

Record of Research Work
Of Individual Members of the Staff
1923-28

N.Y. Agricultural Experiment Station
Geneva, N.Y.

Division of Horticulture

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REPORT
OF
THE VICE-DIRECTOR AND HEAD OF THE DIVISION OF HORTICULTURE

As Vice-Director of the Station, my work is that of the Director in the Director's absence; to make an occasional address in place of the Director; to aid in the preparation of the annual budget; and to advise with and assist the Director. As head of the Division of Horticulture, in which there are now fourteen scientific workers, I have general oversight of the experiments under way, and advise in regard to the details of carrying them on, almost from day to day. More and more the task of counseling and planning with the men has occupied my time until now my office, combined with that of the Vice-Directorship, is largely one of administration. Still, there are individual accomplishments to be recorded, and there is work quite separate from that of any other member of the staff. I now report these in detail:

1. I keep a supervisory eye on the tests of hardy fruits which are being carried on at this Station, now recognized the world over as being the most extensive ever attempted. The number of distinct varieties of fruits and nuts now under test is 2510. The object is to ascertain whether each variety is distinct; the time of blooming, leafing, and fruit ripening; how long to come into bearing; susceptibility to insects and fungi; whether self-fertile or self-sterile; for what purpose adapted; to describe varieties so they can be identified, and to ascertain adaptability to climate and soil. The results of these tests are set forth in seven volumes, illustrated with colored plates, on the several groups. Two of these volumes have appeared within the last five years. Supplementary to these large volumes are a series of bulletins called New or Noteworthy Fruits, nine of which have been published, and three of which have been issued during the past five years.

Perhaps the next most important item of accomplishment is in the breeding of new fruits. During the twenty-three years the writer has had charge of the horticultural division at this Station, more than 80,000 seedlings have been grown, of which 41,000 have fruited. From the number that have fruited, 90 varieties have been named, of which 45 sorts are now being grown in the state and country. Of the 45, 27 have been named and distributed during the past five years. The writer is a Director and a constant advisor in the management of the New York Fruit Testing Association which grows and distributes the new fruits produced at this Station.

Besides the fruit books and bulletins on new fruits, the writer has published during the past five years a bulletin on "Plum Stocks"; another entitled "Twenty years Profit from an Apple Orchard"; and with H. B. Tukey, a third, entitled "Twenty-five years of fertilizers in a New York Apple Orchard." Besides these bulletins there have been a half a dozen circulars on one phase or another of Pomology.

2. My present program of work is, as I have indicated above, that of helping to plan experiments with my assistants, and advising with them in regard to the details of the experiments. At present the chief specific investigation occupying my attention is that in association with Mr. Hall and Mr. Hawthorn of bringing forth a series of books on Vegetables similar to the one on fruits. The details of the investigations for this series of books have been set forth in Mr. Hall's report, and need not be repeated here. My part of these reports on vegetables is that of writing the introductory chapters, histories of the various vegetables, and correlating the work and seeing it through the Press. I have, besides, perhaps as many as fifteen or twenty addresses to Horticultural and Agricultural meetings during the year. A major task which cannot be escaped, even by dividing up the work among the members of the Department, is that of answering letters. Roughly,

about six thousand letters asking for information on horticultural subjects are answered by the members of the Department during the year. Of these, perhaps the head of the department answers five thousand. From a half dozen to a dozen papers are prepared for scientific meetings or scientific publications during the year.

3. Several members of my department have set forth their individual needs for additional facilities for the effective prosecution of their work. It suffices for me to specify but the major needs. Chief of these is a new horticultural building. Twelve members of my staff now carry on work in rooms with laboratories which were built twenty-five years ago to accommodate three scientific workers in the division. In order to move about, two of my staff must work in a crowded, dark, poorly heated room in the basement, and two others have offices away from their associates in the Administration building, where neither library nor herbarium facilities are at hand. I may add as a second prime need of this Department the necessity of a well trained man who can carry on work in plant physiology and cytology. At nearly every turn the workers in this division need the help of a plant physiologist. We cannot hope to make the progress we want to make in several phases of the work without the aid of a physiologist who is well trained in cytology as well.

MEMORANDUM REGARDING ACCOMPLISHMENTS, PLANS, AND NEEDS.

H. B. Tukey, Acting Chief In Research (Horticulture)
New York State Agricultural Experiment Station

I. Results Accomplished from April 15, 1923, to April 14, 1928.

Three lines of research have been undertaken during the period between April 15, 1923, and April 14, 1928, namely,

- A. General horticultural work at Geneva as Assistant in Research (Horticulture) until June 30, 1923.
- B. General horticultural work in the Hudson River Valley as Associate in Research (Horticulture) from July 1, 1923 to April 14, 1927.
- C. Nursery work as Acting Chief in Research (Horticulture) from April 15, 1927 to date.

The accomplishments of each of these periods will be considered in order.

A. General Horticultural Work

1. Fruit breeding. One of the major projects of the Horticultural Division is the improving of fruit varieties by systematic breeding. The accomplishments of this work are measured through the accumulations of the efforts of many individuals, culminating in such meritorious new varieties as have been produced at this Station, among others the Cortland apple, the Portland and Ontario grapes, and the Seneca cherry.

It was one of the duties of the writer until June 30, 1923, to assist in the breeding work, in making the crosses, in describing the fruits, and in recording the data.

2. Fruit variety testing. A second major project of the Horticultural Division is the testing of varieties, the cataloging of their blooming dates, season of ripening, keeping quality, susceptibility to insect and disease attack, vigor, and general plant characters. This data has eventually found its way into the series of fruit books published by this Station of which the "Apples of New York" was the first and the "Small Fruits of New York" the last, and the monographs on "New and Noteworthy Fruits". The writer assisted in the accumulation of this general data until June 30, 1923.

3. Orchard management. A fertilizer experiment with apple trees was begun at this Station in 1896 and has become one of the classic experiments with fruit trees. The responses from nitrogen, phosphorus, and potassium, either alone or in combination have been negative and have been so reported at the end of 10-year and 20-year periods. At the completion of 25 years a final report was made reaffirming previous recommendations, that "in the average western New York apple orchard that is well cultivated, properly drained, and sufficiently supplied with organic matter and humus by means of a cover crop commercial fertilizers are not needed". These results are the basis for the standard fertilizer recommendations for western New York.

4. Studies of fruit seed storage and germination. The nursery interests in New York State are extensive. They are depend-

ent upon seedlings as stocks upon which to bud and graft known fruit varieties, seedling stocks in turn being raised from seed. Seed from the hardy fruits will not germinate immediately it is mature, but must go through a period of so-called "after-ripening" in which its internal make-up is changed and prepared for germination.

It is the common opinion that seeds of the hardy fruits must be frozen before they will germinate, and practices of storage and stratification are based thereon. Results of investigations conducted at the Station show this idea to be erroneous. In the case of the peach, freezing did not necessarily crack the stone, but temperatures below freezing were actually harmful to the vitality of the seed. After-ripening processes were effected best under moist conditions and at a temperature just above freezing.

Cherry, plum, apple, and pear seed responded in general to similar conditions. Apple and pear seeds gave high germination after 6 to 8 weeks under cool, moist conditions; peaches slightly longer; and cherries longer still.

Tests with berry seeds showed a combination of both internal and external factors involved in after-ripening and germination. Gooseberry seed germinated after storage under cool, moist conditions, but blackberry seed presented an additional problem of an impermiabile seed coat. Treatment with sulfuric acid was of uncertain benefit.

The results of these investigations are treated in full in a bulletin published by this Station and have been the basis for recommendations to nurserymen in the handling of fruit seeds.

B. Hudson Valley Fruit Investigations.

Because of increased activity in fruit growing in the Hudson River Valley and because of the differences between eastern New York and western New York growing conditions, appropriation was made by the Legislature of 1923 for research work in fruit problems in the Hudson River Valley. The writer was placed in charge of the horticultural work and planned and developed the work as it now exists. Following are reports of the projects.

1. A test of fertilizers for apples. Tests in three cultivated orchards on three principal soil types during three seasons showed a response from applications of nitrogen, though in no instance was the response what would be considered beneficial. Phosphorus and potash, either alone or in combination, produced no effect. In a young orchard the effect of nitrogen was seen solely upon a heavier growth of the cover crop. In a young bearing orchard the effect was seen in darker foliage but no crop increase. In a mature biennial orchard the effect was to set an overload of undersized and poorly colored fruit in the "on" year, at a financial loss to the grower.

2. A test of fertilizers for nursery stock. Tests with two parcels of apple trees of 3,000 each showed a slight gain in diameter from applications of nitrogen but no increase in the number of first-class trees. Phosphorus and potash, either alone or in combination produced no effect.

3. A test of fertilizer applications for apple trees at planting time. Tests during three seasons with various natural and chemical fertilizers have indicated the possibility of injury to newly planted fruit trees from the injudicious use of fertilizers.

Too close or too heavy applications, especially of the more soluble and more readily available fertilizers, have proven undesirable. Slower acting materials, such as bone meal and urea, have shown some increase. These tests gave the first comparative effects in New York State of some of the newer forms of nitrogen, in which it was shown that cyanamid was very harmful even in very small amounts, and that calcium nitrate was more slowly available than nitrate of soda.

4. Types of pruning for apple trees at planting. Trees whose scaffold branches were headed-back when the trees were planted made more shapely trees but not such large ones as those which were left with the scaffold branches unpruned.

5. A variety test with fruits. A test orchard planted at Kinderhook, including only new and noteworthy varieties of fruits, contributed information upon the growing and bearing habits of young trees. Among other notes, the Macoun apple, which had been observed to be a weak grower at Geneva, proved an exceptionally vigorous grower in the Hudson River Valley. The "blightproof" Pineapple pear succumbed to blight, and the Cortland bore fruit at four years of age.

6. A test of fertilizers for sour cherries. Three season's records showed definitely that applications of nitrogen resulted in increased shoot growth, trunk diameter, leaf area, and yield of fruit. Phosphorus and potash produced no response, either alone or in combination. Studies of the growing and fruiting habits of Montmorency, Early Richmond, and English Morello trees showed that the first season of nitrogen applications resulted in greater

shoot growth. Since leaf-buds, as contrasted with fruit-buds, are formed on growth over 7 inches in length, the consequence of this greater shoot growth is to form leaf-buds the first season. The leaf-buds develop into spurs the second season, and fruit the third season. Because spurs can carry much more fruit than short shoots fruiting from lateral blossom-buds, the yield is greatly increased.

This information is the first available in New York State showing clear-cut response from nitrogen fertilizers on sour cherry trees. It is especially valuable because of the fact that the sour cherry is now perhaps the one profitable orchard fruit in the State. Fertilizer recommendations in the State are based upon these results.

7. A test of fertilizers for grapes. Applications of nitrogen, phosphorus, and potash, alone and in combination have shown a response from nitrogen. Evidence has been found in the increased growth of cover crop, larger and greener grape foliage, and increased yield. These findings agree with those reported from the Chautauqua grape region.

8. Cover crops for orchards in the Hudson River Valley. Because Hudson Valley orchard soils are acid, low in fertility, and low in organic matter, tests have been conducted with eighteen different cover crops using six different rates of limestone application. Three year's records of dry weight produced per acre on the 108 plots at Kinderhook and the plots on other soil types at Hudson and at Germantown have given some indication as to which crops will produce the most humus at the least cost.

It was determined that a combination of buckwheat and millet was reliable, cheap, and produced a good quantity of organic matter.

Limestone applications less than 2 tons per acre were of little or no value. Two to 4 tons per acre gave good results. Corn sown broadcast gave an abundance of green matter and could be plowed under with little difficulty if taken before the stalks became hard. Such heavy limestone applications as 8 tons per acre decreased the growth of most crops used as cover crops.

In a search for an acid-tolerant legume, a new clover was brought into New York State from Iowa and tried with some success. Known as Wood's clover, it produced a good amount of organic matter on plots receiving no limestone while alfalfa plants nearby by contrast grew no alfalfa whatsoever.

9. Pruning and renewing mature sour cherry trees. Because many mature sour cherry trees in the Hudson River Valley have reached a height at which harvesting is accomplished with difficulty, and because these trees tend to produce the bulk of their fruit in their tops, investigations were begun designed at lowering these trees. Trees thinned-back to outside laterals so as to reduce the height of trees approximately 6 or 7 feet were severely dwarfed unless also fertilized with nitrogen fertilizers. Applications of nitrogen fertilizers to pruned trees resulted in greater trunk diameter, larger leaves, and increased yields. The first season after pruning the pruned and fertilized trees carried approximately half the crop of the unpruned and unfertilized trees. The second season the pruned and fertilized trees had nearly caught up, and the third season they had passed them.

Investigations with the English Morello, Early Richmond and Montmorency varieties have shown how each should be handled for

maximum gains.

The results, like those with fertilizers, have come at just a time when New York State growers were seeking information of this kind. They are the only data available, and that upon which recommendations are made to cherry growers.

10. Pollination of fruits. Because of the tendency to plant the newer commercial Hudson Valley plantings in solid blocks information was desired by growers on the sterility relations between fruit varieties in that section. Three season's results with the more important commercial varieties showed practically all apples, pears, and sweet cherries to be self-sterile. The J. H. Hale peach was found to be self-sterile, as it had been in other States, and any of the common varieties grown in the Valley were found to be good pollenizers for it.

In a solid block of Windsor cherries striking results were secured showing the necessity of having pollenizers adjacent to the trees they are to pollenize. From a percentage set of 42% in trees adjacent to pollenizers the set decreased to 26% in the second row, and so on down to approximately 10% in rows beyond the fifth.

11. Observations and tests upon the bearing habits of fruit trees in the Hudson River Valley. A study of the various ways in which a given variety may carry its fruit under different conditions may give indications as to how to change its habit from one of biennial bearing to one of annual bearing. Baldwin trees were found which produced their fruit on one-year wood much as a Wealthy tree may do. Baldwin trees were found which produced crops annually, but always in different parts of the tree. By these studies the attention of growers was focused upon studying and observing what their trees were doing.

C. Nursery Investigations.

Because of the likelihood of the promulgation of a Federal Quarantine in 1930 against the importation of nursery stock and because American nurserymen have not as yet developed an adequate and satisfactory domestic supply of understocks to replace the imported stocks upon which they are now largely dependent, appropriation was made by the Legislature of 1927 at the request of New York State nurserymen for studies in "problems of the production, storage, and distribution of seedlings and nursery stock of trees, shrubs, and plants". The work was undertaken by the writer on April 15, 1927.

Land was leased, tilled, and laid off in plate for experimental purposes. An extension to the greenhouse was completed, and an organization with working equipment was built up to effectively carry on the projects.

This work is the first of its kind that has been undertaken by an experiment station in this country so that it was necessary to confer with nurserymen and to secure their point of view on the problems involved before effective work could be done. In conferences with nurserymen and representatives of the New York State Nurserymen's Association the following list of projects was outlined work upon which is now under way.

1. Comparison of seedling stocks from various regions. Fruit tree and rose seedlings have been secured from the principal seedling producing sections of both America and Europe, to determine the best source of domestic stock for New York conditions, and particularly to ascertain whether any of the domestic stocks now being produced meet the needs of New York nurserymen as satisfactorily as the foreign stocks.

2. Sources and varieties of seed for seedling stocks. Tests are being carried on to determine the best sources of seed and the most suitable varieties for the growing of seedling stocks under New York conditions.

In the selection of seed from varieties of cherries it was determined that there is a definite relation between the time of fruit-ripening and the soundness of seed. Seeds from varieties requiring less than 60 days in which to mature seed had almost no viable seed. Those requiring 65 to 75 days developed 30 to 60% sound seed, and those requiring 80 days or more developed almost 100% sound seed. These facts are important because the production of cherry stocks is dependent upon the securing of viable seeds. It is now possible to advise the seed collectors to take seed from the late ripening cherries.

In the case of the apple it was found that certain domestic varieties, namely Rome Beauty, Ben Davis, and Northern Spy produce seedlings of good vigor and uniformity, while others, as Tompkins King and Baldwin, are unsatisfactory. With the cherry, seedlings from several domestic sweet varieties appear superior to Mazzard seedlings.

3. Methods of growing seedling stocks. Extensive investigations are in progress to determine the best methods of growing seedling stocks under New York conditions. These include the determination of the best rates of seeding, a comparison of fall vs. spring planting, and especially a study of methods of transplanting. Unless the seedling trees are transplanted at an early stage they grow with a straight tap-root instead of a branching root system. This is undesirable. In Europe, with the cheap labor supply these little seedling trees are transplanted by hand. Such methods are impracticable under our con-

ditions. Efforts are therefore being made to devise some efficient and cheap method of transplanting such seedlings.

Three methods of transplanting were tried, (1) by hand, (2) with planting boards, and (3) by machine. Hand transplanting gave good seedlings but was too expensive. Planting board transplanting proved as good as hand transplanting and was much faster. Machine transplanting was developed to a point where plants could be set 2 inches apart. A reduction in speed to 7 feet a minute was accomplished, the slowest that a machine of this type has yet been made to operate. The plant losses from machine planting, however, were too high to be practicable.

Applications of such fertilizers as nitrate of soda, ammonium sulfate, calcium nitrate, and urea failed to produce any response in Mahaleb seedlings. Thinning plants to different numbers in the row showed 7 to 9 to the foot to give the best grade of stock.

4. Study of storage conditions. Since seedling stocks must be stored over winter it is important to determine the exact conditions necessary for satisfactory storage in the climate of New York State.

In cooperation with other storage investigation projects in the State, attention has been given to storage problems to find out just what the conditions are in different cellars. Records of humidity and temperature are being secured in five different storages selected because of their accessibility and because they represent five different types of storage, for example (1) Constant temperature cold storage, (2) Modern concrete storage, (3) Low-ceiling wood construction, (4) High-ceiling concrete construction, and (5) Dirt Bank Cellar.

Records show that fungus develops under conditions of high

humidity and poor ventilation and that it is definitely associated with the maturity of the stock. Fungicidal sprays have not controlled fungus once it has become established in the plant.

5. Asexual propagation. Seedling trees grown from the same source of seed differ greatly in many characteristics, including vigor. Hence fruit trees propagated on such seedling roots are not uniform, and many trees in an orchard are consequently inferior individuals. It is, therefore, important to determine whether an economical method can be developed of propagating fruit trees asexually; in other words, by propagating them by methods somewhat similar to those used in propagating grapes and raspberries. Some progress in this direction has been made in England and in some sections of the United States.

If fruit trees can be propagated at a low enough cost from uniform and selected root stocks, such trees would have manifest advantages. The important successful asexual stocks have been secured from both European and American sources, the best collection of its kind in America today.

6. Use of cover crops to retain fertility of nursery land. At present, most nurserymen find it necessary to use new land for each crop of fruit trees, which occupies the soil only about three years. Often they go to the expense of tiling the land for the one crop of trees. The growing of the fruit trees is so "hard" on the land that after the crop is harvested the field is either sold for whatever price can be secured or other crops are grown for a considerable period of years on the land before putting it into fruit trees again. This is an expensive process. A thorough study is therefore being conducted to ascertain whether the fertility of nursery land can be built

up and maintained by the use of suitable cover crops, so that the same field can be used successively for more than one crop of trees.

Plats have been laid out and seed sown for these tests.

7. Fertilizer requirements of nursery stock. Most nurserymen are making large expenditures for fertilizers with but very limited data to show whether such expenditures produce sufficient results to justify the expense. Fertilizer tests are therefore being conducted with apples, cherries, and rose stocks to secure definite data on this matter.

Bulletins and Circulars

- Bul. 509. Studies of fruit seed storage and germination. 1924
- Bul. 516. Twenty-five years of fertilizers in a New York apple orchard. 1924
- Bul. 541. Responses of the sour cherry to fertilizers and to pruning in the Hudson River Valley. 1927
- Cir. 79. A guide to the Horticultural Work of the Hudson Valley Fruit Investigations. 1925
- Cir. 17. (Revised) Propagating Plants. 1928 (In press)

Scientific Papers and Journal Articles

- An experience with pollenizers for cherries. Proc. Am. Soc. Hort. Sci. 69. 1924
- Pruning and fertilizing young apple trees at planting. Proc. Am. Soc. Hort. Sci. 13. 1925
- The comparative effect of various kinds and amounts of fertilizers upon yearling apple trees. Proc. Am. Soc. Hort. Sci. 59. 1926
- The possibilities of Wood's clover as an orchard cover crop. Proc. Am. Soc. Hort. Sci. 56. 1926
- The viability of seed from certain cherry varieties. Proc. Am. Soc. Hort. Sci. 129. 1927
- Observations on an own-rooted Kieffer pear orchard. Jan. Heredity. 1928. (In press)
- Horticultural problems in the Hudson River Valley. Rpt. N. Y. St. Hort. Soc. 91. 1925
- New developments in eastern marketing. Rpt. Kans. St. Hort. Soc. 1925, and in Rpt. Missouri St. Hort. Soc. 1925
- What the Horticultural Investigations are accomplishing. Rpt. N. Y. St. Hort. Soc. 156. 1926
- Profits from delaying the cherry harvest. Rpt. Mich. St. Hort. Soc. 138. 1926
- Recent tendencies in eastern marketing. Rpt. Pa. Hort. Soc. 53. 1927

- Rambles in horticultural research in the Hudson River Valley.
 Rpt. Pa. Hort. Soc. 75. 1927
 New developments in eastern marketing. Rpt. Vt. Hort. Soc. 5.
 1927
 A fruit tour of the Pacific Northwest. (Delivered both at
 Rochester and at Poughkeepsie.) Rpt. N. Y. St. Hort. Soc. 1927
 Rambles in horticultural research in the Hudson River Valley.
 Rpt. N. Y. St. Hort. Soc. 191. 1927
 Growing sour cherries for the freezer. Rpt. N. Y. St. Hort. Soc.
 147. 1927
 The trend of eastern marketing. Rpt. Mass. Fruit Growers Assoc.
 1928
 Rambles in horticultural research in the Hudson River Valley.
 Rpt. Mass. Fruit Growers Assoc. 1928
 Experiences with fruit stocks in New York State. Rpt. National
 Assoc. Prop. Nurserymen. 1928
 Plans and accomplishments of the N. Y. St. Nursery Investigations.
 N. Y. St. Nurs. Assoc. 1928 (Mimeographed)

Encyclopedia Articles

1924	Americana Annual.	Horticulture in 1924
1925	" "	" " 1925
1926	" "	" " 1926
1927	" "	" " 1927

Books

The Pear and its Culture. New York City 1928

Addresses at Farm Bureau and Grange Meetings (19)

Kinderhook Farm Bureau	March	1924
Hudson " "	"	"
Germantown " "	"	"
Claverack " "	"	"
Livingston " "	"	"
Ulster Park " "	February	1925
Athens " "	March	"
Kinderhook " "	May	"
Ulster Park " "	February	1926
Muitzeckill " "	March	"
Kinderhook Grange	August	"
Athens Farm Bureau	"	"
Germantown Co-operative	November	"
Germantown Fruit Show	October	"
Marlboro Farm Bureau	February	1927
Muitzeckill " "	March	"
Upper Red Hook " "	"	"
Catskill " "	April	"
Sodus " "	February	1928

Addresses to Garden Clubs (1)

Kinderhook April 1926

Radio Broadcasting (19)

WEY, Schenectady, N. Y.	December	1924
" " " "	January	1925
" " " "	February	"
" " " "	March	"
" " " "	April	"
" " " "	May	"
" " " "	June	"
" " " "	September	"
" " " "	October	"
" " " "	November	"
" " " "	December	"
" " " "	January	1926
" " " "	February	"
" " " "	March	"
" " " "	April	"
" " " "	May	"
" " " "	June	"
WDAF, Kansas City, Mo.	December	1925
WTAG, Worcester, Mass.	January	1928

Rotary and Kiwanis Talks (4)

Hudson Rotary	July	1925
" "	"	1926
" Kiwanis	August	"
Geneva Rotary-Community at Bellona	May	1927

Addresses to Miscellaneous Organizations (9)

Pennsylvania Horticultural Society	York,	July 1925
" " " "	Arendtsville,	" "
" " " "	Lancaster,	" "
Connecticut Annual Field Day	New Haven,	" "
Yakima Fruit Growers	Yakima, Wash.	June 1926
Salem " "	Salem, Ore.	" "
Tacoma " "	Tacoma, Wash.	" "
N. Y. St. Hort. Soc. (Summer Meeting)	Poughkeepsie,	August 1924
" " " " " " " "	Marlboro,	" 1925

Scientific Meetings Attended

Amer. Assoc. for the Advancement of Sci.	Washington, D. C.,	1924
" " " " " "	Philadelphia, Pa.,	1925
" " " " " "	Nashville, Tenn.,	1927

Official Capacities with Scientific Bodies

Secretary-Treasurer American Society for Horticultural Science and
Editor of Annual Proceedings 1928

Official Connections with Other Organizations

American Pomological Society; Executive Committee and Board of Managers	1924
" " " " " "	1925
" " " " " "	1926
" " " " " "	1927

Connections with Publications

Chairman Advisory Board, Fruits and Gardens	1925-1927
Member " " " " "	1926, 1927, 1928
Contributing Editor, The Rural New-Yorker	1925, 1926, 1927
Member of Executive and Editorial Staff, Rural New-Yorker,	1928

Fruit Tours Assisted in Promoting

American Pomological Society August 1925
(Pennsylvania, Delaware, New Jersey, New York, and Connecticut)
Pennsylvania Horticultural Society August 1926
(Hudson River Valley)

Fruit Judging (11)

Germantown Fruit Show	1924
N. Y. St. Hort. Soc. Poughkeepsie Meeting	1924
Germantown Fruit Show	1925
N. Y. St. Hort. Soc. " "	1925
" " " " " "	1926
" " " " " "	1927
" " " " " Rochester "	1927
Yates County Fair	1927
Rochester Exposition	1927
N. Y. St. Hort. Soc. Poughkeepsie "	1928
" " " " " Rochester "	1928

News Items Furnished (Daily and weekly-64)

No. 247	Special fruit work begun in Valley	July 5, 1923
" 272	How to buy apples	Sept. 22, "
" 289	About buying apples	Nov. 24, "
" 284	Hudson Valley fruit growers	Dec. 11, "
" 349	Sour cherries to be studied	Apr. 14, 1924
" 379	Orchard cover crops for Hudson Valley	June 14, "
" 380	Germination of fruit seed studied	" " "
" 383	Fruit seed germination	" 21, "
" 416	Hudson Valley fruit growers secure State aid	" 23, "
" 418	Fertilizers in the apple orchard	" " "

No. 426	Fertilizing apple orchards not profitable	Sept. 6, 1924
" 429	Buying apples	" 13, "
" 430	Some hints on buying apples	" 20, "
" 498	Big fruit exhibit at Poughkeepsie	Feb. 7, 1925
" 524	Cherries affected by pollination	" 21, "
" 531	Study fertilizer needs of Hudson Valley soil	March 28, "
" 554	Fertilizing young apple trees	Apr. 18, "
" 555	Pollination of peaches studied	" 25, "
" 570	Fertilizing apples	May 9, "
" 574	" " may not pay	" 16, "
" 576	Fruit trees bagged for pollination study	June 19, "
" 577	How nursery stock is propagated	" 26, "
" 618	Why nitrate kills plants	July 18, "
" 619	Cover crops show marked differences	" " "
" 640	Fertilizing apples	Aug. 29, "
" 644	" " does not pay	Sept. 5, "
" 652	Buying apples	" 19, "
" 653	Hints on buying apples	" 26, "
" 656	Pollinating peaches	" " "
" 657	Report on peach pollination studies	Oct. 3, "
" 661	New fruits displayed at Germantown show	" 5, "
" 730	Hudson Valley growers meet	Feb. 13, 1926
" 731	Cherries need cross-pollination	" " "
" 733	Fruit studies in Hudson Valley reviewed	" 20, "
" 737	Mixed cherry plantings advocated	" " "
" 793	Fruit growers plant trip west	May 22, "
" 849	Fertilizing apples	Sept. 18, "
" 852	Fertilizers do not pay on apples	Oct. 2, "
" 946	Issues report on cherry growing	March 19, 1927
" 959	Fertilizing young trees	Apr. 9, "
" 962	Wood's clover	" 16, "
" 975	Use care in fertilizing young trees	" 30, "
" 976	To study nursery stock production	May 7, "
" 977	New cover crop worth trying	" " "
" 982	Will aid nursery stock production	" 14, "
" 994	Seedling fruit stocks	June 4, "
" 1003	Nursery investigations are showing results	" 18, "
" 1013	To honor the Jonathan apple	July 9, "
" 1018	Jonathan apple tree to receive monument	" 16, "
" 1032	Fruit growers to meet at Woodstock	Aug. 6, "
" 1034	Beautifying the home grounds	" 13, "
" 1041	What to plant about the house	" 20, "
" 1055	Tells how to buy apples	Sept. 17, "
" 1062	Buy apples on quality basis	Oct. 1, "
" 1073	Fruit seed germination	" 22, "
" 1090	How to make fruit seeds grow	Nov. 19, "
" 1099	Growing cherries for the freezer	Dec. 10, "
" 1107	Increasing cherry yields	" 17, "
" 1172	Cherry growing	March 10, "
" 1175	Fertilizing and pruning aid cherries	" 17, "
" 1191	Care of nursery stock important	" 31, "
" 1194	Urges care of nursery stock	Apr. 7, "
" 1209	Fertilizers may injure shrubs and trees	" 21, "
" 1211	Care needed in fertilizing trees	" 28, "

II. Present Program of Work

During the session of the Legislature last year, the nurserymen of the State took the initiative in securing an appropriation of \$5,400 for the remainder of 1927-28 to permit the undertaking of investigations on nursery problems at the New York Agricultural Experiment Station, Geneva. The primary reason for their request of the Legislature for such action was that under the quarantine regulations of the Federal Horticultural Board all importations of seedling nursery stock will be prohibited beginning 1930.

In the past, the nurserymen of the United States have relied almost exclusively on seedling nursery stock grown in Europe for the propagation of all varieties of fruit trees except peaches and for many other classes of ornamental nursery stock, including roses. The seedling stocks have been grown mainly in eastern France and in Holland, where climatic conditions are especially favorable. The nurserymen of this country have imported these seedlings and then grafted or budded upon such seedling stock the buds or scions of improved varieties of trees or shrubs, growing this grafted or budded stock in their nurseries until it reaches an appropriate age.

The Federal quarantine regulations which will become effective in 1930 mean that the nurserymen are faced with the most immediate and pressing problems. After that time, the nurserymen cannot secure seedling stocks from Europe, but must have available in the United States satisfactory sources of such material. Up to the present time but very little has been done to ascertain whether satisfactory seedling stocks can be produced in the United States. Furthermore, with the cheap labor in Europe, hand methods of transplanting can be

employed which would make material produced by such methods in the United States unduly expensive. In many other respects, European methods cannot be transplanted without change to the different conditions in this country.

Most of the seedling stocks thus far grown in the United States are deemed inferior by nurserymen to the usual European stocks. On account of the importance of the nursery industry in New York, it is essential that careful investigations be conducted as expeditiously as possible to aid the nurserymen in meeting this emergency.

As soon as the appropriation was made in April, 1927 by the Legislature, the following lines of investigation were decided upon by the Experiment Station in conference with representatives of the New York State Nurserymen's Association. Work upon all these projects is now under way.

1. Comparison of seedling stocks from various regions. Extensive tests are being carried on to compare fruit stocks raised in various districts of the United States with the standard foreign grown stocks, to determine the best source of domestic stock for New York conditions, and particularly to ascertain whether any of the domestic stock now being produced meets the needs of New York nurserymen as satisfactorily as the foreign stock.

2. Sources and varieties of seed for seedling stocks. Thorough tests are being carried on to determine the best sources of seed and the most suitable varieties for the growing of seedling stocks under New York conditions for the propagation of fruit trees.

3. Methods of growing seedling stocks. Extensive investigations are in progress to determine the best methods of growing seedling stocks under New York conditions. These include the determination of the best rates of seeding, a comparison of fall vs. spring planting, and especially a study of methods of transplanting. Unless the seedling trees are transplanted at an early stage they grow with a straight tap-root instead of a branching root system. This is undesirable. In Europe, with the cheap labor supply these little seedling trees are transplanted by hand. Such methods are impracticable under our conditions. Efforts are therefore being made to devise some efficient and cheap method of transplanting.

4. Study of storage conditions. Since seedling stocks must be stored over winter, it is important to determine the exact conditions necessary for satisfactory storage under our climate.

5. Asexual propagation. Seedling trees grown from the same source of seed differ greatly in many characteristics, including vigor. Hence fruit trees propagated on such seedling roots are not uniform, and many trees in an orchard are consequently inferior individuals. It is, therefore, important to determine whether an economical method can be developed of propagating fruit trees asexually; in other words, by propagating them by methods somewhat similar to those used in propagating grapes and raspberries. Some progress in this direction has been made in England and in some sections of the United States.

If fruit trees can be propagated at a low enough cost from uniform and selected root stocks, such trees would have manifest advantages.

6. Use of cover crops to retain fertility of nursery land. At present, most nurserymen find it necessary to use new land for each crop of fruit trees, which occupies the soil only about three years. Often they even go to the expense of tiling the land for the one crop of trees. The growing of the fruit trees is so "hard" on the land that after the crop is harvested the field is either sold for whatever price can be secured or other crops are grown on the land before putting it into fruit trees again. This is an expensive process. A thorough study is therefore being conducted to ascertain whether the fertility of nursery land can be built up and maintained by the use of suitable cover crops, so that the same field can be used successively for more than one crop of trees.

7. Fertilizer requirements of nursery stock. Most nurserymen are making large expenditures for fertilizers with but very limited data to show whether such expenditures produce sufficient results to justify the expense. Fertilizer tests are therefore being conducted with apples, cherries, and rose stocks to secure definite data on this matter.

Seasonal activities.

The growing season extends from the first of April until the first of November. Beginning with the first of March, cold frames are prepared and fruit tree seeds sown for later transplanting. In April, seeds and stocks are planted out. In May transplanting and fertilizer treatments are carried on. June and July demand cultivation, insect and disease control, and note taking on the performance of plants. The last of July and August is devoted to budding and to collecting seed. In September is the State Fair Exhibit and

preliminary digging of stock. October and November are the months for laying-by stock and for storing. December, January, and February are given over to the trimming of stock preparatory to spring planting, to grafting and greenhouse propagation. In this way the labor force is occupied throughout the season. In addition to the field activities storage problems are studied from November until May, and greenhouse propagation is practiced with greenwood cuttings during May and June.

Meetings with nursery and fruit organizations require attendance and preparation during August and January, with occasional executive meetings during the year. A report of the season's activities are given before the New York State Nurserymen's Association in January.

News items that may help the nursery industry are sent out on an average of one a month to the newspapers of the state.

An exhibit of nursery plants is made at the State Fair in September.

Letters of inquiring and correspondence estimated at 900 to 1,000 letters are answered during the year.

Addresses and talks before organizations number fifteen or twenty.

Contributions are made to such scientific organizations as the American Society for Horticultural Science.

Official duties in connection with scientific organizations are: Secretary-Treasurer, "American Society for Horticultural Science" and Editor of the Annual Proceedings; and member of the Board of Managers and of the Executive Committee of the "American Pomological Society."

III. Additional Needs for Effective Prosecution of Nursery Investigations.

The needs of the Nursery Investigations for more effective prosecution of the work include,

1. Storage facilities. At the present time there are no facilities of any kind for proper storage of nursery stock. Make-shift arrangements were made under an old barn during the winter of 1927-28 to handle the small amount of stock for spring planting. These accommodations are entirely inadequate. Requirements are for a common insulated storage forty feet by twenty feet, eight feet high, with adjoining work room twenty feet by fifteen feet.

Facilities are also needed for studying the storage of nursery stock, one of the major lines of investigations in these projects. Requirements are for a storage with four controlled temperature chambers, ten feet square and eight feet high which can be maintained constantly at temperatures between 20 and 40 degrees Fahrenheit and in which humidity and ventilation are also controllable. These chambers could be built in conjunction with fruit storage facilities or with common nursery storage facilities. With facilities of this kind it would be possible to determine the best conditions for the storage of nursery stock, including fungus control. Under the present cooperative arrangements with nurserymen such disappointments are encountered as one during this past season where four weeks of work on the storage of roses was entirely lost because of the misunderstanding of new labor at one of the nursery cellars where the stock was stored.

2. Greenhouse facilities. Reliable work in propagation of plants cannot be done without controlled conditions. Unless it is

possible to tell under what set of conditions certain results are secured they are of no value to the nurseryman because he does not then know how to duplicate them. The Station is pitifully lacking in modern equipment of this kind, so that problems of an exact scientific nature cannot be worked upon. Controlled greenhouses which are divided into smaller sections with controlled conditions are badly needed.

3. Facilities for seed storage and after-ripening. Because Federal Quarantines are becoming more inclusive and are forcing American nurserymen to resort to their own methods of propagation with plants which they formerly imported, studies are necessary in this field. Many plants propagated by seed are now grown with difficulty because the proper conditions are not known under which the seeds should be held. With cherry seed, for example, it is not known definitely whether late stratification affects germination or not. Furthermore some conifer seeds require two years to germinate under some conditions and only one year under others.

A small automatic refrigerative unit such as those used in household refrigerators is needed for this work.

4. Assistance in chemical studies. Assistance is needed in such studies as tests for maturity of nursery stock, internal condition of stock grown under various conditions and stored under different conditions, and composition of plants at different periods under-going propagation tests. At the present time it is impossible to say in what way the various treatments are affecting the internal make-up of the plant.

The cooperation of plant chemists would result in an outstanding contribution in a field now untouched.

H. B. Tukey

Acting Chief in Research(Horticulture)

Geneva, New York
April 27, 1928

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Hudson Valley Horticultural Investigations

E. V. Shear, Jr.

F. G. Munding

L. C. Anderson

R E P O R T O N T H E W O R K O F E . V . S H E A R

HUDSON VALLEY FRUIT INVESTIGATIONS

POUGHKEEPSIE, N. Y.

MAY, 1928

Project No. 12
Sub-project 1

DIVISION: Botany

NAME OF PROJECT: Raspberry Diseases: Mosaic of Red and
Purple Raspberries.

PROGRESS OF THE WORK:

The work on this project during the past five years has definitely eliminated a number of raspberry varieties from consideration as possible commercial sorts because of the severity with which virus disease attacks them. The work has further suggested the desirability of other varieties for commercial production. Numerous tests in small experimental plantings and in commercial production plantations have been and are now being conducted.

Five and six years ago the red raspberry industry in the Hudson Valley was completely disorganized. The industry is still far from having resumed its one-time importance but a definite new start toward commercial production has been made with clean stock grown under methods calculated to curb loss from virus disease. The stock has been furnished partly by the New York State Experiment Station and partly by other Experiment Stations. The methods are those developed in entirety by the New York Station, other Experiment Stations and the United States Department of Agriculture.

The fundamental studies on the ~~XXXXX~~ cause and transmission of virus disease of red raspberry in the Hudson Valley has yielded no results that have been interpreted to add to the knowledge of this type of disease. At present, May 7, 1928, there are 610 inoculated red raspberry plants growing in the experimental plots in the Hudson Valley. 200 additional plants are available for new work.

May 7, 1928

DIVISION: Botany

Project 2

NAME OF PROJECT: Apple Fruit Spot Diseases in the Hudson Valley.

PROGRESS OF THE WORK:

This project has developed chiefly along the lines of studying apple scab and the use of fungicidal sprays against this disease. Efforts have been made to combine insecticidal materials with scab sprays.. Much attention has been given to the study of spray injury. A minor division of this spray work has been the study of removal of spray residue from fruit.

No fundamental work on any phase of this project has been done.

Work was begun in 1924 on new sprays containing oils, coppers and sulfurs designed to serve as efficacious treatments against both diseases and insects in early spraying treatments for apple trees. Most of the ideas for these sprays were borrowed from the published work of the U.S. Department of Agriculture and Experiment Stations on the Pacific Coast, in the Middle West and in Florida. The adaptation of these materials to apple spraying and the choice of the time for using them were largely original with this Station. cursory reports of the work have been published in the Proceedings of the New York State Horticultural Society for 1925 to 1928 inclusive.

Also this work is far from finished and great need for additional research has proved desirable in this field. *However* the materials and methods developed at this laboratory have shown sufficient promise so that they have been adopted by commercial fruit growers. In 1927 and 1928 half or more of the commercial spraying in the Hudson Valley was modeled on the experimental work of this laboratory. In 1927 more than half a million barrels of apples were produced in the orchards where spray practices corresponding to the experimental work prevailed.

The matter of injury to trees by spray materials deserves most serious study. This work has not progressed far enuf for this laboratory to make a report. It is that that much careless speculation in this field by investigators has so confused the issues involved that any statements should be supported by better evidence than has so far been obtained.

The arsenic scare of 1926 forced the search for a method of cleaning fruit from an experimental plot. Hydrochloric acid was used and proved desirable in commercial trials during the fall of 1926. since this work a great deal of careful experimental work has appeared in the Western boxed apple states. wide commercial adoption of this method has followed with very encouraging results. Acid washing experimenting with eastern type fruits has continued at this laboratory. The work has been widened to investigate the possibility of removing superficial fungous fruit spotting following infestation of sucking insects. No success has followed this latter phase of the work. This laboratory initiated what

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Project 22

has proved a successful method for cleansing fruit from some types of dirt. This work was done at a time when many other investigators were reporting satisfaction with other methods that have since been shown to be inferior to the hydrochloric acid method. Preliminary results of fruit washing experiments were published in the Proceedings of the N.Y. State Horticultural Society 1927:149-151.

Normally the apple is the fifth or sixth most valuable agricultural product of the United States and the group of fungous diseases causing fruit spots include the worst pests of this fruit. It is that this justifies continued study of this problem. It is also planned to continue work on the related problems involving the fungicidal value of sprays, combined insecticidal and fungicidal materials, spray injury and cleansing fruit.

May 7, 1928
Project No. 24

DIVISION: Botany

NAME OF PROJECT: Root diseases of Fruit Trees in the Hudson Valley.

PROGRESS OF THE WORK:

During the early part of the work on this project a great deal of time was spent reconnoitering areas with sick orchards. Over 200 blocks of trees are listed in this project file as containing trees with root, crown or trunk disorders. This part of the work was pursued to find whether there were valuable correlations between varieties, sites, soils, water relations or areas of fungous parasitism and the occurrence of sick trees. Efforts are now made to keep these known plots under observation and future work is intended to take this course.

Different types of cover crops and cultural and manurial treatments are being used on adjacent plots. Numerous inoculation experiments with suspected organisms have been made. Work has started on determinations of soil quality, soil temperature and soil moisture. Considerable work has been done in bridge grafting across injured spots at the bases of trees and more extensive experimenting has been done in grafting into the bases of sick trees the tops of small trees previously transplanted about the bases of diseased trees. Crab stock, stock of unknown parentage and stock of named varieties on their own roots have been transplanted in supposedly severe sites.

There have been no practical results under this project. It is expected that, in time, some of this work may yield something of practical value to fruit growers. Some of the work is not expected to furnish any conclusions for some years in the future.

It requires long years and large money outlays to grow orchard trees and the death of such trees wipes out the fruit growers' investment and hope. The problem is of great importance to the fruit industry and it is intended that the present program as given in the first two paragraphs above shall continue, at least during the immediate future.

Perhaps it is best to describe the year's program in the plant disease laboratory by beginning with the spring season. In spring time is divided between apple scab, raspberry, and sick tree projects. The last named work continuing from winter and ending with grafting work during late April and May. The scab and raspberry work begins about April first and the scab work is about over by June first. The raspberry work continues thru the growing season.

During midsummer considerable time is consumed by the care of the sick tree blocks and the raspberry inoculation plots. The Station produces most of the stock used in planting and this nursery stock requires considerable time in summer.

Autumn calls for least work as the work is now arranged. Early September and late November are especially light. Mid-autumn is taken up by checking up spray plot experiments and putting all plots in shape for winter and work in cleaning fruit begins and continues thru the winter.

Most of the winter time is spent on ~~misc~~ literature. Spray materials and fungous collections receive most of the attention given them during the year.

Attendance at Farm Bureau meetings and similar sessions during 1927 totalled 23 days. I think these covered 33 meetings. This is considerable reduction from previous years as it has been decided this may not be the most profitable research work.

Probably fifty letter inquiries reach this laboratory yearly from fruit growers. A larger number of ~~these~~ *letter* inquiries come from manufacturers of spray materials and other institutions concerned with horticulture. Most inquiries come by phone during the scab period in spring when such calls run up to a dozen a day. As this laboratory is located in a section where gardening and greenhouse interests and truck farming are extensive and where there are hundreds of large estates, many calls pertain to troubles on flowers, truck crops, ornamentals, shade trees and exotics. A large percentage of these inquiries are not satisfactorily answered because of lack of knowledge. Such questions are referred elsewhere.

From a plant pathologist's viewpoint this laboratory needs better facilities for hiring semi-skilled labor for experimental plots and laboratory work. The equipment needs are: a typewriter, soil temperature apparatus, camera, apparatus for securing constant temperatures and humidities. Authorization to purchase pleasure type automobiles instead of commercial cars is desirable. It costs thirty cents ~~more~~ to cross the ferry with a car bearing a commercial license and there is no compensation to offset this.

REPORT ON ENTOMOLOGICAL INVESTIGATIONS IN THE HUDSON VALLEY
1924-1928

F. G. Munding

1. Important results accomplished:

- A. Determined the value of calcium cyanide as an insecticide against the pear psylla and the safeness of this method of treatment in the hands of average growers.
- B. After three years of work, have devised a dust mixture for use in the control of the pear psylla which is effective against the insects, noninjurious to trees, cheap and easily applied. This is the hydrated lime-plaster of paris-nicotine dust. This season's experiments should determine definitely the merits of the dust for treatment of pear orchards.
- C. Have conducted experiments to determine the value of oil sprays for the control of pear psylla, red mite and aphid.
- D. Secured data on the habits of the apple maggot fly. The data has made possible better control since we have a definite basis for the timing of the spray applications. The new method for spraying against the insect has made it possible to reduce the number of treatments formerly employed and thus has reduced the danger from excessive amounts of spray deposits on apples.
- E. Secured data on the habits of the pear midge in the Hudson valley which doubtless will make it possible to devise control measures.

Publications:

Experiments with calcium cyanide as an insecticide, pp. 134-135
N. Y. State Hort. Soc. Proceedings 69th Annual Meeting 1924.

Susceptibility of the pear psylla to calcium cyanide dust, pp.
182-186 N. Y. State Hort. Soc. Proceedings 70th Annual Meeting 1925.

Investigations on the control of pear psylla, New York State Agr.
Exp. Sta. Bul. 529. 1925.

Some Insect Pests of the Hudson Valley, pp. 142-144. N. Y. State
Hort. Soc. Proceedings 71st Annual Meeting 1926.

Some experiments relative to insect control, pp. 138-144.
N. Y. State Hort. Soc. Proceedings 72nd Annual Meeting 1927.

Results of some investigations on insect control in the Hudson Valley,
pp. 189-195. N. Y. State Hort. Soc. Proceedings 73rd Annual Meeting
1928.

2. Present program of work:

- A Continue with pear psylla investigations. The results obtained with oils against the flies and the data secured from treatments with the new dust mixture on both psylla nymphs and flies indicate that we are not far from solving the problem of finding an economical and efficient method of combating this pest. Since the pear psylla is the worst enemy of pear growers in the Hudson valley and since practically all known control measures are costly and none fool-proof, it seems advisable that a little more time be spent on this problem in order that we may be sure of our position. The most diligent fruitgrowers find it difficult and nearly impossible to attain the protection they desire with present control measures in seasons of heavy infestation.
- B Continue with apple maggot investigations: Two seasons of experimental work have been done on this pest and some helpful data found relative to its control. Several effective sprays have been used. The timing of applications appears to be of paramount importance. With the proper timing of applications, which can only be determined by emergence records, the grower will be able to secure the maximum amount of protection with the minimum amount of lead arsenate residue on his fruit. In 1925 the apple maggot fly took a large portion of the apple crop in the Hudson valley and is a serious pest in many apple-growing regions.
- C Continue with pear midge investigations: A study of this pest was begun in 1926 but more attention has been given to it during the last two years. Some important facts regarding its life history have been found and a step toward control has been made. However, it is felt that further investigation is needed to solve the problem. There are many locations about Hudson, Germantown, and Marlboro, N. Y., where the pear midge has caused serious damage. Where investigations are now being carried on at Hudson the midge has taken practically every crop of pears since the orchard has been in bearing.
- D Activities during year: General observations on pear psylla and pear midge begin in March and early April. The first control measures are tried against pear psylla in late March or early April and continued thru the summer and into the fall. Control practices begin early in April for midge and continue thru May, and possibly June. At this time preparation is begun for apple maggot study which runs thru summer and into the fall when fruit counts and final observations are made. During the winter months there is often material to be worked over from cage collections and seeded boxes. Inquiries from farmers are answered and talks given at meetings. Usually there are from three to five such meetings. Some time is given to the reading and examination of literature bearing on my problems. When data is thought valuable enough manuscript is prepared for publication.

3. My work could be facilitated by the aid of an assistant during the busy summer months. A good typewriter would be of value to this Laboratory.

HUDSON VALLEY FRUIT INVESTIGATIONS OF THE
NEW YORK STATE EXPERIMENT STATION.

The present program of work of the Hudson Valley Fruit Investigations consists largely of fertilizer experiments on different varieties of apples, on grapes and on cherries. The fertilizer reaction on the different soil types is also considered.

The pruning and fertilizer experiment on sour cherries is in its fifth year. Nitrogen has proven to be advantageous in the production of cherries and the growth of the tree, and has given a more luxuriant foliage. The combination of pruning heavily, chiefly by cutting the tops of the trees back, and an application of nitrogen has proven to be the most beneficial to good growth. While production is decreased for two or three years, yet, it soon catches up. This method of treatment also has a desired effect in keeping the bearing surface of the tree nearer the ground. It will probably be unnecessary to continue this experiment after this year.

The cooperative fertilizer experiment at Red Hook consists of the application of acid phosphate, potash, and nitrogen alone and in combinations on young bearing McIntosh. The soil is a Dutchess Stony Loam. Nitrogen is the only fertilizer giving direct results. These results are seen in the production, the growth of the tree, and the better color ^{of} foliage. This experiment is in its fifth year. It will probably be desirable to run this experiment longer to see how the trees react to the fertilizers as they bear heavier loads.

The cooperative fertilizer experiment at Germantown on Newtown Pippin trees consists of the application of the acid phosphate, nitrogen, and potash alone and in combinations. This experiment had as one of its objects, the possibility of changing the bearing habits

of the trees, and asking them annual bearers. This experiment is in it's fifth year and has shown no such tendency. Nitrogen has shown to be advantageous in growth of tree and production. It seems advisable to continue this experiment and do some pruning and thinning in the next bearing year.

The cooperative fertilizer experiment at Germantown on grapes consists of the application of nitrogen, acid phosphate, and potash alone and in combinations. Nitrogen shows some increase in production and better color of foliage. It is questionable as to the advisability of continuing this experiment after this year.

The rented ground at Kinderhook is divided into fertilizer experiments a varietal planting. The larger fertilizer test consists of the application of nitrogen, phosphate, and potash alone and in combinations on young trees. This experiment has been running since the trees were planted and is now in the fifth year. The soil at Kinderhook is practically a virgin soil, of a coarse sand. This experiment should run indefinitely.

The varietal plantings consist of the more promising fruits originated mostly at Geneva to find their adaptability to Hudson Valley conditions.

This spring three new experiments have been started. Two on McIntosh using six different nitrogenous fertilizers, one at Kinderhook and the other at Saugerties. These are both cooperative. The question of the best form of nitrogen to apply is one which is giving a great deal of concern among the fruit growers. The third experiment is with cover crops, on McIntosh, Wealthy, Baldwin and Ben Davis all in one orchard. This experiment will be carried on with golden millet and sweet clover as cover crops and to the soil will

be added lime and acid phosphate in plots.

The nitrogen fertilizers are first spread in the spring and soon after the phosphate and potash. Later a check on the bloom is made. The set of fruit is watched as well as it's development during the season, and data taken as developments prove worthy. During the summer, cover crops are sown on the experiments, growth of the trees watched, and records taken on cherry production. In the fall records are taken on the production of the McIntosh, Grapes, and Newtown Pippin experiments, and the plot at Kinderhook looked after. There were seven groups of people last summer who visited the experiments; one group was from the Massachusetts Station and one from the N. J. State college. There were also several smaller groups who visited the experiments. During the winter, the data taken on the various experiments is worked up and put into shape. Details are worked out for the work of the coming season.

Among other duties performed have been talks to twelve meetings of fruit growers and one each at Rotary and Kiwanis Club meetings. At least 250 inquiries from fruit growers concerning horticultural problems have been answered. The problems have been chiefly that of pruning fruits, fertilizers to apply, root stocks for new plantings, and varieties for cross-pollination. At present I am giving some assistance in making arrangements for the eastern meeting of the Horticultural Society this summer.

April 20, 1928.

L. C. Anderson.

