiopian College of Agriculture and Mechanical Arts during 1957.

The new Agricultural Building under construction at the Imperial Ethiopian College of Agriculture and Mechanical Arts. The building is due to be completed in early 1958.
Expansion of the Agricultural Engineering Department of the Imperial Ethiopian College of A & M Arts during the calendar year of 1957 has been along three principal lines; namely, near-completion of the physical plant, organization of the instructional program, and the initiation of developmental research in the area of agricultural tools and equipment.

BUILDING NEAR COMPLETION

At year's end, the Eth.$180,000.00 structure being built to house the Agricultural Engineering Department was nearing completion. Some minor changes and modifications seemed desirable, such as providing additional ceilings in the building, installation of additional artificial lighting and installation of larger transformers to handle the power load; however it was not expected that these changes would delay the anticipated date of occupancy tentatively set at late in the first half of 1958.

Equipment specifications have been sent to local representatives of companies in Belgium, Germany, Great Britain, Sweden and the United States; however a limited budget for equipping the shop will necessitate holding purchases to a minimum. Bids were solicited on only the most essential items. It is hoped that additional budgetary allocations will be set up in the future in order that additional needed tools and equipment might be purchased.

Completion of the building should greatly increase the possibility for the Agricultural Engineering Department to make its rightful contribution toward both teaching and research.

ORGANIZATION OF INSTRUCTIONAL PROGRAM

A general understanding was reached that due to the cost of acquiring adequate staff and to the possibility of overlapping certain aspects of instruction offered by other college-level institutions, agricultural engineering would not, in the foreseeable future, be offered as a major at the Imperial Ethiopian College of A&M Arts. Therefore, there was the need for organizing instruction in agricultural engineering so as to provide the best possible service to other areas of majoring. At the same time it appears desirable to offer as much training as possible of a well-rounded nature to students who were particularly interested in that area of instruction and whose formal education might be expected to terminate with a Bachelor of Science Degree from the college.
Accordingly, an effort was made during the first semester of the 1957-58 school year to organize the instructional program on a basis which would best serve the several needs. Course content and course sequence were designed to (a) complement the instruction offered in other areas, (b) give students of general agriculture who wish to concentrate their effort in the area of agricultural engineering a strong and well-rounded background, and (c) to provide a substantial background for those students going abroad who might wish to secure a degree in agricultural engineering. Courses were arranged in a sequence which would fit the degree of advancement of the student and which would provide for him a logical expansion of knowledge concerning the subject.

Certain key courses were set up as required so that all students would acquire a basic understanding in the area. Other courses were instituted as electives with the assumption that students would choose one or more particularly appropriate in their area of specialization. Under the present organization freshman students have no contact with the Agricultural Engineering Department. However, a student wishing to do so, may, by beginning in his sophomore year, take all courses offered in the department.

The following is a brief summary of the courses now offered:

**Driving:** This course was scheduled for four laboratory hours per week without credit. Because most students enter college with little or no experience in the operation of vehicles and because field activities regularly include the operation of tractors and equipment it was considered desirable for driver training to be offered. In general, the course appeared to have been well received by students.

Instruction stressed the reasons why vehicle preservation, safety, and courtesy are important. Emphasis was upon small vehicle and tractor operation. To facilitate training, dual controls were installed in one college owned vehicle. As time permitted, work was begun on reconditioning of an old Fiat wheel tractor which could be used full time for driver training in the future when enrollment is expected to be doubled or tripled.

It was noted that students received little benefit from instructional periods of less than 12 to 15 minutes duration. This meant that one instructor with one vehicle or tractor might provide instruction for no more than four students per hour. A class of sixty boys would then require two full days of the instructor's time per week. The time-consuming nature of the training would indicate that eventually a full-time driver training instructor would be needed. An alternative might be to utilize some of the better qualified upper classmen for field instruction while the lecture could be handled by a staff member.
The dual control vehicle used in driver training courses at the Imperial Ethiopian College of Agriculture and Mechanical Arts.

A class in the farm machinery course studies the operation of equipment in the field.
Shop Procedures - Experience during the 1957-58 school year showed very clearly that most upperclassmen lacked skill in basic shop practices. Excessive tool breakage through improper usage, inability to condition commonly used tools and poor workmanship on work assignments were cited as evidence that a course was needed which would give students such basic understanding.

It was suggested that shop procedures take the place of and, in part, include portions of formerly scheduled courses in woodworking and welding. It was made a required course.

Although there is indication that future classes will be large, possibly 60 or more, sectioning should permit conducting the class without crowding the students excessively. Undoubtedly the small number of welders designated for the new quarters will be a factor in determining the size of sections.

Surveying & Conservation Practices - This course was increased from two to three hours and was moved from sophomore year to the first semester junior year. The content was broadened to include not only the principles of surveying but also the application of those principles in laying out and constructing conservation measures; namely, terraces, contour strips, drainage ditches, ponds, and irrigation ditches. The possibilities for utilizing these measures in Ethiopia are nearly unlimited. It was the judgement of those concerned that so long as the staff is very limited the course might best be retained in the dual-topic nature. Eventually, it might well be replaced by two courses; one in surveying and a second in conservation practices.

Agricultural Electricity - Required of juniors, this two-hour course was scheduled for the second semester. It was set up to give students a working knowledge of electricity, one of their country's latent power sources. Institution of the course has been requested by a number of the students.

There appeared considerable possibility that the course was underrated from a credit standpoint. Generally, students coming to the college have had little prior experience with electricity and therefore may find more lecture hours and a more thorough coverage of the material desirable.

Farmstead Structures - This course was included in the senior schedule as a three credit course. Its intended purpose is to provide students with an understanding of improved methods of construction and their application to Ethiopia where prepared materials are relatively expensive and where indigenous materials are somewhat scarce. Despite these drawbacks, it is believed that much can be done to improve native construction.

Farm Machinery - This course was scheduled for the second semester of the senior year as a three credit course. As was true of Farmstead Structures,
it was made an elective. The course was offered in September 1957 and was chosen as an elective by sixteen of the seventeen seniors enrolled in the school. No other elective offered in the agricultural engineering section was so well received by students.

An effort was made in the course to appraise agricultural machinery on the basis of potential usefulness in and adaptableness to Ethiopian agriculture. In the classroom, students learned something of the theory behind the construction of farm machines. In the laboratory they learned the fundamentals of maintenance, repair and operation. The latter included frequent field demonstrations.

Respecting the future of the course, one observation stood out. It was almost impossible to adequately cover the material and perform laboratory demonstrations when both farm machinery and farm power were included in the course. Therefore, it was recommended that as soon as it is feasible the material should be divided and that one course be offered in farm power and a second one devoted to the study of farm machines.

DEVELOPMENTAL RESEARCH

Perhaps, no part of Ethiopia's underdevelopment is more apparent to the observer than is the lack of adequate agricultural tools and equipment. The very limited use made of the wheel, and the crude tools and implements used by the Ethiopian farmer are concrete examples attesting to the fact that improvement is needed.

It is apparent that one of the most valuable services which the Agricultural Engineering Department of the college could render would be that of improving the design of simple agricultural tools. The potential increase in production could be expected to have a positive effect on the Ethiopian standard of living as well as upon the Ethiopian economy.

With these points in mind there was outlined a series of projects in the Agricultural Engineering Department which might make some contribution toward the country's needs. Briefly, the work planned for the 1957-1958 school year was as follows:

1. Portable machine for converting animal draft to rotational motion for use in operating belt-driven stationary machinery.

Such a machine is badly needed in isolated communities for grinding flour, for operating community threshers if and when they become available, for operation of certain shop tools, and for numerous other jobs of a related nature. In the design and construction of all such machines simplicity and low cost will be given close attention.
2. Improvement of the native plow.

Although plowing is always a costly operation from the standpoint of time and power consumption and although native oxen are comparatively small and are, therefore, unable to deliver a desirable draft force, an effort will be made to improve the design of small plows. There may be a possibility of adapting the disk plow to oxen.

3. Development of one or more types of drag harrows suitable for ox-draft farming.

The typical Ethiopian farmer has no specially-designed secondary tillage tool at his disposal. Therefore, plans were made to construct one or more such tillage tools. The first completed was a triangular type harrow. The lightweight implement was constructed largely from indigenous material at very low cost, however, preliminary trials showed it to perform well.

RESEARCH

Agricultural research is an integral part of the Agricultural Education Program in Ethiopia. Continued emphasis has been placed on those research projects from which it is believed the greatest immediate benefits will accrue to Ethiopian farmers. Research directed toward long term benefits has not, however, been neglected.

Research conducted by technicians assigned to the Agricultural Education Program is centered principally at the Imperial Ethiopian College of A&M Arts farm near Alemaya; at the Agricultural Experiment Station, Bishoftu; and at the Agricultural Technical School farm near Jimma. Research done at the Ambo Agricultural School and at the Research Station near Asmara is studied and an effort made to use results in our own work.

SOILS

By Dr. H. F. Murphy

The soil is the basic agricultural resource of any country. Ethiopia's economy is primarily dependent on agriculture, and it is therefore fundamental to the nation to protect the soil from undue losses and to promote such soil management practices as will guarantee to future generations a continuously productive land. To accomplish this it is necessary to control erosion and to keep up, or even improve, the fertility of the soil.

Erosion is the major soil problem in Ethiopia. Second to this is the matter of soil fertility. Through erosion control fertility is conserved to a very great extent, however, not all soils are subject to major erosion problems. There are many soils where soil reaction, organic matter, and
Dots on the map show the location from which soil samples have been collected in Ethiopia for analyzing in the soils laboratory at the Imperial Ethiopian College of Agriculture and Mechanical Arts.
plant nutrients are of primary concern.

During 1957, Dr. H. F. Murphy, Soils Scientist at the Imperial Ethiopian College of A & M Arts, made many trips to different areas of Ethiopia in order to collect representative soil samples. Many samples also were collected by others engaged in the Point Four agricultural program and by Missionaries in the country. During the last two years over two thousand soil samples have been processed in the soils laboratory at the Imperial Ethiopian College of A&M Arts. A number of these have also been tested for their ability to furnish nutrients to plants. Data compiled by Dr. Murphy are being tabulated for publication.

Some of the results on an over-all basis are indicated in the following table:

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>No. OF SAMPLES TESTED</th>
<th>Very low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen L¹</td>
<td>1854</td>
<td>7.4</td>
<td>21.6</td>
<td>25.6</td>
<td>31.3</td>
<td>14.1</td>
</tr>
<tr>
<td>Phosphorus L¹</td>
<td>340</td>
<td>13.2</td>
<td>29.4</td>
<td>37.1</td>
<td>6.8</td>
<td>13.5</td>
</tr>
<tr>
<td>Organic Matter L¹</td>
<td>1808</td>
<td>9.6</td>
<td>25.5</td>
<td>22.9</td>
<td>30.7</td>
<td>11.3</td>
</tr>
</tbody>
</table>

¹ Nitrogen: Very low .05%; Low .05 -.099%; Medium .10 -.15%; High .15 -.25%; Very High .25%

¹ Phosphorus: Very low .02%; Low .02 -.0375%; Medium .0375 .075%; High .075 -.100%; Very High .100%

¹ Organic Matter: Very low 1.0%; Low 1.0 - 2.0%; Medium 2.0 - 3.0%; High 3.0-50% Very High 5.0%

FERTILIZER INCREASES YIELDS

Fertilizer field trials during 1957 showed that the use of a nitrogen fertilizer on corn increased the grain yield by 31.7% on the college farm at Alemaya. In a farmer's field adjoining the college site the use of nitrogen on an interplanted corn-sorghum field increased the total grain yield slightly over 17%. For each pound of nitrogen applied in this case there were 8.65 pounds of corn-sorghum grain. In both experiments the nitrogen was applied when the crops were approximately knee high. The vegetation had a decided yellow appearance.

In another experiment nitrogen had little effect in increasing the grain yield of a tall native sorghum. It increased the forage yield slightly. Nitrogen increased the grain yield of a dwarf sorghum (44-14) 38%. Each pound of nitrogen applied gave an increase of 5.8 pounds of grain per acre.

On a black clay soil on the college site various fertilizers were
applied on a wheat crop. The greatest increase was produced by an application of twenty pounds of nitrogen and twenty pounds of phosphoric acid (\(P_2O_5\)) per acre. The increase amounted to 5.42 bushels per acre.

On a dark brown clay soil with a clay subsoil which had been in native grass at least for several years (perhaps had never been plowed), a fertilizer test was established to determine the effect of nitrogen on both hay and pasture production as well as on the production of protein. The treatments were randomized in triplicate blocks. The following table gives the results:

<table>
<thead>
<tr>
<th>Hay Plots</th>
<th>Lbs. of hay per acre</th>
<th>Lbs. of protein per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fertilizer</td>
<td>4263</td>
<td>177.1</td>
</tr>
<tr>
<td>56 lbs. Nitrogen at start</td>
<td>5934</td>
<td>284.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clipped Plots</th>
<th>Lbs. of hay per acre</th>
<th>Lbs. of protein per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fertilizer</td>
<td>3384</td>
<td>270.4</td>
</tr>
<tr>
<td>56 lbs. nitrogen at start</td>
<td>3920</td>
<td>341.8</td>
</tr>
<tr>
<td>56 lbs. nitrogen at start and 56 lbs. of nitrogen after each clipping</td>
<td>4478</td>
<td>387.6</td>
</tr>
</tbody>
</table>

While clipping (to simulate grazing) reduced the total yield of forage produced, it increased the pounds of protein produced per acre by 93 pounds or 52.6% on the unfertilized areas. Clipping with no fertilizer applied produced nearly as much protein per acre (270 pounds against 284 pounds) as was produced by harvesting the forage as hay where nitrogen was applied. Applying nitrogen and harvesting the forage by clipping practically doubled the protein yield per acre over harvesting the forage once during the season as hay on unfertilized land. The extra nitrogen applied after clipping was ineffective for the most part.

In a late sorghum planting (June 7, 1957) at Alemaya, the tall native sorghum produced 3306 pounds of oven dry forage compared with 564 pounds of forage for the dwarf 44-14 variety, but it did not produce any seed while the dwarf variety produced 1725 pounds of grain per acre. It is quite possible that such dwarf varieties may be quite useful in areas where the soil moisture season is short.

At the Central Experiment Station near Bishoftu, fertilizer application on teff growing on medium gray clay loam failed to have much effect on seed yields in 1957. This was at least partially due to the lack of soil moisture. In 1956 an application of two hundred pounds per acre of superphosphate increased the yield by 401 pounds per acre over the unfertilized area.
On the black clay soil at Bishoftu unfertilized teff gave a yield of 714 pounds of grain per acre while a 60 pound per acre application of nitrogen increased the yield to 924 pounds. Alfalfa on the medium gray soil produced 6430 pounds of air dry hay per acre while an application of potassium sulfate so as to furnish 20 pounds of potash gave a yield of 7388 pounds of hay. In 1957 fertilizers had little effect on the yield of rye grass because of a lack of soil moisture while in 1956 forty pounds of nitrogen per acre increased the yield of hay 2495 pounds over that produced on unfertilized medium gray clay loam. In 1957 fertilizers were ineffective in increasing the yield of wheat on the black clay soil. This was again due to lack of soil moisture. In 1956 twenty pounds of nitrogen and twenty pounds of phosphoric acid increased the wheat yield 321 pounds per acre over that produced on unfertilized soil. In general, fertilizers have had little effect in increasing the yield of sweet sudan on the medium gray clay loam soil at Bishoftu.

During the seasons of 1956 and 1957, thirty four samples of teff were analyzed for protein content. On an over dry basis the average was 10.08% with a range of 8.14 to 12.65%. Twenty samples of wheat from the same number of fields averaged 11.28% protein with a range of 8.23 to 14.42%. The shelling percent of thirty one samples of sorghum collected during 1957 showed an average of 83.9% with a range of 73.06% to 90.53%.

FIELD CROPS

by

Ben Jackson

The research work with field crops at the Central Experiment Station, Bishoftu, and at the Imperial Ethiopian College of A & M Arts, is designed to evaluate strains and varieties of crops for possible use by Ethiopian farmers. Crops that were tested include wheat, barley, teff, soy beans, oats, castor beans, corn, sorghums, grasses and forage crops.

The results of each test will be discussed briefly. A more detailed report may be obtained from the Imperial Ethiopian College of A & M Arts.

Wheat - Kenya 5, Kenya 1, Mida and Rushmore appeared to be the outstanding varieties. These varieties have consistently out-yielded all others tested for three years. They show excellent disease resistance, have a very strong stem (straw) and appear to have a fairly wide range of adaptation (based on reports from the Agricultural Technical School, Jimma, and the Agricultural Extension Service). A limited amount of seed of these varieties will be available to selected growers this year. It is hoped that there will be sufficient seed within two more years to supply most of the demand of farmers.

Barley - This crop was a complete failure at Bishoftu in 1957, but yielded
Combine harvesting a seed increase field of Kenya 5 wheat on the research farm at the Imperial Ethiopian College of Agriculture and Mechanical Arts.

Native workers harvesting a field of teff at the Central Experiment Station, Debre Zeit, (Bishoftu).
well at the college farm near Alemaya. The better varieties produced an average of twenty-five bushels per acre. As yet, a superior variety has not been found, and consequently, a seed increase program has not been initiated.

**Teff** - A date of seeding experiment was conducted with white teff, the principal bread grain in Ethiopia. Plantings were made on five dates in July and August. Each planting was made on the light gray soil of the Central Experiment Station farm as well as on the black soil which is typical of the soil on which most teff is grown. Three replicate samples were taken from each plot for yield determination. These samples were taken at random and were one meter by one meter square.

Surprisingly, the gray soil produced much better yields than did the black soil except for the last date of seeding which was made on August 7.

The early plantings on the gray soil were much better than the late ones and conversely, the last date on the black soil was much better than the early plantings.

One year's data are not sufficient to draw definite conclusions, however, the indications are as follows:

1. Teff seeded on the light soils in July will yield more than that planted on the black soils on the same date.
2. Teff may do better when planted in July than in August. (August is the usual planting date for teff in the Bishoftu area).

The highest yield for the gray soil was the first planting made on July 10th, 3030 kilograms per hectare, and the lowest was the last planting on August 7, 1957, 1560 kilograms per hectare.

The black soil produced the highest yield on the last date of planting, 2550 kilograms per hectare. The next to last date July 31st was lowest with 770 kilograms per hectare.

As an average for the five dates, the gray soil produced 2290 kilograms and the black soil 1330 kilograms per hectare.

**Soy Beans** - This crop should be of real value to the Ethiopian people, particularly during the extended fasting periods preceding Easter, since the seed is high in protein and oil. Three years of data from the Central Experiment Station show that the S-100 and Ogden varieties are the best of those tested, with yields of fifteen bushels per acre. The test at the Imperial Ethiopian College was not harvested due to poor stands and very little growth. Another attempt will be made in 1958 to determine whether this crop is suited to the Harar Province area.
Oats - Very few oats are grown in Ethiopia at the present time. However, it is the feeling of research agronomists that new, improved varieties should meet with the Ethiopian farmer's favor. Yields of up to 90 bushels per acre were obtained at the Central Experiment Station and 75 bushels at the college farm. The Andrew variety appears most promising at both locations.

Castor Beans - Some of the introduced combine types of castors from the United States appear sufficiently well adapted to warrant detailed testing in 1958. The Connor variety appears to be the highest yielder.

Corn - The corn test was confined to the college research farm near Alemaya since corn is not widely grown in the Bishoftu area and previous tests at the Central Experiment Station were disappointing. The corn test at the college farm produced reasonably good yields although not nearly as good as those reported from the Agricultural Technical School near Jimma. It appears that the Ethiopian selections are better than the introduced varieties tested. An Ethiopian selection from the Jimma school produced 53 bushels per acre and was the highest yield in this test.

Sorghums - The sorghum test was conducted at the college research farm. An Ethiopian selection from Sidamo Province ranked first in yield with 1278 pounds per acre. As was the case with corn, the introduced types did not appear to be well adapted to Ethiopian climatic conditions.

Grasses - Numerous species of introduced grasses were tested. Weeping Lovegrass appears to be the most promising, but it is doubtful that the average farmer would be willing to undertake the laborious task of keeping the weeds removed from around this grass until it became established. The species of indigenous grasses appear to be more promising than any of the introduced types which were tested.

Legumes - Alfalfa appears to be the most promising legume crop. It has been able to withstand the prolonged drought which occurs at the Central Experiment Station each year. It makes a quick recovery as soon as the big rains begin and produces a large amount of forage during the rainy season. The most promising variety appears to be Oklahoma Common.

Other Tests - Date-of-seeding tests were conducted at the Central Experiment Station on soy beans, wheat, barley and teff. In 1957, the best yields of seed were produced from crops planted considerably later than those of local farmers. For example, the barley variety, Magi, produced forty bushels per acre when sown on July 25th, whereas it was a complete failure when planted July 1.

Wheat Observation Test - A set of the 398 varieties of wheat which were used in the International Wheat Rust Nursery, sponsored by the United States
Department of Agriculture, were obtained from Dr. Vettoria Nostasi, Ministry of Agriculture, Asmara, Eritrea. This seed was divided in half and observation rows were grown at both the College research farm and at the Central Experiment Station, Bishoftu. Ninety three different selections were harvested from these tests. The selections will be grown in an advanced test in 1958.

Seed Increase - Pure seed increases were made of Kenya 1, Kenya 5, Fortunato, Mids, Rushmore and Lee varieties of wheat. The amounts obtained ranged from five hundred bushels each of Kenya 1 and Kenya 5 to fifteen bushels of Lee. This seed will be sold to interested growers at market price in order to encourage acceptance by farmers.

HORTICULTURE

by

Hugh Hedger

Approximately 160 varieties of vegetables were planted to observe their adaptability to conditions in Ethiopia. Seeds were obtained from Ethiopia, The United States, Israel, Italy, England, Canada, Denmark, and Guatemala. Test plots were planted of snap beans, lima beans and dry beans, garden peas, carrots, radishes, lettuce, cabbage, tomatoes and pepper. Many of the vegetables tested have shown promise of being adapted to rather heavy production under Ethiopian conditions. Seed of several of these better varieties will be increased in 1958.

Strawberry plants of unknown origin were obtained from the Agricultural Technical School at Jimma and are producing heavily, and have shown remarkable drought resistance.

Dry Beans - Forty five varieties of dry beans were tested. Most of the varieties were from seed obtained from Guatemala in 1954. They have been previously grown for observation and to increase the seed for use in test plots. The two highest yielding varieties are black seeded. There, the question arises as to whether there can be enough demand for black beans to make it worth while carrying them in the tests and increasing the seed. The third highest producer is a round, cream colored bean that produced 3674 pounds per acre and showed promise because of its desirable color. Five local varieties were obtained at various locations in Ethiopia and were found to rate lower than all the Guatemalan varieties. Two U. S. varieties, Red Kidney and Mitchel, were found to be no better than local varieties. The local varieties and U. S. varieties were severely damaged by leaf rust as well as several of the Guatemalan varieties. Some anthracnose was observed on a few varieties. The eleven highest yielding varieties showed little or no rust damage and no signs of anthracnose.
Professor Hugh Hedger inspects a field of young beans on the research farm at the Imperial Ethiopian College of Agriculture and Mechanical Arts.

A section of the experimental vegetable garden at the Central Experiment Station, Debre Zeit, (Bishoftu).
Lima Beans - Nine varieties of bush lima beans were obtained in small quantities from the U.S. Southern Trials Seed and observed along with U.S. 253, Burpees, Fordhook and Hendersons. Equal portions of each plot were picked as green shell beans and the rest of each plot was used for seed increase. The Southern Trials variety No. 12 and U.S. 253 were the most outstanding of the 12 varieties tested. However, plots were too small and only one year's observation is not enough to begin to formulate results. There appeared to be no particular disease problems with the limas. Limas show very good drought resistance and were still bearing to some extent when they were plowed up eight months after they were planted. One variety of pole limas, King of Garden, planted so it would climb on nearby shrubs, is still bearing profusely fifteen months after being planted, having survived light frosts in December 1956, January 1957 and January 1958. The only lima beans on the local markets are the large, speckled pole types and they have not been planted yet at the experiment station.

Snap Beans - Wade Bush green beans, with a yield of 3276 pounds of green snap beans for four pickings, was the outstanding producer of the 23 varieties tested. This is the first time this variety has been planted. Another high producing variety planted for the first time in 1957 is Variety B3370, obtained from the U.S. Southern Trials. The snap beans were planted in two replications, of two row plots ten feet long, because of a lack of seed. They were harvested four times and then left for seed increase. Enough seed was harvested to permit larger plantings in 1958. Refugee No. 5 has been planted for three consecutive years at the Central Experiment Station, Bishoftu, and has been the top producer there but was third highest in the small test at the Imperial Ethiopian College farm, Alemaya. Other snap beans showing good production are five other varieties obtained from the Southern Trials and the Contender and Pencil Pod Black Wax varieties. Six varieties obtained from Denmark showed only moderate production.

Tomatoes - Manalancie, a U.S. variety, and Marmande, a variety from Israel, showed greatest promise of the new varieties planted for the first time in 1957. Of the varieties planted previously at the Central Experiment Station and during 1957 at the College farm, Rutgers is still the outstanding variety, with Firesteel giving good production even though it has been extremely dwarfed. These have only been under observation with occasional weighed samples taken. Therefore, no definite conclusions have been drawn except that the above mentioned varieties definitely show higher production possibilities than the local cherry types of unknown origin and the Ponderosa type that was supposedly introduced by the Italians.

Cole Crops - All of the cole crops do exceptionally well in Ethiopia. Broccoli is perhaps the more prolific of this group, and cabbage produces well except that there is no uniformity of head size. Cauliflower grows
and produces well but is lacking in foliage sufficient to protect and bleach the cauliflower. Kohlrabi produces remarkably fast but becomes overmature and fibrous very quickly after reaching edible size. Two or three years of test records should do much toward determining variety qualifications.

**Pepper** - Seven varieties of pepper of the sweet type were planted and found to produce well. Elephant Trunk is obviously the more prolific variety, though no weights have been made to determine the variety that provides the heaviest yield. One very interesting thing that was found is that this planting survived several frosts and temperatures that dropped to $-3^\circ C$ for short periods. These plants are still producing well after eight months.

Most other vegetables have been planted in various quantities though little work has been done to collect data as the vegetables have been placed in field plantings to supply the school cafeteria rather than in plots for data. Almost all vegetables do very well and produce within a reasonable time. Onions grow well and rapidly but seem to lack the proper length of day to make large bulbs. Garden peas and southern peas grow slowly but eventually produce large plants with few pods.

**EXPERIMENTS IN UTILIZATION OF LOCAL PLANT DERIVATIVES AS INSECTICIDES**

by

Robert Hill

The biological department at the Imperial Ethiopian College of A & M Arts has begun experimental work on the utilization of local plant derivatives as insecticides.

The most important modern insecticides are synthetic organic compounds. However, if a practical insecticide could be obtained from common plants it would be of considerable importance to Ethiopian agriculture. Aside from their peculiar values as contact poisons with practically no residual effects, plant products could offer an inexpensive method of reducing the annual loss of crops to insect pests.

Preliminary investigations indicate that the Genera Datura and Euphorbia possibly have important insecticidal qualities. Meanwhile, a thorough search is being conducted for other plants that could be even more promising.

Experiments are now being planned for the next growing season with the object of devising practical methods of extraction and application of insecticides obtained from the above mentioned plants.
ANIMAL HUSBANDRY

By

Dr. K. K. Keahey and Delbert Whitenack

Cattle - The Animal Husbandry Department of the Imperial Ethiopian College of A & M Arts feels that the first step in a cattle breeding program for Ethiopia is in the improvement of the animals native to the country. Consequently, the college is working primarily with Zebu cattle, various strains of which are found throughout Ethiopia. The improvement program includes selection upon beef merits, feeding trials and proper management.

In March, 1957, the college purchased forty eight females and two males which were selected from the better herds of the Somali tribes in the Jiggiga area of Harar Province. For many generations, the Somali herders have selected their service males upon performance merits. Their cattle are more uniform in size, are of medium bone, deeper bodied and their general body conformation is superior to cattle in the highland areas of the country. It is planned to purchase an additional 150 females and four to five males to complete the foundation indigenous Zebu herd at the college. As the improvement program progresses careful selection will be made of the better animals and the culls slaughtered for consumption in the college cafeteria. Replacement heifers will come from the offspring of the original herd.

Although the Somalis use the milk from their cows for food, and have through generations increased the milk supply from their herds, the Zebu cattle are not potential heavy milk producers and the college herd will not be milked.

In order to provide a sufficient fresh milk supply for use in the college cafeteria, the Animal Husbandry Department plans to import thirty to forty head of purebred Holstein-Friesian females and five to eight males from Kenya. It is believed that the Kenya animals will be better acclimated to conditions in Ethiopia. Such a herd would also produce purebred bulls for a crossbreeding program for the improvement of the indigenous stock for milk production.

The improvement of the indigenous cattle for beef production and the up-grading through crossbreeding for milk production is a long range program of at least ten years.

Sheep - The Imperial Ethiopian College of A & M Arts has also started a foundation herd of sheep consisting of 71 ewes and three rams purchased from the Somali herdsmen in the Jiggiga area. As with their cattle, it appears from observation that the Somali's have also bred for uniformity of their sheep, at least in size and color. The sheep are of medium size,
Some of the animals in the cattle herd at the Imperial Ethiopian College of Agriculture and Mechanical Arts.

Prof. Delbert Whitenack inspects a young lamb in the flock of Samoli Sheep at the College.
having a modified fat tail, covered over the body with white hair, and with black hair over the head and neck. They have a high fertility rate, but rarely produce twins. They are hearty and very resistant to the local infectious diseases. Due to availability and the reasons stated, it was decided to purchase this type of animal for the foundation breeding stock at the college.

The purpose of this indigenous sheep program is to improve the breed through careful selection, proper feeding methods, and proper management; and, at the same time an effort will be made to standardize one good breed of indigenous sheep for Ethiopia. By cross-breeding with an imported wool type sheep, the indigenous animals can be made to produce wool, and carcass quality improved, thus giving the Ethiopian farmer two sources of income, that from the wool and mutton.

Both the sheep and cattle will be put on feeding trials using local feeds and feeds grown on the college farm. A similar number of animals will be fed only grass for control. These two classes will be compared on rate of gain, carcass quality and price received when sold.

A cattle barn, 30x6 meters has been completed and is now in use in the college breeding program. This building was constructed by student labor under the supervision of the Animal Husbandry Department. A sheep barn of the same dimensions is also being erected.

POULTRY

by

Otis S. Adams

It has been estimated that 85% of all meat and meat products consumed in Ethiopia is poultry and poultry products. This being true, and with Ethiopia situated as it is in relation to large population centers of the world, it would seem that a great deal of effort is justified on the part of the Imperial Ethiopian College of A & M Arts to establish a poultry operation that will meet the requirements of an expanding poultry improvement program for the country.

The poultry program at the college has been designed to meet the needs of Ethiopian poultry producers. The object is to provide a source of improved birds, along with reliable information as to the best methods of housing, feeding, marketing and management of poultry.

Realizing the importance of poultry to Ethiopia, it is certain that much good can be done by supplying improved chicks to farmers of the country. In addition, trials and experiments are being conducted in housing,
A 100 hen capacity laying house built entirely of local materials at the Imperial Ethiopian College of Agriculture and Mechanical Arts.

Professor O. S. Adams, College Poultry Instructor, selects heavy breed Rhode Island Red Cockerels for distribution to farmers in Harar Province.
feeding, brooding and disease and parasite control. As an example, the poultry department has constructed two laying houses for poultry from the same material used in the construction of native dwellings. Observations and comparisons are continuously being made as to the effectiveness of this type of house. Tests also are planned to determine the best ways of feeding local flocks. Some tests may be run in order to determine the response of the native fowl to good feeding, housing and management.

At the present time a 30 x 100 foot brooder house and a small hatchery building have been constructed at the Agricultural Experiment Station at Bishoftu. One thousand U. S. Record of Performance chicks were ordered from the United States, and out of this number, some 700 were raised. There are approximately 500 hens in the laying flock.

On the campus of the Imperial Ethiopian College of A & M Arts near Alemaya, four brooder houses were constructed in 1956, using student labor. In order to care for pullets that were coming into production, four frame buildings with sheet iron roofs and siding were constructed and it is planned to use these buildings in the future as experimental houses.

One thousand Rhode Island Red chicks were purchased from the Kigwaru Poultry Farm in Nairobi, Kenya Colony, during the early months of 1957. From this group of chicks has come the present laying flock of 350 selected pullets for the College. Cockerels have been distributed to farmers in exchange for the same number of native cockerels. Others have been sold direct to the farmers of Harar Province. Approximately three hundred cockerels have been distributed in this manner.

A central laying house, 6 x 34 meters constructed of concrete blocks, has just been completed. This house is being used to house the foundation breeding flock for the College. It is from this flock that hatching eggs are being secured for incubation in two, six thousand egg capacity incubators which have been set up temporarily in a portion of the laying house.

It is planned to continue the distribution of improved cockerels to farmers. In addition, the college will be able to hatch between five and ten thousand chicks per month this year to be distributed or sold direct to farmers. The poultry department of the College will be in a position to sell chicks of any age up to eight weeks. A cost of production figure will be established for the chicks that are to be sold and this will be the prevailing price for the same.

One thousand pedigreed eggs have been ordered from Denmark. Eight hundred are Brown Leghorn and two hundred are Rhode Island Red eggs. These
eggs are being secured in order to bring in new and improved blood lines for the present flocks of Rhode Island Reds and to establish a second breed of chickens for the college poultry farm. The Brown Leghorns will also be especially adaptable for use in an upgrading program among the poultry producers of Ethiopia.

It is planned to make the college poultry department the center for most of the production and experimental work in Ethiopia. With a few additional facilities the department can conduct the most needed tests and produce the poultry needed for distribution throughout the country. Centers such as the Central Experiment Station at Bishoftu will be used as growing and conditioning places for chicks supplied by the college. Then from these centers the poultry will be distributed to producers in whatever manner may be determined by those responsible for the service. The types of experimental work recommended for the Bishoftu Station and similar institutions is to determine the types and kind of housing suitable for the particular climate of the area and the best age for distribution of chicks.

In any program of distribution or sale of chicks up to eight weeks of age, it will be necessary to have some method of handling or using surplus stock. For the present, this problem is being met at the college by supplying the cafeteria with poultry and eggs. In addition, a good potential market for eggs and poultry is to be found in Harar and Dire Dawa. At Bishoftu the same potentialities in marketing surplus products are to be found as in Addis Ababa. Markets may be built up at both places without any cost to the program since it will be an easy matter to sell surplus products at a cost of production price. It is not the intent nor purpose to get the College or the Experiment Station into the commercial poultry business, but it is the objective not only to upgrade the quality of poultry and eggs in Ethiopia but also to point the way in finding and developing markets for an increased production program as well. As the program moves forward, it will be an easy matter for individual producers to take over markets that might be developed by the college.
METEOROLOGICAL DATA

Detailed information on the climate and rainfall of Ethiopia has been published in a previous edition of Agriculture of Ethiopia. The following table is a record of rainfall and temperatures recorded on the campus of the Imperial Ethiopian College of Agriculture and Mechanical Arts during 1957.

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<th>MAXIMUM TEMP. C°</th>
<th>AVERAGE MIN. TEMP. C°</th>
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<td>9.5</td>
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Total rainfall for 1957, 1028.2 mm
41.2 inches
A view of the farm area at the central Agricultural Experiment Station at Debre Zeit, (Bishoftu).
The third harvest since the beginning of operations at the Central Agricultural Experiment Station was completed in January, 1958. Research data have been reported by technicians of the Imperial Ethiopian College of A & M Arts elsewhere in this report.

During the year, negotiations were completed for a change of boundary for the farm. Approximately forty hectares of land on which several native families lived was exchanged for a similar tract which was unoccupied. The change will be advantageous to the Experiment Station since livestock owned by the natives were detrimental to crops during the growing season.

Numerous other improvements were made at the farm during 1957. A small nursery thresher was purchased which will eliminate considerable labor during the harvest season and will be a great help in maintaining varietal purity in harvesting test plots. A larger thresher, secured from the machinery pool of the Imperial Ethiopian Government, is being used to thresh larger crops. Other equipment added includes a 3-ton Thames truck, one heavy disk plow, one heavy disk harrow, one power plant, one welder, a gasoline engine for the combine, and one Landrover pickup in addition to numerous hand tools and small shop equipment. Buildings and structures added during the year includes two livestock barns, one chicken brooder house, one hatchery building, one grinding and feed storage building, numerous fences, cattle and sheep pens, working and loading chutes for livestock and a pump house.

A new water well has been drilled on the farm and a gasoline engine powered turbine pump installed which is capable of pumping thirty eight gallons per minute into a supply tank. Although the well appears to have sufficient water for irrigation, the pump is too small in capacity. Future plans include the installation of a larger pump on this well, or one of the other wells on the farm, and a larger storage tank. A water system has been installed to carry water to all barns, chicken houses, shops and fields where minor irrigation is required.

During the year, day laborers on the farm varied from as many as one hundred during the busy growing season to twenty in the slack periods. Ten students were hired to work during the summer school vacation. Permanent employees on the joint fund payroll varies from three to six. These include technical or semi-technical workers such as truck drivers, tractor drivers, mechanics and field engineers.

Ato Dagnatchew Yirgou, a graduate of Purdue University, has been named Co-Director of Agricultural Research and assigned to work with Mr. Bill Webb, Experiment Station Farm Manager, at Bishoftu.
The Agricultural Extension Service is an educational arm of the Imperial Ethiopian College of Agriculture and Mechanical Arts. Its purpose is to make a knowledge of improved farming practices and research information developed by the College available to farmers through trained Ethiopian agents stationed in agricultural areas throughout the country.

With the beginning of 1957, the Extension Service had an Ethiopian staff of twelve agents, two supervisors and twenty-nine trainees. At year's end, there were thirty-nine full-time agents in the field with fifteen trainees. Ato Hailu Mulatu had been appointed by the Ministry of Agriculture to work as a Co-Director of Extension with Mr. Lee C. Craig, the American technician.

During the year, six of the original agents, one of the old supervisors and one newly appointed supervisor were granted scholarships for one year's special training in extension methods at the American University in Beirut. The second of the original supervisors was given a year's leave of absence for study in the United States. Upon their return to Ethiopia, these men will be assigned to positions in the service.

Training - In selecting trainees for the Agricultural Extension Service an effort has been made to obtain men with, at least, a basic knowledge of the agriculture of the country. The first group of agents and trainees were required to have at least an eighth grade education. The newer trainees were required to have a twelfth grade education at either the Agricultural Technical School at Jimma, or, the Ambo Agricultural School.

During their training period, the prospective Extension Agents are taught the various phases of livestock production, such as; the breeding, feeding and vaccination of cattle, castrating and docking sheep, control of external and internal parasites, sheering and selection for meat and wool production. This training is received by actually working with the livestock under the supervision of American Technicians.

In short courses held at the Central Experiment Station in Bishoftu the trainees were given instruction in gardening, controlling harmful insects with insecticides, the operation and care of small improved farm implements, making practical and inexpensive equipment, improved practices in poultry production and management, constructing improved bee hives, soils and field crops and the proper use of small hand tools. Instructors for these short courses, two of which were held in 1957, were recruited from the American
Eight Agricultural Extension Agents were sent to the American University in Beirut, Lebanon for advanced study of extension methods. Boarding an Ethiopian Airlines plane are: Zewdie Chernet, Abayneh Tessema, Katabo Daksisso, Berhane Haile Selassie, Teferra Belayneh, Demeke Zellelew, Abraham Tassene and Haddis Wolde Yessulse.

A group of farmers attending an Extension Field Day at Fiche.
teaching staff at the Imperial Ethiopian College of A & M Arts, The Agricultural Technical School at Jimma and technicians in the various other agricultural programs of the U. S. Operations Mission to Ethiopia.

Following the second of these short courses, held in August, 1957, twenty-nine trainees who had completed a ten month training period were presented with certificates of award by the Vice Minister of Agriculture and assigned to posts as full time Extension Agents. Fifteen new trainees were assigned to work with the more experienced agents for on-the-job training in extension methods and experience in working with farmers. During the coffee processing season these trainees were assigned to work with the Coffee Processing Advisor of the U.S.O.M. and receive training in modern coffee processing methods. After completion of this training, they were scheduled to attend a four weeks short course in extension methods, animal Disease control and livestock management. This was in early 1958 before returning to posts in the field for additional on-the-job training.

Accomplishments - According to monthly reports, Extension Agents visited approximately five thousand individual farms to give assistance with a wide variety of problems during 1957. One hundred and two adult educational meetings were held with over nine thousand farmers attending. Provincial teacher-training short courses were held in six different provinces. During these short courses the Ethiopian Extension Agents explained their program and gave the teachers basic information which could be used in their classroom work with students.

Agricultural Extension Agents have organized sixty-eight Agricultural Youth Clubs with a membership of 8,233 boys and girls at schools in their service areas. Members of these clubs are assisted in establishing garden and poultry projects and given the necessary instruction and guidance for their successful operation. The club members are also taught other skills such as parasite control and better management of livestock, insect control, home sanitation and other health practices.

In assisting the Agricultural Youth Clubs with their school garden projects, Extension Agents furnish seeds and small garden tools supplied by the Extension Service, and teach the club members proper planting, spacing, cultivation, insect control and harvesting of a wide variety of vegetables. Members are encouraged to carry on individual projects at home. To establish club poultry projects, the Extension Agent designs a poultry house and supervises its construction by the club members themselves. Native hens are supplied by the club members and the Extension Service supplies heavy breed Rhode Island Red cockerels from the poultry flock of the Imperial Ethiopian College of A & M Arts for a progressive poultry improvement program.

Agricultural Extension Agents organized and conducted a number of successful field days during 1957. These events were given active support
An Agricultural Youth Club garden on the school compound at Dessie.

Agricultural Youth Club members working with a poultry project at Debre Zeit, (Bishoftu).
by Provincial Government officials and attendance by farmers was good. Field
days were usually held at locations where farmers could observe the results
of improved farming methods and demonstrations were given to show the proper
preparation of seedbeds for vegetable gardens, the proper width of rows and
spacing of seed in the rows, the use of small garden tools and control of
insects. Other demonstrations included the use of a simple barrel duster
for treatment of seed wheat to control smut, sheering of sheep, methods of
controlling livestock parasites, vaccination of livestock against infectious
diseases, the castrating and docking of sheep, and simple methods of erad-
icating leaches in ponds and streams where livestock drink.

Cooperation with other Agencies - As mentioned previously, the Agricultural
Extension Service furnished fifteen trainees to work with the U.S.O.M.
Coffee Processing Advisor during the 1957 coffee processing season. In addi-
tion to these men, five agents with previous coffee processing experience
were assigned to work as supervisors in the coffee processing centers.

The Extension Service has cooperated with the Livestock Development
Project of U.S.O.M. by assisting in the distribution and supervision of
Merino Rams and Holstein-Friesian bulls used in a breeding program with
native sheep and cattle.

In cooperating with the Animal Disease Control Project, agents of the
Agricultural Extension Service were asked to do educational work with farmers,
pointing out to them the advantages of vaccinating their cattle against rinder-
pest and contagious bovine pleuro-pneumonia. The agents then arranged dates
and times when farmers would have their cattle at a convenient place for
vaccination by vaccinators of the Disease Control Project.

The Agricultural Extension Service has also arranged field meetings
where the U.S.O.M. Farm Machinery Use Specialist could demonstrate improved
small implements such as steel plows, and harrows developed in the Point
Four Farm Machinery Shops. In addition to arranging the meetings and en-
couraging farmers to attend, agents of the Extension Service acted as
leader at such meetings and explained to the farmers the operation and ad-
vantages of such equipment as well as how the implements could be obtained.
The classroom and laboratory building at the Agricultural Technical School, Jimma. A similar building on the school compound houses administration offices and the school clinic.
The Jimma Agricultural Technical School is situated on a hill overlooking the city of Jimma, capital of Kaffa Province. The campus itself within the main compound contains the administration and classroom buildings, the storage buildings, laboratories, and housing facilities for the staff members. The campus is beautifully landscaped with many varieties of flowering plants which bloom the year around, many fruit and shade trees, and special lawn grasses. Since the elevation is moderate for the country, about 5,600 feet, and since the temperature varies throughout the year from approximately 80 degrees down to 40 degrees with a light frost occurring only once every two or three years, the gardens which furnish vegetables of all kinds for the students and staff are in production continuously throughout the twelve months of the year. The campus also houses the coffee processing facilities conducted by the students, as well as brooder houses and incubators for chick production.

Surrounding the immediate campus of the school is the remainder of the gasha of land granted to the school by the Imperial Ethiopian Government. It stretches from the hill-top downward across a small river valley, giving a variety of terrain for experimental crops of all sorts. Experimental plots for vegetables, field crops, fruits, and coffee are located strategically over the land. In addition, a barn and out-buildings within a pasture area provide the means for an experimental herd of cattle, for the care, breeding, and slaughter processing of cattle, for care and breeding of sheep, for the processing and storage of all kinds of feed, and for the propagation and care of experimental flocks of chickens. An implement shed protects different kinds of tractors and tractor implements, which the students learn to drive, operate and service. In the same area is the shop building, which houses the equipment for instructing in the different kinds of welding, in cement work, in carpentering, in metal work, in soldering, in blacksmithing, in the use and care of measuring instruments, etc. The school utilizes the fresh water from three deep water-wells on the property for drinking and cooking, but water for irrigation of school crops and gardens is pumped up from the river bed below.

The instructional facilities of the Jimma Agricultural Technical School are greatly enhanced by the use of the Giran Farm, placed at the disposal of the school by the Imperial Ethiopian Government. This farm, located in the country beyond the city of Jimma, near the site of the ancient city of Giran, gives much needed land for conducting experiments in coffee, in row crops, in field crops, in propagation of plants of all kinds. For instance, in 1955 alone 120,000 coffee seedlings were produced which were made available to Ethiopian coffee growers. On the school and Giran lands, some forty nine varieties of coffee have been collected from many parts of the world for purposes of comparative study: Brazil, Guadeloupe, Guatemala, Kenya, Uganda, Sumatra,
Tanganyika, Surinam, Ceylon, Eritrea, and Ethiopia itself. Experimentation includes work in the processing of this coffee, in both dry and wet methods of coffee decorticating.

The 1957-1958 school year opened September 30, 1957 to begin the 6th year of operation at Jimma. Enrollment figures are given by grades:

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</tr>
</tbody>
</table>

In addition to training in technical agriculture, students have been given subjects in general education to give them a better background for productive citizenship. A well rounded recreational and physical education program has been offered to insure better health and morale among the students. Highlighting the sports activities was the football (soccor) competition with the All Star Police team from Kaffa and Illubabor Provinces. The J.A.T.S. team won by a score of 9 to 2. This was considered the most skillful game played in the history of local sports federation. Students are encouraged to participate in other extra-curricular activities such as music, art, leather craft, and the school newspaper. Theatrical performances are also given by each class during the school year.

The research program of the school is made possible because of the active participation of students in the various projects. Emphasis has been on "learning by doing" in the various fields of agriculture.

The physical plant has been enhanced by the renovation of the assembly hall and the construction of a new farm mechanics building. New land has been placed into cultivation for irrigated gardens.

Of particular satisfaction is the fact that several students are acquiring land in the Kaffa province for future land development.

A summary report on research projects, given by staff members concerned follows:
The following statements are a brief narrative, summarizing the experimental, field, and observational plantings of various crops by the Agronomy Department of the Jimma Agricultural Technical School for the year of 1957. Detailed charts and tables showing results of the various experiments may be had by writing to the school.

Cereals - Since corn is one of the major grain crops of many sections of Ethiopia and is very important in the Jimma area, much of the research activities have been devoted to this crop. The methods of culturing corn in Ethiopia vary widely, and it is believed that some improvements could be made for the Jimma area. The Agronomy Department, with the help of student assistants, has devoted considerable effort in determining improved production techniques and demonstrating them to the local farmers.

1. Broadcasting versus Row Drilling of Corn.

For the second consecutive year a controlled experiment was conducted to compare the broadcast method of planting corn with the row drilling method. The local farmers broadcast their seed when planting and use the regular plow to cover the seed and to cultivate the crop. This broadcasting results in an uneven distribution of the seed, and the regular plow causes considerable damage to the root system during cultivation by pruning the feeder roots. Both of these factors can result in decreased yields as compared to other cultural practices.

In the experiments two areas, 13 x 65 meters, were prepared for planting. One area was broadcast by a local farmer who is employed by the school. Approximately seven times more seed was required to plant this area than was needed to plant the row-drilled area. The row-drilled area was hand planted in 1 meter rows which were made with the regular oxen plow. Both areas were cultivated with the oxen plow. Eight replications were harvested from each area. The row-drilled corn yielded 55.2 bushels per acre while the broadcast corn yielded only 33.7 bushels per acre. This gives a two year average of 64.0 bushels per acre for the broadcast method of planting. The average stalk size for the row-drilled method was 3.30 centimeters as compared to 2.58 centimeters for the broadcast corn.
A comparison of stalk and ear size of row planted and broadcast planted corn in the experiments conducted at the Agricultural Technical School.

A comparison of yields of row planted and broadcast planted corn in the experiments at the Agricultural Technical School.
The stalks of the row-drilled corn appeared much healthier and were more resistant to lodging and pink stalk rot. The plants in the row-planted area showed less susceptibility to leaf rust. In checking the plant population of the two areas, it was found that the broadcast corn contained an average of 31,475 plants per acre, while the row-planted corn contained only 19,220 plants per acre. There were 7.8 percent lodged plants in the row planted corn while 20.9 percent of the plants lodged in the broadcast corn.

In connection with this experiment, three local farmers have expressed interest in trying a small area on their farms to the new method of planting corn and are working with the local extension agent in obtaining information on how to plant in rows. As well as conducting the demonstrational experiment, the department with help of student assistants has constructed some simple tools which are adaptable to the oxen plow in order to encourage the farmers to try this method of planting corn. A simple and crude wooden box type planter has been constructed and used with a fair degree of success. The wooden box fits on the tongue and handle of the plow, and a spring operated trap door drops the seed when the farmer pulls the string attached to the plow handle. By planting every other row made by the oxen plow, the corn will be spaced in approximately 1 meter rows. Also, a simple cultivator attachment has been made for the plow which will reduce the depth of plowing and therefore will not prune as many of the feeder roots of the plant.

2. Rate of Planting Experiment.

On the assumption that the row-drilled method of planting corn would be tried by the local farmers, this experiment was designed to answer the likely questions regarding the spacing of the corn in rows. Six spacings ranging from 10 to 50 centimeters were planted in replicated 3x8 meter plots on April 16, 1957. The 50 centimeter spacing required 9.1 kilograms of seed per hectare and the 10 centimeter spacing required 43.5 kilograms of seed per hectare. The yields progressively increased with the closer spacing and heavier planting rate with the 10 centimeter spacing yielding 6,244 kilograms per hectare. The plant population ranged from 8,097 plants per acre in the 50 centimeter spacing to 40,488 plants per acre in the 10 centimeter spacing. This data is based on one year's results and should be repeated several times before any conclusive evidences can be shown.

3. Corn Variety Test.

Again this year a corn variety test was conducted with 13 corn varieties planted in four replicated plots of 3x8 meters. The measured results were not
considered to be too reliable because of an unusually severe hail storm on June 7, 1957, which practically stripped the plants of their leaves. Introductions from Brazil, Kenya and the U.S.A. were compared with the local selections. Some of the Kenya varieties were comparable to the local varieties, but it appears that the Ethiopian varieties are superior to any introductions that have been made to this date. There are other areas from which introductions should be tried, especially from countries such as Colombia, S. A., where the climatic conditions are similar to those found in Ethiopia. However, it appears that much could be done to improve corn yields through a good selection program for superior yielding local corn.

4. Proposed Residue Management Experiment.

Locally most of the residue from the corn fields is removed or burned before seedbed preparation for the next crop begins. A test was established on the row-drilled and broadcast corn areas to study the effect of various residue management practices. Each of the two areas was divided into three 13x20 meter plots for this test. On one plot the residue was completely removed, on another the residue was burned, on the third the residue was left to be turned under as a check on the other two systems of handling the residues. These plots have been permanently established, and these practices will be continued for several years. This test was initiated to study the results of burning, removing, and plowing under the residues produced on each of the respective areas. This will be a long range test but may give some rather interesting as well as useful results for future use.

Teff.- Since teff is one of Ethiopia’s major crops, it deserves a great portion of research. There are a number of varieties of teff which presumably stem from a distinct white variety and a distinct red variety with many variations as a result of years of mixing. Eight teff selections were planted in replicated plots at Jimma this year. The results show that there are many variations of plant characteristics (glume color, height, stiffness of straw, color of grain, and other characteristics associated with fruiting) as well as considerable variation in yielding ability. The top yielding selection, a white seeded type, produced 2,236 kilograms of grain per hectare while the lowest yielding selection, a red and white mixture, produced only 1,301 kilograms of grain per hectare. With continued selection and testing it is very probable that a superior strain can be selected which will be a very good yielder as well as having other desirable characteristics such as resistance to disease and lodging.

An exploratory teff fertility experiment was conducted to determine if more detailed fertility studies might be useful. Results of the test indicate that applications of fertilizer materials can increase the yields of
Mr. I. E. Sigenthaler and Charles Wilson, left, instructors at the Agricultural Technical School, inspect an experimental wheat plot on the Giran Farm near Jimma with a group of visiting Point Four Officials. Left to right, the officials are: Dr. Herman Kleine, Point Four Director for Ethiopia, Mr. E. N. Holmgren of the Washington Point Four Office, Mr. Bonnie Nicholson, Principal Representative of Oklahoma State University and Ato Mulatu Debebe, Ethiopian Co-Director of the Agriculture Program.

A comparison of teff yields in the experiments at the Agricultural Technical School.
Additions of nitrogen, phosphorus, and potassium were applied singly and in combinations. Additions of nitrogen and a nitrogen and phosphorus combination gave yields very close to a complete fertilizer consisting of ammonium nitrate, superphosphate, and muriate of potash. Additions of muriate of potash alone gave very little increase in yields substantiating the soil tests which show that most of the soils in this area contain sufficient potash for most crops. Phosphorus alone increases yields considerably, but it is believed that nitrogen would be the first limiting plant nutrient. Further work with various levels of fertilizers should prove useful for future reference.

**Wheat** — Although the immediate Jimma area would not be considered as a wheat producing area, wheat can be found growing at higher elevations only short distances from Jimma. Wheat has been observed growing between elevations of 1,890 and about 2,600 meters in the surrounding highlands. This wheat very rarely reaches the Jimma market and is generally used for home consumption either as breads or for brewing purposes. Wheat sold on the local market is generally brought in from Shoa and other provinces and the transportation costs increase the cost of the grain considerably. Although the Jimma area will probably never become a competitive producer of wheat, it is believed that a reasonable amount could be produced locally with added savings to the farmer.

A wheat variety test was conducted at Jimma for the second successive year with the hopes that a good yielding, high quality, disease resistant variety could be found and recommended to the local farmers. The yields produced were not as high as those reported in other areas, but it is felt that production is adequate to justify efforts of producing wheat. The test indicated that introduced varieties were superior to the local wheats in the Jimma area, Kenya 1, Fortunato, Mida, and Kenya 5 produced 2,062; 2,029; 2,010; and 1,944 kilograms of cleaned wheat per hectare respectively with moderate susceptibility to leaf rust and with 4 per cent or less lodging. The closest indigenous wheat was a local selection No. 1 while 85 per cent lodging was counted for the H.R.S. variety.

Other wheats were selected this year from the Nada area east of Jimma and will be included in next year's variety test to see if they are superior to those already grown locally.

**Barley** — Six varieties of spring barley were planted in a replicated test on the school compound. The varieties planted were Trial (CI No. 9538), Forest (CI No. 9187), Mars (CI No. 7015), Vantage (CI No. 7324), Parkland (CI No. 10,001) and Peatland (CI No. 5257). All varieties were planted on June 10, 1957 and emerged to a good stand. They looked very good for the first 2½ to 3 weeks until they became infected with a cereal blight. None of the varieties demonstrated any resistance to leaf rust. The Mars variety was the only one to produce an appreciable amount of seed and it
Soybeans - Oil Crops: A soy bean variety test consisting of twelve oil varieties was planted this year. Six of these varieties were tested last year. As in previous years the soybean plant seems to be very well adapted to the Jimma area. The varieties under testing were planted on May 29, 1957 in four replications of 4x10 feet plots with the rows spaced twelve inches apart. The Ogden variety was again one of the top yielding varieties with an average yield of 42.9 bushels per acre or 2,698 kilograms per hectare. Other high yielding varieties were C.N.S., Lee, Improved Pelican, D-29-2524, and Jow with yields of 42.0, 36.5, 36.2, 25.9, and 35.5 bushels per acre respectively. Not only does the soybean offer a possible cash crop but could be a valuable crop to include in a crop rotation in this area. It also shows promise in being a valuable green manure crop for use in coffee plantations as well as a cover crop for the rainy season to prevent erosion of the sloping hillsides. Soybeans have a longer growing season than horsebeans and field peas and therefore would offer protection for the soil for a longer period of time.

One edible variety of soybeans (Manrota) was planted this year and yielded 1,517 kilograms per hectare. More of the edible type of soybeans will be included in next years variety testing experiments.

Several farmers in the Jimma area have expressed an interest in the soybean crop and small amounts of seed from the field increasements have been given to them for trial. The farmers are obtaining help on inoculation, planting, cultivating and harvesting of the soybeans from the local extension agent. The more promising varieties of both oil and edible soybeans will be increased next year so that seed will be available to any interested parties.

Castor Beans - Oil Crops: Six new varieties of castor beans were received from Oklahoma State University and were planted in observation plots at the Giran Farm. The varieties were U.S. 3-384-8, Dawn, Baker 296, USDA 65, Custor and Cimmaron. All varieties were planted on May 11, 1957, and emerged to a good stand but by the middle of the rainy season began to show considerable damage of a leaf blight. In the early fruiting stages all varieties suffered from a fruiting blight. Therefore, very little mature fruit was collected from any of the varieties. Attempts were made to bag some of the individual fruiting branches to keep the seed pure but this attempt failed due to a very high average humidity and an unsatisfactory type of bag.

Locally the wild castor bean has been observed to exhibit a wide range of plant characteristics. These indigenous species range from very short
(dwarf) types to the extremely tall growing trees of twenty to thirty feet tall. It is believed that, if time permitted, a great deal could be accomplished by making some selections from the local disease resistant castors. However, due to the perennial growth habit of the castor bean plant in this latitude the observation plots of last year will be cut back and allowed to grow for observations in the coming year.

Other Oil Crops - Observation plots of Sesame, Noog, Rape, Safflower, and Sunflower were planted to study their growth and fruiting habits in this area. These plantings were made primarily for instructional and observational purposes in studying their characteristics.

Miscellaneous Crops - Crotalaria - Crotalaria incana is an annual legume found growing frequently in abandoned fields and waste areas in the Jimma area. It is unpalatable to livestock but due to its rapid rate of growth, it may have possibilities as a green manure crop. Some seed of this species was collected and planted in twelve inch rows for observation. The seed was planted on April 5, 1957, and by the middle of July the plants averaged a height of about 275 centimeters. This same species in the wild state seldom reaches more than fifty centimeters in height.

Buckwheat & Green Mungbeans - Buckwheat (Fagopyrum esculentum) and Green Mungbeans (Phascolus aureus) have been grown at the Jimma station during several different times of the year. Both crops show promise not only as an edible cereal and legume respectively but as very good fast growing green manure crop. Either crop may be planted at the end of the rainy season (sometime in September) and mature fruit can be harvested the latter part of October or November. Also, they may be planted again during the short rains in February and turned under as a green manure crop preceding such mid-season crops as teff and wheat.

Other Miscellaneous Crops - Observation plots of Seradella, Fitche cowpeas, vetch, and several local spices were planted to use as an aid to classroom instruction in studying plant characteristics and classification of plants.

Much progress toward a fully equipped soils laboratory was made during the year. Three new laboratory benches were constructed and installed. The benches provide needed working space as well as storage for the equipment. Also, a shipment of laboratory supplies including chemicals, a complete Kjeldahl apparatus, soil dispersing machines, a vacuum pump for use in making total exchangeable cation and total exchangeable base determinations, an air compressor and flame photometer, and some badly needed glassware was received and is now in use.

The laboratory will be used primarily as a co-ordinating study for research with coffee and other important agronomic crops. However, some
Professor C. A. Wilson and Ahmed Mohamed, a student assistant, at work in the soils laboratory at the Agricultural Technical School.

Another view in the soils laboratory showing equipment used in analyzing samples of soil.
students who have a special desire to learn something about soils will be trained to do the technical work necessary in the efficient operation of a soils laboratory.

A complete general analysis of any particular soil is now possible. Determinations of texture, percentage of organic matter content, pH (the degree of acidity or basicity), total exchangeable cations, total exchangeable bases, total nitrogen, available phosphorus, total phosphorus, available and total potassium, calcium, magnesium and sodium can be readily made. Also, the available iron and manganese contents of soils and plant materials can be made. These analyses are in addition to such analyses as percentage of pore space, specific gravity, percentage moisture content and other physical measurements.

The Jimma herbarium has expanded considerably during the year with an addition of about one hundred species to the collection. These collections include local grasses and legumes as well as some of the undesirable vegetation that competes with the cultivated field crops. Some of the indigenous species of legumes (Trifolium, Indigofera, Crotalaria, and Medicago) that were collected this year appear to be promising as possible forage subject and certainly merit more study and observation with this objective in view.

**Student Participation** - The practical training program has contributed much to the effective continuation of various research projects at Jimma. The Agronomy Department has three student assistants under its direction. One college sophomore student, Yohannis Negash, has been helping with the various tasks connected with the setting up and operation of the soils laboratory. Two other college sophomore students, Getachew Tekelchaimanot and Tsagga Amlak Worku, have assisted with the various field projects and have conducted one research problem on the variations of coffee yields in relation to hulling losses. These boys have also assisted with the various work leaders in the harvesting of experimental plantings. They have also played a major role in the construction of the simple field equipment adaptable to the oxen plow. This student participation is not only valuable in helping to conduct research but is of great value as a practical application of approved agricultural practices. This work program is used as a teaching aid in conjunction with classroom studies and is considered as a great asset in the training of Ethiopia's young agriculturalists.

**COFFEE INSTRUCTION**

By

Hugh F. Rouk

Coffee instruction has continued along the lines as covered in previous reports:
(1) Seed Selection and Processing

(2) Nursery Management

(3) Plantation Management
   (a) Forest Coffee
   (b) Sun Grown Coffee

(4) Processing and Marketing

The objectives are to give the student a better understanding of proper management of the coffee tree to insure better and more economical production, and to handle the coffee in such a manner that the market quality will be improved.

Experimental projects at the school are very useful in giving students practical experience in coffee culture and processing. The nursery program of the ICA Coffee Production Project also gives the students of the Jimma Agricultural Technical School valuable experience. A work unit for processing coffee by the caustic soda method has been made available to the school by Dr. Don Shuhart, ICA Coffee Processing advisor, and is very useful in training students. The forest of His Excellency, Ras Mesfin Selashi, located near Jimma, has been the source of valuable training and research materials. Frequent visits to coffee developments and marketing centers such as Agaro, Lemu, Gore and Mizan Teferi have provided good instructional material. Much of the instruction is carried on in the field and laboratory where the student gains much practical knowledge.

Coffee Processing Methods are tested in the Laboratory - Because of the bad reputation Ethiopian coffees have experienced on the world market, much attention has been directed to the proper handling of the coffee beans. One of the primary objectives has been to impress upon the student that one cannot judge the quality of the coffee bean by simply looking at it. The important test is the flavor of the brew made from the roasted beans.

This year students of the coffee class were required to process coffee cherries in various ways and to make comparative tests to determine the market quality.

Methods used were:

(1) Dry cherry

(2) Fermentation
Professor Hugh Rouk, Director of the Agricultural Technical School, operates a small coffee roaster in the laboratory on the school compound.

Businessmen and local coffee handlers in the Jimma area are invited to the Agricultural Technical School to compare the flavor of coffee brewed from the various grades of berries found on the Jimma market with that from scientifically processed coffee.
(3) Chemical Processing

(a) Caustic Soda (.5% NaOH)
(b) Lime (CaCO₃)
(c) Ash (K₂O active ingredient)
(d) Lime and Ash combined

In these experiments only ripe cherries were used. Each sample was carefully handled so that undesirable flavors did not come in contact with the coffee. All samples were dried on trays and were stored in clean containers. For comparison of these processing methods with those followed locally, a number of samples were purchased from the Jimma market. Local processors were also invited to submit samples of their best quality for comparative studies. All samples were roasted in the school's coffee laboratory. A brew was made by placing a measured quantity of the ground roasted coffee in a cup and adding boiling water. In about ten minutes, the coffee was ready for testing. Each student is permitted to taste the coffee samples and record his evaluation of the quality. Local processors were also invited to participate in this project. After the coffee samples are evaluated on the basis of flavor, the original sample of green coffee is studied to determine the relationship between physical appearance of the cleaned coffee and the flavor of the roasted beans. One processor agreed that a sample submitted by his firm and which was advertised as "Top Quality - hand picked" actually "tasted awful!" Although he had been sold on washed coffee because it brought a better price, he had never experienced the difference in flavor of the washed coffees.

Conclusions of the students who participated in these experiments are somewhat as follows:

(1) Dry cherry coffee, if properly picked, dried and stored in clean containers will yield good quality coffee. Coffee samples purchased from the local market, however, had a strong groundy flavor and it is evident that the usual market coffee does not measure up to the standard of coffee processed at the school.

(2) Washing methods are more exacting in requirements and as a result yield better quality coffee. Red cherries are necessary and the processing procedures are such that good quality coffee can be expected. The main objection to this method was the time required for fermentation. Also the fact that fermentation was complete and the parchment was ready for washing at odd hours of day and night. Some students thought it rather inconvenient for coffee to be washed at 4 o'clock in the morning!

(3) Students preferred Caustic Soda for chemical processing because
it was easy to prepare and could be done quickly. Lime and Ash yielded good quality coffee but lacked the convenience of the Caustic Soda method.

It was generally concluded that if properly done the various methods will yield considerably better quality coffee than is normally found on the market. Ripe cherries and proper handling are absolute requirements. The use of Caustic Soda is a quick, efficient method for processing and yields a very good quality coffee.

Students Investigate the Merits of Koja and Kuti - Coffee hulls and leaves can often be found at the market. These are used in lieu of the coffee bean for making a beverage. Although Ethiopia is the "home" of coffee, it is still considered a luxury item in many homes. As a result the coffee hull which is usually discarded by processing plants has become useful in preparing a beverage called Koja. Beverage made from the leaves is called Kuti.

To determine the relative merit of the various beverages made from the coffee tree, the students made comparative studies of Koja, Kuti and Buna.

Koja is made by roasting the coffee hulls to a light brown color. The roasted hulls can then be placed in boiling water and allowed to steep for a few minutes or it can be made in conventional coffee makers. The brew has a somewhat coffee taste and with milk and sugar added becomes a very delightful beverage. It was considered a very good substitute for the coffee bean.

Kuti is prepared from dried coffee leaves. They are roasted slightly on top of the stove and then used much the same way as the coffee hulls in preparing a drink. Kuti has more of a tea flavor and was more desirable with milk and sugar. Although it was considered to be an acceptable substitute for coffee, it was not preferred over Buna.

COFFEE RESEARCH

By

Hugh F. Rouk, I. E. Siegenthaler, Charles A. Wilson

The second year's data has been collected from the various coffee experiments at the Jimma Agricultural Technical School. Most of these experiments were planted in 1954. The following is a brief narrative summarizing this year's research data.

Coffee Variety Trials (International selections) - As pointed out in previous project reports, variety trials and local selection experiments are considered to be basic to research. Before other tests such as various cultural management experiments are started, some outstanding varieties should be determined.
In experimental work at the Agricultural Technical School duplicate plantings of coffee seedlings have been made in the native forest near Jimma and in the school nursery. The photograph on the left shows a plant under native conditions in the Buda Buna forest and the photograph on the right shows the duplicate planting under scientific cultivation at the school.
by planting as many varieties and selections as possible in experimental variety trials.

Another objective besides finding superior varieties for continued coffee research is to make available to local farmers and planters a source of seed of the outstanding varieties and selections that have been proven by several years of testing under local physiological conditions.

This international variety experiment was planted in eight, one tree replications on three different types of soil in 1954. One place was a well drained, red, sloping soil. Another was a well drained level area with deep dark soil, while the third place was a level, rather seasonably wet, dark soil. The test includes varieties from Kenya, Tanganyika, Guatemala, Brazil and Ethiopia. However, some of the varieties received from these countries had originated from other places; therefore, the varieties represent coffee from the various coffee producing countries of the world.

The results of the yield data taken from these areas in 1957 very definitely shows that several years data must be collected before any definite conclusions can be drawn regarding the superiority of any particular varieties. The coffee was picked from the trees every two weeks during the season. The data was recorded in grams of red cherries produced by each individual tree. Of the top ten trees in this year's test only one tree appeared in the previous year's top producers. As a whole, when making a total average for the 24 trees of each variety (combined total average for all three places) the total tree average for this year was slightly higher than the total tree average for 1956. It should be pointed out that these trees are young plants and are only in their second year of full production.

The management practices for the three areas were the same. Horsebeans were planted as a green manure and cover crop combination during the big rainy season. A grass mulch was maintained during the dry season. The trees were pruned to a single stem system following the full blossom period, and an application of commercial nitrogen and compost manure was applied to each area.

Data should be collected from these areas for several more years before the outstanding varieties will begin to make themselves known. Perhaps a five year average of these areas in 1960 will begin to point towards the superior varieties.

Coffee rust (Hemileia vastatrix) began to appear on some of the varieties for the first time the past year. The susceptibility or resistance
DISEASE RATING
of
COFFEE LEAF RUST

IMMUNE FLECK TRACE ZERO ONE TWO THREE
of the several varieties was one of the major objectives outlined for the study when the original plantings were made in 1954. Therefore, careful notes were taken in August so that a more complete study could be made, and a rating of the susceptibility or resistance was given to each of the trees according to the degree of rust which occurred. Of the 49 varieties being tested only three appeared to be rust resistant. All of the 49 varieties that are in the test at Jimma have been sent to the international rust laboratory at Oeiras, Portugal. Dr. d'Oliveira has informed us that these trees were tested under controlled conditions for their reaction to *Hemileia vastatrix* and only two of the varieties were found to be resistant to all cultures of the rust. Both of these were Ethiopian selections. These resistant seedlings from Ethiopia and few from India (Coffee Research Station, Ballhennur) are the only immune plants so far differentiated at the center.

This disease study as well as other important plant characteristics will be continually studied on the varieties under testing. It is important to consider factors other than yield along with yielding ability when making a final decision as to the superior varieties.

Pruning and Mulching Experiment - This coffee experiment was also planted in 1954. It was designed to compare four mulching practices (1. Banana leaf mulch, 2. Grass mulch, 3. Coffee hull mulch, and 4. no mulch) and three pruning treatments (1. Single stem, 2. Multiple stem, and 3. no pruning). There were six varieties placed in four one-tree replications with all possible combinations of the above treatments.

In comparing the two years' data one cannot yet find any patterns beginning to form. One of the multiple stem treatments yielded the most in grams of red cherries during 1956, while in 1957 one of the single stem treatments produced the most fruit. The no-pruned, no-mulched treatments produced yields which were somewhat comparable to the higher yields of any of the other combined treatments. In order to have any conclusive evidence for the management practices under test, several more years of data collecting are necessary. In addition to the above mentioned data, it is planned to take soil samples from these various treatment areas to study the effects of these treatments on the physical and chemical properties of the soil.

Local Selection Experiment - This experimental area was maintained during 1957 and will produce its first yield data during the next picking season. There were approximately fifty selections chosen from 150 selections of nursery seedlings. The original seed was seed was collected from local coffee forests. These fifty selections were transferred to the field (balled and bagged) in 1955 and spaced in 2½ meter squares with three or four ten tree replications of each selection. The purpose of this experiment is to select from local coffee the more outstanding trees in respect
to their yields and other growth habits. Also, it will serve for more detailed study of the genetic complexes found in wild and semi-wild coffee which is found growing in local forests.

**Study of Wild-Growing Coffee Continues** - A detailed study of the wild type coffee of the Buda Buna Forest is being continued with the assistance of Dr. Edgar Anderson, internationally known botanist and curator of useful plants, Missouri Botanical Gardens, St. Louis, Missouri, U.S.A. The Buda Buna Forest is the property of His Excellency Ras Mesfin Selashi and contains valuable material for research. This study was started in 1955 and a preliminary report was submitted in Vol. II and Vol. III of "Agriculture in Ethiopia". Results of the study at Buda Buna are being compared with wild growing coffees in other areas of Ethiopia, such as Gore, Mizan Teferi, Maji, Tippi, Lemu, Benga, and possibly Sedamo.

**HORTICULTURE**

*By*

Louis A. Meissner

The major objectives of the Horticulture Department are as follows:

I. To train students so that they may be able to:

1. Teach others.
2. Acquire the ability to produce fruits and vegetables for home use.
3. Make a living by producing horticulture crops if they so choose.
4. Know when to harvest vegetables for best quality.
5. Control insects.
6. Make the area around their home more beautiful.
7. Add more variety to their diet.

II. To produce and harvest fruits and vegetables for school consumption in order that the students might have more variety in their diet at less school expense.

III. To keep the school compound attractive.

IV. To carry on experimental research with horticulture crops.
The year 1957 realized several accomplishments within the Horticulture Department of the Jimma Agricultural Technical School. Some of the main accomplishments were as follows:

1. Two thousand meters of fence was constructed by the department around the garden areas along both sides of the river. This fence secured clear ownership of the land by the Jimma school and all boundary disputes are supposedly settled. Six houses are included within the fence and four of the six houses contain at least one employee of the Jimma school. The fence does not only increase the garden area tremendously but also provides some bermuda grass pasture for the school. The added area provides sufficient ground for several different plantings of Irish potatoes so that they can be harvested at various dates. It is necessary to stagger the planting dates of potatoes because the temperature is such that potatoes only keep for a short time. The increase in area also provides ground for the production of native peppers and native red onions. The students prefer native peppers and onions over varieties imported from the United States because they are hotter in taste.

2. Vegetable irrigation costs have been reduced by discontinuing pumping and by the development of a water supply that flows by gravity to the newly fenced garden area. The newly developed irrigation costs about the price of two full time employees and water may be used if necessary twenty-four hours per day. The new system eliminates dependence upon machinery, requires no oil or fuel and cannot cause much damage if neglected for a few hours while in operation. People skilled in the operation of expensive irrigation machinery are not required when a natural stream of water can be utilized to such a good advantage.

3. The results of the Irish potato variety experiment indicates that selection of local seed may secure as high a yield as introduction of new varieties. The 1957 test which included the two top yielding varieties from Canada, namely F 5096 and Keswich along with a selection of potatoes purchased from the Jimma market indicates from one season of observation that if seed are selected carefully, the local smooth white potato is equal in yield and probably very close in quality of production. Mere information may be available next year.

4. Oklahoma 46 sweet potatoes out yielded All Gold and Improved Puerto Rica sweet potatoes in the 1957 test. However, differences in yield were not great enough to formulate any definite conclusions as to the best variety over a period of years.

5. The Horticulture students are learning by doing.

Each student in Horticulture class has his individual garden plot
Students of the Agricultural Technical School cultivating a vegetable garden on the school farm.

Students inspect a hybrid banana plant on the farm at the Agricultural Technical School.
and is receiving or has received training in planning, preparing, planting, controlling insects, cultivating, and harvesting vegetables. When harvesting, they are taught that quality is more important than quantity.

6. In the tomato experiments the popular U.S. varieties yield very well during the dry season and during the small rains, but require spraying with Bordeaux mixture during the heavy rains. The varieties tried include (1) Western Red, (2) Rutgers, (3) Urbana, (4) Baltimore.

7. Other observations indicate that most vegetables can be grown twelve months of the year at Jimma when under irrigation. Exceptions are as follows:

   a) Tomatoes need spraying during the rainy season.

   b) Peppers are affected by disease, and production is very low during the rainy season but some plants will produce new growth and fruit after the rains.

   c) It is usually too wet to produce profitable yields of Irish potatoes during the heavy rains:

   d) Cucumbers and cantelopes bloom profusely but fail to produce desirable amounts of fruit.

INTERNATIONALLY KNOWN BOTANIST VISITS THE JIMMA SCHOOL

Dr. Edgar Anderson, Curator of Useful Plants, The Missouri Botanical Garden, St. Louis, Mo., spent six weeks at the Jimma Agricultural School as special consultant to the research staff. Although his principal interest was to assist with research projects underway in such crops as coffee, maize, wheat, barley, teff, sorghums, and grasses. Dr. Anderson made an intensive study of plants being grown and used by the Ethiopian farmers.

Of particular importance are the many plants grown for flavoring foods or in the preparation of beverages. Some of these plants are already being exported and others have possibilities as export crops. Other food plants are of interest because of their anthropological significance. Lists of plants or plant seeds found at the Jimma market and in the gardens of local farmers was compiled by Dr. Anderson and may be had by writing to the School. Both plant and seed specimens of many of these plants were sent to the U.S. for further investigation by Dr. Anderson.

Research projects have been started on many of the crops listed and others will be added later:
Dr. Edgar Anderson, world renowned botanist, center, inspects a coffee plant growing in the Ministry of Agriculture compound at Addis Ababa. Looking on are Hugh Rouk, Director of the Agricultural Technical School, left, and Bonnie Nicholson, Principal Representative of Oklahoma State University.

I. E. Siegenthaler, agronomist at the Agricultural Technical School, inspects a native planting of Kororema near Jimma. Under cultivation the plants grow six to eight feet high.
Spice Crops: Very little attention has been directed to the many spice producing plants (some indigenous - some introduced) grown in Ethiopia and used to flavor foods and beverages which are used daily in the diets of the Ethiopian people. That these spices are important domestically and are a part of the heritage and culture of the peoples of the Ethiopian highlands is unquestioned; but equally important is the prospect of greater exports in this field of erotic flavors and preservatives of foods.

Of particular interest in this respect is Kororema (Aframomum *Spp.*), which grown wild in the forest of Kaffa and Illubabor provinces. The spice (seed pod) is harvested and dried much the same as coffee berries and is shipped to Addis Ababa for domestic use and for export. Although the spice is known on the world market, little is known about the plant. Perhaps the only complete herbarium specimen in existence has been made by a student of the Jimma Agricultural Technical School, Gingebelle (Zingiber *Spp.*), is closely related to Kororema and is also found growing wild in the forest of Western Ethiopia. It is important as a domestic spice and is the well known Ginger of the spice trade. The rhizome is used for flavoring many foods. Gesho (Rhammus *prinoides* L'Herit) is an indigenous shrub and is used in brewing. More intensive research with this plant is desirable from an international standpoint. Abish (Trigonella *Foenum-graecum* L.) or Fenugreek is an important spice world wide and is presumably an introduced crop for Ethiopia. It is a legume and the quality of Ethiopian Fengugreek is especially good. It has many possibilities for export in addition to domestic use. Dimbilal (Ceri-andrum sativa L.) is an Umbelliferae and the seed are used in flavoring. Netch Asumd is also an Umbelliferae and the seed are used for flavoring. Tuker Asumd (Nicola *sativa* L.) is a member of the Buttercup family. The seed are also referred to as black cumin and are used in flavoring foods. Beribera (Caesium *Spp.*), is made by pulverizing hot red peppers. Beribera is one of the principal spices used in preparing Ethiopian foods. It is a source of certain vitamins and because of the burning effect is probably a safeguard against amoeba and other internal parasites common to the tropics. Tena Adam (Ruta graveolens L.) is a shrub like plant. The seed pod is mixed with beriberra for flavoring water and the leaves and stems are used for flavoring coffee and other beverages. Temist (Piper *Spp.*), called Long Black Pepper is related to the black pepper (P. *nigrum* L.) so common in world trade. The Temist found at the market does not seem to be the same as an indigenous species of Piper found in the forest near Gore. Further research with the indigenous plants seems desirable. Desobila (Ocimum *Spp.*), or Sacred Basil is a small shrub like plant of the ment family. It can be found growing near most farm homes and is used widely as flavoring for food.
Kocho, or false Banana plants under native cultivation near Jimma.

A planting of Aceituno on the compound of the Agricultural Technical School.
Minor Food Crops - Several plants are found in Ethiopia which from all indications have been used as a food crop since ancient times. The origin of these plants are in some cases undetermined since they were a part of the agriculture practiced by ancient tribesmen in widely scattered areas of several continents. Lishalisho or Grain Amaranthus (Amaranthus caudatus L.) was used, for instance, as a food by the ancient Aztecs of Central America and likewise by the ancient people of Tibet. It is a weedy plant and apparently will thrive where other cultivated crops fail. Farmers in the Mizan Teferi area where rainfall and temperature make all vegetation flourish, say that Grain Amaranthus is planted on newly cleared land where weeds are a big problem. The amaranthus competes with the weedy growth without cultivation and after maturity produces a good yield of food grain. The seeds are very tiny and are used to make porridge and injera. There is some evidence that the seeds are popped in some areas near Maji and ground into flour from which bread can be made. The people contacted at Mizan, however, did not follow this practice.

Oromo Dinitch (Galla Potato, Coleus edulis) can be found at the Jimma market in season. From all indications, this is a very ancient food plant of the Mint family. The plant is grown for the tuberous rhizome which is prepared and tastes somewhat like the Irish potato. The plant has a pubescent stem and opposite, crenate, netted-veined leaves; small high quality cylindrical rootstalks with encircling leaf scars. The plant reaches a height of 15-18 inches and puts out runners.

The Dioscorea or tropical Yam deserves a place in the research program of Ethiopia. It is widely grown throughout Western Ethiopia and is a staple food crop in some areas. It is from this family of potato-like plants that the Sweet Potato (Ipomoea Batatas Lam.) gets its name "Yam" so popular in U.S. trade. Several species of Dioscorea are cultivated for their large edible subterranean and aerial tubers. One can find one or more species growing in most gardens around Jimma. At Mizan Teferi rather large fields are planted to "Ketch" and "Ungubay", which produce subterranean tubers. Near Jimma the large-leaved Yam is called "Cotehare" while the small-leaved Yam with aerial tubers is called "Katch". No doubt the local names are used somewhat interchangeably for the various species. It has been said that the Yam is filling but does not give strength. Since it is a starchy food, it presumably would not be an adequate diet unless supplemented with other foods.

Other Useful Plants - A plant which adds to the economy of Ethiopia and needs special attention is "Chatt" (Catha edulis Forsk). The leaves are used widely as a stimulant and for release from fatigue. Research needs to be directed towards finding the active agent in Chatt which is responsible for this effect. It is possible that it might be quite useful as an anti-tension drug.
"Kocho" or False banana - (Musa Ensete J. F. Gmel.) is used widely over Ethiopia as a food crop and is also important as a source of fiber. More attention should be directed toward the understanding of this plant and its uses.

ACEITUNO SEED FAT IS TESTED AT JIMMA

The Aceituno tree (Simaruba Glauca D.C.) is a tropical tree of the family Simaroubaceae. It grows to a height of fifteen meters, is dioecious, and produces an edible fruit. The seed of the aceituno tree was introduced from El Salvador where it is used as a source of seed fat. The fat is unique in that it is a natural vegetable shortening requiring no hydrogenation or blending with other fats. The crude fat is greenish in color and has a slightly bitter taste, but after refining it yields a snow-white, odorless, and practically tasteless product having the same uses as commercial shortenings. The crude fat can be used directly for making soap. It is readily saponified and yields a soap with excellent lathering properties. The trees planted at the Jimma Agricultural School in 1954 will not come into production for another two or three years. As soon as seed samples are available they will be sent to oil mills in Addis Ababa for testing.

RECREATION AND PHYSICAL EDUCATION

By A. W. Vance

Recreation - The principal recreation activities for students at the Jimma Agricultural Technical School can be categorized as follows: intramural team and individual sports competition, informal leisure-time games and activities, an arts and crafts program, and audio-visual services.

Intramural sports competition is the most important phase of the program, both from the standpoint of morale and participation. During the first semester schedules are played among the classes in football and volleyball; during the second semester, softball and basketball are the major sports. Every two or three weeks throughout the year a tournament is initiated in various other games; checkers, chess, ping pong singles and doubles, 4-ball croquet, 8-ball croquet, badminton singles and doubles, tennis singles and doubles, and horseshoes singles and doubles. In addition, certain special events are held; a tug-of-war tournament, 11-man teams from all classes participating; a "strength" tournament, comprised of weight-lifting, rope-climbing, and related
The Soccer team of the Jimma Agricultural Technical School has won the championship of their league the last three years.

Students at the Agricultural Technical School play basketball on the school court.
activities; a track meet; and a "crazy" day tournament, consisting of amusing contests suggested by the students. All of these events provide place points and thus contribute toward determining the intramural all-sports champion for the year. Competition is keener every year, and participation has been increasing steadily, ranging as high as 60% of the student body in some of the contests.

The recreation hall is the major facility for leisure-time activity. It is open during the late afternoon, early evening, and during all non-working hours on the weekends. It contains fifteen game-tables and three ping pong tables. Equipment is provided for some fifteen or twenty table games, from cards to "Scrabble". Outdoor facilities include a softball field, a basketball court, three tennis courts, two volleyball courts, three badminton courts, three horseshoe courts, a croquet court, two jumping pits, a shot and discus field, and a punching bag stand. Under construction is a miniature golf course. The facilities are well-used.

There are three activities at present making up the arts and crafts program. The newest of these is the Photography Club, which was started this year. An elementary instruction course is presented, and complete darkroom facilities and developing and printing supplies (at cost) are provided for students who complete the course. The club has been a success thus far; 12% of the students are members. The second and third activities are combined into the Arts and Crafts Club. A room is set aside in the recreation hall for use by the members, and facilities are provided for art work and leathercraft work. The students buy their own materials and tools, but quite a number of them still show a profit from the sale of their products; 25% of the student body are members of this club. Interest and participation are quite high among the members of these two organizations.

The audio-visual services include recreational films, which are shown whenever available. Recorded music is played via the school public address system for two or three hours daily. Finally, a photography service is operated at cost for the students.

One additional and very important recreational enterprise is the school football (soccer) team, the "Aba Buna" team. Tryouts are held each year in November and sixteen players are selected for the team. The team practices regularly and competes with teams from Jimma and neighboring towns in the Jimma Sports Federation football league. The team has not been defeated in league play in three years; it was Kaffa province Champion in 1956 and 1957, and is far out in front for the championship again this year. In both 1956 and 1957 the team competed in the national tournament in Addis Ababa, giving a good account of itself against more experienced and more "professional" teams. In March and April this year, two of the country's top teams, the Addis Army team and the Bishoftu Air Force team, will journey to Jimma to play exhibition games with the
Aba Buna team. The team members have definitely been a credit to the school, collectively and individually. They play hard and fair, and they follow well the rules of sportsmanship. This year's team is the best yet, and the entire school is hoping that they will be able to win some games in the national tournament this year.

Physical Education - Physical education classes were initiated for the first time at the Jimma Agricultural Technical School in 1956-1957 school year. This past year has seen considerable improvement in the program, both in the organization and quality of the program and in the attitude of the students toward the program.

All classes are supervised by an American staff instructor, and he teaches the college classes. The high school classes are taught by student instructors from the college classes whenever possible and by twelfth grade students when college students are not available. The instructors are selected on the basis of their leadership capability, personality, character, and athletic ability. The only benefits they receive for the work are the leadership experiences which they accrue. These chosen have done an excellent job thus far in organizing, supervising, and training their classes.

Class activities include instruction, practice, and competition in all the various sports mentioned as being part of the recreation program, plus numerous special activities and group and individual contests. In addition, the first five or ten minutes of each period are devoted to group calisthenics, which serve to warm up and condition the students.

Grades are awarded on the basis of attendance, participation, cooperation, and successful completion of a series of minimum physical skills tests. Practice time is devoted to the activities concerned in these tests throughout the semester, and the tests are administered as a "final examination" at the end of the semester. Thus far no unsatisfactory grades have been awarded.

This year it has been possible to schedule all the physical education classes during the morning periods, and this has helped considerably in organizing the classes and in imparting to the students the idea that the classes are an integral part of the curriculum. The classes vary in size from fourteen to fifty students; this variation is compensated for by the assignment of three or four instructors to the larger classes.

In summary, it can be said that both the physical education program and its complement, the recreation program, are steadily improving. Both have an increasing appeal for the students, if participation and enthusiasm may be used as yardsticks. The program is becoming a major factor
in improved student morale and in an improved general attitude toward classroom, work-program, and leisure-time activities.

POULTRY DEPARTMENT

By

Lloyd L. Wiggins

On January 1, 1958, the Jimma Agricultural Technical School poultry flock consisted of 90 white Leghorn hens, 95 Rhode Island Red hens, and 25 Australorp hens. Also, there were three groups of 25 Rhode Island hens each on feeding experiments. The hens were all imported from Kenya on January 29, 1957, as day-old chicks with exception of the Australorps.

The young stock included 90 four month old chicks, 250 two month old chicks, and 125 one month old chicks, all of which were incubated at the school.

Eleven students are employed in the Poultry Department to perform the various tasks of selecting eggs for hatching, operating the incubators, brooding baby chicks, and caring for laying hens. Students develop good poultry management practices through balancing rations and mixing feed, treating birds for lice and mites, selecting and culling birds of all ages, and cleaning and sterilizing houses and equipment. Sanitation is one of the key factors in raising poultry. Much emphasis is placed on sanitation because it is inexpensive and can be used by anyone through good management practices.

Incubation - Hatching percentages started off with a 32% hatch, followed a month later by a 11% hatch. Before the year was over the percentage reached 79.6%. The average for the four hatches was 47.5%. Hatching percentages have always provided much interest at the school. The first two hatches which averaged 21% were set in an old building which had very little air circulation. The incubator was moved into an office, and the two succeeding hatches produced an average of 73%. Many reasons were offered for the increased percentages by everyone involved. The general opinion was that in an area of this altitude, air circulation can easily be a limiting factor on hatchability. The eggs are living organisms and require oxygen to replace the carbon dioxide produced during incubation. In the small office area the air is circulated by the opening and closing of the door, which takes place many times during the day. There are two windows which also form a cross draft that helps circulate the air. Also the building is large and there is a tendency for temperatures to remain constant throughout the day and night.
Incubation Records for 1957

<table>
<thead>
<tr>
<th>Date Set:</th>
<th>No. of Eggs</th>
<th>Date Hatched</th>
<th>No. of Chicks</th>
<th>Hatching %</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 20</td>
<td>500</td>
<td>September 10</td>
<td>165</td>
<td>32%</td>
</tr>
<tr>
<td>August 27</td>
<td>500</td>
<td>September 18</td>
<td>55</td>
<td>11%</td>
</tr>
<tr>
<td>October 10</td>
<td>500</td>
<td>November 1</td>
<td>335</td>
<td>67%</td>
</tr>
<tr>
<td>November 10</td>
<td>500</td>
<td>December 1</td>
<td>396</td>
<td>79%</td>
</tr>
</tbody>
</table>

Average Hatching Percent 47.5

Incubation experiments will be carried on during 1958 in order to help determine the reason for low hatching percentages.

Baby Chick and Flock Management - After the chicks are hatched they are removed to the brooder house. The brooder houses are heated at 90°F the first week and the temperature is gradually reduced until 70°F is reached the sixth week.

Kerosene was previously used for heating, but because of the expense involved charcoal stoves were installed. Kerosene heating for six weeks cost $140.00 and charcoal heating only costs $35.00 - $40.00 depending upon the price of charcoal. Charcoal requirements are about one-half of a sack each day, depending on weather conditions.

The chicks are fed a ration of equal parts of corn, barley, nueg, meal, wheat with a supplement of fish meal, salt, and bone meal. After the chicks are moved to the range house at six weeks of age, an addition of "attala" is added equal to the ration by volume measure, thus reducing the expense of feeding.

The laying flocks receive a very similar ration as the range chicks. Pasture is provided the laying flock at the rate of 10 square yards or 9 square meters per hen which is considered a minimum amount.

The laying houses are cleaned and sterilized each month. Once a year the houses are completely reconditioned for disease prevention. In the process, the brick floors and a small part of the dirt are removed. The bricks are allowed to remain in the sunshine for one week then turned over for another week. Fresh dirt is added and bricks are disinfected individually and replaced. Roosts and nests are treated similarly. The house is white-washed and the four to five month old pullets are deloused and placed in the house. Through sanitation, diseases have been controlled very well. The equipment is cleaned and scrubbed weekly with hot soapy water throughout the year.
Ethiopian Flock Improvement: The main objective of the poultry department in our school is to provide classroom instruction and laboratory work whereby the students can become proficient in poultry production in Ethiopia. Another objective is to help the Ethiopian people secure breeding stock for improvement of their home flocks.

Breeding stock is dispersed to the people by the sale of hatching eggs, baby chicks, and young stock. Hatching eggs are sold at the rate of twelve for one dollar. During the year there were 3,612 eggs sold for $301.00. This is an average of 10 per day. We have noticed that many people wanted to buy hatching eggs during December and January in order to take advantage of the high prices of chickens during the Easter season.

Baby chicks, two weeks of age, were sold to individuals for $1.00 each. Two groups of one hundred each were sold and approximately fifty were sold in smaller groups.

Of the larger size chickens, 380 were sold to people of the local area. Thirty of our students took seventy five young chickens to their Provinces throughout Ethiopia. The extension service found homes for 175 young breeding roosters. This made a total of 880 chickens selling for $2,384.50 that left our school and went into breeding flocks for the year.

Experiments - Ethiopia has many agricultural by-products which are not being utilized to the best advantage at the present time. These by-products include nueg meal, wheat bran, molasses, attala, and several others.

Excellent use can be made of these materials in poultry rations. Since poultry products are in great demand and basic feeds such as corn, wheat, and barley are quite expensive, it seems feasible to utilize these products for poultry feeding.

In order to determine what part of the poultry ration could consist of inexpensive by-products without greatly affecting egg production, a feeding experiment was conducted on laying hens. Three laying rations (all containing 16% protein as could be determined by analysis given in Feeds and Feeding by Morrison) were mixed as follows:

<table>
<thead>
<tr>
<th>Ration I</th>
<th>Ration II</th>
<th>Ration III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn 22</td>
<td>Molasses 40</td>
<td>Corn 40</td>
</tr>
<tr>
<td>Barley 22</td>
<td>Wheat Bran 20</td>
<td>Attala (dry) 40</td>
</tr>
<tr>
<td>Nueg Meal 22</td>
<td>Nueg Meal 20</td>
<td>Blood (liquid) 18</td>
</tr>
<tr>
<td>Wheat Bran 22</td>
<td>Attala (dry) 18</td>
<td>Salt 1</td>
</tr>
<tr>
<td>Wheat 10</td>
<td>Salt 1</td>
<td>Bone Meal 1</td>
</tr>
<tr>
<td>Salt 1</td>
<td>Bone Meal 1</td>
<td></td>
</tr>
<tr>
<td>Bone Meal 1/100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

-60-
A view of the poultry area at the Agricultural Technical School. These range shelters will be replaced with larger houses made entirely of native materials early in 1958.

A graphic comparison of egg production from hens fed the three different rations in experimental work at the Agricultural Technical School.
Three groups of twenty-five young hens each were selected of the same age, breeding and individuality and were placed in experimental laying houses on July 1, 1957. Ration I produced 1,591 eggs, Ration II produced only 135 eggs, and Ration III produced 1,315 eggs.

### Monthly Egg Production

<table>
<thead>
<tr>
<th></th>
<th>Ration I</th>
<th>Ration II</th>
<th>Ration III</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>181</td>
<td>54</td>
<td>143</td>
</tr>
<tr>
<td>August</td>
<td>309</td>
<td>40</td>
<td>243</td>
</tr>
<tr>
<td>September</td>
<td>319</td>
<td>6</td>
<td>263</td>
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<tr>
<td>October</td>
<td>274</td>
<td>13</td>
<td>243</td>
</tr>
<tr>
<td>November</td>
<td>223</td>
<td>22</td>
<td>253</td>
</tr>
<tr>
<td>December</td>
<td>185</td>
<td>—</td>
<td>170</td>
</tr>
<tr>
<td>TOTALS</td>
<td>1,491</td>
<td>135</td>
<td>1,315</td>
</tr>
</tbody>
</table>

Ration I, which consisted of corn, barley, wheat, nucg meal, fish meal, is the ration fed to our laying flocks. Ration III which consisted of corn, attala, and blood yielded nearly as many eggs as Ration I. The latter ration is available all over the nation and it could easily be used by anyone. In future years it is hoped to revise Ration II and improve it to the extent that it can easily be fed to large commercial flocks.

**LIVESTOCK**

By

Lloyd L. Wiggins

**Dairy Breeding Program** - (Native stock) Six Borono cows produced between 2,000 and 3,000 pounds of milk for the year. The best producer, number 10, produced 3,077 pounds (1,398 kilo) of milk. Four more cows produced between 1,000 and 2,000 pounds of milk. The remaining cows were low producers and are not qualified as foundation animals for the dairy herd. However, these poor producers are being kept in order to produce calves which are needed in the herd. After a few years these cows and all their offsprings will be disposed of.

In 1958 there will be four first cross heifers (¾ Borono x ¼ Brown Swiss) going into production. This will add several good producers to our herd and their calves will provide good bulls for local farmers' use.

**Dairy Feeding** - The regular dairy ration consists of nucg meal, wheat bran, and mineral supplements. Corn, barley, and wheat were not included because of the expense involved.
The cows were fed according to their milk production at the rate of one pound concentrate for each two pounds of milk produced. This is a higher rate of feeding than is usually used, but the pasture areas do not provide enough grass for the herd during the dry season.

The young stock are fed the ration during the dry season in order to maintain good growth and health.

Parasite Control - The cattle tick has been the most difficult parasite to control at the school. Lindane or BHC application every ten days has controlled the tick with good results, but all other insecticides have had very little effect.

The sheep were drenched every three months with phenothiozine in order to control stomach worms. The sheep foot ticks caused considerable trouble but were controlled by bathing the foot in lindane solution.

The control of swine parasites was relatively simple. Every three months the swine were sprayed with BHC for lice control. At the same time they were given worm treatment which consisted of mixing one pound of sodium fluorde with one hundred pounds of feed. They were fed free choice for twenty four hours.

Sheep Breeding Program - The school maintains a flock of twenty five head of sheep for laboratory and instructional use. These sheep make instruction in castration, docking, drenching, and shearing possible. Management practices of feeding, tagging, and general care are also demonstrated.

Another major purpose of the flock is to produce rams for the local farmers to use in cross-breeding programs. The farmers want these sheep, but are a little reluctant to follow a systematic breeding program.

At the present time there are three rams on local farms, and they seem to be doing quite well. There are several others at the school which are available to farmers who agree to use them wisely.

Swine Production - Four sows farrowed thirty seven pigs and raised thirty one to weaning size at eight weeks of age. This is an average of 7.7 per litter. The swine herd is maintained to provide breeding stock and furnish pork to the staff. Seventeen head were sold for breeding purposes. Most of these went to areas close to Addis Ababa where there is an established market.

Swine seem to do quite well here at Jimma as the heat never bothers them and green pasture is available nearly all of the year.

Pasture provides much of the food, although scrap material from the school cafeteria is another good source. "Attala", which is presently
The photograph shows part of the livestock herd at the Agricultural Technical School. The light colored animals are native cows and the darker animals are the progeny of crosses between the native cows and a Brown Swiss bull.

Students in the farm mechanics classes at the Agricultural Technical School are taught to build and repair equipment for use on the farm. Here two students are building a trailer.
obtained free of charge, is also a good food product. With these three products; pasture, garbage and attala, swine can be produced very economically.

The "hog-corn" ratio is 1:12.8 and usually any ratio above 1:10 results in profitable swine production. Therefore, swine production could be quite a profitable enterprise, though on a limited scale.

**Student's Responsibility** - Forty-two students work in the Animal Husbandry Department doing the jobs associated with livestock and poultry.

Much time is spent on an organization to get the necessary jobs done, which provides an excellent means of learning. A rotation plan is used in most cases whereby each student working in a division, such as poultry, is given training in all phases of poultry production. Upperclassmen are given the responsibility of organizing the work crews in such a way that the students may acquire a good understanding of all phases of production.

Weekly meetings with the work leaders help to uncover new problems or jobs to be done. Many of these problems are connected with repair or improvement of physical plant, as well as with the everyday problems of animal husbandry. Work requests are issued and discussed, and a time limit is set to complete the job in question. As the jobs are completed, the work requests are returned, and the work is graded according to the merit of work done. This seems to add much interest to many a task which otherwise might be unpleasant.

Many times the students work at odd hours because of the nature of the work involved, for example checking the incubators and turning the eggs at 2:00 a.m., which is more inconvenient than most afternoon jobs. However, the students realize that through doing the job themselves they are learning, and they work with this fact in mind at all times.

**FARM MECHANICS**

By

W. Dick Turner, Conrad L. Evans

Responsibilities of the Farm Mechanics Department include class instruction in Farm Mechanics skills and service to other departments of the school in the form of maintenance of equipment, secondary construction, and tractor work in the field.

The classroom instruction is a very important part of this work. Farm Mechanics instruction begins in the tenth grade with seventy two hours of
instruction on hand wood-working. In this course stress is laid on proper use of basic wood-working tools such as the hand saw, plane, hammer, screw driver, wood chisel and brace and bit. Most of the students construct a suitcase for themselves during the course.

In the eleventh grade students take up tractor driving. A great deal of time is spent on safety. It is believed that the skills and confidence gained in this course is worth much to the student even if he never drives a tractor again. It is certain that he is helped a great deal when he later learns to drive a car.

During the 12th year the student spends 172 hours in learning shop skills of arc and oxy-acetylene welding, concrete work, farm carpentry, cold and hot metal work, soldering, pipe work, and tool conditioning. It is heartening to see the progress these students make in learning these skills.

The practical work program is considered no less important to the training of the students than the formal class work. Here students have much opportunity to apply the instructions of the classroom. They also have opportunity to gain leadership experience as they supervise others in work groups. Jobs performed in this program include tractor driving, carpentry, construction of welded projects, machinery repair, fence building and many others. During the past year students have painted the school signs, erected small buildings, pulled and installed pumps weighing 4,000 pounds in wells 400 feet deep--to mention but a few examples. Not only have these students learned skills, but they are learning the dignity of labor which may well be the most important part of the program. There is no doubt that the students of this school would compare favorably with students of any land when it comes to a willingness to work with their hands.

Work is progressing nicely on a new Farm Mechanics building. This is quite important since our present building is to the point of being dangerous. Included in the new building are areas for general shop instruction, hand wood working instruction, a classroom and office, and a separate area for maintenance. A new floor drill press has arrived for installation in the new shop.

Our larger tractor, Massey Harris 745, and disk plow, which were received in late 1956, have proved an asset in working the heavy clay soils found in this area. It was necessary to convert the disk plow from a four bottom to a three bottom in order to pull it with the tractor. This is more economical, however, than using the crawler tractor for the purpose.

A final observation is that in each succeeding year of operation, students are able to take more initiative and responsibility in the use of mechanical equipment than they could the year before.
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<td>January</td>
<td>5</td>
<td>5.5</td>
<td>31</td>
<td>9.3</td>
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<td>57</td>
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<td>March</td>
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<td>April</td>
<td>151.5</td>
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<td>27</td>
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<td>May</td>
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<td>23.5</td>
<td>12.8</td>
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<td>June</td>
<td>221</td>
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<td>26</td>
<td>13.6</td>
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<td>July</td>
<td>197.5</td>
<td>11.5</td>
<td>26</td>
<td>13.9</td>
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<tr>
<td>August</td>
<td>215.75</td>
<td>11.5</td>
<td>25.5</td>
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<td>September</td>
<td>91.1</td>
<td>9</td>
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<td>12.6</td>
<td>25.1</td>
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<td>October</td>
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<td>27</td>
<td>15</td>
<td>26.2</td>
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<td>November</td>
<td>40.5</td>
<td>4.5</td>
<td>28</td>
<td>10.7</td>
<td>26.6</td>
</tr>
<tr>
<td>December</td>
<td>1.5</td>
<td>2</td>
<td>30</td>
<td>7.3</td>
<td>27.3</td>
</tr>
</tbody>
</table>

Local hail storms occurred on the following dates:

- May 2, 22, 24, 28
- June 7, very severe
- August 30, very light.

No frost was recorded at the school weather station, however, frost damage was evident in some low lying areas surrounding the school.
THE AGRICULTURAL PROGRAM
OF
THE UNITED STATES OPERATIONS MISSION TO ETHIOPIA

COFFEE PRODUCTION

By

Dr. Arthur W. Bechtel

The Coffee Production Program continued work as outlined in previous reports and as originally stated in the Cooperative Coffee Development Project, namely; "Nurseries will be established for distribution of superior plants to local growers and improved methods of planting, cultivation, harvesting...will be demonstrated."

Work had started in Kaffa Province in 1955 with nurseries at Godjeb, Mito and Giran (near Jimma). In 1956, an additional nursery was started at Suntu and the lack of accessibility made it necessary to drop the production program at Godjeb. The 1957 nurseries, for 1958 distribution, were concentrated at or near Jimma, partly because there were not sufficient funds available to continue the more isolated nurseries where labor, supervision and distribution were more expensive; and partly because the greatest demand was from people who saw the Giran nurseries, either as travelers to and from Jimma, as residents of Jimma and the surrounding towns, or from the "inland telegraph". While Giran, then, had the concentration of nursery work, the distribution was not limited to Kaffa but was spread over the provinces of Arussi, Ilababor, Kaffa, Shoa and Sidamo.

The number of nursery plants distributed in 1957 was approximately the same as in previous years, and the price was the same as in 1956. There was no difficulty in selling 115,050 plants in the Jimma area, in fact, many more could have been sold at the set maximum of 2,000 plants per person. The Mito and Suntu nurseries distributed 109,750 plants and 73,050 plants respectively, but sales were slower and greater numbers of plants allotted to individuals. With the close of the distribution season, Mito and Suntu were closed and Kaffa activities centered at Giran. Funds from the sales of the young coffee seedlings were deposited in the Coffee Production Program account.

The young plants from the seedling beds were transplanted to land which had been used in the previous three seasons for the same purpose. Fertilizer replications of nitrogen and phosphates were made in these nurseries to determine the effect of these elements in what is expected to be normal in the field-continued coffee cultivation without return of
nutrient materials. Results from these trials are expected to indicate field recommendations for fertilizers. The amount of seedlings transplanted totaled 350,000; about 250,000 at Giran and the remainder on newly acquired property nearer Jimma on the Dodo road. Additional seedlings remain to be transplanted when land can be prepared.

Land acquisition remained a problem until near the end of the year when the Ministry of Agriculture released the Machinery Pool property on the Dodo road and acquired, by purchase, the adjoining property. These two new properties amount to slightly less than five hectares, including the space now occupied by buildings. The Giran property which has been used with the active cooperation of the Jimma Agricultural Technical School, will be returned to the school's use.

In addition to the program in Kaffa Province, arrangements were made to start two nurseries in Sidamo Province. One is located on the prison compound with seed supplied by the governor of the province and work done by the prisoners themselves. Technical supervision is provided by a Ministry of Agriculture employee under the direction of the Chief of the Coffee Section. The final disposition of approximately 40,000 plants in the prison nursery will depend on demands and may be used to establish an experimental garden on the prison grounds.

The second nursery in Sidamo was established by contract with the Wondo-Cola Plantations and will provide about 200,000 plants for sale. However, the lack of funds in the beginning of the fiscal year caused a delay in planting and these plants will not be ready until late in the 1958 season.

Other nurseries planned for other provinces were not started for the afore-mentioned reason, that is lack of funds at the proper time to buy seed and prepare land.

Establishment of the Coffee Section - One of the most promising steps made in the overall coffee program was the establishment of a Coffee Section within the Ministry of Agriculture and the appointment of Ministry personnel to the following positions: Ato Kassahun Adere, Co-Director of the Coffee Production Program and Ato Mulugeta Habte Georgis, Chief of Coffee Production in Sidamo Province. Ato Muleta Buba remained as Co-Director of the Kaffa branch, having been named to this position in early 1956, and Ato Shibeshe Asfaw, a former trainee of the previous FAO coffee expert, was appointed to aid the Kaffa program.

Education & Demonstration - Educational work continued as in previous years, that is, through gatherings of coffee farmers and talks over the public address system in Jimma. The new chief of the Coffee Section in the Ministry of Agriculture has written a summary text in Amharic which
A typical coffee seedling nursery established by the Coffee Production Advisor of USOM, Ethiopia. When the plants are approximately ten centimeters high they are transplanted into growing beds, and when they reach a height of forty centimeters they are again transplanted to the coffee plantation.

Workers picking ripe coffee cherries from a young plantation on a farm operated by His Imperial Majesty Haile Selassie I near Shashemane.
the Ministry has agreed to publish. The previous bulletin, "Buna", in Amharic, is still available as a beginner's aid.

The Demonstration work has been two fold: 1. The nursery procedures at Giran and Dodo, and 2. Field demonstrations to farmers. In the former, the Jimma prison has been successful in duplicating the correct methods and will produce about 125,000 plants for the 1958 distribution, and the proceeds from sale of the plants will go to the prison. In the latter, the joint-fund has provided necessary transportation and Ato Mulugetta has travelled in both Arussi and Sidamo Provinces to bring technical help and demonstrations directly to coffee planters.

**Technical Assistance** - In Kaffa Province, technical assistance has been given to those planters requesting it whenever it was possible to visit the areas. Other calls, with problems primarily in the physiological and pathological fields, have been received from Ilobabor, Wollega, Shoa, Goggou and Wollo Provinces.

**Future Program** - With funds and lands available, the demonstration of cultural methods will be carried to other provinces which have not yet had the opportunity to observe nursery production as have Kaffa and Sidamo Provinces. However, even without lands and funds, the services of the Coffee Section and its affiliated personnel can contribute greatly to coffee knowledge in Ethiopia by making surveys of coffee areas, not only for production but for the best types of plants for different soil conditions, the prevalence of disease and methods of combatting it, insect problems and to provide technical assistance to those growers who encounter problems with which they are unable to cope.

**COFFEE PROCESSING**

By

Dr. Donald V. Shuhart

The processing of Ethiopian coffee has been done in a manner which has not produced a high quality of coffee. With a few isolated exceptions, the 1956-1957 season was the first time that washed coffee was produced in this country. A little over 300 metric tons of parchment coffee was produced by fifty work units that season. Buyers were skeptical of this coffee but enough of it entered trade channels without being mixed with the coffee processed in the usual dry method to prove its value. Its acceptance in critical markets, especially in Germany and Switzerland, spurred buyers to pay more for the washed coffee. This created some incentive for more washing of coffee during the 1957-1958 season.

During this 1957-1958 season, an estimated 1,260 tons of parchment coffee will have been processed by 150 work units operated under the supervision
A coffee processing station set up on a plantation owned by His Imperial Majesty Haile Selassie I near Shashemanna.

After the coffee is processed it is sun dried in mesh bottom trays.
of employees of the Agricultural Extension Service working cooperatively with the ICA Coffee Processing Advisor and Ministry of Agriculture counterparts.

In addition to the coffee processed by this agency, some exporters adapted the washing process. One large exporter has operated three medium size central plants and numerous small units. It is estimated that some 2,500 tons of washed coffee will be produced in Ethiopia this season. However, this amount is probably not more than five percent of the total exportable coffee produced in the country. It has been estimated that 4,000 work units will be required to convert Ethiopia completely to washed coffee. This seems to be a reasonable figure in view of the fact that 3,500 pulpers were placed in the field in Tanganyika to convert that country from the dry processed to washed coffee.

The price received for this coffee in world markets has been favorable, but of greater importance to the internal economy of Ethiopia is the fact that the price to farmers has been increased. In many instances the price received by farmers has been doubled.

Experience with heated dryers last year was not entirely satisfactory for two reasons: 1. It is difficult to teach the correct operation of a stove to a people who are not at all acquainted with them. 2. It is difficult to get the kind of wood needed to give uniform heat. The wood used throughout the country for cooking consists of small split faggots that are excellent for the fires built on the floor of their native tukels, but not satisfactory for a large oil drum stove used by the dryers. As a consequence, some 3,000 sun drying trays were constructed for the current season. These were built locally as far as possible to reduce the difficulty of transportation. They proved to be very satisfactory, being much simpler to use and more nearly approximated what the people already knew about sun drying.

Transportation of equipment and personnel is one of the major problems of the program at present. Many roads are rough and numerous breakdowns occur in our trucks. Insufficient numbers of trucks were available to properly service the units placed in the field during the season. The Coffee Processing Advisor was unable to give the close supervision needed because of lack of transportation.

LIVESTOCK DEVELOPMENT PROJECT

By

Michael Galli

During the early part of 1957 the Livestock Development Project was confined primarily to an extension type program of distributing
rams and bulls to farmers and other types of extension demonstration activities. Ninety-four Rambouillet sheep, including seventy five rams and nineteen ewes, four Hereford bull calves and three Holstein-Friesian bull calves were imported from the United States by air for use in an improved breeding program. A number of Holstein bulls were purchased from the Shola Ber Dairy at Addis Ababa for distribution to farmers who would care for them and make them available for breeding service to other farmers in the area.

As a follow up to the sheep breeding program of previous years in which wool type rams were placed with farmers for breeding with native ewes, a number of sheering demonstrations were conducted to show farmers how to utilize the wool from the improved sheep. Other demonstrations included the castrating and docking of sheep, control of external and internal parasites and other management practices.

With the arrival of Mr. Michael Galli, U.S.O.M. Livestock Advisor, in August, the project was altered from an extension type program to a development program. The primary reason for the change was a recognition of the fact that there were no basic facilities for a controlled animal husbandry program on government livestock stations whereby foundation herds of brood cows and sheep could be established to bring about a continuous upgrading of the various classes of livestock utilizing the bulls and rams imported from the United States in February.

In terms of reference, Economic Assistance Program funds were allocated to develop the required basic facilities on government livestock stations, therefore a Joint-Fund project was initiated and designed to complement this project. At present, the Livestock Development Project encompasses both Joint-Fund and Economic Assistance activities.

Joint Fund Activity - The aim of this program is to establish rural bull stations in the Addis Ababa area. A station was established at Shola Ber and two bulls placed into service at that station. Other stations were requested at the Akaki Garage compound and at the old Makanisa farm, both near Addis Ababa. These stations will be completed in 1958.

At the Entoto sheep farm near Addis Ababa, one hundred and sixty ewes were selected to establish a foundation flock of wool type sheep for breeding with a group of the rams imported from the United States.

At the new Holeta Dairy Farm a foundation herd of Holstein-Friesian brood cows was established. These cows are all progeny of old UNRA and Italian imports. The three imported Holstein bulls have been placed in this farm for breeding to these selected cows.
Economic Assistance Activity - Funds allocated to this project are for the development of basic facilities at the following stations: Entoto, Holeta, Kundi, Coffale, and Adamitulu. Aside from presentation of detailed budget requirements, designs and specifications for fencing and buildings required at each station, no concrete progress has been made in this phase of the program by the end of 1957.

ANIMAL DISEASE CONTROL & VETERINARY ASSISTANTS TRAINING

By

Dr. James W. Allen & Dr. Clifton N. Murphy

The Animal Disease Control project of the U.S.O.M. Agricultural Program was established with a view to the employment of three veterinary technicians. Two have been recruited and arrived in Ethiopia during 1957.

The Veterinary Assistants Training project was established to train vaccinators of the Animal Disease Control Department of the Ministry of Agriculture. The principal program of the Animal Disease Control Project is to control rinderpest. The training project is designed to give the vaccinators eight weeks of training. This is followed by a closely supervised period of work in a demonstration area. The students have a limited background and maximum use is made of visual aids in teaching.

A training center was established on the old Holeta Government Farm. A large abandoned building was renovated and equipped with dormitory and kitchen facilities. The classroom was equipped with chairs, blackboards and other teaching equipment. The first group of trainees arrived November 21, 1957. This group was necessarily small because a teaching outline and a program of instruction had to be developed on a suitable training level. This group completed their training in December 1957. During the first week of January, 1958, the field demonstration work was started in the Suluta Awarda. Twenty-two thousand cattle were vaccinated against rinderpest in this area by the middle of February when the training period was completed.

It is planned to rotate two hundred vaccinators and other personnel of the Animal Disease Control department of the Ministry through this training center for similar short courses and on-the-job training.

Classroom instruction and instruction in field operation is given by USOM veterinary technicians. A graduate from the Imperial Ethiopian College of A&M Arts has been assigned as a training leader for the project and a position has been established for another graduate to serve as an assistant training leader.
A remodeled building on the Holeta Government Farm houses classrooms and dormitory facilities for students of the Veterinary Assistants Training Program.

Dr. Clifton Murphy, veterinarian, performs a post mortem for a class of students.
In addition to the projected activities, the USOM veterinary techni­cians serve as advisors and consultants to the Director of Animal Disease control and senior officers of the Imperial Ethiopian Government and the U. S. Operations Mission. Investigation of diseases and study of disease problems in the country are made as a routine to provide suitable information on which to base plans and programs of control. Assistance is given to the Livestock Development Project and disease control work is done on the farms of the Ministry of Agriculture, the Central Experiment Station at Bishoftu and at the Agricultural Technical School, Jimma.

FARM MACHINERY PROJECT

By

Gordon Brand & Elbert Bowen

The Cooperative Agricultural Machinery Pool was established in 1953 as a U.S.O.M. Project with the technician being recruited at that time by the Oklahoma Contract. Its purpose was twofold: First, the training of Ethiopians in farm machinery repair, maintenance and operation. Second, the rehabilitation of tractors and implements in the various government machinery depots. Although most of this equipment was fifteen to twenty years old, a remarkably high percentage was in such condition that it could be economically salvaged and repaired. As this equipment was repaired, it was transferred to other U.S.O.M. projects such as the Imperial Ethiopian College of A&M Arts, the Central Experiment Station and Agricultural Improvement Centers. The value of this equipment has been proved by its highly satisfactory and continuing performance under field conditions.

The training aspect of the Farm Machinery Project has likewise been proved through the improved capabilities and skills of the trainees, the assignment of many of them to supervisory positions in other programs, and, in the services they have been able to perform for individual farmers.

Progress of the entire program has been very satisfactory. Shop equipment and facilities have been greatly expanded. Most of the equipment facilitating such expansion has been by direct contribution and transfer by the Ministry of Agriculture. Today, the trainees work and learn in one of the most complete and best equipped shops in all of Ethiopia.

As the machinery requirements of U.S.O.M. Projects were met, it was determined that a still greater need of Ethiopian agriculture could be served through the establishment of a rental pool of farm machinery. As equipment is rehabilitated and repaired it is placed in the pool and
An improved oxen drawn steel plow produced in the Farm Machinery shops is demonstrated before a group of farmers.

A simple harrow of indigenous material is demonstrated at a farmers' meeting.
leased to individual farmers for terms of varying duration. Custom plowing is done for individuals by trainees. Such a program fills many needs. The experience gained by trainees is extremely valuable, cost and operational data is accumulated and the benefits of mechanized equipment are demonstrated to a large number of farmers with a resulting ever-growing interest and demand for individually owned equipment.

An even greater contribution to Ethiopian Agriculture is anticipated through the initiation of a small implement program. Only the most primitive implements are used by the average Ethiopian farmer, consequently, they are barely able to produce enough to feed their own families. There is a large inventory of small implements in Ministry of Agriculture warehouses, and, although this equipment was received more than ten years ago, distribution has been deterred by the fact that in their present state, the implements are unacceptable and are not adapted for use behind oxen, and because there has been no organized plan for demonstration and distribution of these implements.

At the present time, the small implement program is working in the following areas: 1. Modifying and adapting implements to meet local needs and conditions, 2. Field testing such implements to determine satisfactory operation behind oxen, 3. Field demonstrations to farm groups to show Ethiopian farmers how to use such implements and to determine adaptability, 4. Research with other small implements such as hand seeders and scythes that are within economic reach of the smaller Ethiopian farmer, 5. Manufacture by trainees, from scrap materials, such simple implements as peg harrows, scrapers and packers, and, 6. Distribution of the above implements at acquisition or modification cost.

Each year the list of services performed by the Farm Machinery Project in behalf of Ethiopian Agriculture is expanded, more nearly approaching the economic self-sustaining level.

REGIONAL INSECT CONTROL PROJECT

By

W. C. Kurtz, Entomologist

The Pest Control Program in Ethiopia was established in 1956, and the present entomologist arrived in Addis Ababa in January 1957.

It has been comparatively few years since losses to agricultural crops from plant pests have been recognized in Ethiopia. During the war years attention was focused on the desert locust problem because of international implications, and thus interest was stimulated in other insect and plant protection problems. Various organizations such as
A portable sprayer is demonstrated to a group of Ethiopian pest control workers.

Don Kjos, Regional Insect Control Pilot-Mechanic, instructs trainees in the operation and maintenance of a Piper Cub spray plane.
the British Desert Locust Control Organization, the Food and Agriculture Organization of the United Nations and the United States Regional Locust Control Project, (now known as the Regional Insect Control Project) as well as the U. S. Operations Mission assisted the local government in combating the desert locust plague. At the present time, the Ministry of Agriculture has assumed the major responsibility in controlling the depredations of the plague in Ethiopia.

By continued encouragement of Point Four (U. S. Operations Mission) and the Regional Insect Control Project, the depredations of other agricultural pests have been recognized as an important factor in the economy of Ethiopia. Losses to agricultural crops have never been fully appraised and no estimate has been made of the economic damage caused by these pests, however, it is well known that losses are high even during years when the desert locust infestation is at a low ebb.

Efforts are being made by the Ministry of Agriculture to establish a unified Plant Protection Section which will have the responsibility for the control of economically important insect pests and plant diseases. Rodents, besides being a public health menace, cause considerable damage to agricultural crops, and consequently, some control measures must be considered.

There has been a serious lack of trained personnel, equipment and pesticides with which to carry out the proposed Pest Control Project. Funds from a joint-fund setup by the Imperial Ethiopian Government and the U.S.O.M. were used to purchase adequate supplies and equipment with which to carry out small scale demonstrations for the purpose of showing the farmers that they need no longer tolerate extensive crop losses, and to find out what pesticides are most practical for use in Ethiopia. Also, and more important, was the proposed development of trained personnel who would be able to carry on these demonstrations and help educate the farmer in pest control problems. This type of farmer assistance naturally ties in very closely with the Agricultural Extension Service, and the Pest Control Project advises agents and assists with crop pest problems.

According to the agreement setting up the Pest Control Program, the Ministry of Agriculture was to furnish ten trainees for instruction in pest control work. Eight trainees have received training in pest control theory and practical field work. Five of them are capable of conducting limited surveys and field control demonstrations.

As a further expansion of locust and pest control work, the Regional Insect Pest Control Project, at the request of the Ministry of Agriculture, has sent in two Piper Cub spray planes and a pilot-mechanic. The plans can be used on an emergency basis to assist the Ministry with desert locust control activities. Also, Ethiopian pilots and mechanics are being trained so that within a few years, the Ministry will be able to own and operate spray planes of its own.
Dealers, so far, have been hesitant to stock pesticides because there has been almost no demand for them. It is hoped that through the demonstrations being carried on by the Pest Control Project that a demand will be created and the dealers encouraged to stock at least some of the more common and useful pesticides.

Prices of chemicals are generally beyond the supposed means of most farmers, but through educational work coupled with demonstrations, the farmers are being shown that for a small investment in pesticides, they can make a better profit because of better crop quality and yield.

Import, export and domestic plant quarantines are non-existent in Ethiopia. However, protection of agricultural production through quarantines is being seriously considered by the Ministry of Agriculture and it is hoped that, at least, import regulations will be enacted within the near future. Due to the lack of trained personnel and better knowledge of insect and plant disease problems within Ethiopia, it is impossible at the present time to consider export and domestic quarantine regulations. Also being considered is a basic plant pest law under which the Ministry of Agriculture will be authorized to carry out control problems and operate and enforce plant quarantine regulations.

Accompanying pest control and regulatory programs there must also be developed an expanded educational program. At present the supply of trained personnel is very inadequate. Educational facilities in general agriculture are expanding rapidly, but in many fields, including entomology and plant pathology, there is as yet no provision for specialization. Specialists are needed, not only to carry out the control programs, but to direct and carry on research on the habits and life cycles of Ethiopian insects, and how best to control them. Similarly, this applies to plant diseases.

Ethiopia has a great potential in agriculture, and enough food and fibre can be produced through improved agricultural methods to raise the standard of living of all its people and have surpluses for export. Equally as important, with improved agricultural methods, is the protection of crops from insect pests, plant diseases and rodents.