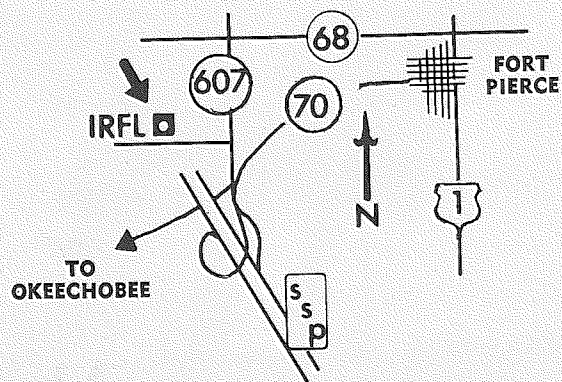


INDIAN RIVER FIELD LABORATORY

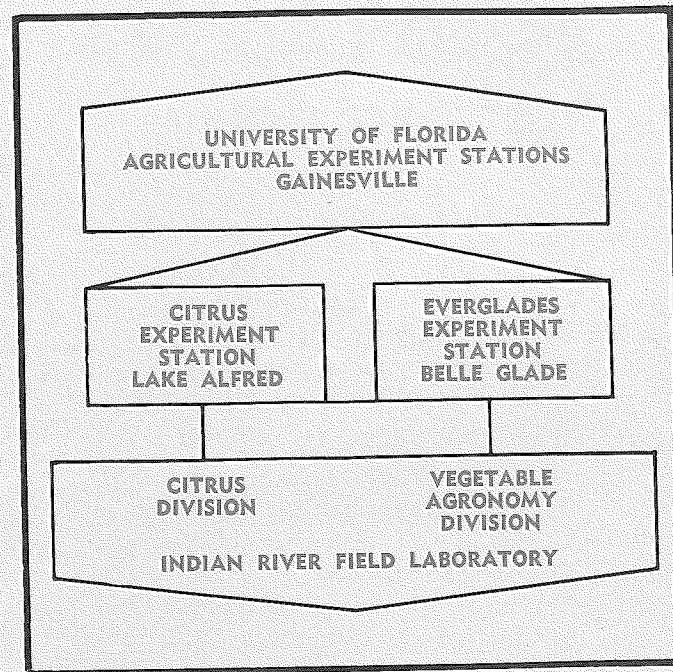
FORT PIERCE, FLORIDA



A BRANCH OF THE FLORIDA AGRICULTURAL EXPERIMENT STATIONS, INSTITUTE OF FOOD AND
AGRICULTURAL SCIENCES, UNIVERSITY OF FLORIDA, GAINESVILLE. J. R. BECKENBACH, DIRECTOR.



The laboratory (IRFL) is located about five miles west of Fort Pierce on Kings Highway (route 607) between State Roads 68 and 70, and about one mile north of the entrance to the Sunshine State Parkway Turnpike (SSP).



History and Development

The Indian River Field Laboratory had its beginning in 1947. During that year research on an 80-acre plot containing 35 acres of bearing grove that belonged to St. Lucie County, included a citrus soil survey, water salinity studies, water table studies and fertility trials.

Two staff members of the Citrus Experiment Station—a plant pathologist and a horticulturist—were permanently assigned to Fort Pierce in 1949, and the program was expanded to include nutritional sprays, insect control, cover crops, and weed control in citrus.

The first major step toward establishing a permanent agricultural research laboratory was when St. Lucie County granted a renewable lease to the State Board of Education. This made the 80-acre plot available for both short-term and long-range research by scientists of the Citrus Experiment Station.

Research was expanded to include vegetables and agronomic crops in 1950 when the North St. Lucie River Drainage District donated 720 acres of agricultural land to the State Board of Education. This land, adjoining the 80 acres leased from St. Lucie County, provided ample acreage not only for immediate needs, but for future expansion of the research program into any field of agriculture which may be important to the Indian River area. It also provided State-owned land on which State financed buildings could be constructed.

Another milestone in the history of this Laboratory was adoption of the official name, the "Indian River Field Laboratory." The Laboratory was "established to serve the research needs of Florida with special emphasis on a five-county area comprising Martin, Okeechobee, St. Lucie, Indian River, and Brevard counties".

The Everglades Experiment Station transferred an entomologist to

Fort Pierce in 1950 to survey the needs, and establish a permanent research program on vegetables and pastures, with special emphasis on tomato production. The early work of accumulating equipment and preparing land for research plots required the assistance and cooperation of many local people since state funds were not available at that time.

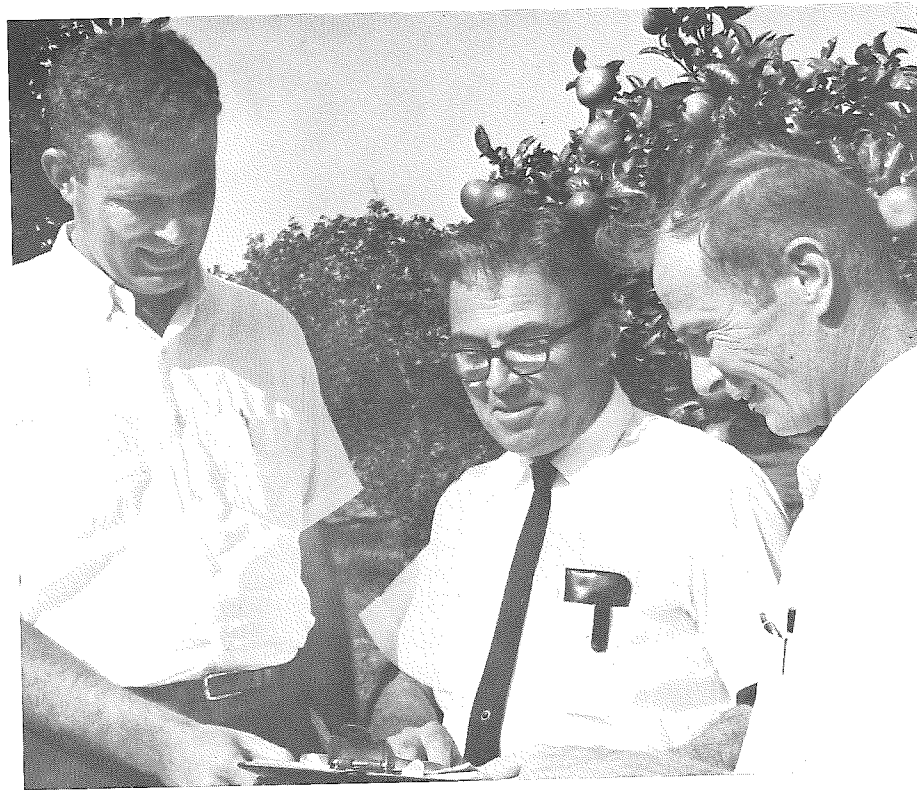
A plant pathology position was created soon after the vegetable-pasture division was added to study tomato and other vegetable diseases. An agronomist was transferred from the Everglades Station to this Laboratory in 1955 to expand research on pasture and grain production.

During the early 1950's research was initiated on citrus rootstocks, root depth of citrus trees, and timing of scabicide sprays (a long-term study). An entomologist was added by the Citrus Experiment Station in 1955 to the staff already at Fort Pierce.

Finally, to bring this brief history up to date, a \$62,000 modern office-laboratory unit was completed in 1960. Added to a previously constructed \$20,000 greenhouse-laboratory, this completely air conditioned facility provides office and laboratory space for the entire staff. Three greenhouses round out this research center.

The Indian River Field Laboratory has always worked in close cooperation with growers and ranchers, manufacturers and suppliers of agricultural products, and Extension personnel. This teamwork among those most interested in the expansion and betterment of agriculture has resulted in major strides which have had a healthy influence on the Indian River area economy.

The following pages will illustrate the type of research at the Indian River Field Laboratory and a few of the major accomplishments since its beginning in 1947.



Staff members of the Citrus Division discuss a problem. Reading from the left they are Dr. David V. Calvert, Assistant Soils Chemist, Dr. Mortimer Cohen, Associate Plant Pathologist, and Dr. Robert C. Bullock, Associate Entomologist.

CITRUS RESEARCH

The Indian River Area

The Citrus Division works to improve production methods in the Indian River area. This area differs from Florida's central ridge because of shallower, finer-textured soil, and relative freedom from freezes, which often beset the central area. It also has some special insect and disease problems. The freezes of 1957 and 1962 led to tremendous expansion of citrus acreage in this area, and consequently more problems.

Since more and more shallow soil areas in Florida are being planted to citrus, research done at the Indian River Field Laboratory can benefit more than the immediate area.

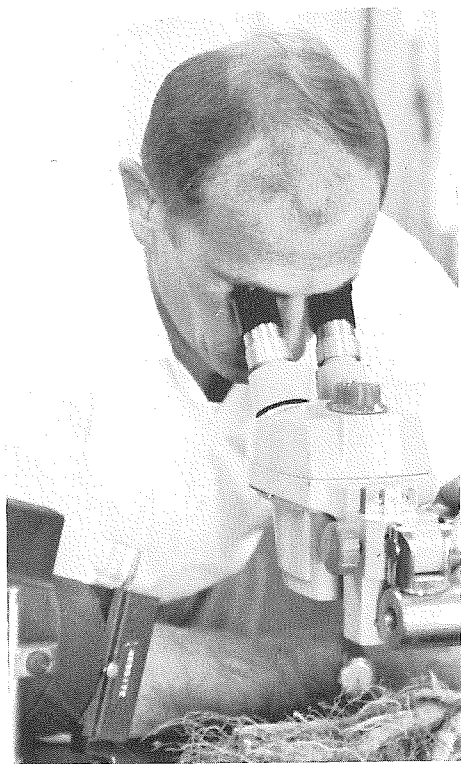
Citrus Spray Program

Modern citrus production requires the use of chemical sprays applied to trees. These sprays provide insect and disease control and also can add needed nutritional materials. New materials and meth-



James DeWitt, lab assistant, prepares for bio-assay of soil insecticides using the small fly, *Drosophila melanogaster*. Flies used in this test are always less than 24 hours old.

Dr. Robert C. Bullock, Associate Entomologist, examines citrus roots for evidence of feeding of the Fuller rose beetle, or other soil insects.



ods are examined constantly in an effort to improve the spray program. The Citrus Division Staff also helps prepare the annual Florida Citrus Spray and Dust Schedule. Methods of applying spray materials are also studied, with special emphasis recently on aerial spraying and techniques for applying low volume sprays.

Special Insect Problems

Soil insects cause much damage in many parts of the world by feeding on the roots of trees. Pioneering studies by the Citrus Division have uncovered basic information on the life history and control of the Fuller Rose Beetle, one of the most damaging of this type pests. Studies have also been made of the fruit piercing moth which works at night to puncture mature fruit hanging on trees. Scale insects and mites and other minor citrus pests are under constant study. New materials to control these pests are regularly evaluated in careful experiments.

Drainage and Irrigation

The water table is never far below the soil's surface in the Indian River area, making both drainage and irrigation of utmost importance to growers. Special instrumentation is being used to study changes in water level, soil moisture, and root growth throughout the year. This information is helping to establish improved drainage and irrigation procedures. A special problem of the Indian River area is the use of artesian water for irrigation. Such water is often high in salt content. Studies by the citrus staff have shown that typical salt burn symptoms can be produced by daytime, low rate, long duration, overhead sprinkle irrigation with water containing 1000 ppm⁽¹⁾ or more total dissolved solids.

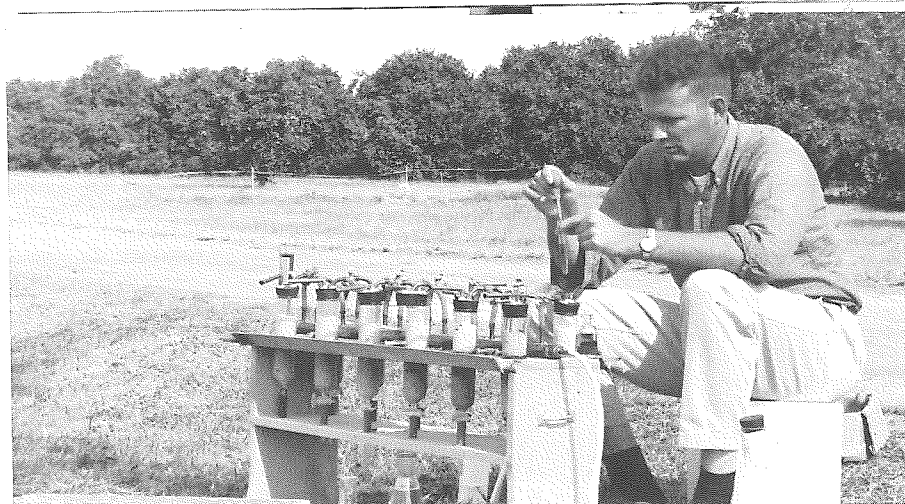
Indian River soils, because of their greater water-holding capacity, present irrigation and

⁽¹⁾ ppm—parts per million

drainage problems not found in other parts of Florida. Some of the earliest work by the Citrus Division provided the first good description of these soils.

Fertilization of Citrus Trees

Fertility studies at Fort Pierce have helped provide a scientific basis for fertilizer practices, not only in the Indian River area but throughout Florida and the world. Essentially no experimental data existed concerning the amounts of fertilizer, times of application, or ratios among the elements when these studies were begun. Fertilizer practice was based on grower experience and Central Florida research. Studies conducted over a period of years have provided a better understanding of the problem of applying fertilizers to Indian River groves. New experiments are in progress to determine the rate and timing of fertilization under conditions of recent developments in the Indian River area.



A study of the permeability of some soils to water is being conducted by Dr. David Calvert, assistant soils chemist, above). Rate of growth of trees in field experiments is often determined by measuring trunk circumference as is shown by W. Dwight Mallard, lab assistant (below).



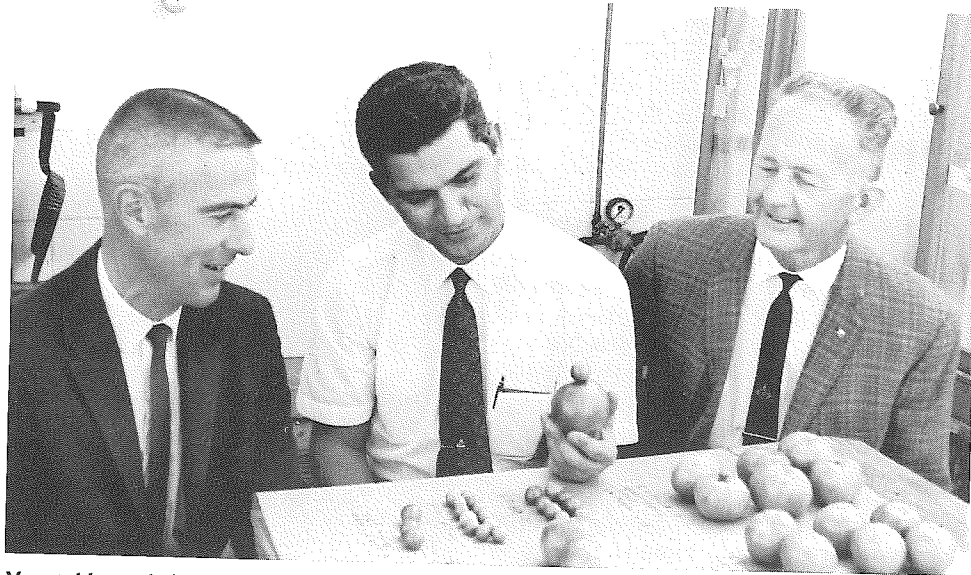
At the same time, new techniques for applying magnesium, potassium, and iron to trees deficient in these elements are being studied.

Disease Problems

Citrus scab, melanose, brown rot, and greasy spot disease studies have helped provide a basis for present control recommendations. Citrus blight, a disease for which the cause is unknown, is also under study at this station. Citrus virus diseases, such as tristeza and exocortis, have been investigated in the greenhouse and in field trials. Studies indicate present methods of controlling foot rot are not effective, but that trees often recover spontaneously whether treated or not.

Selection of Best Citrus Trees

Experiments comparing the performance of 'Valencia' orange and 'Ruby Red' grapefruit rootstocks on two soil types were first set up



Vegetable and Agronomic research staff examine tomatoes. From left are Dr. A. E. Kretschmer, Jr., Agronomist, Dr. N. G. Vakili, Asst. Plant Pathologist, and N. C. Hayslip, Entomologist.

in 1950. Additional trials with these and other scion varieties have been begun since that time. Under way is a study comparing performance of different selections of 'Valencia' orange. This should help determine the value of old

line versus nucellar selections, and to study the influence of symptomless virus diseases on trees. A trial recently begun will evaluate the effect of introducing mild strains of the exocortis virus into citrus trees.

AGRONOMIC RESEARCH

Agronomic work at the Indian River Lab was initiated during the early 1950's. The program's overall objective was to obtain uniform distribution of quality forage by increasing winter production and summer quality.

Cultural studies, and fertility and liming experiments helped to develop white clover for use in permanent pastures in south Florida. This increased spring yields and quality.

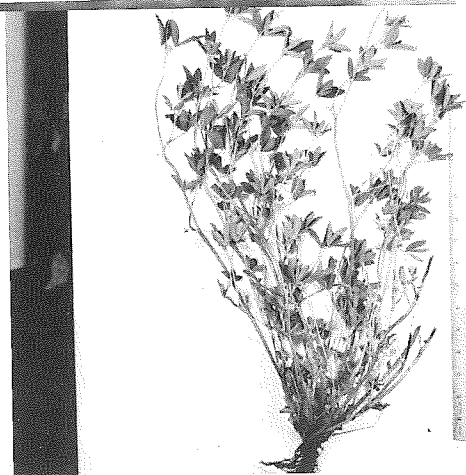
Yields and crude protein content of improved grasses being used in south Florida were compared. White clover also was grown in combination with several of the improved grasses to de-

termine compatibility and yield. These studies led to publication of two bulletins.

The unit began widescale introduction of various other clovers in an attempt to find more productive legumes for late fall and early winter. Although tests are continuing, berseem clover proved ideal for early winter production.

A circular on its use was published. Work continues on the adaptability of Persian, Red, and other selections made at the Laboratory.

Cliff Boyles (right), Okeechobee County Agricultural Agent, observing a commercial planting of *Stylosanthes humilis* growing with pangolagrass.



Berseem clover (above) and *Stylosanthes* are two promising forage crops resulting from plant introduction studies at the Indian River Field Laboratory.



In efforts to find grasses more productive than pangola for the late fall through early spring period, almost 200 introductions have been included in observational and replicated experiments. Work is continuing on more than 20 that appear to be adaptable.

Another phase of winter pasture production research has been work to determine yield and adaptability of oats, rye, and ryegrass.

Extensive work has been completed on the effect of fall fertilization of pangolagrass to provide reserve feed in early winter. The program included intake and digestibility studies, and the practice of "late fertilization." In this practice the reserved pangolagrass is fertilized heavily with nitrogen about three weeks before it is utilized as hay or for grazing in November or December. Depending on the tonnage of grass present when fertilized, and the rate of nitrogen applied, the crude protein level can be elevated markedly.



A box of Indian River Variety tomatoes, the result of a state-wide cooperative tomato breeding program.

The intake by cattle of such treated grass also is increased.

With respect to summer production of quality feeds, field corn and sorghum variety tests, plant population studies, and dates of planting experiments have been completed. A circular has been published on the production of these grain crops following winter vegetables.

Large scale testing of tropical legumes for use in permanent grass pastures, or for use singly for green-chop or storage, was initiated several years ago. Preliminary results were sufficiently promising to increase the efforts in this phase of pasture research. *Stylosanthes humilis*, a self-renewing annual, summer-growing legume, has proved to be adaptable to south Florida and grows well in pangolagrass. Siratro, a perennial legume for grazing also is adaptable to most of Florida. In tests, when either legume was added to pangolagrass the result

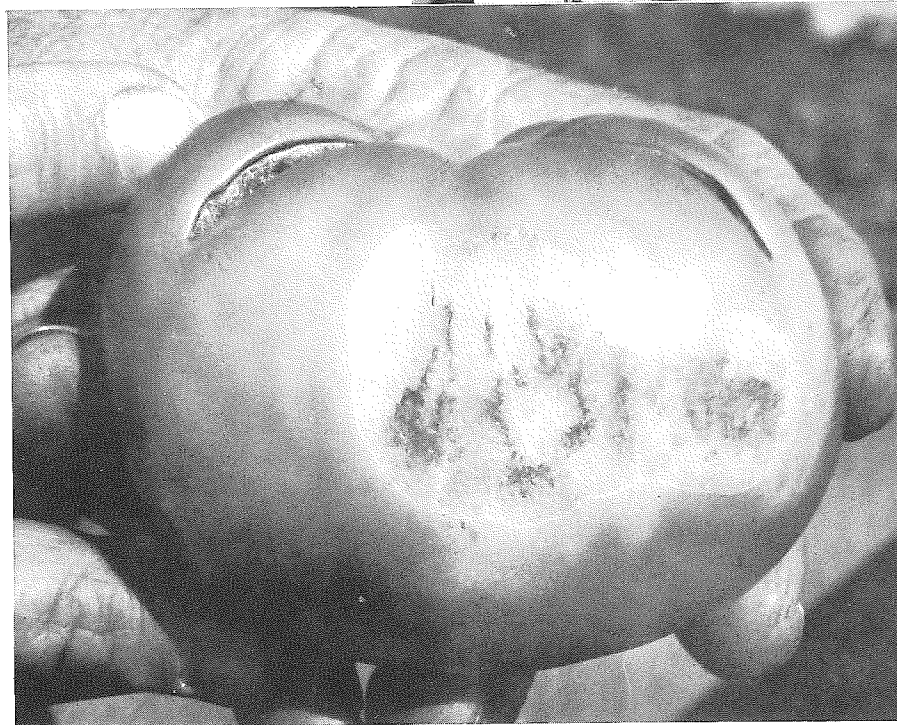
was a large increase in both production and crude protein content compared to pangolagrass alone.

VEGETABLE RESEARCH

Tomato production problems have received major emphasis at this laboratory since the late 1940's, and continue to have priority over research with other vegetable crops.

The first concern of Indian River Lab personnel was a survey of tomatoes growing on "old" (previously cropped) soil and on virgin land. This study identified several important reasons for frequent losses on the "old" land, and formed a basis for early research. After the costly late blight epidemic of 1948-49, tomato research was established on a permanent basis in 1950.

The knowledge of scientists throughout the world, and cooperative projects with specialists from other Florida research units have made possible an active,

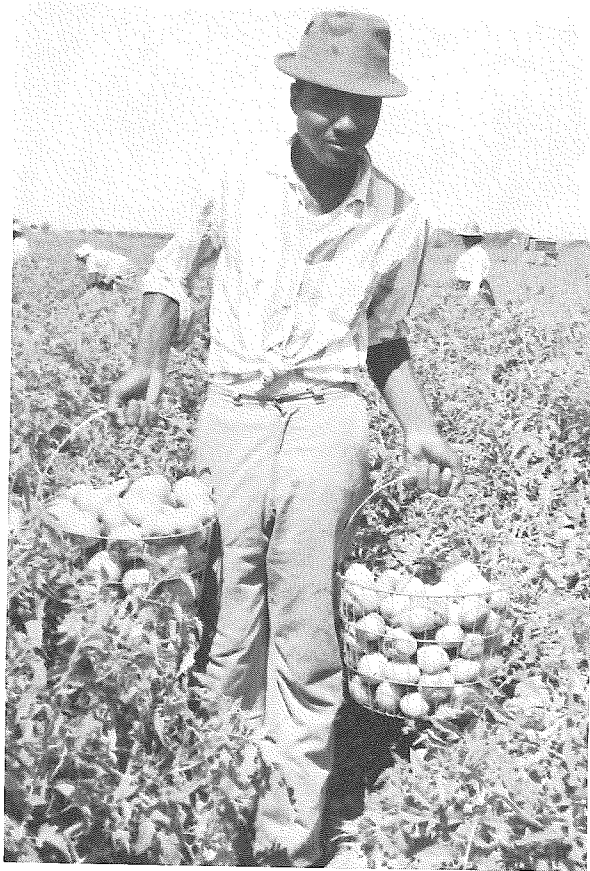


Graywall of tomato is being reduced through tomato breeding and nutrition studies.

broad and productive research program. Most research involves the tedious and time-consuming job of small refinements which alone make little news, but which are basic to a progressive and expanding tomato industry. However, the

following achievements will illustrate the way research plays a vital role in Florida's tomato industry.

Past Accomplishments.—From a land-use study evolved a circular recommending the rotation of



Lugging and hand-harvesting may become a thing of the past, but not before intensive research develops the right machine, variety and know-how for mechanical harvesting.



The machine in photo above was built to harvest tomatoes for the processing industry. It was found unsuitable for fresh market tomatoes. At right, W. W. Deen, Jr., of the Everglades Experiment Station, tests a principle which might work for handling fresh tomatoes.



tomatoes and pangolagrass. This provides a practical means of eliminating certain "old land" problems—such as root-knot nematodes and bed erosion—and reducing others, such as weeds and various rots of tomato fruit.

Gray mold, *Botrytis cinerea*, emerged as a serious threat to the sand land tomato industry during the early 1950's. Through research, highly effective controls were developed, including use of fungicides and application of higher rates of lime.

Resistance to graywall was discovered in some tomato breeding lines, offering a chance to solve this serious problem through breeding. Recent research using susceptible varieties indicates severity of graywall may be reduced by higher rates of potassium.

A major advance was made in better gray leaf spot control when Dyrene was found to be highly effective and safe on tomatoes. A



The value of plastic strips placed over banded fertilizer as method of preventing leaching is shown in this photo. Fertilizer was applied just prior to transplanting crop.

new race of the fusarium wilt fungus was discovered while the problem was still localized. A prompt search for resistance formed the ground work for control through breeding of this threatening disease.

When leafminers developed high

resistance to recommended insecticides, new chemicals were tested and Cygon and Guthion proved to be effective. From nutrition studies since 1950 has evolved revised recommendations for liming and use of trace elements. In addition recent research has shown changes in the use of major elements will

further increase yields and ripening quality of tomatoes.

The use of full bed cover and of strip plastic over drilled fertilizer greatly reduce the leaching of fertilizers, and improve yields. A major effort in the cooperative tomato breeding program has produced several important disease resistant varieties, such as Indian River, Manapal, and Floradel.

Current Investigations—Present research emphasis includes the development of mechanical harvest equipment for fresh market tomatoes; breeding for resistance, and developing chemical control of bacterial spot of tomato; breeding for a vine-ripe type tomato which can be harvested off plastic covered beds without pruning or training; development of a tomato resistant to the new race of fusarium wilt; and further studies on tomato nutrition as it relates to quality and yield.

Other Vegetable Research

Onions — Varieties, seeding dates, plant spacing and fertility studies have been completed. **Peppers**—Disease control and breeding for resistance to bacterial spot have received some attention.

Sweet Corn — Disease and insect control trials made up some of the early work at this laboratory.

Potatoes—A limited program of research on potato varieties and fertility has been completed.

OTHER INVESTIGATIONS

Roses — A large scale fertility trial designed to determine optimum rates and ratios of N, P, and K for yield, quality, and stem length of Happiness and Christian Dior roses is entering its third year. Another test compares the use of plastic covered beds and

fertilizing at one or two year intervals with no plastic and fertilizing every two weeks.

Blackberries — Variety Brazos has been shown to produce high yields of large attractive berries in the Indian River area. Preliminary information indicates that insects and diseases may be controlled by use of a spray program.

Grapes — The production of grapes on the low poorly drained flatwoods soils was achieved by use of beds similar to, but smaller than those used for citrus. Breeding lines are evaluated.

Sugarcane — A secondary quarantine plot of imported sugarcane accessions are grown each year as a service to the USDA Sugar Crops Field Station, Canal Point.

