successful in the area of transfer education for students going on to four-year colleges, but in general the non-transfer students have been neglected.

2. Courses in technical agriculture have been of value to former non-transfer students and were recognized as valuable by the students and employers alike. This is indicated by the employer's willingness to hire students from the program and to advance them.

3. The placement and follow-up of non-transfer students in agriculture has been given minimal attention. A need also exists for some curricular changes to better fit these students for agricultural jobs where their rural background and training would be fully utilized.

4. Agricultural technician training program similar to those recently started at Modesto Junior College and Mount San Antonio College have much value. They are based on and meet local agricultural needs of the community. These programs also fulfill important needs for junior college agricultural students not planning to transfer to a four-year college.

5. There seems to be little duplication of effort between the junior college and state college programs of terminal agricultural education.

III. IMPLICATIONS

Some of the possible implications that may be drawn from this study of the non-transfer agricultural program in the California junior colleges are now presented.

This study seems to point to a continued demand for well-trained agricultural workers both in production agriculture and in related agricultural occupations. There needs to be greater stress on training for related agricultural occupations since it is in this field that most of the job openings exist.

The investigation also indicates that the junior college agricultural programs now in existence have an important role to play in the training of these workers. However, before the junior colleges can become fully effective in this training they must greatly expand their placement and follow-up work with the non-transfer students in agriculture. There seems to be considerable need for better communications between the junior colleges and related agricultural industry.

It appears that the training program for agricultural technicians has made a good start in California junior colleges and may well become a major part of their offering in agriculture.

The stiffening entrance requirements and the increasing cost of attending the university and the state colleges may lead to even larger gains in enrollment in the agricultural program at the California junior colleges.

Soils . . .

C. G. Hobgood, Editor

Comments on Foliar and Plant Tissue Test As A Guide to Plant Needs

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Since man is so dependent upon plants, he has searched for more accurate methods of increasing yields by various chemical methods for approximately 300 years, or since the famous experiment of the willow tree conducted by von Helmont in which he concluded that water was the only factor of plant growth. One hundred and fifty years later Jethro Tull declared earth to be the substance of plants; but, it was not until Justus von Liebig published a series of lectures in 1840 that the problem of plant nutrition began to come into focus. Useful interpretations of plant nutrition have progressed from that time by the aid of such men as Laws and Gilbert of Rothamsted, Winogradsky and Beijerinck with their work on nitrogen fixation and Dyer who supplied information on availability of nutrient elements in the soil. Later in the United States two men decided to break away from the European methods and attack the problem on what they believed to be a more fundamental basis. C. G. Hopkins worked on the theory of total content of nutrient elements in the soil and plants, while Milton Whitney thought that the productive capacities of soil were to be found in the natural soil solution. It is meaningless to say wherein these men were right or wrong because both contributed much to scientific agriculture and both contributed greatly toward stimulating workers in experiment stations all over the country to attack the plant nutrition problem.

Peech (7) points out the limitations of the classical methods for adequately characterizing a fraction of the total supply of a given plant nutrient element in the soil that is equal or at least proportional to the amount of the element that the plant can utilize during its growing period; and that the total supply of a given nutrient element as determined by chemical analysis is no measure of the amount of that element that is at the disposal of the plant. "As empirical as such chemical methods for assessing soil fertility may be, they provide, nevertheless, one of the useful tools for ascertaining the most profitable returns from fertilizers and for diagnosing causes of crop failures. Their successful use depends to a very large degree upon careful calibration of the results of the chemical test with responses of different crops to application of fertilizers on different soils (7)".

Scarseth (10) and others (6) have reported that many fertility experiments have been handicapped or have failed to give true information because it was assumed that the growing crop was adequately supplied with a particular nutrient element.

The mere addition of an element to the soil is no assurance that the nutrient is effectively entering the plant. Since only the nutrient that enters the plant is effective, it is most important to know wheher or not the plant is absorbing the nutrient. Many factors may contribute to the failure of the plant to obtain the nutrients needed.

Accordingly, more and more attention began to be paid to the plant as an indicator of soil deficiencies. At first, consideration was given primarily to plant symptoms. It soon became apparent that by the time such deficiencies appeared, the crop yield might have already fallen too low for profitable farming. Consequently, thoughts were turned to development of procedures for testing the nutrient status of plant tissues. In recent years, interest has been revived in the possibility of the chemical analysis of the plant as a means of studying the nutrient relationship between the crop and the soil. As a result of the broader view now taken with respect to the problems of soil fertility, it is recognized that the conditions required for maximum growth must be sought from the facts of plant physiology as well as from those of soil science. For satisfactory growth a particular soil must satisfy certain conditions with respect to temperature, nutrients, water and air supply to roots. In the method of foliar diagnosis the development and yield of a plant is related to the series of chemical transformations taking place in the synthetic laboratory of the plant—its leaf. The experimental factors established by this method are proof that this basis of reference is more reliable and in addition, supplies much more information concerning the factors governing the development and yield of a plant than the traditional method relating ultimate yields solely to the fertilizer applied. "Foliar diagnosis makes it possible to study the variations in the mineral nutrition of the plant resulting from very diverse factors, physical, chemical, and biological. The evidence so far (11, 12, 13) has indicated that the composition of a leaf is modified both quantitatively and qualitatively with respect to nitrogen, phosphorus, and potassium by factors hitherto little suspected (12)".

Thomas (14, 15) reports that a relationship exists between percent of nitrogen in dried material of the leaf and in the fertilizer, but none between nitrogen in the leaf and yield, or between nitrogen in the fertilizer and yield except when used with phosphorus and potassium. Another relationship exists between percent phosphorus in the leaf and in the fertilizer, between phosphorus in the leaf and yield and between phosphorus in the fertilizer and yield. But, there was no relationship between potassium in the leaf and in the fertilizer, none between potassium in the leaf and in the yield, nor between potassium in the fertilizer and yield. Thus, he concluded there are two concepts: the quality or intensity of nutrition and the quality or physiological ratios of the elements and that a fertilizer may intervene to effect a change in quanity or quality or both. An explanation may be that in his report low intensities of nutrition are associated with low yields and high intensities with high yields but when "luxury consumption" of potassium occurs then low yields accompany high intensities of nutrition.

Wolf and Ichisaka (16) concluded that because of the variability of potash and phosphorus in the plant due to other causes than availability, the usefulness of tissue tests as a guide to the fertilization of spinach is limited. Nitrogen analysis seems to be of more value. However, Peterson, Altoe and Ogden (8) in comparison of nitrogen in soil test, with nitrogen uptake by the tobacco plant found a good correlation in the first crop, but not in the second. Scarseth (9) reports that two farmers' problems in the field could not have been solved without the aid of plant tissue test. Nitrogen was needed in both cases, but failed to be indicated as such in soil tests or visual symptoms. Lynd, Turk, and Cook (2) report that analysis of soil samples taken from the fertilizer rotation field experiments at the beginning and after seven years continuous experimental treatment did not show differences sufficiently great to account for differences in corn yields. Also, that, "Tissue tests throughout two growing seasons on these experiments indicated that nitrogen is the limiting factor in plant growth and that a definite change took place in the nitrogen status of plants with the initiation of flowering period." Falloon (1) using tissue test on 125 corn fields found 58.4% lacked nitrogen, 29.6% lacked adequate phosphorus, and 25.6% lacked adequate potassium. Of the fields that had been fertilized on the basis of soil tests, 3 out of 38 lacked adequate nitrogen, 15 out of 79 lacked adequate phosphorus and 5 out of 67 lacked adequate potassium. However, he concluded that over half the farmers had followed only a part of the fertilizer recommendation. Morgan (4) reports the development of tissue tests for minor elements such as boron, copper, and zinc when they exist in toxic amounts, but the range of concentration that appears to be limiting for each does not appear to exceed one or two parts per million. Morgan and Wickstrom (5) summarize the use of tissue tests, to show the need of laboratory soil test, to supplement soil testing to see if it is adequate, to survey large areas quickly and to follow the uptake of nutrients in research field tests. They suggest however, that the ideal time of tissue testing is when the plant is in a period of stress which is usually about the time of flowering or seed formation.

Lynd, Turk, and Cook (3) say there are differences of opinion as to whether nutritional status is best indicated by total quantities of nutrients in the leaves (foliar analysis) or the unassimilated inorganic nutrients in plant tissue (tissue testing). However, they report the third functional basal leaf of corn used in foliar and tissue testing were "reliable indications of fertilizer treatments". They further suggest that plant tissue testing be utilized for determining the period of sampling for foliar analysis, for indicating possible limiting factors in plant growth and for substantiating the interpretation of results.

Many workers have shown positive correlation between tissue testing or foliar analysis and yields on specific crops under specific conditions; but most workers agree that more data need to be accumulated along with the development of means to express variations in plant nutrient uptake more quantitatively before it can be used as a guide in itself. When used in combination with the more conventional methods, together, they make possible positive diagnoses that none could do alone.

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Special Features . . .

Dr. Ralph Benton, Editor

A Study of the Factors Involved in the Decisions of Unemployed, Unskilled Workers to Forego Retraining Under the Manpower Development and Training Act of 1962

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This is a report of research completed by the Norfork Division of Virginia State College under contract with and supported by funds from the Office of Manpower, Automation and Training, United States Department of Labor. This study attempted to identify the factors involved in the decisions of unemployed, unskilled workers to forego retraining for a higher level of skill under the Manpower Development and Training Act of 1962 and to appraise these factors in terms of the implications involved for future planning and execution of retraining programs.

Basic to the success of the efforts of government and industry and to provide retraining for unemployed, unskilled workers are the choice processes of workers themselves in deciding to invest the time and effort in retraining. In many cases the workers needing the most assistance are the rejecters of offers by agencies to lend it.

The study attempted to gain insights concerning these choice processes in order to guide future planning of retraining programs and the manner in which the opportunities for retraining are offered to prospective trainees. The study was completed in Norfolk, Virginia. It used a combination of interview and attitude assessment techniques. Men who had rejected retraining opportunities and men who enrolled in retraining programs were the subjects.

PROCEDURE

A total of 314 unemployed and unskilled men in the Norfolk—Portsmouth Metropolitan Labor Market Area were interviewed in an attempt to identify the factors involved in the decisions of workers to forego retraining. The sample consisted of 90 who enrolled in retraining and 224 men who were offered the opportunity to enroll but decided not to do so. A combination of interview and attitude assessment technique were used to gather data. A team of interviewers from Virginia State College and the Virginia Employment Commission visited homes and conducted the interviews.

Ten hypotheses were tested in the study. They were as follows:

1. That communications with the men were not sufficient to adequately convey the requirements for enrollment in the program or the potential benefits.
2. That education, level of income, size of family and other personal-family characteristics distinguished the men who did not enroll.
3. That the men who did not enroll in the program felt that the training allowances were too low.
4. That the men who did not enroll in the program would have felt academically insecure in a structured learning situation.
5. That the idea of school attendance for older persons conflicted with cultural expectations for the men who did not enroll in the program.
6. That the men who did not enroll in the training program regarded it as some form of government relief which would have compromised their dignity as self-sufficing citizens.
7. That the men who did not enroll in the training program had some reservations about migrations for placement.
8. That the men who did not enroll in the program felt that the economy would eventually reabsorb them.
9. That the men who did not enroll in the program felt that they would experience difficulties in placement.