AIRGRAM

DEPARTMENT OF STATE

Gattoni, Louis A.
Rural Development
4890594-17 AGR

KS
635.072
K64
Gattoni 65
1

UNCLASSIFIED
CLASSIFICATION

For each address check one ACTION | INFO

AID/W TOAID A 1583

DATE REC'D. PD-AAD-424-A1
AGENCY FOR INTERNATIONAL DEVELOPMENT
1965 JUN 18 AM 10 41
25p
CAROL DATE SENT RECORDS SECTION
6/15/65

DISTRIBUTION
ACTION
FTEC
INFO.
WC
EC
FPER
PERS
FEA
TCR
OTS
RES

FROM - SEOUL

SUBJECT - End-of-Tour Report, Louis A. Gattoni, Horticultural Advisor, Rural Development Division

REFERENCE - AID/W Report Control No. U-513 489-11-110-594

As the attached report will indicate, Mr. Gattoni has applied himself with great vigor and considerable initial success to the many horticultural problems of Korea.

He has, among other things provided valuable technical assistance to the U. S. Eighth Army in its campaign to encourage the production of sanitary fruit and vegetable supplier for consumption by its forces. On an experimental basis, he has directed the first commercial production of grape juice and wine in Korea. He has recently undertaken to promote the use of Korea's vast reserves of peat moss for composting material.

USOM/K will welcome Mr. and Mrs. Gattoni back to post after home leave.

100-W

OTHER AGENCY
State
CIA
NSA
Agriculture
FAS-4

A.I.D. Reference Center

BROWN

Attachment: End-of-Tour Report
Louis A. Gattoni

PAGE 1 OF PAGES 25

DRAFTED BY	OFFICE	PHONE NO	DATE	APPROVED BY
JRMotheral:slj:	RDD	8401	6/7/65	Frank M. Landers, Acting DD

AID AND OTHER CLEARANCES

RDD (25 copies)

PERS

UNCLASSIFIED
CLASSIFICATION

END-OF-TOUR REPORT (Control No. U-513)

Name : Louis A. Gattoni Job Title: Horticulture Advisor

Country of Assignment : Korea

Year of Duty Began: July 12, 1961

Year of Duty Ended: June 30, 1964 Prior Country Assignment & Years:
El Salvador, Central America -
2 Years, 8 months

Project Activity (Name and No.) 489-11-110-594 Rural Development Policy Planning and Survey

* * * * * * * * * * * * * * * * * *

A. Summary of Report

Horticulture Research Program in Korea.

1. Improvement of Vegetable Crops.

There are three main aspects of improvement to follow: native Korean vegetables which require disease resistant strains and breeding or multiplication of improved pure seed and virus resistant lines; potatoes, research on late blight resistant varieties, selection and multiplication of virus-free potato seed; western vegetables, the adaptability of new commercial varieties for a crop diversification program and the increase and improvement of vegetable production techniques to supply the US and UN Military Forces requirements in Korea and improve local market products.

2. Fruit Crop Improvement.

Research for commercial fruit quality improvement through surveys of fruit trees, mineral nutrition, field and laboratory investigation on leaf analyses and soil fertility to achieve a better balance of nutrients.

Adaptability of commercial fruit varieties, particularly apples, pears and grapes for export and processing.

3. Viticulture and Grape Technology Improvement.

Introduction and adaptability evaluation of new varieties, hybrids and rootstocks. Adaptability and selection of wine grapes for grape juice and wine processing to replace rice wine (cereal wine) which consumes more than 10 million dollars of grain annually.

4. Vegetable Crops

For more than 40 years the local Asian vegetables, namely Chinese and Japanese species and varieties such as cabbage, radishes, onions, garlic, hot peppers, cucumbers, etc. that are used extensively in native dishes, have received considerable attention in the investigation and improvement program but production is not what it could be, handling and marketing of the produce is deficient and prices are high.

There is a shortage of vegetables in the Korean diet although the famous Korean Kimchi, composed largely of pickled radishes and Chinese cabbage, is eaten practically in every home.

Western vegetables are mostly new to Korea and consumption is limited among the Korean people, but Korea is displaying great interest in participating in extensive research in western vegetable improvement to supply the US and UN Forces in Korea. Improvement in cultivation methods, production of better commercial varieties, introduction of U.S. seed, fertilization, disease and insect control, harvesting, grading, packing and marketing are an essential part of the new western vegetable program.

5. Fruit crops

It is rather difficult to make a comparison between the fruit production of Korea and that of the United States. While there is a certain similarity in climate, the conditions under which fruit crops are produced in Korea are very different.

Korea's domestic fruiticulture production has not kept pace with demands, thus resulting in a great need for expansion. Increased consumer purchasing power along with population growth has brought about a greater demand for fruit production and expansion for processing and exports.

Total annual fruit production is very low; roughly 200,000 metric tons, which represents about one pound (453 grams) of fruit per person per year. This fruit consumption is insignificant compared with the 374 pounds (170 kilograms) of grain consumed in the Korean diet per person per year.

The main fruit crop is apples which is produced in the Taegu, Yesan and Chongju districts. Pears, peaches and grapes are seen all over the country but plantations are concentrated in Gosa, Osan and other areas near Seoul and along the West Coast as far as Naju, Cholla Namdo Province. The largest and most famous district for persimmons is Jinyeong, near Pusan, but there are several areas on the South Coast and Gangneung on the East Coast where they are grown. Cherries and chestnuts grow almost spontaneously anywhere, but because of a serious disease affecting cherries and insects attacking chestnuts neither crop has much commercial value. Citrus fruit, tangerines in particular, is produced only in Sokipo, Cheju Island and experimental plantings are seen on some of the southern coastal islands (Jindo Kohung, Koje, etc.).

The fruit industry in Korea is capable of large expansion but the lack of modern methods, lack of valuable commercial varieties and appropriate orchard management, particularly correction of soil acidity, fertilizer balance, and the control of insects and plant diseases is preventing attempts to increase marketable and exportable production.

Many modern production methods are known in Korea, but are not being practiced as yet by the producers. Suitable fruit harvesting, selection, grading, packing and storing are priority requirements.

There is no doubt that Korean fruit growers could be helped very effectively by increasing fruit production techniques. Presently fruit growing is on its way to modernization.

Since 1960, USOM has contributed considerably to Korean fruiticulture progress. New imported commercial varieties of apples, grapes, peaches and pears will improve fruit quality for export, storage and processing.

The Pomology Experiment Stations have a large collection of the following fruit trees under experimental trials: apples 105 varieties; pears 68; grapes 87; peaches 88; strawberries 22 varieties.

6. The advisor came to Korea on a direct transfer from El Salvador. A six month extension of tour of duty from December 16, 1964 to June 30, 1965 was granted.

In Korea there is no evidence in the USOM file that an American Horticulturist Advisor had ever been assigned to this country before. It has been impossible to find modern horticulture reports, references or literature of any kind. For this reason this end-of-tour report may seem prepared more in a narrative manner but this is justifiable as a great deal of file references

have had to be compiled for the first time.

Project Activity on:

Horticulture Experiment No. 6 (Improvement of vegetable crops).

Fruit Crop, Pomology Experiment Station No. 6 a. (Varieties, orchard management, storage and marketing practices improvement).

Viticulture and Grape Technology Improvement No. 6 b.

Plateau Land Research, White Potato Research No. 9.

Existing Differences Between U.S. and Local Practices and Adaptations Attempted

For better understanding of the Korean technical horticulture situation and its attempt toward modernization it was necessary to consider some aspects of the past and some of the characteristics of the nation. Therefore upon the arrival of the advisor about 5 months were exclusively dedicated to a general study and survey of Korean fruticulture, viticulture and vegetable production. It was essential to take a quick glance of the land area, the soil, the climate in relation to the geographic location of the Korean peninsula, the people and many of the Asiatic customs, particularly typical rural life and deep-rooted farm operation methods.

As a result of many field trips, surveys and studies, a special report entitled "A Standpoint of Horticulture Development in the Republic of Korea" was prepared. The photographs have not been completed yet to have this report published.

For hundreds of years vegetable and fruit growing in Korea has been carried out on a small scale for domestic supply only. From 1905, when the Model Agriculture Farm was established in the Seoul area, horticulture experiment work as

a well organized vegetable and fruit crop production has made significant progress in the field of native species.

In 1929, the investigation program received considerable attention in the introduction of new seeds and plants, hybridation, selection and improvement of local Asian vegetables, namely Chinese and Japanese species and varieties such as cabbage, radishes, onions, hot peppers, eggplant, cucumbers, melons, garlic, squash and ginger that are used extensively in native dishes.

From 1930 to 1940 some large vineyards and wineries were established by the Japanese in the Pohang area (Kyongsang Pukdo) and the Asan area (Chungchung Namdo) and a large yellow peach plantation program and peach cannery was established in Naju. These industries were interrupted and destroyed during the Second World War.

During the Japanese occupation (1910-1945) the Horticulture Experiment Station in Chong Yang Ri, the Pomology Experiment Station in Suwon and the Tongnae and Kimhae Branch Station were established. These stations were and are responsible for research on vegetable and fruit cultivation.

On account of climatic conditions in the hot rainy summers Koreans have obtained many hardy and pest resistant varieties.

A great deal of credit for this success is due to the Koreans for this scientific research work in fruits and vegetables; work that takes many years of constant effort.

In 1950, research and guidance work in fruit improvement became very active. Through variety improvement, intensified fruit tree nurseries and grafted stock distribution, fruit plantations were extended in different areas

of the country. It became evident that fruit growing was more profitable than rice and other crops and that fruit orchards also provide work and keep the farmer and his family busy almost all year round. But Korean fruit farmers have always had economic difficulties in increasing and improving orchard productivity.

Extensive research has been carried out on fruit, particularly on Korean pears, peaches and persimmons. There are hardy and well adapted fruit varieties, but they do not have the flavor, sweetness, color, shipping, storing and keeping qualities as well as many other commercial and processing requirements that are mandatory for export and industrialisation.

Consequently, Koreans have made a great effort to export apples. They have been able to export some late apple varieties to Taiwan and Hong Kong. Some 100,000 boxes are exported annually from the Taegu area at (U.S.) $3.50 per box FOB Pusan. But as the price of fruit on the Korean market is much higher than on the international market and because it is good for domestic consumption but does not meet export standards this business is not too successful at present.

The canning of peaches for domestic consumption and export also presents problems; flesh color, texture, flavor, etc. do not fill international standards and grades.

At present there are three wineries in operation trying to process pure grape wine, but as with apples and peaches, the quality is the problem. Common local grapes such as Campbell Early, a Concord type, notwithstanding its excellent yield, have a sugar content of 14% which is too low to produce the

percentage of alcohol required for good wine preservation.

The U. S. and U. N. Forces in Korea have proposed to purchase all its produce from Korean farmers in-so-far as the Korean farmers can produce good quality western vegetables. The present requirements represent 5 million pounds with a value of about ½ million dollars. Purchases could increase to one million dollars if quality and quantity are obtained.

These and many other examples reflect the stage and situation of old Asian horticulture techniques and are showing and proving that Korea must achieve achieve new progress, new development in cultivation methods, improvement of new varieties, a revision and rehabilitation of fruit production. Therefore, the renovation and modernization of technology; a new stage of horticulture, is urgently needed.

Research in both vegetable and fruit crops has made significant progress in 17 years, but production must be improved, modernized and intensified. At present, the 1965 national horticulture improvement program or plan in operation could be summarized as follows:

Vegetables

a. The horticulture research program of the Office of Rural Development consists of investigation and experimental work on fruit and vegetables conducted at the five Horticulture Experiment Stations throughout the country. The principal research effort to improve horticultural crops is the breeding or multiplication of improved varieties; development of disease resistant vegetable strains, continuous studies of a large number of plants, new varieties and hybrid adaptability for crop diver-

diversification to increase production.

b. The expansion of private vegetable seed breeding production on a basis of a pure seed line. A large and well organized number of vegetable seed production farms are in operation and all of these commercial seed producers are in contact with and are receiving the pure seed line provided by government horticulture experiment stations. Technical help to increase the private seedsmen breeding program activity is important.

c. The production of selected potato seed at the Alpine Research Station in the Taekwalyong Mountain area is a most efficient technical labor and constitutes a remarkable example of the national horticulture progress and seed cooperation program.

d. Research on Vegetable Improvement in Asia.

At the Regional Vegetable Research Center for Southeast Asia it has already been pointed out that as a result of overpopulation, the diet of Asian people is preponderantly starchy and lacking in protective foods. The necessity for growing more vegetables of high nutritive value has become increasingly urgent because of the rapid growth of population and the need for a balanced diet of plant nature. Vegetable production in some of the Southeast Asian countries is confronted by many important problems such as:

(1) lack of adequate varieties, especially leafy vegetables, adaptable to the long, hot and humid summer weather;

(2) lack of a sound vegetable seed production and marketing system;

(3) lack of techniques for local production of important vegetable seeds; and

(4) limited means of storage, processing or preservation of vegetables.

These and other factors have caused vegetable production to show unevenness in seasonal supply, great fluctuations in seasonal prices, and costly spoilage of products during the peak production seasons in the Southeast Asian regions.

e. Study of Korean peat as a source of humus that could be used by vegetable growers and on upland bench terracing production practices.

Results of a study made on Korean vegetable farms indicate that due to the light texture of the soil, sandy to sandy loam, and the limited organic content the retention of fertilizer nutrients is relatively poor. To insure the quality in growing western vegetables for the US and UN Military Forces in Korea there are several essential recommendations and instructions to follow. One, which is very important and very difficult to teach the Korean farmer is suitable compost preparation and appropriate application of organic matter to the soil.

Farmers destroy almost all organic material and animal manure is not plentiful in an economy poor in domestic animals. Dry leaves, straw and plant stalk cellulose is used for other purposes such as cooking and heating; apparently more essential than compost.

Therefore, facilities for humus are obviously restricted. It has been estimated by the Forestry Experiment Station that there is a reserve of approximately 20 million metric tons of peat soil deposits in Korea.

Large amounts of superficial or half-decayed peat is commonly dug and used for fuel, but now that coal brickets are becoming very popular and convenient, peat demand will begin to decrease. It is possible that by making a study of the richest peat deposits a good peat for humus could be found in some of the several areas on the western coasts. The peat deposits of Korea are often 1 to 10 feet deep, almost all located underground on private rice paddy land. The thickness of peat stratus or layers varies from 6 feet to 10 feet depending on the area. In order to use peat as organic material (humus) the excess water content must be dried out and lime added to destroy the injurious organic acids present; an average of pH 4.

Experimental cultural work using different rates of peat, sand and lime is being conducted on leafy vegetables at the Horticulture Experiment Station.

f. Vegetable production to supply the US and UN Military Forces. Since 1960 the US and UN Forces in Korea have had contacts with a number of farmers for vegetable produce. There are five agencies connected with vegetable production that render assistance to the growers. The US Army Korean Procurement Agency inspects sanitary conditions on farms, submits the total annual vegetable requirement to the Ministry of Agriculture and buys the produce, handles the business deal and inspects vegetables, grading, packing, etc.

The MAF Production Bureau and the Special Crop Section, in particular, allots each group, the private producers of the Korean Horticultural

Farms Association and the Cooperative members of the NACF, the estimated quantity of vegetables to be supplied. The NACF provides cooperative aid to the producer members in the form of: imported seeds and allocated fertilizers, pesticides, materials, etc.. Finally the ORD Horticulture Experiment Station in Chung Yang Ri, besides their entire national horticulture program, is now conducting western vegetable experimental work to find better varieties, to improve cultural practices and to increase and improve quality standards for US Army requirements. The US Army wants to purchase all its vegetable produce from Korean farmers, but farmers cannot furnish produce all year round and they fall short on their agreed deliveries due to climate conditions, cultural difficulties, lack of operational facilities, transportation and other problems; consequently a high percentage of losses from rejected vegetables due to low grades and low quality constitutes a distorted feeling on the future prospect of Army vegetable procurement in Korea. According to information provided by the US Army on rejected fresh vegetables, a large part is due to damage attributed to carelessness in protecting the harvest, careless loading and time of loading and shipment, lack of protective carriers for shipments, etc. It is apparent that vegetable freeze damage occurs in transit during December to March in addition to various other defects and spot diseases which contributes to fresh vegetable deterioration.

It has been recommended that a study of the present situation be conducted to evaluate horticulture production capabilities for US Forces

in Korea as well as to find out what suitable technical help is needed by the producers.

The purpose of the Horticulture Advisor's visit to a number of approved farms under the farmer grower's program of the US Army was the preliminary action taken in the study to improve the quality of vegetables procured by US/UN Forces.

Due to the importance of the problem, detailed field observations were made to find the precise recommendations and instructions for the Korean farmers and Farm Associations to overcome this difficulty.

As a result of a study made on Korean vegetable farms to insure quality in growing western vegetables for the US and UN Military Forces in Korea it has been found that there are several factors responsible for the existing situation: soil conditions; lack of organic material; correction of pH; application of lime; fertiliser usage; mixed balanced fertilizers; irrigation facilities; crop rotation; soil fumigation; seed imports and storage; proper variety selection; variety experimental trials and adaptability of western commercial varieties to Korea; harvesting and packing procedures and climatic conditions of the Northern, Central and Southern areas as limitant factors of the productive growing season.

The consequence of the severe cold winter season affects production shortages; only Cheju Island has a better climate and a milder winter but other problems must be faced.

From May through November 15, 7½ months, there are no major weather or climate problems to interfere with vegetable production. Aside from tomatoes, head lettuce and celery which suffer during the hot rainy months of July and August, the rest of the vegetable crop grows well.

With the use of protective covering such as vinyl, polyethelene or other transparent plastic materials, production can be extended from the middle of April to the middle of December; a period of nine months.

Winter vegetable production in heated "quonset hut" type greenhouses in the southern provinces of the Republic of Korea, particularly in the Kimhae area, is becoming common practice. Farmers build their own vinyl greenhouses; plant tomatoes, cucumbers, celery, lettuce and squash in November and harvest them from February to May.

Korea could increase vegetable production considerably with the promotion, improvement and increase of heated vinyl greenhouses. Electric and oil fuel heating systems are feasible and are being used, but vinyl hot house heating systems require technical help for improvement as well as for economy.

Vinyl house cultivation is a promising industry for the winter and early spring vegetable market and total acreage used for this from 1964 to 1965 has been increased to more than 200 acres in the Kimhae area alone.

For winter crops, the establishment of some vegetable farms on Cheju Island could be considered as a possibility if irrigation and transportation facilities could be worked out.

Fruits

a. **Research work to improve fruit crops**

To improve and increase fruit production, based on local climate, soils and other environment requirements for commercial fruit expansion for processing and export, research has been increased considerably.

A survey of fruit tree mineral nutrition needs and physiological diseases including both excesses and deficiencies of nutritive elements has been carried out for three years obtaining considerable progress. From the diagnosis of fruit tree nutrition, an analysis of leaves has been developed and the studies on the nutrition and physiology of fruit trees by means of sand water culture have been made. Thus, to some extent, a standard has been obtained to decide the amount of fertilizer for fruit plants. Research programs on orchard leaf analyses had never been carried out before because of the unavailability of trained technicians and adequate facilities for analyses. But since 1962 Korea has been receiving valuable help from the International Cooperative Research Program in Plant Nutrition at Michigan State University, under the directorship of Dr. A. L. Kenworthy, Program Coordinator. Recently, however, a few trained technicians were made available and the Pomology Section, Horticulture Experiment Station in Suwon is being equipped with laboratory facilities to make leaf analyses. The survey on general nutritional conditions of apple, pear and grape orchards have already been made.

Data on the analyses of selected fruit trees help in the interpretation

of crop performance observations, in the initiation of additional research and in improving the economy of crop production. The usefulness of such evaluations in diagnosing fertilizer needs for maximum quality of fruit constitutes very valuable information in the planning of an orchard rehabilitation program and is useful in planning the future of Korean fruiticulture. The leaf samples were analyzed for 13 elements: N, Ca, Mg, Fe, Cu, B, Zn, Mo, Al, and Mn. The result of the analyses indicated that the majority of the samples were high in nitrogen and low in potassium by U.S. standards. It is well known that excess nitrogen delays maturity, reduces flavor, color and keeping quality and this is just one of the several problems of the domestic commercial fruit production situation which is now in the process of being corrected. The harmful effects of the lack of magnesium and potassium have also been detected by leaf sample analysis and manganese and copper toxicity which also appears to be the cause of severe physiological disorders affecting fruit production are also gradually being overcome.

Soil samples were collected from each orchard at the time the leaf samples were collected and the soil pH and N-P-K determined. As a result the Pomology Section of the Horticulture Experiment Station is extensively recommending new orchard management practices. Attention has been focused on the demonstration of the use of lime and mixed fertilizers to control orchard soil acidity and to achieve a better balance of nutrients for the fruit trees.

These new orchard soil management practices in a combined program of orchard diseases and insect, pesticide, fertilizer, etc. control to improve fruit quality is being understood, accepted and used successfully by farmers.

Orchardists are recognising the fact that fruit trees require a number of minor elements for healthy growth. Minor element application will contribute to better growth and high yield.

b. Investigation for adaptation of fruit crops on upland bench terraces

Korea has devised an ambitious plan for economic development but the lack of farmland remains a serious obstacle in fruit crop progress. Studies and demonstrations are proving that fruit crops are successful on Korean sloping upland under contour and terracing planting methods and soil conservation practices. This will be a big and important program.

According to the 1964 National Statistics Year Book 642,793 acres (260,240 hectares) are planted in vegetables, including white and sweet potatoes. Fruit orchards and vineyards have been estimated at 57,539 acres (23,295 hectares). Just where fruit crops should be extended is one of the important questions. Available paddy land for rice and other cereals, textiles and many industrial crops in Korea is not extensive enough to supply local demands. Therefore, this land cannot be used for fruit orchards and vineyards.

The American-Korean Foundation is demonstrating the practicability and economic feasibility of using bench terracing methods in converting

upland to suitable cropping land. Since 1964 bench terracing is accepted as a national upland conversion technique; this is the most significant impact in Korean agricultural economy improvement.

Now, with the bench terrace demonstration program, farmers are realising that fruit crops could be planted on sloping hilly land. Vineyards are most appropriate for hilly terraced land culture. Peaches, pears, persimmons, plums, chestnuts, apples and many kinds of berries are also being cultivated on contoured bench terraces.

Therefore, Korea must enlarge its fruit production and is expected to increase it substantially by using a large selective part of 3 million acres of uncultivated upland (forest mountain land). By using the hilly, sandy and sandy loam type soil, fruiticulture and viticulture production can be rapidly expanded on a profitable level.

c. Viticulture

The study and expansion of vineyards and wineries by increasing plantations and cultivation improvements, dissemination of new wine grape varieties, rootstock, fertilization, and disease and pest control also constitute the principal fruiticulture activities for the year to come.

The Advisor prepared a special "Bulletin on Viticulture and Winery as a Korean Industry" which was published in February 1965. Continued requests for information on this subject made by Korean farmers and commercial vineyardists at the Pomology Experiment Station, Suwon, obliged us to prepare this technical bulletin. The contents of the bulletin cover:

Land for vineyard expansion; Grain consumed for wine and brandy, Grape production in Korea and Japan, The world area in grapes, Appropriate wine grape varieties in Korea, Expansion of vineyards for the wine industry, Wine and grape juice industry, and One of several methods of making wine. As this bulletin on Korean viticulture is a complete report it is not necessary to give further detailed information on the subject here.

d. Study on citrus fruit

The establishment of standard orchard practices and adaptation of advance technology have been recommended.

A great deal of information on the various local citrus species is still lacking, particularly the study of microclimate of citrus crops, it's relation to cold protection and the checking of cold-hardy varieties for the future feasibility of this industry on Cheju Island.

At the request of the Office of Rural Development the Advisor prepared a technical report on the study of the citrus situation and it's improvement in Sogwipo, Cheju Island. A general evaluation of the local factors such as weather conditions, the economic aspect of production, the cold-hardy varieties having a high commercial value and research work on cold protection, behavior studies of tangerine varieties, rootstocks, orchard management, pest control, fertilization, etc. are recommendations made in this report published in July 1964. Consequently this report may be used for references not described here.

e. Technical report on fruit orchards

In cooperation with the Chief of the Pomology Section of the Horticulture

Experiment Station, ORD and other technicians from the Pomology Section a report on fruit orchards was prepared and mimeographed in November 1963. Subjects covered in this report are:

Commercial Fruit Orchard and Vineyard Possibilities; Soil Management for Fruit Production; Soils; Thickness and Depth; Exposure; Holings and Planting; Purchase of Fruit Trees and Estimated Price; Estimated Price per Seedling and Grafted Plant; Recommended Varieties; Planting Distance; Tree Supports; Windbreaks; Fertilizing-Manuring; Fruit Tree Maladies; Insect Damage; Soil Analysis and pH Chart Provided by the Soil Laboratory in Suwon; Fungus and Bacterial Diseases; Physiological Disease Effects of Soil Condition; Pesticides Needed for Fruit Orchard per Acre in a Year; Estimated Fruit Orchard Cost per Acre Peaches, Apples, Pears and Grapes; Average Fruit Tree Production per Acre.

Future Measures and Directions for U. S. Activities

Korean horticulture has not reached the same par as the rhythm of progress made by the country during the past few years; consequently basic recommendations should be made.

It seems that at present the colleges of agriculture are not giving students intensive, scientific, modern and practical instruction on fruit and vegetable production. Therefore, participant training in U. S. A. is of great importance. In the past 5 years USOM has contributed substantially by sending abroad participants in horticulture as a vital medium for the country's development program. These participants were: Kim Daung Woo; Bae Dae Han; Lee Kwang Yon; Choe Jung Ill; Yun Kun Hwan; Kim Jong Chon; Kim Jung Ho; and Pak Hung Sup. Not

withstanding, it is recommended to send more participants in the fruit industry and western vegetable field.

It would also be desirable for the Ministry of Agriculture and Forestry to give serious attention to horticultural research work, particularly in western vegetable experiments, fruit production, marketing, storage, processing and exporting. In this respect the Horticulture Experiment Station does not have enough land space or enough employees to carry out large scale western vegetable experiments. It is possible to consolidate the Chong Yang Ri Experiment Station and the Suwon Experiment Station with the immense advantage of economizing in technicians and laboratories with fructiferous work results.

Furthermore, the manner in which orchardists, vineyardists and vegetable growers receive research and experimental results on modern varieties and other agricultural experiences is deficient due to the fact that the number of horticulturists working in research, education and extension is totally inadequate to fulfill the requirements of so many farmers.

The group of well prepared Korean professors and technicians from the Colleges and Universities of Agriculture of the MAF, the RDD and the Guidance Bureau, etc. have made a significant contribution to the fruit industry, but numerable problems that the producer must face require an increase in personnel and work facilities.

Many modern experiences in horticulture are unknown to the growers. This may be due to the fact that the agencies responsible for spreading technical information have a limited number of technicians and there is a lack of transportation facilities to reach all the growers. Effective assistance could be

achieved by increasing the number of horticulturists in fruit and vegetable production. A lack of capital, however, is also a limiting factor and prevents the fruit industry from realizing its full possibilities.

Among production practices that require most attention from the government institutions in charge of education, research and extension are the following:

Study for Adaptation for Fruit Crops on Upland Bench Terraces

Because of the topography arable agricultural land in Korea is very limited; the future expansion of the fruit industry and some vegetable crop production will be conducted on the uncultivated upland foothills on contours and bench terraces.

Therefore, modern fruit orchard cultural practices must be taught for the new upland terrace fruiticulture expansion plan. A new search for the suitability of the hedgerow orchard types will be sought in pears, apples, plums and peaches by producing grafted dwarf trees, planting in hedgerow density and trained on wire supports similar to some European orchards. Considering the possibility of utilizing uplands, terracing methods and the climate and other local environmental factors, hedgerow types offer the greatest advantage. Experimental trials will be established.

In using bench terraces to plant fruit trees any advantages and disadvantages, such as soil moisture, will be taken into consideration. Generally the soil of the upper part of the terraced slope is dryer than the lower part. As the lower part contains more moisture, resistant species to moisture should be selected and drought resistant species should be planted on the upper part of the slope.

The use of drought or moisture resistant rootstock for grafting different species or varieties should solve the problem. This is true in the case of apples, grapes and peaches. For example: peaches, grapes, apricots, chestnuts, walnuts and citrus are drought resistant trees. Apples, pears, persimmons are not resistant to drought. Persimmons, pears, grapes are moisture resistant. Peaches, apricots, plums, cherries are not resistant to moisture.

Viticulture and Winery Expansion

There is a significant expansion of vineyards on uncultivated upland. Studies for adaptation of fruit crops and vineyards on bench terraces constitute a new and extensive program for the year to come.

There is no other more appropriate crop than growing fruit trees and vineyards extensively on bench terraces on the hilly upland slopes. Fruit crops are perennial and have deep roots that penetrate the soil in search of necessary moisture during long periods of drought. The expansion of fruit cultivation and vineyards on uplands is based on good soil conservation practices and adequate liming and fertilization. Grape juice and the wine industry offer a great opportunity for a good dollar earning market for the US and UN Forces in Korea as well as to supply the extensive local and export market.

Improvement of Western Vegetables

Winter production by improvement of vinyl hot houses and the establishment of some vegetable farms on Cheju Island; the use of peat moss as organic matter; vegetable production problems during the hot humid summer and the study of the adaptability of hot weather resistant varieties; the need of a home economic

program to teach the use of western vegetable dishes, canning and preparation of some processed products. All this, which will improve local market demands is also one of the important ways to utilize the high percentage of wasted vegetables rejected by the US Army inspectors.

Research on Potato Improvement

There is a definite need for research to improve and increase potato production, not only for meeting local market demands and U.S. Army requirements but for industrialization purposes as well.

Research on white potatoes began in 1960 with the introduction of 28 certified varieties to be used as potato foundation stock of selecting improved seed adapted to conditions in Korea. Certified seed potato production is 200 metric tons per year representing about 10 per cent of the country's needs. For the past 4 years seed potato production at the Alpine Experiment Station should have been increased but because of several problems such as the lack of new non-contaminated or virgin land for potato planting and crop rotation, limited operational work facilities, adequate farm equipment, tools, green house space and ventilated storage, etc. no progress has been achieved.

It is also recommended that MAF and ORD provide significant economic support to solve these problems.