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# Pennsylvania State Horticultural Association News

PUBLISHED BY THE ASSOCIATION

Issued Quarterly at State College, Pa. Subscription Included in Annual Dues of $2.00

*Entered as second-class matter at the Post Office at State College, Pa.*

Vol. XII State College, Pa., March, 1935 No. 1



Proceedings of the

## *Seventy-sixth Annual Meeting*

Held in Harrisburg, Pa.

*January 23 and 24, 1935*

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# *State Horticultural Association of Pennsylvania*

## OFFICERS FOR 1935

**President** . . . . . H. F. Hershey, Hamburg

**Vice President** . . . . . R. Johnston Gillan, St. Thomas

**Secretary** . . . . . R. H. Sudds, State College

**Treasurer** . . . . . C. B. Snyder, Ephrata

**Executive Committee:** The above named officers and C. J. Tyson, Gardners; H. M. Anderson, New Park; J. Eric Linde, Orefield.

## STANDING COMMITTEES

**Legislation and Representatives on Agricultural Council:** C. J. Tyson, Ch.; H. S. Nolt, Columbia; R. T. Criswell, Chambersburg, (Representative on Tax Committee).

**State Farm Show and Exhibition:** John Ruef, State College, Ch.; R. J. Gillan, St. Thomas; Paul Thayer, Carlisle.

**Insect Pests:** T. L. Guyton, Harrisburg, Ch.; H. N. Worthley, State College; H. E. Hodgkiss, State College.

**Plant Diseases:** H. W. Thurston, State College, Ch.; R. S. Kirby, State College; K. W. Lauer, Harrisburg.

**Game Laws:** J. A. Runk, Huntingdon, Ch.; Geo. Balthaser, Wernersville; R. H. Bell, Harrisburg.

**True-To-Name-Trees:** F. N. Fagan, State College, Ch.; F. M. Trimble, Harrisburg; G. L. Baugher, Aspers.

**Inspection Fund:** E. B. Mitchell, Harrisburg, Ch.; M. E. Knouse, Peach Glen; C. J. Tyson, Gardners.

**Representative from Horticultural Association of Pennsylvania to Eastern States Fruit Council at Washington:** R. H. Sudds, State College.



# Proceedings of the State Horticultural Association of Pennsylvania for 1935

The seventy-sixth annual meeting was opened in Room B, Farm Show Building at Harrisburg, Wednesday morning, January 23, by President Reiter who called upon the Rev. H. B. King of the Paxtang Presbyterian Church to give the invocation.

## PRESIDENT'S ADDRESS

**F. G. REITER, Mars, Pa.**

It gives me great pleasure to greet you at this seventy-sixth anniversary meeting of our State Horticultural Association. I want to congratulate our Secretary on the program he has prepared and on the cut on the program, "The Spirit of '76." It has taken a lot of this spirit to come through the last few years. Business conditions, markets, drought, insects, and diseases have brought us a lot of anxious moments but still we are holding on.

A severe drought in the early part of this season diminished the prospects for a crop but helped the control of diseases. The government report of the lightest crop since 1921, and the second lightest on record, made conditions look good for better prices. Heavy rains during late summer and early fall developed our apples to large size giving us more of a crop than anticipated, which sold at fair prices.

The few peach growers favored with a crop were favored also with an especially good market. The peach crop was very light in many sections and as an old neighbor would say, "The cellar shelves will be well cleared and ready for a crop next year."

I want to thank all the committees for their faithful work during this year and I especially want to comment on the splendid fruit show, a credit to any organization.

It is said that history repeats itself. Dr. Fletcher, in his "History of Fruit Growing in Pennsylvania," quoted statements of years ago that sounded like our depression years and so at our Annual Horticulture Week at State College, Dr. Weaver, in his analysis of the fruit situation, indicated better times ahead for the fruit grower.

I believe our Secretary's report will show an increase in membership and in finances during the past year, but let us not be satisfied with what we have accomplished but strive for a stronger organization and even a better show.

## SECRETARY'S REPORT

With this meeting, your Secretary completes five years of service to the Association. His efforts, he hopes, together with the aid of the other officers, have helped keep this organization on a strong foundation through the depression. As Mr. Snyder's report will show, we have the largest bank balance in many years with every outstanding bill paid in full.

We have obligated ourselves to pay for a much more expensive program this year with many new speakers. This was done because complaints were made that you were having to hear the same State College speakers all too frequently. It is up to you to support the Association by securing more members to enable us to continue such programs in the future.

Part of the compensation for the Secretary's position is the pleasure of associating with men such as our Presidents have been. President Reiter is the third President under whom your Secretary has served; they have been in order, Dr. J. S. Rittenhouse, Mr. R. T. Criswell, and Mr. Francis G. Reiter. They have been a credit both to this Association and to themselves and it is to be hoped that Mr. Reiter's successor continues this unbroken line of outstanding gentlemen.

Our membership last year at this time was 610; now we have 754 members, which is quite a decided gain. This is in part due to the affiliation of the Lackawanna County Horticultural Association which brings us a large group of progressive growers, and in part to an improved financial condition of the growers. We have also more inducements to join than previously.

So far as we know, the affiliation with the American Fruit Grower whereby we give a year's subscription with each membership has been quite satisfactory. This will be continued this year. The editor, Mr. J. T. Bregger, welcomes any suggestions for improving his magazine.

We have been giving a two-year membership credit for all joining after July 1. This was intended as a means of inducing new members to join. However, there are certain individuals who have been regularly receiving two years' membership for one year's dues. The Executive Committee has decided to change this so that the dues paid in any one year pay only to the next annual meeting.

This Association through a committee has been handling all the Pennsylvania State-Federal fruit inspection funds from the growers to lower the cost of the service, and to prevent any surplus at the end of the season from being lost forever to the growers in the State Treasury. Mr. E. B. Mitchell has been handling this work to the entire satisfaction of those using this service. Mr. M. E. Knouse and Mr. C. J. Tyson are also members of this committee which your Secretary unintentionally left out of the program.

The financing of the Pennsylvania Quality fruit labels will be discontinued by this Association since our carry-over is all sold and we have had much of our capital frozen up in these labels several times in the past two years. This has been a real service to the growers but we are not able to do this any longer with our small cash capital. Any such future label orders will be between the buyer and the printer.

What are your wishes concerning a summer meeting? Is there enough interest to arrange a trip in Pennsylvania or in another State, or will a summer meeting at State College be satisfactory? Your expression of opinion will be welcomed.*

The Resolutions Committee will present a resolution on the death of F. H. Fassett, Meshoppen, President in 1918 and 1919, according to Dr. Fletcher's "History of the State Horticultural Association of Pennsylvania."

Your Secretary attended two meetings in 1934 at the expense of the Association. The first one, last April, was the annual meeting of the Eastern States Apple Growers' Council. Various problems of interest to the eastern growers were discussed. A complete report of this meeting was given in the June News Letter.

The Northeastern States Agricultural Conference, called in December by the Farm Bureaus of those states, met in New York. The report of the fruit division of the meeting calls for (1) Improved market reporting including a coverage of truck movement, (2) City terminal markets were recommended for some of the larger cities to help fruit handling in these larger places, (3) Improved chain store merchandising systems are sought for the benefit of all concerned, (4) County auctions are urged where practicable, (5) Regional fruit markets are suggested for some of the larger cities of 500,000 and more population, (6) Marketing agreements are recommended where they are desired by the growers and can be made effective, and (7) Research is recommended in greater amounts, especially on marketing problems, rather than on production problems. A shift of energies in this direction was thought highly desirable.

The activities of the Association are increasing markedly every year, requiring a correspondingly greater amount of time. This means that the present Secretary has less and less time to devote to his other work at the College. But until some grower is both able and willing to take over the secretaryship, the present arrangement will probably have to be continued. The College has unofficially recognized this work as one of its legitimate functions so that there is no present difficulty regarding the use of College time in conducting Association affairs.

Please feel free to write the Secretary at any time if you have suggestions for the good of the Association.

*A Summer meeting and trip is being planned.



## SECRETARY'S NOTES

Any talks not published are due to inability to obtain the copy.

**The Agricultural Library of The Pennsylvania State College would appreciate a January, 1933, issue of The American Fruit Grower. None can be secured from the publisher. Will someone please donate his copy to the Library? It may be sent either to the Agricultural Library, The Pennsylvania State College, State College, Pennsylvania, or to R. H. Sudds, State College. Your postage will be refunded and an acknowledgment made of your courtesy by personal letter and likewise in the June News Letter.**

## TREASURER'S REPORT 1934[1]

**C. B. SNYDER, Ephrata, Pa.**

| | |
|---|---|
| Receipts to date of meeting | $ 1,702.23 |
| Expenditures[2] | 1,268.22 |
| Cash on hand | $ 434.01 |
| Bonds, bank certificates | 800.00 |
| Total assets | $ 1,234.01 |

We have audited the accounts of Mr. Snyder and found them to be correct.

Signed: J. Gordon Fetterman
Thomas Jefferson
F. W. Walker.

Dr. Anthony: We have the largest paid membership of any state Horticultural Society not receiving State or similar aid and we are the second or third largest society in the United States. The advertisers have proven their faith in our Association by continuing and even increasing their patronage all during the depression. The Association has also paid off a debt of $900 since 1914. I hope all of you realize the true worth of this Society to you.

## NOMINATING COMMITTEE REPORT

Our tentative selection of officers for 1935 is as follows:

President.....H. F. Hershey, Hamburg
Vice President.....R. J. Gillan, St. Thomas
Secretary.....R. H. Sudds, State College
Treasurer.....C. B. Snyder, Ephrata

**Executive Committee.**—The above officers and C. J. Tyson, Gardners; H. M. Anderson, New Park; J. Eric Linde, Orefield.

Signed: F. S. Dickenshied
Luther P. Creasy
W. E. Musser.

The above nominees were elected by acclamation as there were no nominations from the floor.

[1]The full report is omitted because of its great length. Mr. Snyder or the Secretary will answer any questions.

[2]This does not include the receipts or expenditures of the Inspection Fund Committee which is handled entirely at the request of those using State-Federal Inspection, by Mr. E. B. Mitchell. No salaries are paid any officer of the Association.

## Game Laws Committee Report

Mr. Runk stated that there was nothing to report at this time but said that the game laws were tightening up and only male deer were to be killed now. He suggested that all those interested secure a copy of the report published by the State Game Commission.

## True-to-Name Trees Committee Report

Mr. Fagan reported that no nursery school was held this past summer. The nurserymen were all very busy and the committee felt they had been so faithful in other years that it would be inadvisable to have a school in 1934. The Pennsylvania nurserymen have been cooperating to the fullest extent, even trading labor in culling their blocks. They realize the responsibility which they have to the members of this Association and to other growers of fruit trees. We have no expert on cherries in this state and it is possible that such a man will be brought in to cull cherry blocks for the nurserymen. As in the past, the nurserymen will no doubt pay for this service themselves. Your committee has the full support of the nurserymen of Pennsylvania. They are culling their blocks and trying to give buyers absolutely true-to-name trees.

## Inspection Fund Committee Report

Mr. Mitchell reported that the growers are using more inspectors today than ever before. The plan is to continue the work as last year and possibly expand if there is a demand for it*.

## RESOLUTIONS COMMITTEE

1. Whereas, since God in his Divine Ruling has taken from our membership Past President F. H. Fassett, Meshoppen, be it resolved that a minute of respect to him be entered in our records, and that a message of condolence be sent to his bereaved wife.

2. Whereas, Dr. T. L. Guyton of the Bureau of Plant Industry, and D. M. James of the Bureau of Markets have rendered their customary service to this Association in connection with these meetings, be it resolved that a vote of thanks be extended to them.

3. Whereas, Mr. R. H. Bell, Director, Bureau of Plant Industry, and Mr. George A. Stuart, Director, Bureau of Markets, have always rendered sympathetic help and wise counsel in all possible ways to the Association and its members, be it resolved that this expression of appreciation be given to them.

4. Be it resolved that this Association thank the Farm Show Commission through its Director, Mr. J. H. Light, for their efforts to improve projection and other facilities in Room B and for furnishing such a courteous and efficient employee to make any required adjustments of that room.

*See Executive Committee Resolution on this subject elsewhere in the Proceedings.

5. Resolved, that due to the continued large number of American Foul Brood diseased colonies of bees, that we ask our Secretary to request the Pennsylvania Department of Agriculture and State Council of Agricultural Associations for their help in having allotted to apiary inspection service additional funds of sufficient amount to increase the number of Deputy Apiary Inspectors so as to completely cover all counties in the State this year, thus making a complete clean up, getting and keeping American Foul Brood in control. Bees are as much benefit to fruit growers as to the beekeepers. Estimated appropriation necessary—$25,000.00.

6. Whereas, the apple growers of Berks and Lehigh Counties are suffering increasingly severe losses from the ravages of apple cedar rust, and whereas the Pennsylvania Bureau of Plant Industry has no money for indemnification of the owners of destroyed red cedar trees, therefore, be it resolved that this Association request the Pennsylvania Legislature, through the Agricultural Council and through the representatives of the counties concerned to provide at least $10,000 for the indemnification of the owners through the Bureau of Plant Industry.

Mr. Linde: I think this is a move in the right direction. I am sure that Berks County as well as Lehigh has been very seriously affected by cedar rust. We have made constant efforts to remove all red cedar trees on the farm and have asked the neighbors to do so. We have had some success but it means a lot of work. We have some neighbors who have not removed their ornamental red cedar trees. The State has had a fund to pay indemnification to the owners for the removal of such trees whether ornamental red cedar or apple trees. I think we should get before this Association a motion to push this work.

7. Whereas, the fruit judge at the 1935 farm show had too much work for one man to do, and whereas, it seems probable that the fruit exhibit will increase in size in normal seasons, therefore be it resolved that the Farm Show Commission be respectfully requested to furnish an additional fruit judge for the 1936 Farm Show.

8. Whereas, the experimental work in fruit growing at The Pennsylvania State College is not adequately fulfilling the needs of the orchard industry of the State, and whereas this deplorable situation has been brought about solely by a lack of proper financial support from the State, therefore, be it resolved that the Legislature be requested to appropriate $25,000 for research work at The Pennsylvania State College in the control of insects and diseases affecting fruits, with special reference to trying out the newer materials and methods.

9. Whereas, we the Fruit Growers of Berks County feel that the Extension Service in Pennsylvania does not meet the needs of the growers to the fullest extent, be it resolved that we protest the policy of the Extension Service in withholding information obtained from their experiments with branded spray materials used in this State. And whereas Lime Sulphur Solution, as recommended by our spray service, does not fully meet the requirements of the growers during the entire spray season; be it further resolved that we request the Director of Extension and the Director of Research to use their best efforts to find some other material that may more fully meet these requirements and to make public the experimental or demonstrational results obtained by the use of the various branded materials now on the market.



Resolutions 1 to 7 inclusive were passed without comment. Resolution 8 was tabled after nearly one hour of discussion. The discussion of No. 9 follows in brief:

President Reiter: I wish that some member from Berks County would discuss this.

Mr. Funk: I would like to say a few words on this resolution. I would like to make myself clear at the beginning. I have no criticism against any of the workers in this State. I appreciate the ability of such men as Dr. Anthony, Mr. Fagan, Dr. Kirby, and the rest as much as anybody. I know their ability and I do not want you to think for a minute that I have anything against any men at the College. I am not satisfied with the spray service and spray recommendations that we are getting here. I say that as a fruit grower and I know that there are a lot of men in this auditorium that will agree with me. I do not believe this is pure contrariness for I can point out men in this room—large fruit growers in this State—who are not satisfied. If that is the case, I believe there is some reason for it. I believe that our present recommendations here in Pennsylvania calls for a spray schedule of self-boiled lime-sulphur on peaches. I believe it calls for lime-sulphur, arsenate and nicotine for apples. Now that was the recommendation we had eight or ten years ago. I would like to know how anybody can spray 500 acres of peach trees with self-boiled lime-sulphur. I have used lime-sulphur for a good many years and ten years ago I had good success but we did not have to spray all the time, nor so many trees. Today we start spraying and keep on spraying. Has it been satisfactory to you fellows? It has not been satisfactory to me. Last year I got to the point of burning foliage on trees where I put it on. I changed to a proprietary material and I believe that change made me 10 cents more on each bushel of Stayman, for I sold my Staymans in the Philadelphia market at ten cents above the market price. I had better foliage than ever before.

Now I know that self-boiled lime sulphur was the recommendation from the College 10 or 12 years ago and also in other states; Virginia, New Jersey, New York have changed. Can you point out any state in the east still following that recommendation? No! Those states have changed and for a reason. Maybe they are all wrong and we are right but again maybe they are right and we are wrong. I have attended quite a number of meetings outside of the state and frequently heard

men refer to Pennsylvania along lines of soil treatment, tree management, etc. but never about the spray recommendations in Pennsylvania—Yes, I did once but I will not repeat what this man said. I cannot see why this must be. New Jersey will tell you about wettable sulphurs, tar oils, etc. I have repeatedly tried to get information about these materials from Pennsylvania but without success. Why cannot we do it in Pennsylvania if in other states? I would like to go to my Station when a product has been used some time and say, "What do you know about this? Is it good or is it not?" If a new product comes out, should I experiment with it or should they? Why must I go to Virginia to find out about tar oil or to New Jersey to find information on copper sprays. I quit spraying with lime-sulphur on peaches. I am not satisfied to use it on apples at the strength recommended. I do not want to be arbitrary but that is the way I feel about it.

MR. GRIEST: Is it your idea to find out personally about these things or to get the Extension Department to give it in letters? I know that they have a lot of that information but they can't give it to me. There has been a rumor going around that Penn State is not following its own recommendations. Is that true?

MR. FAGAN: We have not used self-boiled lime-sulphur for six or eight years. We have been using tar oil since it was first emulsified.

MR. GRIEST: I have no brief for one side or the other. I think we want to be fair. A lot of new things come out. I took the recommendations on one or two occasions of the Virginia Station. One of which was Calmosul—it ruined my spray pump. I have found all members of the Extension Service willing to unofficially give me information that I asked for. There are a great many people that as soon as they see a new brand tried out, even though it is not proven and not recommended, start using it and then say, "Yes you recommended it and it was no good." I think we want to make ourselves clear. Do we want them to put in spray letters what they are experimenting with or what they think is best?

MR. FUNK: Do you think they should give out one recommendation and use another?

MR. GRIEST: If they got out a spray letter for Centre County* and then used another for their orchard, I should say they were wrong but if they make a recommendation for Adams County it may not be the best recommendation for their own orchards where conditions are different.

MR. RUNK: It is not a question of a recommendation for an individual county. It is whether the Experiment Station and the Extension Service are stepping out and giving us the information we need. In other words, if they have something which

*There is no spray service in Centre County, for the College has practically the only commercial orchard. Timing of sprays is done by the station departments concerned,not by the Extension Spray Service.

they have been using for six or eight years that is better than lime-sulphur, why is it better? The College is limited by lack of funds. The Director of Research says they have no funds. Why could we not establish a fellowship for such a project? We need information on this problem. I was called into a meeting at State College and I was asked to state some of the problems of the growers. I stated that one of the greatest problems to growers in Pennsylvania was spray recommendations and spray residues. We want our Station to give us this information. We can either bring pressure to bear on the legislature or we can throw some money into the breach and do it ourselves. We have read with interest what the clean fruit clubs of New England are doing. We have been sitting on our tails and not doing a thing and it is time we put ourselves on the "spot" as well as Professor Fagan.

Dr. Fletcher: I wish to present the point of view of the Agricultural Experiment Station. There are two sections to this question; one of policy and one of finances. The Agricultural Experiment Station represents the interests of the farmers and fruit growers of this state, supported in part by your taxes to serve you. In this particular case it is a question whether the interests could be best served by the results of tests of proprietary spray materials in which there is keen competition. Our recommendations would be quoted and used by manufacturers. Many of these spray materials change in composition from year to year and the results of tests this year may not apply next. Therefore we are compelled to be ultra conservative. More adequate finances must be provided for research. What is the appropriation from the State of Pennsylvania to represent your interests? The Pennsylvania State College has $134,000 for agricultural research, New York $1,500,000. New Jersey $508,000, Ohio $651,000. A larger appropriation is needed in Pennsylvania and the problem lies with you. We will render an account when we are sure of the material tested.

Mr. Runk: You see we receive less than one-tenth the appropriation that New York receives. We are to blame for this situation, not the Experiment Station.

Professor Fagan: Some of you people may not realize the full importance of what Dr. Fletcher has said. The Department's orchards are commercial and if they were not we would not be in existence. That is something to think about. Most of our budget has to be made up out of sales. We have been criticised for spraying off the tank. We had to do this to save man power. We built the storage and still have it to pay for and we will pay the entire cost of this storage out of sales from our fruit crops. In 1929 we did not get control of aphis with $390.00 worth of nicotine sulphate. Cold weather conditions in delayed dormant and pre-pink prevented our getting control. Is it any wonder then that I turned to tar-distillates, successful in England and Australia, when I could get them for $130? As



long as we have to make the orchards pay to keep us going I expect we will be cutting corners wherever possible.

Mr. Funk: I do not see how you can expect me to go on using the spray recommendations when I see you using something different and getting better results.

Mr. Harvey: I am glad you brought up this subject and I am ashamed that Pennsylvania is contributing only one-tenth of what New York is. I would like to see our Legislature asked to give us an added appropriation.

Dr. Fletcher: The policy of the College has been to ask the General Assembly for a general appropriation. At a meeting held at the college recently the President indicated that he would be favorable to the agricultural interests bringing in separate bills for specific appropriations such as the tobacco growers for tobacco wild-fire, potato growers for potato research, etc.

Mr. Runk: I would like this Association to go on record as favoring the asking of the Legislature for $25,000 for the next biennium for this research.

Mr. Linde: If we all use our influence I believe we can get this appropriation. What will be our policy on dissemination? I think the commercial orchards need more information than we are getting. Why do they not give us the information on oil emulsions? We have to go to oil companies for this information. Is there some political influence that prevents them from giving us this?*

## DEPARTMENT OF AGRICULTURE

Washington, D. C.

January 24, 1935

Notice to Producers and Consumers of Apples and Pears:

For many years the continued maintenance of the Nation's supplies of apples and pears has been dependent upon the use of insecticides sufficiently effective to control the destructive ravages of insect pests which, if unchecked, would soon eliminate these practically indispensable foods with consequent impoverishment of the American dietary.

In spite of continued efforts to develop a safe and at the same time effective substitute, lead arsenate is still essential to the production of these fruits. Until these efforts are successful, the employment of poisonous sprays on fruit must be followed by the adoption of precautions to guarantee reduction of the residue to the lowest possible figure. The overwhelming toxicological evidence against arsenic and lead imposes this obligation on the producer for the proper protection of the consumer.

The industry has demonstrated its ability to reduce the arsenic content to the world tolerance of 0.01 grain of arsenic

*See page 124.

trioxide per pound of fruit and this tolerance will continue in effect. The fluorine tolerance will remain at 0.01 grain per pound of fruit. The reduction of unavoidable lead residue, to a point involving complete elimination of the most remote health hazard, continues to offer serious difficulties in spite of the utmost effort. The results of commercial cleaning operations on fruit before shipment during the 1934 season have demonstrated, however, that in general the 1934 tolerance of 0.019 grain of lead per pound has been successfully met without material damage to the fruit, and expectation of continued progress downward is fully justified. To grant the requests emanating from some quarters in the industry for a relaxation in the lead restriction would be wholly incompatible with public safety. The Department will therefore institute action under the Food and Drugs Act on apples and pears of the 1935 season's crop containing lead in excess of 0.018 grain per pound of fruit.

Current public apprehension about the safety of the fruit supply from the standpoint of spray residue is very properly based on the unquestioned danger of poisons such as lead and arsenic. Consumers are entitled to know, however, that the restrictions imposed for many years against the shipment of fruit subjected to poisonous sprays have been so effective that unquestionably today most of the fruit offered the public is entirely safe. The effects of lead and arsenic in the amounts which might be present on sprayed fruit are chronic rather than acute in character. The relatively few instances in which fruit entering interstate traffic containing excessive residue escapes seizure under the Food and Drugs Act would not be sufficient of themselves to rank as significant health hazards. While Federal control does not extend to local traffic within the borders of a State, some States are supplementing Federal measures and are effecting comparable protection of their own citizens.

Many consumers desiring to make assurance of safety doubly sure have sought advice as to measures that may be taken in the home to cleanse fruits such as apples and pears. Commercial cleaning methods generally involve the use of dilute acid or alkali solutions to loosen or dissolve the residue followed by rinsing in water. Such vigorous measures are unnecessary in the kitchen where attention can be given to each individual fruit. The usual sanitary practice in the home of scrubbing with water is desirable under any circumstance. Peeling the fruit or perhaps better, removal of stem and blossom ends where the residue is most difficult to reach is an added measure of safety which may be recommended.

Sincerely,

HENRY A. WALLACE,
Secretary.

## FINAL STATEMENT

### State Horticultural Association of Pennsylvania
### Barrel and Basket Label Sales—1934
### As of January 17, 1935

Expenditures

| | |
|---|---|
| Stock on hand—22,400 Barrel labels carried over from 1933 | $ 151.20 |
| Ohio Valley Lithographing Co. Imprinting 20,000 Barrel labels | 20.00 |
| Ohio Valley Lithographing Co. Imprinting 2,400 Barrel labels | 3.60 |
| Osborn Printing Co. Printing 56,750 Basket labels — $2.75 per M | 156.06 |
| Osborn Printing Co. Imprinting 56,750 Basket labels — .50 per M | 28.38 |
| Osborn Printing Co. Parcel post charges | 1.02 |
| | $ 360.26 |

RECEIPTS

| | | |
|---|---|---|
| Cooperative Fruit Growers of Adams Co., Gettysburg, Pa. | | |
| 20,000 Barrel labels imprinted | $ 155.00 | |
| 30,000 Basket labels imprinted | 97.50 | |
| H. G. Baugher, Aspers, Pa. | | |
| 4,000 Basket labels imprinted | 13.00 | |
| 4,000 Basket labels imprinted | 13.00 | |
| 1,750 Basket labels imprinted | 5.70 | |
| A. F. Gibboney, Belleville, Pa. | | |
| 4,000 Basket labels imprinted | 13.00 | |
| Parcel post | .45 | |
| Keystone Cooperative Grape Association, North East, Pa. | | |
| 6,000 Basket labels imprinted | 19.50 | |
| Parcel post | .57 | |
| | | $ 317.72 |
| Due from E. E. Wishard, Biglerville, Pa. | | |
| 2,400 Barrel labels imprinted | $ 19.80 | |
| 7,000 Basket labels imprinted | 22.75 | |
| | | 42.55 |
| | | $ 360.27 |

## CHANGING HORTICULTURAL PRACTICES

**H. W. MILLER, Paw Paw, W. Va.**

Twenty-five years ago when most of the orchards now bearing were being planted, the main aim was a large acreage with very little thought given to soils, topographical location, and other conditions which have been very seriously brought to our consideration during the last ten years of difficult production.

The soil and site being the very foundation of horticultural success, they should be considered first. A generation ago many orchards were planted on land which was considered too steep, too rough, or in soil too shallow to be used in agriculture. This method should be changed so that nothing but the best soils and locations be used for orchard purposes.



An orchard is a permanent investment and in order to meet the growing competition we must be prepared to grow not more acres but more and better fruit on less acres. In order to do this the soil must be grown with the trees, as trees cannot be rotated like other agricultural crops. We must feed the soil with fertilizer and organic matter to enable it to produce maximum results. This country is becoming older; many orchards are suffering very serious loss from erosion and bad horticultural practices.

Not many years ago we were told that all that was necessary to make an orchard bear was to apply plenty of nitrogen, cultivate well, and let the soil take care of itself. Eastern growers are now finding that drought, insects, and fungus diseases defeat the average grower about two years out of five. In order to overcome this we must not allow either the soil or the trees to become exhausted. As fruit is from 80 to 90 percent water it is absolutely necessary to keep the soil full of humus in order to retain a large part of the water which falls on the orchard during the whole year.

The Experiment Stations are now finding that extremely acid soils may waste about half of the nitrogen applied as well as lose much of the returns from complete fertilizers. Instead of continuing to work and fertilize sour land, have the soil tested and apply lime enough to make it more nearly neutral depending on what crops are to be grown, then we will be able to get a good stand of leguminous plants which will make their own nitrogen out of the air and soil and at the same time prevent the fertile top soil from being washed away.

According to the Bureau of Soil Erosion at Washington, it takes nature 2800 years to make the first seven inches of top soil, yet by bad management, man can exhaust this soil in one generation. The land is not an inexhaustible mine which can be worked forever without putting anything back; also trees cannot be rotated like farm crops so we must follow the old adage, "Feed the land and the land will feed you." Nothing depletes an orchard so quickly as continuous cultivation without cover crops, as leaching and washing go on summer and winter. Keep the soil covered.

The Pennsylvania 25-year experiment shows that cultivation every two or three years will do, if the land is kept covered with vegetable matter. The Virginia experiment station shows that limestone chips having no humus absorb only 10 per cent of their weight in water while a soil well supplied with humus absorbs 200 per cent of its weight in water. Water is one of the limiting factors in size and color of fruit. It is up to the grower to see that his soil is in condition to retain all the moisture possible. If the soil is not supplied with humus, supply it as soon as possible. This is one change absolutely needed if we are to raise good fruit and plenty of it.

Horticulture is no longer a sideline of farming but is a food manufacturing profession. As such we must change our operations and adopt manufacturing practices in every possible way. No orchard can be profitable when run at half capacity either in crop production or by raising a crop which is about half second grade fruit. In order to avoid either of the above conditions the tree must be kept in first class physical condition by spraying at the right time with the right materials, fertilizing, and cultivating.

Thinning apples is another practice which must be adopted. The orchardist can raise all the good apples the tree can carry without the culls and save the cost of harvesting the cull crop, and at the same time prevent the tree from being too exhausted to bear in future years. Thinning rightly done gives, size, color, and finish. If it pays to thin corn, it will pay much better to thin fruit, and especially apples.

Most eastern orchards are under-equipped especially with sprayers. This is shown by the fact that hardly any growers have enough spraying capacity to get over their orchards before the insects and fungus diseases have started. Better have 25 per cent too much equipment than lose 25 per cent of the crop from being behind with the spray. If two sprayers cost too much buy a 10 barrel tank and use a truck to haul the material out to the sprayer. Experience has shown that a tank equipped with a rotary pump to load the sprayer in the field will help the spraying out as much as another sprayer at about one-quarter the cost of an extra machine. Above all see that the water supply is abundant and close at hand. Stationary spray systems especially need a large supply of water. In order to have only one operator do the mixing for stationary plants use a mechanical mixer. This can be attached to the pumping outfit and all the operator has to do is to pour in the chemicals and the machine will do the rest.

Trees should carry their foliage about six or seven months of the year. Many orchards lost their foliage six weeks too soon this year. This is caused either by the tree being exhausted from lack of spraying thoroughly and early enough to hold the insects and diseases in check or from being improperly fed during the crop growing season. This is a very wasteful process as it robs the tree of its power to store carbohydrates and other plant foods just when it needs them most, and makes small, weak fruit buds for the next crop. Both scab and aphis are serious factors in destroying the foliage. Don't let them get there first if you want the foliage to function to the end of the season.

Another change West Virginia experience has shown to be a great help in holding both fruit and leaves on until full maturity is that instead of applying five or ten pounds of nitrate of soda to the tree all at one time early in the spring, it is better to apply five or six pounds of a 4-16-4 fertilizer early in March, then use two pounds of nitrate in early spring, two pounds the



first week in July and two the first week in September. Yellow Transparent and other early varieties should have the second nitrate application made about June 1. The purpose of this is to provide a continuous feeding of the tree during the whole crop growing period. This enables the foliage to function to the end of the growing season each year and we find it holds the fruit on the tree until the fullest color is attained. This is particularly valuable for Rome Beauty, Stayman and Winesap.

Another change which is absolutely necessary, is to eliminate unprofitable varieties such as Dutchess, Lowell, Summer Hagloe, Buckingham, and in most orchards, Black Twig. As an evidence of our faith in this change we have cut down about 2500 bearing trees in the last three years. Quit working either marginal land or varieties; get rid of them and put the work on paying soil and varieties, or you may have to sell the good part of the orchard to pay for the losses on the bad part.

At harvest time the whole investment for the year is in the crop. Any bad management at this time may defeat the year's work. See that the fruit is picked without bruising. Have the pickers put their sacks down to the bottom of the barrel or box before emptying. See that they do not lie down on the apples while picking on the ladder. This is particularly good practice in picking Grimes Golden, Winter Banana, Stayman, and Delicious. We pick by the ticket so that it is easy to find out

who is doing the bruising. If your grader has a drop of six inches for the fruit see that it is cut down to two inches. This change can easily be made and will pay many times for any extra cost.

Use a brusher or wash the fruit. Do not put up dirty, dull-colored fruit and expect to sell for No. 1 prices for it can't be done any more. If packing for storage do not put in a handful of shredded oiled paper instead of a half pound to the bushel and expect to get by without scalding.

Apples should be packed as soon as picked and either sent to market or storage at once. A few days out of storage in hot weather will ripen apples as much as a month in cold storage. Growers must deliver to the buyer as nearly as possible the whole life of the apple. No dealer can afford to buy over-ripe fruit except for immediate consumption and he should know its condition when he buys it. The seller's and buyer's interests are the same in this matter and should be so recognized.

As the foreign market is dwindling we must pack our fruit largely for American markets. This means better color, better size, and better condition of the fruit. Growers must get out of the notion of packing just on the margin to get by the inspector. As has been said by one of our largest advertisers in drugs, "The priceless ingredient of every product is the honor and integrity of its maker." This is true in horticulture as in every other line of business today. In order to put up a No. 1 pack we must begin right now to make a No. 1 crop of fruit, as nobody can put up a No. 1 pack out of a No. 2 crop of fruit.

Growers should go into the open market and see what brands and packages are showing the best on arrival. Our sales manager toured the markets this season before we were shipping very heavily and found the crown cover and cushion pad were arriving in the best condition; we immediately changed to that type of package with very satisfactory results. Some growers object to the crown cover, believing that it gives the buyer too good measure. It is an old saying that "No merchant ever lost by giving good measure but many have been ruined by short weighing the trade." Solomon said long ago "A false balance is an abomination to the Lord, but a just weight is His delight." If our pack is not honest, let us see to it that we do not have to learn again this truth which Solomon knew 3000 years ago.

The pack a grower puts up is a reflection of his character and is soon known by the buying public for just what it is worth. Benjamin Franklin said "Honesty is the best policy," but no one likes a man who is honest for policy's sake, for it sounds too much like a politician. I very much prefer the line from the poet Pope which my father used to quote to us boys while working by his side in the orchard and field, "An honest man is the noblest work of God;" we can paraphrase this today and make it read, "An honest pack is the noblest work of a horticulturist."



The day was that the buyer sought the producer but this is changed and the grower must now seek the buyer and the market. A first class pack which is always the same will establish confidence in the buyer and sell itself, while an irregular pack cannot long be sold to the same customer, even by the best salesman. Change to a good pack all the time, and we will give confidence to the trade and make money by the deal.

In conclusion let me say that the successful growers who can change their practice fast enough to meet the difficulties before us and give the trade an honest product will survive this depression and come out both morally and financially successful. Those who do not propose to change will likely have to hunt another business in the next decade.

QUESTION: When do you apply the nitrate to peaches?

MR. MILLER: Apply nitrate to peaches four to six weeks before ripening.

QUESTION: Do you suggest that we pack heavier and still not hurt the fruit?

MR. MILLER: Fruit will not be injured if you use a crown cover; that is one that is bulged up in the center. If you go into the markets and storage houses you will find packs that looked good when they left the packing house but they have dropped or settled down considerably.

QUESTION: When do you make applications of nitrate?

MR. MILLER: Usually in March, then in late June or early July and last in September, about the last week.

QUESTION: Does delayed picking of Stayman make them subject to cracking?

MR. MILLER: I have picked them when there was three inches of snow and found beautiful, red apples on the trees.

QUESTION: Have you tried Cyanamid?

MR. MILLER: Cyanamid is just as good but is slower than nitrate. It carries about 70 per cent lime. We have not been thinking much of lime. Liming is a good agricultural practice and also a good horticultural practice.

QUESTION: Is the last application used by next year's crop?

MR. MILLER: Yes. Trees are living organisms and they grow this year and store material for next year's crop. If you do not put in much this year you get little out next year. The Missouri Station has shown that nitrates migrate from the buds to the roots.

QUESTION: How about the effect of late applications of nitrate on the growth of trees?

MR. MILLER: Two pounds will not hurt the trees. If you put on six or eight pounds it may start growth when they should be dormant.

QUESTION: Is it a help to put nitrate in narrow bands around trees?

MR. MILLER: We have taken up roots to see where they went for their supply. Twenty-five feet from the foot of the tree we would find that roots went straight down for moisture.

We instruct our men to sow nitrate outwards from the tree and never inwards. The soil and trees must work together and to give the trees the proper treatment it is best to put the food where the trees can get it.

QUESTION: Do you recommend three applications of Cyanamid?

MR. MILLER: I think two would be better.

QUESTION: What do you think of McIntosh?

MR. MILLER: McIntosh is out of its latitude in West Virginia.

## CONSCIENCE AND CONTROL IN FRUIT GROWING

**E. STUART HUBBARD, Poughkeepsie, N. Y.**

This is a time in the development of society and industry when people are taking stock of values both of physical properties and of business and social systems and ideals. There is no justice or fairness in the workings of our social or business orders to many who have, through lack of training or because of unfortunate influences strayed from the standards and ideals of hard work, personal responsibility, and respect for their fellow men. To those, however, who believe in and hold to these principles, which have been the foundation of our nation and the cause of the rise of our civilization, there is still rhyme and reason in humanity. God is in His heaven and all can be well with the world.

In analyzing the fruit industry, it is well to remember that the commercial production of fruit in this country is a very young and recently developed business. There are still living, men who saw the first large commercial orchards planted and fruit districts established.

Before the development of refrigeration and rapid freight movement, fruit was mainly used during or shortly after, the harvest seasons and in the immediate vicinity where it grew. Apples, peaches, grapes, and pears in colonial times were used more for making cider, brandy and wine than for cooking or as fresh fruit. Cities were much smaller than now. The health value of fruits was less fully understood. Little more had been learned of scientific culture than was known to the Greeks and Romans 2,000 years ago.

With the coming of rapid transportation under refrigeration, cold storage, modern advertising, dietary research, and the scientific study of fruit growing in state and nationally financed experiments, the demand for fruit grew apace, also the ability to produce and distribute it where and when it was desired. To these factors were added a rapidly growing population and a multiplying export trade, with all nations eager to buy the products of our virgin soil, mines and infant industries. The increase in production was rapid, but the wave of immigration

and the high birth rate of a young and busy nation continued to absorb the increased production with occasional adjustments by frost or local overexpansion.

However, before the start of the world war the prospect of profit in so pleasant an occupation had caused such large plantings of most fruit trees that serious overproduction occurred in heavy crop years. Areas unfavorable for fruit growing, like some of the Plains States, were forced to pull out many orchards. In other sections plantings practically ceased. The war with its stimulus of higher values, better wages, and full employment brought undreamed of prices and profits as in all industries. Foreign nations were glad to buy our fruits with money which we loaned them. The nations of the old world sent commissions to study our methods and learn, if possible, the formulae whereby we were able to pay such high wages, maintained such human activity, and support such a high standard of living. This is a monumental example of the old proverb, "Pride goeth before destruction, and a haughty spirit before a fall." Even while the nations were envying our apparent prosperity, reactions were taking place. Immigration was halted. High living costs and an increase in urban dwellers cut the birth rate. Our population is rapidly approaching a fixed number. The unwillingness or inability of our debtor nations to repay loans, newly erected trade barriers, and world-wide depression swiftly caused our potential markets to shrink and prices to drop to unprecedented low levels. At the same time the production of new kinds of fruits and new sources of supply have added active competition to existing orchards.

It would seem that the time for wild speculation in the planting of orchards is past. Such planting as may be made should be only after serious consideration of all relevant factors.

Refrigeration is fully utilized, scientific methods have greatly increased the yield per tree. Modern packing, storing and shipping methods greatly lessen waste. Distance alone prevents local markets from being flooded with fruit from districts of excess production at ruinous prices. In this situation the grower who plants for the needs of his local market is in a better position to study the requirements of his market than the demands of more distant cities, which can draw from other sources, as well.

So in 1935 we now find ourselves with a prospect before us of markets restricted by stable population, low wages and prices, trade barriers, competing fruits, and an insistent clamor from sections of our population for outside control of production and distribution, because we are unable, or unwilling, to keep our own house in economic order. What can we do about it? In the first place, suppose we consider what would be the ideal in the orderly production and distribution of a fruit like the apple.

From a national, economic standpoint the production of apples should provide employment for the greatest number of persons for as large a part of the year and with the greatest



return possible to the producer, and at the lowest possible cost to the consumer. The same is also true of distribution. This is not the same ideal that has been held in the past by most economists and producers. In times of prosperity, so frequent in the past, the insistent call from the cities for industrial labor has drained the producing districts of so many workers that it has often been necessary to use expensive machinery, because needed laborers could not be found. Immigration was encouraged to provide workers needed for expanding production in all lines of endeavor. The saving of labor was necessarily sought in all possible ways. The thought that produce should pass through the hands of sundry middlemen was abhorrent to producers and economists as wasteful and therefore sinful. This condition has changed. With large numbers of our populations, both rural and urban, clamoring for the chance to work, while being fed at public expense, we have been forced to alter our ideals on the saving of man labor.

Another ideal is to provide crops of such size and quality as to satisfy the normal demand for apples and encourage a larger use of them, without causing prices below the cost of production. This would be difficult to control with exactness if the human element could be excluded, because weather conditions, shifting varietal, and consumer demands, and export vagaries cannot be accurately foreseen. It is, indeed, impossible to keep production in line with economic requirements. When it is greatly increased without regard for the needs of the industry by such influences as large plantings (fostered by real estate, railroad, bank or other promotion interests) and by the insatiable greed or ambition of rugged individualists often encouraged at or least not discouraged by our state or national experts and financing agencies.

How then can we hope to prevent these recurring years of overproduction and still produce adequate crops? It seems to me that the only hope lies in the awakening in ourselves, on a national scale, of the consciousness of our responsibility, first, as servants of a public need; second, as co-producers, with other humans, who will prosper or suffer along with us, depending on the extent to which we, as well as they, are willing to cooperate to work for the good health of the industry and nation. When the spirit of selfishness rules our endeavors, instead of the ideal of service and the recognition of the rights and needs of others, chaos is sure to result, bringing disappointment, disaster and discontent to all.

The rule of conscience has always been the safeguard of mankind. To be of greatest good to an industry or a nation the character which speaks through conscience must be so finely developed by constant exposure to stimulative influences for the common good that it instinctively responds in directing the decisions of the political groups. Laxity or indifference of leaders in maintaining interest in the higher aims and motives of the

group so dulls the mass conscience that shameful failures follow where signal success and proud achievements should obtain.

The sense of honest service must guide the individual if cooperative efforts are to succeed. The incessant clamor for cooperation among producers has resulted in more failures than successes mainly, I believe, because the spirit of service has been lacking at some point. Often the promoters have held their own interests first, regardless of those of the members whom they were supposed to serve. At the same time the cooperators have released themselves from the responsibility of rendering the public the type of service which they, as individuals, would give. The result has too often been a public disappointment because of poor service or producers poorly paid because of excessive overhead or low returns, due to unwise and inexperienced management.

Cooperation need not mean the conventional cooperative set-up. All that is necessary for successful cooperative production and marketing is the desire on the part of producers to work in harmony in serving the public most efficiently and effectively. Where this desire exists, the selection of honest, capable, and trusted leaders or agents, be they local dealers or buyers, commission merchants, jobbers, cooperative associations or fellow growers, is essential to success. A thorough knowledge of production problems, economical purchase of supplies, timely use of local labor and equipment, and sympathetic financiers, who have faith in businesslike production, can be best secured if neigbors will work together, in harmony, with mutual respect for and trust in each other and confidence in their agent's honesty and ability. Merchandising in a nearby market, through a proven expert in his line, can develop the best possible outlet, if the consumers' needs are studied and served faithfully.

It is absolutely essential that men of innate honesty and reliability be placed in responsible positions. No matter how capable and smart a man may seem, if he is willing to be tricky or dishonest in little things, even for his employer, he is sure to lack the guiding conscience that will keep him from injuring his employer in some way—in reputation if not materially. A principal is held responsible for his agent's acts and is judged by his actions. To use or patronize dishonest or disreputable employees or agents is to condone their acts and pay a premium to their type of character. It is far better to encourage and train honest representatives, if those of known worth are unavailable. This should not often be necessary if care is taken in selecting from available material those most worthy of trust.

Lack of understanding of markets, condition or grades of fruit, or timeliness of shipments often result in less of confidence between shipper and receiver. As in all professions and trades there are commission merchants and brokers who are fundamentally honest and conscientious, as well as those whose consciences are dulled or not developed to the degree required of one who is entrusted with the property of others. Producers



should become personally acquainted, if possible, with their agents and work in close understanding and agreement with them. Too often poor results occur because the shipper does not understand how to grade and pack for the market he is using, or because he is so stingy or naturally crooked that he puts up a dishonest pack.

This may so disgust the thoughtless distributor that he fails to do his utmost to show the packer in a diplomatic way how to improve his pack and make it acceptable to the retailer. The national and state grading laws, made necessary because of the lack of conscience and understanding in some growers and shippers, have made it seem less profitable to overface and use a stovepipe in packing than to pack within the letter of the law. There are still many who try to "chisel" wherever possible, as, for instance, the grower who insisted that, since the law permitted a tolerance of 10 per cent, his packers must put in as nearly as possible one small or defective apple to each nine good ones.

One of the great problems of these changing times is the steady use of labor. Good judgment as well as consideration for the workers in one's community makes advisable on the farm and in the neighborhood a planned economy which will give steady employment to required labor under as good working and living conditions as possible. Poorly paid seasonal help

is liable to be inefficient and unavailable at the times when most needed.

If has often been the practice in the past for a man with other vocational interests to decide to make a large planting of but one variety of a fruit which he idealizes as the best money maker. Such a crop requires a large number of workers for a short period during the harvest time. The careful, efficient handling of fruit with such necessarily untrained helpers is often impossible. And what of the workers the rest of the year? Where shall they live? What can they do? In the past this has not been considered a responsibility of the fruit grower. In the future it must be his concern, either individually or as a tax payer. The efficient management of his business adventure requires it; his political interest forces it upon his attention, even if his conscience fails to fan his human sympathies into the flame of personal effort to help provide steady work, wherever possible, for his neighbors.

A farm or neighborhood cold storage may make possible the harvesting of a crop with fewer workers and permit of fairly steady employment of the best local help for some months in packing fruit for marketing when needed. The trucks and drivers can be more fully utilized and local markets better served than when all the desirable fruit is packed at once and shipped away.

This has become a period of specialization in fruit growing, particularly in districts far from the markets where the fruit must be sold. It would seem that such districts must either diversify production so as to prolong labor peaks and work with or create local industries which will employ fruit workers when not needed for production or harvesting, or else give way to communities which will solve this problem more economically and humanely.

There is no greater social influence for the welfare, contentment and economic usefulness of citizens than the possession of a permanent home, thus preventing the dread of enforced wandering in search of an uncertain living. The farm tenant house, which was often deserted during past periods of urban, industrial activity, is again becoming of great economic importance. With good roads and the general use of autos, a modest, though comfortable home on the farm for the more desirable workers may well help pay wages and provide ready assistance when needed. It may also shield them from the influence of discontented radicals. Side lines may be developed to keep help busy between seasons of main crop activity, even though their net profit be small. Cutting wood for use in stove or furnace may tide a man or two over a slack period. The fuel cost may be a bit higher than if coal or oil were used and it may



be a trifle more trouble. But it may keep a good man on your place and help relieve unemployment taxes.

There are many jobs that can be done as cheaply by man labor at present wages as by machine, if the cost of the machine is considered. Mixing concrete, sowing fertilizer, mowing lawns, ditching, and other work, when men are available, can be cheaply and efficiently done if properly planned and supervised and if the mental attitude is shifted from the urge to keep men employed as few days as possible to the wish that they be profitably occupied as much of the time as wise management permits.

If producers are to keep the control of their industry in their own hands they must work with and through representative organizations such as the International Apple Shippers' Association, the Farm Bureau, the Grange, and other assemblies of interested individuals. The smug state of indifferent inertia is preventing the help and support of many who depend upon the efforts and support of a few conscientious fellows for the promotion and defense of the best interests of their business. It takes both money and encouragement to provide able, honest men to fight our battles against the strangling barriers of tariffs, quotas, quarantines and currencies which are drastically curtailing our exports.

We must depend upon the untiring vigilance of such agents (who thoroughly understand the actual workings of our industry and who keep up to date the pertinent statistics) to forestall unwise and harmful legislation and to advise, truthfully and sanely, our political representatives. In these days of experimental groping for ways to stabilize production, rationalize distribution, and maintain the freedom of individual effort, many tempting plans are developed by men of able minds and earnest and often unselfish interest in the human problems. Seldom have such men a sufficiently full knowledge of all the conditions affecting the actual conduct of business operations. We must provide and adequately support agencies for the safeguarding of our interests. We must take personal interest in the maintenance of high business and ethical standards in these agencies. New conditions confront us. We must change our point of view in many things, adjust ourselves to present conditions and unite our interests to meet them intelligently.

If we can rouse ourselves from the spiritual stupor into which our nation has been lulled by unprecedented prosperity, luxury, and too much relief from self-help and personal responsibility, we may be able to call our souls our own and be proud of them. If we prefer to let someone else work things out for us, we must not complain if we find that others have involved us in untried social enterprises formulated without due consideration of the knowledge and experience which we should be best able to furnish.

## FINANCING THE SEASON'S OPERATIONS

**J. H. KARNS, Manager, East Central Fruit Growers' Production Credit Association, Chambersburg, Pa.**

The Act of March 2, 1933, was passed by the Pennsylvania Legislature to give its citizens the right to take advantage of the Act of Congress passed July 21, 1932, establishing regional agricultural credit corporations, by executing chattel mortgages in accordance therewith. At this time I wish to pay my tribute to our law makers for their sympathetic consideration of the farmer and fruit grower in passing laws which will enable them to carry on after the trying times of the past few years.

Under the Farm Credit Administration System, the Production Credit Corporation was set up in 1933 in Baltimore, Maryland, to organize and supervise local Production Credit Associations of the Second Land Bank District which comprises the states of Pennsylvania, Virginia, West Virginia, Delaware, Maryland, District of Columbia, and Porto Rico. Its duty is to organize and supervise local Farmer Production Credit Associations, and make available to them the privilege of discounting their sound loans with the Federal Intermediate Credit Bank. In the organizing of the local association it was thought best to have but one Fruit Growers Association on account of the accompanying hazards, such as, frost, hail, storms, etc., and should any one locality be effected the loss could be distributed over a wider territory.

In accordance with this thought, the East Central Fruit Growers Production Credit Association was organized December 27, 1933, to make loans to the fruit growers of the Second Land Bank District. As I am familiar with only the operation of the Fruit Growers Association, I will discuss only that part of the Production Credit.

The East Central Fruit Growers Production Credit Association was organized with five directors in charge, one from each state; they are charged with the operation of the Association under the supervision of the Production Credit Corporation. Certain rules and regulations are given them under which they must operate, but the general policy is left to them. The duty of the Association is to loan money to fruit growers for Production purposes.

One of the requirements is that all loans must be reasonably sound as in no other way can they expect to be a permanent organization. The Production Credit Associations are cooperative organizations set up entirely for the benefit of the farmers and fruit growers and all profits above expenses accrue to the members. It is set up as a permanent organization and will continue so long as we fruit growers show our willingness to cooperate and enough business ability to operate the Association successfully.

It should be gratifying to any fruit grower to know there is an organization from which he can obtain credit to produce his

crop. To become a member you must be a borrower. Any practical fruit grower of good character and reputation who can furnish a satisfactory financial statement may become a member. By satisfactory statement I do not mean he shall not owe any debts or mortgages on his farm, but it is the duty of the Board of Directors to analyze all financial statements and to determine if the applicant can operate his farm or orchard, pay his interest and other fixed charges, and still have a chance of profit by his operations. If the obligations are too heavy for the property to carry, it is the duty of the Board to reject the loan.

There must always be sufficient equipment to properly operate his farm or orchard and the equipment offered must be free of all encumbrance.

This is where the Act of March 2, 1933 comes in by allowing a chattel mortgage to be taken on property where the notes are discounted with the Federal Intermediate Credit Bank. We are advised, in taking chattel mortgages, that we shall consider them as secondary collateral only, and that the prospective crop shall be sufficient to liquidate the loan within the year as the East Central Fruit Growers or the Federal Intermediate Credit Bank does not want to sell any chattels only as a last resort. If the prospective crop can not pay out the amount asked for, and the financial statement is satisfactory, the loan should be cut down so that the crop will repay the loan, as the purpose of this association is to help growers produce their crop only. The money cannot be advanced through this Association for any other purpose. If money is needed for longer periods, there are other governmental agencies to which one may apply.

How do you go about getting a loan? Secure an application blank from your county agent, or, if he does not have one, write to the office of the East Central Fruit Growers Production Credit Association of Hagerstown, Maryland. Fill out the blank and be sure to answer all questions fully.

Some of you who received the blanks last year no doubt found some questions difficult to answer. This may be true, for last year's blank was made up without any previous experience. Since then, we have had the benefit of one year's operation, and a new application blank, now at the printers, has been prepared which is considerably shorter with a simple budget blank attached.

In setting up the Plan of Production Credit, one of the government requirements is that the moneys shall be advanced only as the crop progresses and as needed to take care of the crop. The moneys are allotted, therefore, each month as needed. You will find enumerated on the budget sheet all the items which are necessary for the proper expense to operate an orchard and each item should be listed in the month required.

If for instance, you wish to apply the dormant spray in March, figure what it will cost to apply this spray and enter the amount in the March column, as well as any other expense in March.



When you are assured of a crop, if you wish to buy enough arsenate of lead for the entire season, place its cost in that month column and so on. You need not separate your lead arsenate costs into months if you do not want to, as all the members of the Board of Directors have orchards and consequently they will understand what these various items mean. This plan gives the grower an opportunity to buy his material on a cash basis which should enable him to save considerable from buying on credit throughout the year.

As your crop progresses, you, of course, will want to buy baskets and other containers to properly market your crop. If for instance you have peaches, you will probably want to buy baskets in July or August. Therefore, enter this item in those months as well as all labor required to harvest the crop and so on throughout the season.

When you have filled out the application, mail it to the East Central Fruit Growers Production Credit Association at Hagerstown, Maryland, where it will be placed before the Loan Committee. Under the rules of the Farm Credit Administration, we are required to have competent inspectors whose duty it is to inspect all collateral offered, list same and secure necessary information. A charge is made for inspection. When the loan is approved by the Loan Committee, the necessary papers are prepared and after they have been properly executed the association can then disburse the money asked for or allotted from time to time as the crop progresses.

I would urge all borrowers to go over their budgets to see that they estimate their crops carefully, and ask for enough money in the first application to fully take care of the crop even to harvesting, for the reason, that if you find you did not ask for enough advances in the first application and wish to make a second application, we are required to ask for the same papers to be made over again which causes additional expense and delay. Also, it is necessary to make inspections of the orchards from time to time and furnish the association with written reports of the progress of the crop, as advances are allotted from month to month on the report of the Inspectors. If for any unforseen reason the crop should be damaged by frost, hail, or wind, the advances would be reduced, as it is the purpose of the Association to help the grower reduce his obligations and not get him deeper in debt by advancing more money than his crop justifies.

After all papers are properly executed, we are now ready to start paying out the money. If for instance you have asked for $500.00 in the first advance, we are required to deduct $25.00 or $5.00 on each hundred dollars loaned for Class B Stock. The money for Class B stock is sent to the Production Credit Corporation at Baltimore which invests this money in Government Bonds. Of course the Association receives the income from these bonds, as well as the income from all Class A stock of our Association which is owned by the Production

Credit Corporation and is invested in Government Bonds. At the present time, this amount is $150,000.00 and with the $30,000.00 we now have in Class B stock makes our investments from which we derive income about $180,000.00.

The present rate of interest to the grower is 5 per cent and so long as the money market remains the same we will be able to continue to loan money at this rate.

For the benefit of those who do not know how the Federal Intermediate Credit Bank operates as to their supply of funds, I think you should know they borrow all their funds by offering their debentures to the public for 3 to 6 months maturity as they require funds. These debentures are offered generally about the 15th of each month. Banks, Insurance Companies and others throughout the United States bid on these debentures and as the Federal Intermediate Credit Bank has never defaulted on their payments, they are sought as short term investments. Therefore, you can see there is no government money loaned to the members. We hope some day this association will be able to establish such a credit standing as the Federal Intermediate Credit Bank and we can do so by making sound loans and all members cooperating.

As the crops are moved the members are required to pay off their loans, and interest is charged from the day the money is advanced till the day it is returned, so that the sooner the loan is paid off, the quicker the interest stops.

Under the rules, all notes become due and payable on November 15, at which time the crops should be sold or placed in storage. If the crop is sold, the notes should be paid off. If not sold but placed in storage, the notes can be renewed payable on demand, by furnishing the Association with satisfactory evidence that the apples are in Storage, in which case the loan can be paid off as the apples are removed from storage.

For the information of those who are members of our Association and those who might become members, the following is the Financial Statement of our Association for the first year's operation:

| | |
|---|---|
| Total Operating Revenue . . . . . | $ 14,765.00 |
| Total Operating Expense . . . . . | 9,675.00 |
| Profit on operation . . . . . | 5,090.00 |
| Loss on Inspection . . . . . | 701.00 |
| Total Profit. . . . . | $ 4,389.00 |

It might also interest you to know that the Association loaned a total of $680,467.00 to 151 members. This divided into states is as follows:

| | |
|---|---|
| Pennsylvania | $ 223,219.00 |
| Virginia | 213,497.47 |
| West Virginia | 142,513.70 |
| Maryland | 71,712.07 |
| Delaware | 29,525.00 |
| | $ 680,467.24 |

Of this amount, $439,938.39 was repaid at the close of the year. The balance outstanding in most cases is represented by apples in storage and will be paid as the apples are placed on the market.

QUESTION: Is there some way to reduce the cost to the borrowers?

MR. KARNS: At the present time this problem is being worked on.

MR. MASON: When one adds the five per cent about which you spoke it runs the cost to 9 2/7 per cent. These costs are recurrent. That is if you had a $5000 loan with the first payment made in apple harvest, there was an interest charge of $84.00. The inspection costs were $47.50 plus $5.00 for inspection in the summer time and then a lawyer's charge of $20.00, or a total of 9 2/7 per cent.

MR. KARNS: Our lawyers have made a flat fee of $5.00 and I cannot understand why you should have paid $20.00.

QUESTION: Can individual growers take out these loans?

MR. KARNS: Yes.

QUESTION: What about hail insurance when a loan is made?

MR. KARNS: We tried to get a mutual hail insurance policy of some kind. We have this up with two or three people at this time. We have a blanket policy written for an entire territory at a reduced rate.

## SURVIVAL OF THE FITTEST IN FRUIT GROWING

**W. J. WELDAY, Smithfield, Ohio**

I come to you not as an experimenter, not as an extension worker, nor as manager of a syndicate plant but as just another orchardist—possibly another one of those muchly denounced "rugged individualists."

I come as a grower who, while teaching English and with a college debt on his hands, got the fever for this orchard game and left his job to set out seventy-five acres of apples on the home farm; who at the time of planting his trees, planted himself with them and have been there ever since.

However, I am not attempting to boast of my personal triumphs nor most certainly admit any personal blunders. The worst blunder I ever made was revealed recently when I



was approached by a man who tried to identify me as the Welday who gave a certain talk at Farmers Week about ten years ago. "Well," said he, "as a result of that inspiring talk I went straight home and put out forty acres of apples." I assure you there shall be no such inspiring attempts in this talk this afternoon.

Survival of the fittest implies no New Deal proposals for deadening initiative, nor cooperative systems which tend to pull the least efficient and the most successful to a common level. I am not even in sympathy with our Ohio Farm Bureau which has adopted such utopians as Mr. Bowen who is preaching such reforms as—"Not only is the consumer entitled to the profits of industry but he must own the machinery of production." I approve of the system where the reward comes to the deserving not that there should be only one successful orchardist, Welday in Ohio. No monopoly is implied by my views; it may be pointed out later where money is a distinct handicap. A recent economic report referring to certain new terms taken by the Administration, puts it, "To allow more freedom for the efficient producer to pass on the benefits of his efficiency." That should be the orchard man's creed.

Pursuant to the above, there is one transcendent statement which forms the background of this talk. Around it centers our hopes and doubts, our danger of failure and our assurance of success. It is that SOMEBODY WILL MAKE MONEY OUT OF THE FRUIT GAME. That assumes of course that the demand will persist, that the apple will not be run out by citrus fruits, and the like; it obtains even in case foreign markets fall off or even if great over production occurs. Somebody is going to make money, and the question for us to decide is, "Is that somebody you?"

Of course the ideal situation would be a well-planned and well-managed orchard. Strangely both of these requirements relate to the man at the helm. Fortunate it is indeed if this can be the one man who both plants the trees and carries on the later development. The man who plans has seen to the matter of markets, varieties, site, distance of planting, investment, etc.; the operator must look to everything involved in the management, so that the ideal situation narrows itself down to the ideal man. No wonder the Federal Land Bank looks upon an orchard loan as anything from a white elephant to an excellent business! This man should be preferably farm bred, trained, and experienced, intelligent, business-like, open-minded, alert yet tactful, conservative yet zealous. He should have sufficient yet limited capital. Open minded:—Oh, How you like those old Rambos!—so you plant them. Alert:—Are you watching Tugwell and his lead tolerance? Conservative:—Remember how you in southern Pennsylvania set out that large block of northern McIntosh because they brought good prices on the New York market, or how you fell for that duster to short-cut your spraying operation? Remember how, following

the war with its attractive prices, you reached out and bit off more than you could chew?

In consideration like these then, lies the test. Go out some time and actually sit down in that orchard of yours—the rest will do you good—and ask yourself, "What about my market? Does it lie in farm demand, roadside possibilities, or commercial requirements?" Therein will be determined both the number and kind of varieties you should have. Locally there is not so much choice as formerly; regionally the market aspect is very important. Look how less and less attractive the West looks as the East perks up. If your market considerations do not look favorable, then just to that extent you are handicapped in this broad field of competition.

Ask yourself about your varieties. "Are they the ones the public is demanding—do they conform to my market needs? Are they making me money?" The writer knows of a certain locality producing Willow Twigs and this variety in their particular locality, under their particular conditions, is making the growers money. There endeth the argument. If your varieties are not favorable, to just that extent you are handicapped.

"Is my site such as to escape a reasonable percentage of frosts? Is my distance of planting not too close for the permanants nor too wide when the fillers are removed? Is the size of my acreage sufficient to make a full sized job for an able man, or is it so large that I cannot give it detailed supervision—in other words, to know my trees by name?" These considerations determine whether again you are handicapped.

"How is my capitalization?" It doesn't matter much whether you are paid up or in debt from the profit angle. It does make a lot of difference whether your motor boat is weighed down with debt so that the least squall will upset you before you reach shore. Under-capitalization means at least a short oil supply for the engine, but the lesson of the depression is that over-capitalization is far more dangerous. Maybe this unfortunately, is a grave handicap.

"What kind of a manager am I?" As Shakespeare says, "Ah, there's the rub." Maybe we cannot answer it ourselves; maybe we do not want to; yet maybe we are again handicapped.

Maybe you are handicapped because of the very advantage you think you have in financing a "Factory-like orchard." Can you secure a manager who qualifies? Sometimes yes; frequently it is the chain store problem; he is already running or will run his own orchard. At best but few managers can take the same interest they would with their own plant. They will not as a rule be disposed to sleep with one eye shut and one eye open to watch for the sudden drop in temperature when the storage doors were left open the night before. Can you refrain from dictating to that manager when indeed you may know half as much about the orchard business as you think you do. As a matter of fact those idle funds lying there may be too tempting. The writer knows of an orchardist with several



hundred acres who had as equipment a huge storage, two large Cutler graders, one of them just unpacked when the orchard was just starting into production. Just as his Baldwins came into profitable bearing he then ordered his manager to start in top-working them to another variety. If his motive is to produce thousands of bushels of fruit merely as a plaything, competing with that orchardist who depends upon fruit growing for his bread and butter—well maybe there is food for thought in these times of codes and restrictions.

At best we are all beset with problems:—"Shall I plant fillers? Shall I plant Golden Delicious? Shall I top-work my ten year old Bens? Shall I replace those old Wealthies when they are low in yield and the orchard has started to depreciate? Shall I construct a storage? Shall I refrigerate that storage? Shall I invest in a stationary spray outfit? Shall I box any apples? Shall I get a washer?" Puzzling? And yet our very success may depend on how we decide issues of this nature.

You all say this is making an intensive grind out of life. But the man genuinely in love with the fruit growing profession will never recognize the drudgery of work. The man who intelligently applies himself to business may feel the comfort of profits; the thrill of accomplishments. It isn't all tenseness. There is plenty of room for optimism, if we but have eyes to see. If he cares to look upon it that way, even the codling moth with its

enforced cost and the gruelling labor necessary to overcome it, is the best friend the real fruit man has. Were it not for this pest, wormless apples would be so plentiful we could not afford to haul them from the orchard. This codling moth has placed the industry in a position where there is a special reward to the thorough-going apple man. Fortunately there is no ideal set up—no perfect orchard, no perfect orchardist, so the field of competition is after all wide in its scope.

Somebody is truly going to make money out of the fruit business. Herein lies the test as to who that somebody will be.

## INSECTS IN PENNSYLVANIA IN 1934

**T. L. GUYTON, State Entomologist, Dept. of Agriculture, Harrisburg, Pa.**

Your insect pest committee has no report this year. We met and made recommendations to your secretary which were favorably received and acted upon.

In the apple orchard the codling moth is still in first place as a pest. From all parts of the state growers report it as follows: "The most troublesome pest," "It ranks first," "Just a little worse than last year," "On the increase." There were a few notes of encouragement as to the control of this pest. A Cumberland County grower reports a crop with a total of 2.2 per cent insect injury, 1.8 per cent due to codling moth and 0.4 per cent due to leaf roller. He used 10½ gallons of spray per application on twenty-year old trees and made 5 applications during the season. Another grower got fair control with sprays which were finished about the first of July. From a grower in the eastern part of the state came a report saying there was no increase in the common insects in his orchard, and a statement saying he expects to practice more rigid orchard sanitation in the future. He was doubtful about the economy of scraping and banding.

Red mite came in for second place as a pest in the apple orchard and was given mention in several instances as a potential pest in 1935.

The curculio in some large orchards in the extreme eastern part of the state resists control measures while other growers report success in its control by following the usual recommendation.

The leaf hoppers were numerous in several orchards late in the season and did considerable damage. Red bugs were reported on the increase by one man.

The Japanese beetle is present in large numbers in a few eastern orchards and is making peach growing more difficult. This foreigner shows a preference for certain apple varieties. Starr, Smokehouse and Rome are favored in feeding; Jonathan is only slightly damaged while Grimes, Stayman and Paragon



were reported as escaping attack. One grower found heavy applications of lime as a repellent most effective as a control.

Reports on the Oriental fruit moth varied from very heavy damage on twigs in the northwestern part of the state to that of "Not a pest this year" in the southeastern part. We made some counts in a small isolated orchard not far from Harrisburg. All the fruit was cut open and counted. On unsprayed Carman, Belle, and Elberta the infestation was a little over 20 per cent. The fruit of trees of these varieties given three applications of the usual peach sprays was 14 per cent infested. Iron Mountain peaches covered 4 times with spray were 50 per cent wormy.

The rose leaf beetle damaged many young apples in one orchard. This insect species is found on blackberries, and orchards in vicinities of heavy brier patches are most frequently troubled by this pest.

Bag worms and eastern tent caterpillars defoliated many unsprayed trees. Both of these insects are controlled by arsenical sprays.

Last year some mention was made of the gipsy moth in Pennsylvania. At that time you were told that an infestation of this devastating insect was found in the Wilkes-Barre-Scranton district in 1932. The work outlined at that time has been continued. The survey or scouting of the neighboring townships was completed and several scattered infestations found. The total area now under quarantine is 880 square miles. Of this only 15 square miles are generally infested.

The control program in Pennsylvania has always called for extermination and we believe marked progress has been made to that end. The work is carried on cooperatively between the State Department of Agriculture and the Federal Department of Agriculture. During the year 54,475 acres of woodland were intensively scouted; 2,444 miles of roadside were scouted; 1,326,587 trees examined in open country; 478,826 egg clusters destroyed. Worthless trees and brush were cleared and burned from 2,263 acres of woodland. Ten miles of barbed wire fence were erected for temporary use around areas to be sprayed. Sixty-four thousand two hundred and seventy-eight bands were applied to trees and 14,291 gipsy moth larvae and pupae were crushed beneath them. Three thousand five hundred and one acres of woodland, 5,055 isolated trees and 2,763 properties in residential sections were sprayed with arsenate of lead. About sixty-five tons of arsenate of lead and 2,500 gallons of fish oil were applied with 21 high power spray machines.

In the enforcement of the quarantine 1,999 shipments were examined and certified. The greater part of these shipments consisted of forest products and nursery stock.

As has been said, good progress has been made with the work in the past year. It is believed that the scouting work has determined the approximate spread of the insect. The area now known to be infested is much greater than a year ago but

the infestations are very scattered and light. Only about one-fourth as many egg masses were treated as in the previous year.

In a recent hearing at Washington, representatives of many of the eastern and central states were emphatic in their expressions favoring the continuation of the extermination work in Pennsylvania.

We believe that the eradication of this insect is of much concern to all fruit growers of the state as well as to home owners, nurserymen and those interested in the well-being of our forests.

The thanks of the writer is here expressed to the growers who so kindly sent reports of the insect condition in their orchards.

QUESTION: Is Red Spider and European Red Mite the same thing?

DR. GUYTON: Yes.

QUESTION: Some of our neighbors had apples with a hard rot inside of them. They had 200 bushels with only 20 bushels of good apples in them. What is this trouble?

DR. GUYTON: I am afraid I cannot tell you but we will be glad to try to find out for you.

## PRESSURES AND NOZZLES

**H. C. STOCKDALE, John Bean Manufacturing Company, Lansing, Mich.**

We have met in this room to talk about spraying fruit trees. By talking spraying problems we hope to put together some facts that will make it possible to get the most out of the sprayer you are using and it is certainly equally important that we lower the expense of our spraying. Above all, we want results.

What do we want our spraying equipment to do? No doubt you all would answer that you would like your spraying equipment to put a thin covering of spray on every side of leaves, fruit and branches, because spray material costs good money and you know only a thin film of spray will stick to leaves and fruit. The excess spray will drop to the ground where it can do no good. One of the best ways to visualize this ideal spray fog is to think of the windshield of our car as we drive through fog. We all know how quickly and completely the windshield glass is covered by fog, but when we drive the car into a dense fog for a given time, the windshield accumulates so much moisture that it runs off; likewise, too much fog spray on one area of the tree is not an economical application.

Just how are we to get this ideal mist-fog into our trees so that it will stick to every side of the leaves and fruit? We might say high pressure—and certainly this is most important—but it is not a complete answer. Other factors just as important are the size of cutoffs, size of hose, size of fittings in hose, type of gun or nozzle, and size of opening in gun or nozzle disc. Not knowing the volume and pump capacity of your spray pump,

I can not give you the correct specifications for these factors for your outfit any more accurately than I could tell you to go into your field and plow with a one, two, three or four bottom plow, not knowing what size tractor you have.

I rather like the way tractors are rated as 8-16, 10-20, 15-30, etc.; sprayers could be rated somewhat in a similar way. With sprayers we could say 10-300, 14-400, 14-600, 30-700, etc.; 10-300 meaning 10 gallons per minute at 300 pounds pressure, 14-600 meaning 14 gallons per minute at 600 pounds pressure, and 30-700 meaning 30 gallons per minute at 700 pounds pressure. How many of you have checked up on your sprayers so that you know how to rate them? Do you have a 10-300 or a 20-600, or don't you know what you have? If you don't know, how do you know what cutoffs, hose fittings, hose and gun or nozzle equipment to use on your outfit?

The best thing for you to do is to check up on your sprayer. First, you must make sure the pump valves are clear of dirt by running clean water through them. You must also see that the strainer on the suction side of the pump is clean. Check the performance of the regulator. Next, put on the hose and spray guns or whatever type of discharge nozzles you use. Then run the spray pump, noting the pressure on the gauge. At the same time discharge the water through the nozzles into a barrel. By timing with a watch, see how much water is discharged into the barrel per minute. To arrive at the total capacity of the pump, the overflow must be measured at the same time the nozzles are being operated. It may require a little piping to get the overflow into a second barrel to measure it, but this can be done. When you have done this, you have the first figure of your rating; for instance, if the nozzles discharge 12 gallons into the barrel and 3 gallons by overflow into the second barrel, you have a 15 gallon pump. If the pressure gauge shows 600 at the same time the test was being made, you have a 15-600 sprayer.

So far, this test is all right but we must know a little more. It may be that the cutoff, the hose fitting, or the hose itself is undersized, and the pressure showing on the gauge is not getting to the nozzles. To determine this, you will need a second pressure gauge which you will first plumb into the line next to the nozzles. If a noticeable difference is shown by the two gauges, place the gauges at different places along the line until you discover if the hose is undersize or if one of the fittings is restricting the pressure.

Some of you will be buying a sprayer before long. There are a lot of things that enter into the purchase of a sprayer. You should ask the salesman from whom you expect to buy many questions. He, in turn, if he knows sprayers and is conscientious, will ask you a great number of questions such as the following: Do you have a hilly or a level orchard? What is the nature of the soil—reasonably firm to drive over or soft at times during the spraying season? With what will the sprayer



be pulled? How many acres are to be sprayed by the sprayer in three days time? How old are the trees, how high and how wide? How far apart are the trees planted? What is the source of the water supply? Do you expect to spray from the ground or from a tank?

The conscientious, experienced man selling a sprayer can help you a great deal by knowing these facts about your orchard. Suppose you had built a house of eight rooms and you wanted to heat it with steam heat. Would you go to a hardware store and say, "You sell me a furnace for eight rooms with a radiator for each room?" You certainly would not. You would expect to figure the size of each room and then compute the proper size of furnace and the correct steam pipes. Buying a sprayer best suited for your orchard also requires careful figuring. If you have only a few trees in the back yard, you can spray them with a knapsack sprayer by taking plenty of time, or if you have a very small home orchard, it would be good judgment to spray it with a barrel sprayer. A little larger orchard will require a small power sprayer. A medium sized commercial orchard requires a larger power sprayer. In this same way, the large commercial orchard should use a much larger sprayer. The point I want to make is this—the size sprayer that Jones uses in his orchard may be too large or too small for your orchard. You could use a small brush to paint the dog house, but it would cost you a lot of time and money to paint the barn with the same sized brush.

If there is anyone here who has heard it said that high pressure will injure fruit, he should satisfy himself on this point by holding his hand in spray streams at 200 pounds, 400 pounds, and 600 pounds pressure. When you have felt the soft spray at 600 pounds pressure, then put your hand back into the spray stream at lower pressures.

Several years ago it was not nearly as difficult to select a sprayer best suited to your orchard because the discharge equipment was much the same in every case, in fact, the manufacturer usually equipped the sprayer with hose and gun and did not ask you any questions. Today, orchard men are using pressures ranging from 300 to 800 pounds. One grower may be using 3 gallons per minute through one line of hose and another may be using 30 gallons per minute. We can not criticize either of these growers unless we know the size of their orchards. The point is simply this—if the fellow using 300 pounds has only a few trees to spray and can spray all his trees within the spray schedule date limits, he can, by using a very fine disc opening and by spraying from a ladder or tower, do as good a job as the fellow using the 30 gallon, 700 pounds pressure outfit. As to the fellow using the 30 gallons per minute, 700 pounds pressure outfit, you can readily see that ten sprayers of the 3 gallon, 300 pound pressure type could not do as much as the larger sprayer suggested above, simply because it takes both pressure and volume to carry a fine fog spray to the top of a bearing tree

of reasonable size. The fellow with the little sprayer can get this fine fog spray to the top of the tree only by somehow holding the nozzle near the top of the tree.

I have pictured rather extreme cases here but the point I want you to get is that you should have a sprayer best suited to your orchard so that you can make a good job of spraying at minimum cost in both material and labor.

Always remember it requires pressure plus volume to carry fine spray to the top of a normal sized apple tree; I checked this very carefully recently. I found that a nozzle operated at 600 pounds pressure, discharging 6 gallons per minute, failed to place any spray stain on a white card target 12 feet from the nozzle. The same pressure used with the same nozzle discharging 10 gallons per minute registered a beautiful, even covering on the target at 12 feet. In both cases, a time curtain was used so that the time of exposure was identical, so do not overlook the importance of the volume plus pressure.

Let us hammer on this statement—volume plus pressure. I will try to analyze this very carefully so that we will understand each other. No doubt all of you have seen or used a small medical atomizer, which produced a fine spray. Was a high pressure producing this fine spray? Its explanation can be given in two words—limited volume. You could take your apples to market in a wheelbarrow but it would be false economy to do so. Likewise, it would cost a fortune to spray an orchard with a medical atomizer. Therefore, we spray with greater volume, but remember—the pressure must be increased with the volume.

We can not stop here because if I make no further explanation, some of your growers may go home and enlarge holes in nozzle discs and by so doing ruin the performance of the nozzle. Remember that the nozzle performance is determined by the relation of one nozzle part to another. Would you change the parts or the jets in the carburetor of your automobile engine? No, you would not. The same rule applies to nozzles. The above statement is made assuming, of course, that the nozzles on your sprayer are now giving good performance.

Some of you may have this question in mind—how can we get the increased volume if not by enlarging the hole of nozzle discs? I have stated that volume plus pressure will carry the best quality of spray to the greatest elevation. Fortunately, it is a fact that several properly proportioned nozzles grouped together will carry a fine spray to a good elevation. Therefore, by using a number of nozzles together we get greater volume, but we do not in any way lessen the quality of the spray.

I do not say that a fine spray can not be produced through a large disc opening, it is possible to produce a fine spray with large disc openings, but remember that in order to obtain the same fine quality of spray that you get with a smaller disc opening, you may have to have a nozzle whose parts are made in proper relation to the larger disc opening. As there are but few experts available who could make such nozzle alterations,

it is a good thing for the grower to keep away from any such radical change in nozzle disc openings.

Will high pressure injure fruit? It is my opinion that we can use just as much pressure as we like. Higher and higher pressure surely brings us nearer to that ideal fog that covers the automobile windshield so nicely. Pressure plus volume carries this ideal fog to the top of the tree.

GALLONS PER MINUTE REQUIRED TO SUPPLY NOZZLE CLUSTERS AT GIVEN PRESSURES

| Nozzle No. | 3 | | 4 | | 6 | | 8 | | 12 | | 16 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size Opening | 1/16" | 5/64" | 1/16" | 5/64" | 1/16" | 5/64" | 1/16" | 5/64" | 1/16" | 5/64" | 1/16" | 5/64" |
| Lbs. Pressure | Gallons per Minute | | | | | | | | | | | |
| 300 | 4.1 | 5.3 | 5.5 | 7.1 | 8.2 | 10.6 | 11.0 | 14.3 | 16.4 | 21.2 | 22.0 | 28.6 |
| 400 | 4.7 | 6.1 | 6.3 | 8.1 | 9.5 | 12.3 | 12.6 | 16.3 | 19.0 | 24.6 | 25.2 | 32.6 |
| 500 | 5.4 | 7.0 | 7.2 | 9.3 | 10.8 | 14.0 | 14.4 | 18.6 | 21.6 | 28.0 | 28.6 | 37.2 |
| 600 | 5.9 | 7.6 | 7.9 | 10.0 | 11.9 | 15.4 | 15.9 | 20.6 | 23.8 | 30.9 | 31.8 | 41.3 |

HOSE FRICTION TABLE*

| Gal. per min. | 3/8" Hose | 1/2" Hose | 9/16" Hose |
|---|---|---|---|
| 2¼ | 295 | 300 | 300 |
| 3¾ | 275 | 295 | 300 |
| 5¼ | 235 | 285 | 395 |
| 8½ | 200 | 265 | 280 |
| 11 | 160 | 240 | 260 |

*All tests taken at 300 pounds at the pump. All hoses 50 foot lengths.

QUESTION: What height can you get with the fine nozzle?

MR. STOCKDALE: You must remember that your extension man is making a statement with regard to a seven gallon, 250 pound pressure outfit. You can take a number of nozzles with low pressure and get up in the trees fairly well. I do not think much of a broom with a tendency to spray higher. The more nozzles that you can put in one group the higher you can get by making more air currents. An eight-nozzle gun is about as good as is a single sprayer.

QUESTION: What experiments have been made in grouping nozzles other than in a straight line?

MR. STOCKDALE: Quite a few have been tried. Nozzles grouped in a straight line have more freedom to go through the air than those grouped in other ways.

QUESTION: What would you advise for a 16-gallon sprayer?

MR. STOCKDALE: I would not recommend a single gun unless it was made especially for 16 gallons at 450 pound pressure. I know of no ready made gun that will do a fine spray at those limits but it could be built or two guns could be used.

QUESTION: What size broom would you recommend for 10 gallons at 300 pounds pressure?

MR. STOCKDALE: A six nozzle broom would be about right for that pump. There are now only two sized discs on a gun. The six nozzle requires a 400 pound pressure, the big 12 nozzle steps it up and the 15 nozzles increase it still more.



QUESTION: What is your biggest opening?

MR. STOCKDALE: 5/64.

MR. STOCKDALE: What is wrong with the advertisement which I passed to you?

ANSWER: The man is trying to use a half-inch hose on a 12-nozzle gun.

QUESTION: What size hose should he use?

MR. STOCKDALE: Three-fourth inch hose, without question.

QUESTION: What is the maximum for a half-inch hose?

MR. STOCKDALE: We might say that eight gallons is getting close to the maximum. Eleven gallons will lose 60 pounds through that hose.

QUESTION: How long is that hose?

MR. STOCKDALE: 50 feet.

QUESTION: How much does 16 gallons lose on 400 pounds with 50 feet of half inch hose?

MR. STOCKDALE: I do not have that but I should say about half of it. On 50 feet you lose 140 pound at 11 gallons on half-inch hose.

QUESTION: How important is the throat size of your cutoff?

MR. STOCKDALE: Mighty important. I cannot tell you except to go home and try it out.

QUESTION: Can you make as good a job with the gun as with the cluster?

MR. STOCKDALE: I would say that you certainly could.

## RECENT DEVELOPMENTS IN CODLING MOTH CONTROL*

**B. A. PORTER, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.**

The mention of codling moth brings to everyone's mind the problem of spray residue which is so intimately connected with the control of that insect. It is unnecessary at this time to review in detail the development of the spray-residue situation in recent years, since you are aware of it. There seem to be two possible ways out of the difficulty—either to develop methods of controlling the codling moth that do not result in the presence of dangerous residues on the fruit when it is harvested, or to control the codling moth with lead arsenate or other effective poison, and then remove the residue before the fruit is placed on the market. In the absence of satisfactory, effective, and unobjectionable substitute materials, the apple industry in most parts of the country has of necessity adopted the second alternative of controlling the worms with lead arsenate, and then removing the residue by washing. Except in rather limited areas in the northeastern part of the United States, this prac-

*Bureau of Entomology and Plant Quarantine Manuscript 2989.

tice has, therefore, become an essential part of the process of preparing the fruit for distribution and consumption. Residue-removal methods are to be discussed by other speakers at this session.

The first-mentioned solution of the problem—the development of an effective and practical substitute for lead arsenate—is engaging much of the attention of the Bureau of Entomology and Plant Quarantine, as well as of many state and private organizations. Although none of this work has yet resulted in the development of a substitute material that can be generally recommended for practical use, a brief outline of the work under way may be of interest to this meeting.

Although we depend very largely on the use of lead arsenate for codling moth control, this insecticide falls far short of being an ideal material for this purpose. During the summer it is an easy matter in any heavily infested apple orchard in certain areas to observe many codling moth larvae entering apples through heavy deposits of lead arsenate, and too large a percentage of these worms make their way through the deposit without being poisoned. Although this condition is probably rare in Pennsylvania, it is all too common in certain southern and western apple-producing areas. What is really needed, then, irrespective of the residue situation, is a better material than lead arsenate, and not merely a substitute for it, and the trend of our research is in that direction.

Probably the closest approach to an effective substitute for lead arsenate at present is nicotine. The mention of this material immediately suggests to practical growers the matter of expense. It should be borne in mind, however, that nicotine is actually many times as toxic as lead arsenate, and that if it were possible to keep it on the fruit and foliage for as long a period as can be done with lead arsenate, it could be used at a sufficiently low strength to permit competition on an even financial basis. The chief difficulties with nicotine are its solubility in water and its volatility. As ordinarily used, it remains on the fruit or foliage for only a brief period of time. Recent research efforts have therefore been largely directed towards fixing the nicotine in some way so that it may not wash off in the rain, nor evaporate when the temperatures are high. The New Jersey Agricultural Experiment Station has been getting results with certain nicotine combinations such as nicotine tannate, and nicotine with bentonite, comparable to those obtained with lead arsenate. We have had favorable results with these combinations in some cases, but have been unable to duplicate them in other tests.

Nicotine with oil emulsion has, in the Northwest, and to a less extent in the Middle West and East, given a degree of control comparing very favorably with that resulting from the use of lead arsenate. The nicotine-oil mixture has, however, a number of disadvantages. The oil is incompatible with the sulphur fungicides, which must be used through much of the



season in orchards in the Northeastern part of the country. As used at present, the applications of nicotine and oil should be more frequent than those of lead arsenate, and the number of applications of oil that a tree can safely be given is somewhat limited, although we do not know exactly what the limitations are. The application of oil-nicotine following lead arsenate increases the difficulty of removing the lead residue. Last but perhaps not least is the cost of the nicotine and oil at the strengths at which they must now be used. Even with the disadvantages of the forms of nicotine now available, this line of development has shown promise as a subject of further investigation.

The fluorine compounds, particularly cryolite, which have given effective control of the codling moth in the Northwest, unfortunately are very difficult to remove from the fruit. In middle-western and eastern areas, the control obtained by the use of the fluorine material has been more or less irregular, and we would hesitate to recommend their use except possibly for one or two summer applications in areas where they have given satisfactory results, and where washing is the regular practice. Their use does not reduce the necessity for washing the fruit.

Derris and pyrethrum, two plants containing highly poisonous principles, have been rather thoroughly tested this season, but the results have not been particularly encouraging. The initial toxicity of these materials is high, but in the combinations in

which they have been used thus far, this toxicity disappears very rapidly after the materials are applied. It should be possible to overcome this difficulty, but this has not yet been accomplished.

It was thought for a while that partial relief could be obtained by the use of calcium arsenate, thus limiting the residue to arsenic, which was thought to be more readily removed. Results from the use of calcium arsenate have varied from reasonably satisfactory, in areas in which the codling moth infestation is not particularly serious, to very poor commercial control in areas in which the codling moth population has been high. In many cases also, calcium arsenate has caused considerable injury to foliage and fruit. In the Hudson Valley, in the New England States, and in parts of Michigan, calcium arsenate is still being given consideration, but in other areas very little of it is being used. Further work, however, is being done with calcium arsenate and other non-lead arsenicals.

Perhaps enough of your time has been taken with this discussion of insecticide research that has not yet borne a great deal of fruit. Although little of immediate promise has yet been discovered, more effort is being devoted to work on this problem than ever before. The Department of Agriculture has intensified its efforts in the last two years in the face of a general curtailment in funds available for research work. Many of the state organizations are working more than ever before in this direction. Added to this is very intensive work by insecticide companies and similar agencies. My own organization has tested many hundreds of materials in the laboratory in the past six or seven years. Recently the statement was made by an eastern state worker that he had tested more than 400 possible substitute materials in 1933 and 1934. It should be remembered that lead arsenate was a product of some 30 years of development. It was in 1878 that it was discovered that spraying with arsenicals would give control of the codling moth, yet it was not until the early part of the present century that lead arsenate came into extensive use.

Much interest has been aroused in the last few years of experiments with the use of electrified light traps, conducted by the New York Agricultural Experiment Station, Purdue University, and other agencies, in which it has been found that large numbers of codling moths can be killed by the traps, in contrast to the negative results obtained a number of years ago with the older kerosene-lantern type of trap. The Bureau of Entomology and Plant Quarantine maintained light traps in a 5½-acre apple block in southern Indiana this past season, and obtained a definite reduction in codling moth infestation, confirming the results obtained by the New York Station. The cost of the installation—several hundred dollars per acre—precludes the use of the traps at present, but there seems a possibility of developing more effective traps and reducing the number needed



per acre and perhaps bringing this practice within reach of the practical grower.

Along with light trapping, we have also been carrying on further work with bait traps, in the hope of developing their use into a practical control measure. Further experiments have also been conducted with the utilization of the codling moth egg parasite known as Trichogramma, about which much has been said in recent years. The results of 1933 were encouraging; those in 1934 were negative.

A brief summary of our present general recommendations as to codling moth control may be in order. Detailed recommendations will be left with your state organizations.

The adoption of washing does not mean that a grower can apply unlimited quantities of lead arsenate, or stick the material on with large quantities of mineral oil, and then expect to remove the residue easily at harvest time. It is true that by heating the solution, by the use of wetting agents, and by other practices, very heavy residues have been successfully removed. In order to avoid possible difficulty, however, and to make certain that the residue may be removed well below the maximum quantity believed to be safe from the consumer standpoint, special attention should be paid to the control of the codling moth by measures other than spraying. Greater emphasis should also be placed in the applications made early in the season, in order to avoid heavy applications of poison late in the season when the apples are approaching full size.

There were a number of control practices in use years before the development of spraying. For the last thirty years, however, the tendency has been to depend entirely on the use of lead arsenate for codling moth control, and to overlook these other valuable practices. Now, with increasing difficulty in codling moth control, complicated by the residue problem, a revival of many of these practices has taken place. A review of these practices may not be out of place.

The control program may well start with a general cleanup of the orchard. As is well known, the codling moth passes the winter in cocoons in crevices underneath the loose bark of the trunks and larger branches of the tree, in coarse trash on the ground, in containers which have been used to handle wormy fruit during the season, in packing sheds, and in similar places. A general cleanup of such situations reduces very materially the carryover of worms and is the first step towards reducing the worm population to a more reasonable level. This means scraping the loose bark from the trunk and larger branches and catching it on a canvas and burning it, in order to destroy worms that happen to drop uninjured with the bark; the removal of coarse trash, such as pruning wood and coarse weed stalks from the ground; and the elimination of any partially decayed stubs that may have been left in the course of pruning operations. The scraping of the trees is of particular importance if

the orchard is later to be banded, a practice which will be discussed presently.

The number of moths which emerge within the packing shed during the early season is sometimes almost unbelievable. This is particularly true if a wormy crop has been handled during the preceding season and if cull fruit has stood around for any length of time awaiting disposition. I need only cite the case of a packing shed in a large orchard in southern Indiana. By placing a cheap grade of cloth around the entire outside of the packing shed the grower was able to confine practically all moths which emerged in it. In the early summer of 1934 nearly a quarter of a million moths emerged within the packing shed, and practically all of them died without reaching the orchard. This grower still had a difficult control problem on his hands, but we can well imagine how much worse it would have been if this swarm of moths had made its way out into the orchard to add to the infestation already present there.

The containers used in handling fruit in the orchard also often carry over tremendous numbers of worms. There are several ways in which these containers can be handled to keep them from adding to the infestation in the orchard. If the grower is fortunate enough to own a moth-tight packing shed, the boxes may be stored in these sheds until the moths have all appeared and died. In the Hood River section in Oregon, equipment has been devised for steaming orchard boxes. They are passed through a long tunnel in which there are a number of jets of live steam, which raise the temperature in the tunnel to about 180° F. In the period that it takes for the containers to pass through, practically all of the worms in them are killed. Many of the orchard men in that section now refuse to permit unsteamed boxes to be brought into their orchards. We are now carrying on additional experiments with the treatment of orchard boxes, and will be able to make more detailed recommendations later.

Perhaps the most effective single control measure, other than spraying, is the use of bands, preferably the chemically treated bands. Many years before spraying was ever thought of, growers trapped the worms in bands made of straw, hay, or cloth. As you all know, on completing its feeding period, the worm leaves the apple and searches for some dark crevice in which to spin its cocoon. If most of the normal cocooning quarters have been eliminated by the scraping of the loose bark from the trees, and the carrying out of the other orchard cleanup practices just mentioned, 50 percent or more of the worms will find the bands and spin their cocoons under them. They may then be destroyed by working the bands over periodically, or they may be killed automatically by the chemical which is used in present-day bands.

The value of banding is felt in two ways. First, the worms which leave the fruit during early summer and midsummer are prevented from transforming into moths to lay eggs for the



second or third broods, which often constitute the greater part of the season's infestation. Many of the worms which complete their development late in the summer and in the fall, most of which carry over until the following year, are eliminated, thus reducing the population for the next year. The preparation of chemically treated bands has not been entirely standardized as yet, but these bands are being steadily improved. Comparatively few growers discontinue banding after once trying it. Observations recently made in the Yakima section of Washington showed that approximately 40 percent of the orchards were banded the past season. What is more significant, a negligible proportion of the orchards showed evidence of having been banded in 1933 and not in 1934. In other words, the growers of that region are rapidly becoming convinced that banding is worth while.

Another control measure which is of great value if properly carried out is the removal of wormy fruit from the trees while the worms are still in it. This is particularly effective if done during the early part of the first-brood period, and its effects are evident in the degree of infestation which develops during the period of the second brood. Whenever thinning is necessary for the development of the fruit to satisfy size, the thinning crew should be instructed to search carefully for wormy apples and to carry them out of the orchard and destroy them, rather than drop them to the ground, which permits the worms to complete their development in a normal manner. The breaking of clusters also aids in thorough spraying. Similarly, the prompt disposal of wormy fruit at harvest time is also very helpful in reducing the general level of infestation.

We cannot emphasize too strongly the necessity for special attention to the early-season portion of the spray program. In normal seasons the killing of one worm in the first brood is equivalent to killing 5, 10, or even more worms in the second brood. The grower has everything to gain and nothing to lose by concentrating the major part of his spraying in this period. There is ample evidence that the worms are more readily killed during the early season, when they travel more or less over the leaves in making their way to the apple, than they are during the latter part of the season when many of the eggs are placed directly on the apple and the worms go in with a minimum of movement over sprayed surfaces. In the early summer, the apples grow very rapidly, and frequent applications are needed to maintain a thorough coverage. The quantity of poison placed on the small apple early in the season, however, is insignificant from the standpoint of residue, compared with that put on when the apple is approaching full size.

In these early applications, special attention should be paid to the tops of the trees. It has often been observed that, with ordinary spraying, the worms are much more abundant in the upper parts of the trees than nearer the ground. This condition can be corrected if special care is taken by the spraying crew.

In recent years there has been quite a tendency towards the use of mineral oil or fish oil with lead arsenate. Although there is no doubt that this combination is more effective than lead arsenate alone, the use of mineral oil with lead arsenate in the late applications causes considerable difficulty in removing the residue, and is therefore not recommended. Growers who feel that the codling moth situation in their orchards demands the use of this combination should do so only with the expectation of having to resort to heating the washing solution. Even with heating there may be considerable difficulty in removing the residue from fruit sprayed with the oil-lead arsenate combination.

To sum up our present general recommendations to growers, we urge a control program in which emphasis is placed, so far as possible, on control measures other than spraying, and on early-season spraying with lead arsenate followed by washing to remove the excessive residue, so that a product which does not offer a hazard to the consumer can be placed on the market.

QUESTION: What do you mean by "wetting agent?"

DR. PORTER: It is a petroleum base product. It has been valuable but has never been standardized.

QUESTION: Were the moths in the containers or in the walls?

DR. PORTER: Both.

QUESTION: How long is it necessary to keep them in tight storage?

DR. PORTER: Until the moths stop emerging. This is in the latter part of June and sometimes into July. From the standpoint of the spray program it is bad to have the packing house in the orchard. The moths from the packing house come out later than those from cocoons on the trees.

QUESTION: Some people scrape at this season; will this freeze the moth?

DR. PORTER: It is better to burn the scrapings if you can. The codling moth is not susceptible to freezing weather.

QUESTION: Are the scrapings on the ground affected by wet weather?

DR. PORTER: Moisture has no unfavorable effect on them. In fact they come through wet weather too well.

QUESTION: Have you any report of bark injury with bands year after year?

DR. PORTER: Rough barked trees are not hurt and we do not use bands on young trees.

QUESTION: Is soluble fish oil to be used as spreader or sticker?

DR. PORTER: I know of no soluble fish oil. The ordinary fish oil emulsifies rather readily with other materials. We emulsify fish oil with the material and then put the mixture in the tank.

QUESTION: How about the keeping quality of apples after washing?

Dr. Porter: Washing does not effect the keeping quality if done properly. Although if fruit is not thoroughly rinsed and arsenate remains, this will cause fruit injury and will not keep as well.

Question: Will the use of alkaline wash take wax off?

Dr. Porter: Yes, and it may cause some damage.

Question: How about storing for a period and then washing apples?

Dr. Porter: The apple secretes a wax and it is desirable to wash as soon as picked.

## SOME FACTORS ASIDE FROM POLLINATION THAT AFFECT FRUIT SET

**LAURENZ GREENE, Purdue University Agricultural Experiment Station, Lafayette, Indiana.**

The failure of a large percentage of blossoming spurs to set fruit presents a problem of economic importance to apple growers and often is the cause of losses in orchards, where pollination and varietal incompatibilities are not limiting factors.

By "fruit set" is meant those fruits that remain on the trees through the "June Drop." Such fruits, under normal conditions, will remain until harvest.

Petal fall is followed, or accompanied, by a heavy shedding of blossoms. During the next few weeks a gradual dropping of partially developed fruits occurs. Finally, the "June Drop" eliminates the remainder of the fruits that are destined to fall before maturity. The extent of each of these fruit "drops" depends upon several interrelated factors, such as the total number of blossoming spurs on the tree, pollination, weather conditions, tree vigor, nutrition, and so on.

The fertilization of the blossoms with viable and compatible pollen is necessary, and ample provision for sufficient bees to insure pollination as between compatible varieties is an essential of good orchard practice. Following such provision, the orchardist still faces several hazards that are not well understood.

The ability of a spur to hold its well pollinated and fertilized blossom and, later, its fruit, depends upon a very delicate balance within the plant tissues concerned. Some factors involved in this balance are: an adequate and continuous supply of moisture, ample food reserves, active food manufacture in adjoining leaves, and other growth relationships. Any disturbance of this balance through changes in these factors—by variations so slight as to escape notice or measurement—may mean the loss of a large percentage of the crop.

After pollination, tree vigor probably plays the most important role in preserving the necessary balance within the tree



and young fruit, that enables the spurs to set a satisfactory crop.

Weather conditions are frequently responsible for a poor set of fruit; but, even under adverse weather conditions, some orchards will mature good crops when nearby orchards, just as favorably situated and with equal facilities for pollination, will drop most of their blossoms and fruits. There are not many aspects of the weather that the orchardist can control, but he can aid his trees to successfully withstand some of the hardships of adverse weather.

Winter injury and late spring frosts not only kill many buds, but may so injure spurs with live buds that their blossoms do not set fruit. Cold, rainy weather may prevent good pollination, and that kind of weather following pollination may so disturb the normal activities of the tree as to cause a heavy fall of pollinated fruits. Frequently, cold, rainy weather following bloom is more important than frosts during the bloom. Warm, dry seasons are usually followed by a good bloom and a good set of fruit. Fruits set better in the inter-mountain valleys, with their sunshine, than on the Pacific coast, where the springs are apt to be damp and foggy. The cold, rainy spring of 1933 prevented blossom bud formation in many Indiana orchards and reduced the percentage of blossoming spurs that set fruit in 1934. Any weather condition that weakens a tree, such as severe drouth or low winter temperatures, may reduce the percentage of blossoming spurs that will set fruit.

Moisture has been listed as one of the prime factors in fruit setting. Few of us realize that lack of moisture in the spring of the year can be a limiting factor. In most seasons, the soils are wet and even on hot days the evaporation does not seem excessive. However, there are several ways by which the flow of moisture to the embryo fruit may be halted for periods of varying lengths. High temperatures or strong winds, or both, may cause the loss of moisture from the leaves faster than the roots can supply it. This is particularly true where the root system is inadequate, whether due to injury or to poor soils. In shallow soils, the roots may not explore a sufficiently large volume of soil to maintain a continuous supply of moisture. In heavy soils, root systems are apt to be less well branched than in more friable soils. Poor drainage may cause the death of the roots below a high water table, thus reducing moisture absorbing roots to take care of sudden increased demands. Winter injury may be responsible for the slowing of the flow of moisture through the vessels of the tree. It is well known that the leaves successfully compete with the fruit for moisture, so that any shortage, even for a very short period, will affect the fruit first. It is easy, then to believe that, in case of high temperatures or drying atmospheres, the stream of water may be reversed for a period long enough to disturb delicate balances within the spur and cause the fruit to drop. A well-distributed, healthy root system, in well drained and deep soils, will maintain

the moisture supply to the advantage of the setting fruits. And, fortunately, such a soil and root system will maintain the vigor that also aids in fruit set.

Food stored, and in process of manufacture, in the vicinity of the developing fruit also play an important part in preventing fruit shedding. Just what the right balance may be, we do not know, but there is ample evidence that the supply must be on a high level. This is particularly true of sugars, starches, and nitrogenous compounds. It is well known that ringing a branch just before the blossoming season will increase the percentage of blossoming spurs that will set fruit. It is as well known that such a practice will increase the sugars and starches above the ring. In like manner, most orchardists are familiar with the increase of fruit set following spring applications of nitrogen carrying fertilizers. Ringing and nitrogen applications may increase the set on different portions of the same tree. It is also probable that where a large supply of these materials exists within the tree, neither would increase the set of fruit. That ringing and nitrogen do increase the food supply, and usually the set, is an indication of the high level of nutrition needed to insure a set of fruit.

There is further evidence that lack of food supply is a prime cause of fruit shedding, in the failure of heavy initial sets to remain on the trees through the "June Drop." Excessive competition between blossoming spurs for limited moisture and food supplies results in the dropping of a very high percentage of pollinated fruits. When conditions are favorable for pollination and fruit setting, too many developing fruits may remain on the trees after the initial set. In such cases, it is not unusual for nearly all of these fruits to be so poorly nourished that less fruits remain on the tree after the "June Drop" than in cases of smaller numbers of blossoming spurs per tree volume. It is certain that the percentage of blossoming spurs to set fruit falls as the number of such spurs increases per tree volume.

Thinning the spurs, the buds, or the flowers has repeatedly increased the numbers of fruits harvested. An illustration of this was reported last month at Pittsburgh. Where 80 per cent of pear blossoms were removed in Oregon, the set of fruit was doubled. Thinning flowers by pruning probably has similar effects, as well as affecting the set in other ways. Pruning older trees during the winter or early spring will often materially increase the set, where blossoming spurs are numerous.

Recognizing these facts, and with a heavy bloom in prospect, growers interest themselves in finding an economical method of removing just enough flowers to insure a good crop, and perchance aid in good flower bud formation. Various compounds have been tried with varying degrees of success. If the desire is to remove all the blossoms, it can be done, but with more or less damage to the trees. In Indiana such methods were not needed in 1933, when scab and cold, wet weather eliminated so large a percentage of the blossoms and small fruits that there was



not sufficient left for a crop. Where the present season's crop is the main consideration, many growers feel that it is safer to depend upon more expensive thinning methods after the initial drop is past, rather than to risk the loss of too large a percentage of the flowers and fruits.

Insects and diseases, particularly apple scab, cause a loss of fruit far beyond that usually recognized. In bad scab years the disease attacks the small stem of the apple, causing the flower or fruit to drop. It also attacks the leaves, reducing the surface and this, in turn, reduces set. Ample protection against apple scab is an essential to hold the fruit on the tree during its formative stage.

Foliage of good vigor is good insurance of a good set of fruit. This is particularly true of the spur leaves—those eight, ten, or twelve leaves among and just below the flowers and on the same spur. Any damage to this foliage will reduce the percentage of fruit set. Workers in several states have shown that the set is reduced in almost direct proportion to the percentage of foliage removed. Reduction of spur leaf area as late as two weeks after petal fall, in Indiana, reduced the set of fruit in all instances. Haller and Magness have shown that fruit may draw upon foliage at relatively great distances for its nourishment, and may attain as good size as that with foliage in close proximity. This fact can not be questioned for the fruit already set; but, for the small embyro, the balance is much more delicate and the foliage close by plays a very important role during a short period after pollination. Good foliage, vigorously functioning on the spur, is a prime factor in determining the number of fruits still on the tree at harvest time. To provide such foliage, a vigorous tree must be protected against insect and disease damage, by the use of spray materials and machinery that will not damage the leaves.

Dutton, in Michigan, points out that lime sulfur sprays under high pressures and on over-sprayed trees injures the foliage and reduces the set. In Indiana, in 1931, lime sulfur on Grimes Golden trees reduced the set from 18 per cent of the blossoming spurs on check trees to 6 per cent on sprayed trees. In Washington, it was found that oil in sprays following lime sulfur greatly reduced the set unless sufficient time intervened. Where lime sulfur was used in the pre-blossom and calyx sprays, followed by oil sprays eighteen days later, the set was reduced by 50 per cent of all the fruits.

The current vigor of the tree is our best index of its ability to set a good crop of fruit under any given set of conditions. Young trees might be considered to be an exception to this statement, for they usually appear to be vigorous, and they do not set as well as do older trees. Because the older trees carry more blossoming spurs proportionate to their volume, we would expect them to set less fruit, if age was not a factor in overcoming the effects of a high total bloom. Therefore, the apparent vigor of the young tree may be an unbalanced vigor, because

some food item is not being supplied in sufficient quantity. It is with this class of trees that early ringing will show its greatest influence. It may be that the demand, in growth extension, for the carbohydrates, sugars, and starches, is so great that there is little left to set the fruit.

On older, healthy, and vigorous trees with heavy twig and spur growth, we expect to have to thin excessively in seasons of abundant blossoming. That fact also emphasizes the importance of tree vigor. This condition is built into the trees over a long period of time and by numerous conditions and orchard practices.

Your own Experiment Station has clearly shown the importance of soil and soil management in developing tree vigor. Comparisons recently made in New York have also called attention to the importance of soil depth and drainage. Drainage, to carry away excess moisture in wet seasons and thereby preserve a good root system, is all important.

Vigor of trees is dependent upon a constant supply of moisture above the wilting percentage, or that amount of water in the soil readily available to the tree, for normal growth. In regions subject to drouth, or on soil types of low moisture holding capacity, the incorporation of organic matter and such tillage practices as will help to absorb and retain rainfall will promote vigor and a better set of fruit.

However, cultivation may result in severe damage to trees through erosion, as well as through the burning-out of organic matter. In examining some southern Indiana trees that seemed to have dropped an unusual percentage of their flowers in 1934, it was found that these trees were standing on ridges or mounds formed by the erosion of the soil between the trees, due to past cultivation. Such trees, with exposed root systems, do not find sufficient moisture and nutrients in the available soil to keep up the needed supply at fruit setting time. Their vigor is weakened.

It needs no emphasis to realize the need for fertility to maintain vigor. Orchard covers, manures, and fertilizers all affect fertility. Aside from the effect upon set from the spring applications of nitrogen, there is, after a few years as important an effect from the increased vigor of the tree. That these fertilizers may be applied at other times than the spring and produce as good effect is doubtless true, but we do not know so much about it. Morris and Luce reported that in Washington fertilizers applied in August increased the percentage of fruit to set the next year, and greatly increased the vigor of the trees. Nitrogenous fertilizers should be applied sufficiently early to insure their availability to the spurs at fruit setting time. The moisture supply must be adequate to insure availability.

One of our best measures of tree vigor and probable fruit set is found in the fruit spurs. Strong spurs are more apt to retain their fruits than are those that are classified as weak. Spurs of large diameter, of satisfactory length growth, which



indicate ample food reserves and ability to apply new foods, will often set fruits in seasons of adverse weather conditions. Vigorous spurs will retain fruits with few seeds when weaker spurs will drop fruits with many more seeds. Several workers have shown a positive correlation between seed count, percentage of fruit set, and fruit size. Certain kinds of apples, however, are exceptions.

The failure to remove filler trees before they overcrowd provides conditions of shortage of moisture and nutrients, as well as light, which reduces the vigor of trees and reduces the set.

In summary, we find that the factors involved are much the same as those involved in the production of vigorous trees, and emphasize orchard practices now in general use. Fruits set best on trees growing on deep, well drained soils of medium texture. Here excellent root systems are developed. Moisture is readily absorbed by such soils, through proper soil management. Soil nutrients, particularly nitrogen, either in tree reserve or from early spring application, are essential. These conditions produce vigorous growth, with well developed spurs of good length and diameter, capable of storing ample food reserves for fruit setting, when the demands are extreme. Such spurs also produce excellent spur foliage which is capable of maintaining a continuous supply of newly manufactured food. Spur foliage must be protected against pests with sprays that will produce the

least possible injury. Young filler trees may be ringed on trunk or branch to insure the set. Competition between the blossoming spurs on heavily loaded trees may be reduced by pruning or early thinning of the blossoms or fruits.

Vigorous trees, properly protected against insects and diseases, will set profitable crops under all but the most extreme weather conditions; and will set, in many seasons, when less favorably situated and weaker trees and orchards fail to set.

QUESTION: Does lime sulphur russet fruit if put on too early? What varieties are best pollinizers for Jonathan?

DR. GREENE: I would not attempt to answer this question for Pennsylvania. Golden Delicious and Delicious are good for Jonathan with us.

QUESTION: Is Jonathan a satisfactory pollinizer for Rome?

DR. GREENE: Yes, ordinarily. Some varieties will produce pollen under some sets of conditions and others will not. I have seen good pollen in Iowa from Winesap. What is a good pollinizer for one section is not always the same for all sections.

QUESTION: What has been the history of the Gallia Beauty in your section in regard to size and color as compared with old Rome?

DR. GREENE: My own impression is that in size it is not quite as good as old Rome but its color is better.

QUESTION: Do you find it necessary to put bees in the orchard during blooming season?

DR. GREENE: Yes and no. Many people are hiring bees for an orchard but if wild bees are present it is not necessary to plant honey bees.

QUESTION: Is there a difference between tree type of Rome and Gallia Beauty?

MR. MILLER: Not much in our section (West Virginia).

QUESTION: Is it as vigorous as Rome?

MR. MILLER: No.

QUESTION: Does it hurt this variety of tree to thin up into June?

DR. GREENE: I would not like to see you thin spurs but to trim a little would not hurt the trees.

MR. MILLER: We thinned in 1933 and 1934 and increased the crop in 1934. You will under some thinning conditions reduce the crop but you do get better size.

QUESTION: Is there any danger of pruning too much and throwing trees into new growth?

MR. MILLER: I think not. There is a chance for an argument; some people think we do too much pruning of old trees.



# SPRAY RESIDUE REMOVAL IN PENNSYLVANIA

**DONALD E. H. FREAR, State College, Pa.**

The problem of spray residue removal has become important in Pennsylvania during the past few years only, because up to that time codling moth control did not require the use of frequent heavy applications of arsenical sprays. Within the past few years, however, the rapid increase of the codling moth has often necessitated the use of seven or eight cover sprays.

Such an intensive spray program has had the natural consequence of building up a high deposit of both arsenic and lead upon the surface of the apples, and since Federal and State tolerance limits for these elements have been set for food products, some means for reducing the amount of the spray residue had to be devised if the fruit and its by-products were to be marketed legally.

Other states have been earlier confronted with this problem, because of peculiar local conditions favoring several codling moth infestations, so that their experiences in the matter of residue removal are of great value in determining the lines of attack in Pennsylvania. However, these practices developed elsewhere are of value only insofar as they can be applied to Pennsylvania conditions.

In cooperation with the department of zoology and entomology the department of agricultural and biological chemistry accordingly began in the autumn of 1934 a series of experiments to determine the best procedures for the removal of spray residues under Pennsylvania conditions. The work was done at Arendtsville, near the center of the Adams-Franklin fruit belt; this location was chosen because of the availability of suitable laboratory space in the branch laboratory of the department of zoology and entomology, and because of the availability of a number commercial orchards from which, through the cooperation of the owners and managers, samples were available for analyses and washing tests.

While the results apply strictly only to the 1934 conditions in this district, they furnish a valuable guide for apple washing in Pennsylvania.

## Results of Experiments

In order to cover all the work, summary statements will be made on each of the points studied.

**Type of Washers.**—The work conducted included a comparison of the flotation type of washer, specifically the homemade model designed by Mr. A. W. Clyde, State College, and a commercial underbrush machine, representative of this type of washer.

The underbrush machine, in which the apples are subjected to brushing while being washed with a spray of wash solution,

was more effective in removing spray residue than the flotation machine. The flotation machine, however, removed the residues nearly as well, and should be entirely satisfactory for a grower with a relatively light residue problem and a limited amount of money.

**Type of Washing Solution.**—Three general types of washing solutions were tested for their efficiency in removing spray residues; dilute hydrochloric acid, sodium silicate, and a mixture of sodium carbonate and soap. Of these three only the dilute solutions of hydrochloric acid were effective. The amount of residue removed varied directly with the strength of the hydrochloric acid, but equal removal of lead and arsenic was secured with a solution containing from 1.5 to 2.0 per cent by weight of hydrochloric acid.

The use of alkaline washes, such as sodium silicate, may be of value when heavy applications of oil are made to the fruit.

**Usefulness of Wetting Agents and Salt.**—Two of the most widely advertised brands of wetting agents[1] were tested to determine if the use of such materials increased the amount of lead and arsenic removed by hydrochloric acid solutions. No increase in the removal of lead was apparent from the use of these wetting agents; only a very small increase was apparent in the effectiveness of the arsenic removal. Four other wetting agents[2] were tested in a less extensive way and none of these were found to add to the effectiveness of residual removal.

The use of salt, often recommended as a fortifying agent with hydrochloric acid solutions, proved to be of little or no value in increasing the efficiency of the removal of either arsenic or lead.

**The Use of Heated Wash Solutions.**—Heating the wash solutions to approximately 100 degrees Fahrenheit was found effective in increasing the ease of removal of spray residues. A solution of hydrochloric acid containing 1 per cent by weight heated to 100 degrees was as effective in removing both lead and arsenic as a 2 per cent solution at 60 degrees Fahrenheit. Temperatures above 100 degrees F. are to be avoided because of possible injury to the fruit.

**Effect of Variety on Ease of Cleaning.**—There was apparently considerable difference between varieties of apples as regards ease of cleaning. Stayman Winesap cleaned most readily, followed in order by Grimes, Jonathan, and York; the most difficult varieties to clean are Albemarle Pippin (Yellow Newton) and Hubbardston, the latter proving by extended trials to be extremely difficult to clean.

**Effect of Washing on Keeping Quality.**—While the time between the washing tests and the writing of this paper has not been great enough to allow any extended investigation of the effect of the washing on the keeping quality of the fruit, certain facts appear certain. The use of insufficient rinse water after

[1]Areskap, Vatsol.
[2]Aresket (liquid), Aresket (solid), W-77, Aresklene. These are experimental products only.



acid washing is extremely dangerous, since it leads to calyx-end injury in storage. Contrary to the general opinion this injury may not be due to the acid itself, but to soluble arsenic set free by the acid, and is similar to calyx-end spray burn sometimes found in the field.

One of the wetting agents* used apparently tended to cause injury in storage, but the results are not yet complete enough to justify any conclusion on this point.

### Summary and Recommendations

It is difficult to make generalizations, but the following is a conservative statement of recommended practices if the tolerances for 1935 remain at substantially the same level as 1934 (arsenic 0.010 grain per pound; lead 0.019 grain per pound).

If possible through the proper timing of cover sprays, the residue level at harvest should be kept below 0.040 grain per pound for lead and 0.020 grain per pound for arsenic. In most varieties this residue will be brought below the tolerance by cold 1.5 per cent hydrochloric acid in a flotation washer. If a higher amount of residue is unavoidable, or in the case of certain varieties such as Hubbardston, if it is known that the waxy nature of the fruit makes residue removal difficult, a 1.5 per cent hydrochloric acid solution should be used, heated to 100 degrees Fahrenheit. This should take care of a lead residue up to approximately .075 grain per pound if used in a flotation washer, or higher if used in a brush washer. All of these recommendations are based on the use of lead arsenate alone or with stickers, but will not apply if any considerable amount of oil is used in the cover sprays.

## OLD FACTS OR NEW FANCIES

**H. E. HODGKISS, State College, Pa.**

The development of orchard insect suppression practices within our memory has been so rapid that we often forget the good things that have come to us in past years. Many of us however are prone to hark back to the good old days when insects according to reports were not so bothersome. Unfortunately perhaps those good old days are but fond memories. Yet during that period most if not all of the fundamentals we use today were in process of development.

More recently the most insistent demands on entomologists have been for something new. And in many instances where these requests were met the results have not been as satisfactory as it appeared they might have been. At the present time we are again taking stock of the situation and there appears to me to be a swing back to a more conservative viewpoint. There has been and is an idea prevalent that perhaps our insect control

*Aresket.

recommendations may need revision in the light of more recent knowledge in fruit insect control practices. This development has prompted me to choose the subject "Old Facts or New Fancies" for this discussion.

My own vision into the past is somewhat clouded by the tremendous developments in insect control of more recent years. In retrospect my time has been only too short. If we confine our discussion entirely to insect control practices rather than to the insects themselves perhaps we can travel a long distance in a short time. The underlying things that have withstood the marks of time are proper timing, correct materials, and thoroughness. The principal changes have been in materials advocated for the different uses. Many of these have become of proven worth; some gave much promise and ultimately were discarded while others came to be considered as effective for one or more purposes. These latter materials are looked upon as having their chief value as special rather than general purpose insecticides. Among them may be mentioned nicotine sulphate, spraying oils, tar oil combinations, calcium arsenate, fluorine compounds, and a host of other chemicals that have been used in one form or another.

Then too progress has been made in machinery to lighten the labor part of the suppression job. It is a far cry from the hand pump to the central spray plant. Many years elapsed between these improvements yet during the period, gas pressure sprayers, air pressure sprayers and other atomizer type machines have all had their day in court.

From the vermorel nozzle to the spray gun and to the multiple nozzle was another extended period. Yet a multiple type nozzle was discarded when the single nozzle spray gun was manufactured. There has been a growth period in the development of each and every tool and every insecticide and even in the development of the understanding of the critical periods during which apple insects are best controlled.

Perhaps I can illustrate the subject best by citing the developments in codling moth control as they have taken place in your own orchards. Methods that we now mention as supplements to codling moth spraying practices were in vogue before my time. No doubt many in this audience can recall the first use of tree scraping and banding as initial rather than secondary control practices for the apple worm or as we now refer to it, more correctly, the codling moth. Bands of burlap were advocated in those early years to trap the worms when they sought shelter for hibernation. They are used today, although the procedure is somewhat different. The self-killing band, or treated band is the most recent improvement and its value has already been proven. In between, there were numerous types suggested only to be discarded on account of inefficiency.

The chief use we made of codling moth bands in the last decade was as a means of catching larvae in the autumn so that they could be collected in the spring. These larvae were bred

for the purpose of forecasting the timing periods of codling moth cover sprays. The larvae were reared in vials or in corrugated paper strips placed in jars. The moth emergence indicated flight periods. This method was unreliable and while it served the purpose for the times a newer method of using pails containing sweetened water was developed and it has been found to be most accurate as an indicator of moth flight. Several apple growers on their own initiative have in the last few years hung bait pails in their orchards as a means of ascertaining the maximum periods of codling moth emergence. We were able last year to place a series of stations in seven counties for the purpose of ascertaining the differences in periods of moth flight for the entire State. Three orchardists in Franklin County and one in Lehigh placed traps in their orchards on their own initiative. Subsequently they offered the records to us for timing purposes. The department of zoology and entomology of the Experiment Station permitted free use of their records in Adams County. On account of these records being taken in the three counties, I did not consider a duplication necessary so that no attempt was made to place bait pails in the area where we had this cooperation. Flight records were taken in 15 orchards so located that for the first there is a true picture of the flight activities of codling moth in Pennsylvania. This was a cooperative venture and I wish to take this opportunity to express our appreciation for the courtesy the orchardists extended to us. Without this assistance the work could not have been accomplished.

A study of graphs prepared from the daily observations indicated that there were no wide fluctuations in periods of peak flights. Comparisons with spraying information dates also shows that the apples were protected during the critical periods. More complete stoppage of stings on apples could perhaps have been prevented by a closer spacing of sprays in the heavily infested orchards. In fact that was brought out in orchards where six or seven cover sprays were used by orchardists instead of the four covers ordinarily suggested.

Lead arsenate has been in use on apples for three decades. Some of you will recall the old home made preparation but with the commercial development of a standard product that earlier form was quickly superceded. Lead arsenate was originally sold as a paste with all its attended weaknesses. The dry powdered material has been a very welcome substitute. Improvements in texture, suspension in water and compounding with spreaders or stickers have been further attempts at perfecting the product. Other arsenical compounds have come and in turn have been discarded for apple insect control either on account of ineffectiveness against codling moth or foliage injury, or both. Lead arsenate is today the safest and most efficient arsenical insecticide that can be used on apples.

My first official contact with fruit growers was at the meeting of the Western New York Horticultural Society in 1905. At



that time I had no understanding of growers' problems or their difficulties in arriving at the solution of them. One point was brought out at that meeting that made a lasting impression. It was thoroughness in the application of spray materials.

There have been improvements in materials, methods, and timing as the years rolled along. But there has been no substitute for proper methods of application. If insecticides are put on thoroughly control is certain. When little attention is given to coverage the results are uncertain. This has been pointed out to you on numerous occasions, but there is no better illustration than the record of codling moth in five orchards where in 1933 the percentages of fruit damage from codling moth ranged from 40 to 86 per cent. This year owing to the thoroughness and timeliness of making the applications the infestations were reduced to either 0.1 per cent, 4.7 per cent, 14.8 per cent, 21 per cent or 64 per cent. The state-wide survey in 53 counties showed that in 171 orchards completely sprayed there were 2.5 per cent of the apples stung or wormy while the average damage in 132 poorly or partly sprayed was 16.8 per cent from codling moth alone.

The placement of tolerances for residual arsenic and lead that remain on apples at harvest and the removal of excess amounts of these chemicals is one of the new phases of control operations that at the present time is of importance to apple growers. Means by which tolerance limitations could be overcome have received attention through the use of reduced dosages of lead arsenate, lowering the dosage of the poison in the last cover spray, substituting calcium arsenate for lead arsenate and restricting spraying to a minimum number of cover sprays. The net result of these efforts was a continued increase in the infestation so that in 1934 we reverted to the older practice and started on a program to clean up the codling moth. It was expected that fruit so treated would need to be washed at harvest and that program was suggested.

At harvest 155 samples of apples were collected in 53 counties. The analyses for arsenic showed that 111 samples were below the tolerance, 7 equaled the tolerance and 37 or 23.9 per cent of them were above the tolerance. Residual lead was below the tolerance on 101 samples, equal to the tolerance on 3, and above the tolerance on 51 samples or 32.9 per cent of the number analyzed.

Brushing and washing practices were used by a number of orchardists to remove excess residues. A comparison of the two practices is given in Table 1 which indicates that of the two methods the brushes were the least dependable.

The relation of method of application to residual poisons on fruits was interesting in that it showed a wide range in percentages of fruit damage between good and poor control practices but the differences in averages of both residual arsenic and lead were unimportant.

Studies on insecticides designed to replace arsenate of lead are

progressing slowly. Much of the work has been with substitutes to take the place of the lead arsenate in late summer sprays. Again we see at close range the developmental stages. Some of the materials have not proven out and to date perhaps the summer oil-nicotine combination is the best for our use. However, before it can be recommended adjustments in spraying

Table 1.—Effects of Cleaning on the Residual Arsenic and Lead on Apples

| Orch. No. | Type of Cleaning Apparatus | Residue Analyses | | | | Differences | |
|---|---|---|---|---|---|---|---|
| | | Before Cleaning | | After Cleaning | | | |
| | | Ars. | Lead | Ars. | Lead | Ars. | Lead |
| 1 | Brush | .007 | .024 | .006 | .027 | —.001 | +.003 |
| 2 | Brush | .004 | .009 | .005 | .013 | +.001 | +.004 |
| 3 | Brush | .006 | .014 | .003 | .008 | —.003 | —.006 |
| 4 | Washer | .015 | .035 | .007 | .013 | —.008 | —.012 |

practice must be made. Its use following closely after lime sulphur is a subject for additional study so that we can be certain of its safeness to foliage if used following the regular heavy schedule of lime sulphur sprays.

The selection of an insect control program is not easy. Last year the use of powdered milk in late season sprays appeared to increase the difficulty of residue removal and the program will be modified somewhat in this respect. The outbreak of red spider in orchards where tar oil combination sprays were applied during the dormant period indicates a change in this respect. San Jose scale developed rather abundantly and care must be taken to keep it within bounds. Curculio is too large a factor in the eastern counties to be over looked. Apple maggot in a number of counties complicates the late season program.

With these old problems again confronting us should we not again take stock of the proven things and those which have caught our fancy for the moment? Extensive apple growers have demonstrated to their own satisfaction that codling moth can be controlled. You know how to get control of red spider, San Jose scale and curculio. Have there been any newer methods devised to give the same protection? In my opinion, no. Yet the door is open and sooner than we now expect our ideas on codling moth control and the suppression of other insects may undergo radical changes. Nevertheless there are three parts of the program that never will be revised. These are proper timing of sprays, the use of correct materials, and thoroughness in the application of insecticides. Together they form the basis on which all insect control practices are erected. These factors



must be satisfied whether our ideas of insect suppression are termed old or whether they can be designated as being new.

## Recommendations for 1935

It is suggested that on account of the weakened condition of trees subjected to extreme sub-zero temperatures during the winter of 1933-34 and to the extended drought period of the past few years attention should be given to these factors in order that additional harm will not result from applications of insecticides made during the dormant period of the trees.

The failure of tar oil-petroleum oil combinations to prevent excessive infestations of the European red mite, or red spider as it is often named; the increase in San Jose scale; and the difficulty some growers appear to have in controlling the rosy aphis have raised doubts in the minds of apple growers as to the selection of insecticides for these purposes.

In those counties where freezing injury was most serious or there is a probability of injury having been done by freezing or drought it will be advisable to use the lime sulphur-nicotine-lead combination in the delayed dormant period.

Some of these orchardists will need to use a petroleum spraying oil for red mite. Many of them may prefer a tar-oil for rosy aphis eggs. They should not attempt to combine the two in one application but decide which insect is the most serious in their orchard and then spray either for aphis eggs or for red mite eggs with one or the other of the materials.

Owners of large acreages of trees who may be unable on account of under-equipment to complete the delayed dormant spraying for rosy aphis before the leaves of the fruit buds expand can extend the time during which this work can be completed by using a dormant tar-oil, a semi-dormant cresyllic acid-oil emulsion, and finish with the delayed dormant lime sulphur-nicotine spray. It must be remembered that the materials other than the lime sulphur-nicotine do not replace the delayed dormant applications in the spray program.

Substitutes for lead arsenate in the control of codling moth where used have been more costly, less effective, and have presented residue removal difficulties that appear to raise a question as to their practicability. Powdered or liquid skim milk also increase the residue problem and for that reason it appears that they should not be included in the late summer sprays.

The spraying information letters should be read closely as these will contain variations from the standard practice as indicated by codling moth or other insect conditions within the several counties.

# FIRST STEPS IN ORCHARD SOIL FERTILITY RECOVERY

R. D. ANTHONY, State College, Pa.

Apple tree planting in Pennsylvania reached the peak about 1915 and then dropped rapidly during the next ten years. In 1920 there were more trees of non bearing age in Adams County than there were bearing trees and in the entire state there were less than three bearing trees to each young tree. In other words, up to the present time cultural problems in general have been those of young orchards; now, with a large group of orchards which are 20 or more years old, we have to consider the problems of mature trees and in some respects we find these problems are quite different. While the ground was not too heavily shaded and while there was yet soil unoccupied by tree roots, cover crop or sod growth was heavy enough to maintain a fair supply of humus in the soil. Where there was a considerable quantity of fairly fertile soil into which new roots could push vigorously each year, tree growth and yield was satisfactory even with treatments which under more rigorous conditions proved to be undesirable. When shading and root crowding became such serious factors that satisfactory soil covers could not be maintained and the humus supply in the soil began to drop down, then tree growth and yield also began to slow up. The close planting which was common 20 years ago has resulted in the soil being completely occupied by roots just so much quicker and has accentuated problems of soil depletion.

**Using Sod to Build Soil Fertility.** It is fortunate that the oldest Experiment Orchard at State College was planted several years ahead of the peak of orchard planting in the state. Because this orchard is well started on its second quarter century we are having an opportunity to study here some of the problems of maturity before they have become acute in a large area in the state.

One of the most serious of these problems of maturity and one which also may be more acute with old age is that of maintaining a sufficient supply of organic matter in the apple orchard soil to sustain a desirable tree growth and yield. The history of certain blocks in the Experiment Orchard throws much light on several of the problems connected with the organic matter supply in the soil. This report is a brief presentation of the story of these blocks.

When this orchard was planted in 1908 one series of 16 blocks of a dozen trees each was placed under annual cultivation with non-legume cover crops. Every fourth block received no fertilizer as a check, the other blocks were given different fertilizer treatments. Plot 1, a check, was on a slope and suffered some erosion. Plot 7, also a check, was in a low area where the soil was more fertile than in the rest of the orchard. Plot 12, which received a complete fertilizer since 1912, was at the top of a

slight ridge where the soil was thin. Plot 13, another check, was on this same ridge and similar to Plot 12, but on the average the soil was probably better than in Plot 1 though much poorer than in Plot 7. Table 1 gives the yields of these plots through 1927 and is an expression of their relative fertility at that time.

Table 1. Yield Through 1927 of Trees Planted in 1908

| | | Pounds per tree |
|---|---|---|
| Plot 1 | Check | 2200 |
| Plot 7 | Check | 3154 |
| Plot 12 | NPK | 3178 |
| Plot 13 | Check | 2742 |

In the summer of 1928, when these trees were in their 21st year, Plots 13-16 were seeded to a blue grass sod and all tree squares were given 10 pounds of nitrate of soda. At that time no change was made in the other blocks in the series. Before this change, Plot 13 had been decreasing rapidly in fertility; the cover crops were seriously injured by dry weather and the soil was becoming thin and hard; branch growth was short and the leaf color indicated that there was very little nitrogen available in the soil. The change in this plot with the establishing of a heavily nitrated sod was most remarkable. The leaf color became a healthy deep green; branch growth increased rapidly; and the yield began to pick up.

In the fall of 1930 the sod was plowed and the first week in June, 1931, a cover crop of millet was seeded in all the original 16 plots. This year also Plot 13 received the usual 10 pounds of nitrate of soda to the tree square. Table 2 gives the green weight of this cover reduced to an acre basis.

Table 2. Green Weights of 1931 Cover Crop

| | | Pounds per acre |
|---|---|---|
| Plot 1 | Check | 2580 |
| Plot 7 | Check | 3795 |
| Plot 12 | NPK | 12363 |
| Plot 13 | Sod plus N | 7342 |

Whereas in 1927 Plot 13 had been below Plot 7 in fertility as indicated by yield and was falling back rapidly, it now had nearly twice as much cover crop as Plot 7 and was beginning to catch up with Plot 12 which had been heavily fertilized since 1912.

The blue grass sod was re-established in 1932 and the fertilizer continued. In the spring of 1933 and again in 1934 this sod was checked by harrowing but this did not prevent a heavy growth of blue grass developing each summer. Each year these trees have shown gains in leaf color, tree growth and yield until now to the eye they are the equal of the adjoining Plot 12. Table 3, however, shows that while 13 had passed Plot 7 which for many years was the best plot in the orchard, it has not yet



equaled the cultivated trees which received a complete fertilizer since 1912. The yields in 1934 emphasized this statement. The trees in the fertilized sod last year averaged slightly over 10 bushels, the adjoining trees under cultivation with annual fertilization averaged a bushel more, while those in Plot 7 bore less than five bushels. Thus a plot which had become so unproductive from years of cultivation with deficient cover crops that the trees were a liability instead of an asset, in seven years under a fertilized sod rotation had become moderately profitable. We should not lose sight of the fact that the soil management cost no more with the profitable than with the unprofitable system.

Table 3. Yield and Branch Growth

| | | Total Yield 1928-34 lbs. per tree | Total Branch Growth 1929-33 inches |
|---|---|---|---|
| Plot 1 | Check | 1953* | 17.7 |
| Plot 7 | Check | 2549 | 20.3 |
| Plot 12 | NPK | 3339 | 27.5 |
| Plot 13 | Sod plus N | 2605 | 23.7 |

## Effect of Sod Residues on Holding Rainfall

In the fall of 1929 a 10-year sod was broken in a block of 90 trees then 22 years old. The series of fertilizer tests described above adjoined this sod block. The first week in June, 1930, the sod block and the fertilizer blocks were seeded to millet. The most successful treatment in the fertilizer series was that where nitrogen and phosphate were applied together. This was the treatment in Plot 2. Directly across a driveway from Plot 2 in the sod block were two rows, one of which had received five pounds of nitrate of soda per tree square for 10 years while the other had never received any fertilizer. When these rows were plowed the fertilizer row had a heavy blue grass sod, the unfertilized row a rather thin, mixed sod but with a fair amount of volunteer clover.

During 1930, there was a moisture deficiency of about 15 inches. By mid-August nearly all the millet in Plot 2 of the fertilizer series was killed, especially in the higher portion where the sod was thin. In the sod block where nitrogen had been used regularly the millet was over 30 inches tall and in healthy condition. More surprising than this, in the row where the unfertilized sod had been turned under, the millet was nearly as tall and as vigorous as where the fertilized sod had been plowed.

In other words, turning under a very ordinary sod made it possible for the soil to hold such a large part of the winter rains and snows that a sufficient moisture reservoir was erected to grow a heavy cover; while 21 years of fertilized cover crops did not prevent the soil from puddling to such an extent that much

*This treatment was changed in the spring of 1934 but the change did not materially affect the yield of that year.

of the rain and melting snows washed down the slight slope and the plot suffered seriously from drought. Table 4 shows the weight of cover crops in these various plots. Two records are given for Plot 2, one at the top of the slope where the soil is thin, the other at the bottom where the soil is deep and moisture conditions most favorable.

Table 4. Sod Residues Hold Rainfall to Grow Cover Crops

| | | Green Weights of 1930 Cover Crop lbs. per acre |
|---|---|---|
| Plot 2 | Annual cultivation plus NP—shallow soil | 1559 |
| | Annual cultivation plus NP—deep soil | 4676 |
| Following 10 years of sod with 5 lbs. nitrate of soda each year | | 7203 |
| Following 10 years of sod—no fertilizer | | 6558 |

## Green Manures

In these two cases we have examples of the beneficial results from turning sod residues into the soil, particularly when those sods have been increased by proper fertilization. But there are many orchards where this is not feasible either because the shade from too closely planted trees prevents a desirable sod growth or because the fertility of the soil has become so low that the use of fertilizers alone will not enable a sod to make a satisfactory growth. What should be done in such cases? Again let us turn to the Experiment Orchard at State College.

At the end of 1933 when this orchard had completed 26 years of growth, most of those plots which had received annual cultivation with non-legume cover crops without nitrogen fertilization were in a seriously depleted condition. In fact trees were beginning to die from what could only be described as starvation. In some of these areas sheet erosion had become so serious that little was left of the surface soil. It seemed hopeless to attempt to build up such a soil by the use of fertilizers and cover crops in time to save the trees. Of course, a heavy application of barnyard manure would be the usual treatment for such spots on the farm. However, few fruit growers have manure or can secure it readily so some other solution seemed necessary. It was decided to grow the equivalent of a cover crop outside the orchard, to cut it early enough so that it would have a fairly high nitrogen content, to bring it into the orchard while still fresh and to disc it into the ground. This, of course, would have to be done in early summer. It was also decided to compare such a treatment with a winter application of manure.

Early in 1934 fresh barnyard manure was spread at the rate of five tons to the acre on Plots 1 and 4, both checks, in the fertilizer series, and on another block of considerably larger area which also had received annual cultivation, a non-legume cover



crop and no fertilizer for 26 years and which was in poorer condition than either Plots 1 or 4. Early in June a mixture of sweet clover and alfalfa growing in a field near the orchard was cut and immediately spread over Plot 5 and 6 of the old fertilizer series at the rate of five tons of green cover per acre. These last two plots had been fertilized regularly with phosphorus and potash but had become less productive than the checks on either side. In early spring all the tree squares in Plots 1, 4, 5 and 6 receive five pounds of nitrate of soda, five pounds of superphosphate and one pound of muriate of potash. As soon as the clover and alfalfa was spread, all these blocks were thoroughly disced and seeded to a mixed cover crop containing several clovers and other legumes and millet. Plot 2 which had received nitrate and phosphate since the trees were planted and Plot 7, the check in a very fertile area, were left unchanged but were seeded with the same cover crop.

Table 5. Effect on Cover Crop Growth of Adding Barnyard Manure and Green Manure to a Depleted Soil

All blocks under annual cultivation since 1908; non legume covers 1908-33; mixed covers 1934.

| | Treatment | | Weight in pounds of Green Cover per Acre | |
|---|---|---|---|---|
| | 1908-33 | 1934 | Total 1929-33 | 1934 |
| Plot 2 | NP | NP | 34346 | 10212 |
| Plot 3 | NK | NPK | 38361 | 7166 |
| Plot 4 | Nothing | Barnyard manure —NPK | 12846 | 12566 |
| Plot 5 | PK | Clover—NPK | 13446 | 12906 |
| Plot 6 | PK | Clover—NPK | 13446 | 12906 |
| Plot 7 | Nothing | Nothing | 19062 | 6092 |

In a very short time it was apparent that both the barnyard manure and the green manure were having a profound effect on the cover crop and the tree growth. By the end of the summer the plots receiving these treatments had the heaviest cover crop that they had produced in many years if not the heaviest since the orchard was planted. Table 5 shows the weight of the cover in the various plots. Plot 2 which received nitrate of soda and super phosphate and Plot 7, a check, were continued through 1934 without change so the cover crop growth here as compared to the total cover crop growth for the previous five years is a good index of the effect of the 1934 season on cover crop growth. The past season has been a little better than average. In Plot 3 where nitrogen and potash had been used since the orchard was planted and where phosphorus was added in 1934 the relation of the 1934 cover to the cover crops of the previous five years was about the same as in Plot 2. In the plots where barnyard manure was used the 1934 cover was as heavy as the total of all the cover crops for the previous five years and turning under the green sweet clover and alfalfa

was just as effective as using barnyard manure. The effect on tree growth was as extreme and as surprising as on the cover crop. Trees which had made almost no growth for years, last summer had dark green leaves and made a heavy growth of sprouts along the bare branches as well as good terminal growth. Another year or two of these treatments promise to bring these trees back into profitable production*.

QUESTION: Will straw do as well as green manure?

DR. ANTHONY: The minute you bring something in from outside you start a rotting process. We brought in green manure high in nitrogen. That material was spread and rotted very rapidly making a tie-up with the nitrogen of the soil. If we had brought in straw we would have checked the trees that year more than no treatment. It would have taken nitrogen out of the soil the first year and the trees would have had to wait until the second year for any benefit from the material brought in. If you do use outside material bring in enough nitrogen to rot this without taking nitrogen from the soil.

QUESTION: Is chicken manure as good as barnyard manure?

DR. ANTHONY: This should be used only in moderation. Chicken manure mixed with straw would be fine.

## THE FARM CREDIT ADMINISTRATION AND THE FRUIT GROWER

**F. B. BOMBERGER, President, Baltimore Bank for Cooperatives, Baltimore, Md.**

In the twenty months since its inception, the Farm Credit Administration has met emergency credit needs of American farmers by making loans at an average of over five million dollars ($5,000,000.00) a day for every day in the year; while at the same time it has created a thoroughly coordinated system of farm credit that is adapted to the requirements of American agriculture, that is cooperative in character and operation, that will ultimately be controlled by the farmers who borrow under it, and that will be financed from funds derived from the investing public and not by subsidies from the public treasury.

This was the message delivered by Doctor F. B. Bomberger, President of the Baltimore Bank for Cooperatives, in his address before the Pennsylvania State Horticultural Association at its 76th anniversary meeting, held in the Farm Show Building at 2:00 o'clock P. M., on January 23rd, 1935, in Harrisburg, Pennsylvania. The system is truly cooperative, he said, and all of its features have been developed with the object in view of putting into the hands of the farmer the financing of his credit requirements to help the farmer to help himself.

*In an off-the-floor discussion, several Luzerne County growers cornered the secretary and argued that from their own observations, many of these trees would not continue to perk up, but would presently go into a permanent slump. Time will tell; we are all open-minded in searching for the facts. Bear in mind the fact that this talk concerns the first steps only.

The credit system of the United States has not always been adapted to the requirements of agriculture. The system was devised to meet the needs of commerce and industry. When agriculture developed into a definite business operating on a commercial, and in some instances an industrial scale, the need for a credit system especially adapted to the requirements of agriculture became very great. The 30-60-90 day note system, admirably adapted for industry and commerce, was not suited to the needs of agriculture. This need was recognized long ago, but it was not until 1917 that the Congress of the United States, in establishing the Federal Farm Loan System, laid the first stone in the structure of permanent cooperative agricultural credit for American agriculture. The establishment of the Federal Land Banks, by means of which credit was provided upon the basis of long time farm mortgages, did not meet the requirements for short term credit; consequently, in 1923 Congress established the Federal Intermediate Credit Banks, one of which was located in each Land Bank District. The primary purpose of the Federal Intermediate Credit Banks was to re-discount notes of farmers placed in the commercial banks and to make direct loans to cooperative associations.

The continued decline of agricultural prices which had begun in 1920 led to various laws intended to provide relief for agriculture. From time to time the Congress of the United States enacted laws providing for seed and feed loans for the relief of farmers suffering from droughts, floods, etc. In 1929 the Agricultural Marketing Act was passed, setting up the Federal Farm Board, to make loans to cooperative associations and to conduct stabilization operations in cotton and grain. In 1932 the Regional Agricultural Credit Cooperations were provided for under the administration of the Reconstruction Finance Corporation.

In 1933, therefore, there were five separate credit agencies operating under the authority of the Government, each maintaining its own policy with resulting duplication, conflict of policies, waste of time, effort and money. The establishment of the Farm Credit Administration under the provisions of the Farm Credit Act of 1933, was to coordinate the operation of all of these various credit activities and to make the credit facilities of the Government more nearly adequate to the needs of agriculture. The Farm Credit Administration is thus only about 20 months of age. It was established by the first Executive Order signed by President Roosevelt, which became effective May 27th, 1933. In the period that has elapsed a purely amazing amount of credit work has been done by the agencies of the Farm Credit Administration.

In an address by William I. Myers, Governor of the Farm Credit Administration, before the Agricultural Commission of the American Bankers Association in October, 1934, he made the statement that "we have received to date 852,000 applications for mortgage loans aggregating $3,800,000,000.00. This



number is something more than ⅛ of all the farms in the United States, perhaps ¼ of the farmers that have mortgages. We have closed during this same period in round numbers 515,000 mortgage loans for $1,320,000,000.00 in addition to the loans closed we have approved 160,000 applications for just under $500,000,000.00." During this same period there was being set up a system of Production Credit Associations and Regional Banks for Cooperatives, one of each being established in each of the Federal Land Bank Districts. The result was that in 1934 a larger volume of credit was extended to American farmers on a cooperative basis than ever before in the history of the country. The amount of money loaned by the Farm Credit Administration averaged over $5,000,000.00 a day for every day in the year.

The system established under the Farm Credit Administration provides in each of the 12 Federal Land Bank Districts for a Federal Land Bank, a Federal Intermediate Credit Bank, a Production Credit Corporation and a Bank for Cooperatives. All of these are coordinated under a General Agent and administratively responsible to the Farm Credit Administration in Washington, which is administered by a Governor and two Deputy Governors and four appropriate Divisions responsible for the administration of each of the different agencies. The Production Credit Corporations provide for the financing of production credit associations, which lend money to farmers for production purposes, the farmers' notes, together with adequate collateral, being taken in return for such credit. These notes are re-discounted with the Federal Intermediate Credit Banks of the respective Land Bank Districts. The Banks for Cooperatives make loans to cooperative associations of producers of agricultural commodities for the purpose of processing and marketing such commodities and for processing, handling and distribution of farm supplies.

A review of the system thus briefly outlined indicates, first of all, that it is designed to meet the credit requirements of agriculture. There are appropriate institutions to provide credit for short term production operations, through Production Credit Associations; for the financing of intermediate credit requirements extending from six months to three years through Intermediate Credit Banks; to finance and purchase and equipment of the farm by long time loans negotiated through the Federal Land Banks, and to provide operating capital for cooperative associations of farmers who desire to market their commodities and purchase their supplies in a collective way.

The next feature of significance in connection with the credit system functioning under the Farm Credit Administration is the fact that it is practically a cooperative system. The National Farm Loan Association, through which the farmer receives his loan from the Federal Land Bank, is a cooperative organization, the individual farmer being required to invest 5% of his loan in the stock of the Association. The Production Credit Associations are likewise cooperative, there being a similiar require-

ment with regard to the investment by the borrower in the stock of the Credit Association. While the Federal Intermediate Credit Banks are not themselves cooperative agencies, they are designed primarily to rediscount the notes of cooperative associations and the notes taken by the Production Credit Associations from individual farmers. The Banks for Cooperatives, as their name implies, are limited in their operations to making loans to cooperatives only, and the Associations are required to take stock in the Banks in proportion to the volume of their respective loans.

The cooperative feature of the credit system established under the Farm Credit Administration is emphasized by the fact that the management and control of its credit agencies are lodged in the hands of the farmers who borrow from them. The National Farm Loan Associations and the Production Credit Associations consist of farmers who are borrowers; they elect their own officers, employ their own loan committees and in general, conduct the affairs of these organizations without control from any outside source. The same is true of the Cooperative Associations who borrow through the Regional Banks for Cooperatives. Three members of the Boards of Directors who control the credit agencies in the several Land Bank Districts are elected directly by the members of the National Farm Loan Associations, the Production Credit Associations, and the borrowers from the Banks for Cooperatives.

Another feature worthy of consideration is that, while all of these credit institutions in one way or another have been provided with initial capital by the Federal Government, the loans made by them are not from Government funds. The Federal Land Banks receive funds from the investing public by selling bonds secured by the mortgages taken as security for the loans made to individual farmers through the Farm Loan Associations. The funds received by the Production Credit Associations, through rediscounting the notes of its members in the Federal Intermediate Credit Banks are obtained by the sale to the general public of debentures of the Federal Intermediate Credit Banks.

As has already been stated, each borrower from the Federal Land Bank, or from the Production Credit Corporation or from a Regional Bank for Cooperatives, must invest 5% of his loan in the stock of these respective organizations. It is evident, therefore, that ultimately these credit institutions operating under the Farm Credit Administration should be operated on a cooperative basis, upon capital secured from the investing public, and should gradually feel less and less the need for the emergency support which the Government has felt necessary to extend to them during the depression that has prevailed since 1933. The system will thus become farmer-owned and farmer-controlled and will be adapted in every respect to the requirements of American agriculture.



## GABRIEL HIESTER AWARD

| | | | |
|---|---|---|---|
| **Number of Exhibitors in County Exhibit:** | | | **50 Points Possible** |
| Lancaster | 17 | | 34 points |
| Franklin | 25 | | 50 points |
| Adams | 17 | | 34 points |
| Chester | 7 | | 14 points |
| **Number of Exhibits:** | | | **50 Points Possible** |
| Lancaster | 91 | | 35 |
| Franklin | 121 | | 47 |
| Adams | 60 | | |
| Chester | 129 | | 50 |
| | Totals: | Franklin | 97 (1) |
| | | Lancaster | 69 (2) |
| | | Chester | 64 (3) |

**State Horticultural Association Cup.** Best Bushel in the Show (Stayman)—C. P. Barnard, Kennett Square, Chester County.

## APPLE EXHIBIT LIST—1935

**CLASS 67—For best exhibit of one box each of standard commercial varieties:**

| Variety | Exhibitor | Address | County | Place |
|---|---|---|---|---|
| Baldwin | Ira A. Hottenstein | Lehighton RD 3 | Carbon | 2 |
| Baldwin | Allen Jayne | West Auburn | Susquehanna | 1 |
| Delicious | C. B. Snyder | Ephrata | Lancaster | 3 |
| Delicious | Guy L. Hayman | Northbrook | Chester | 1 |
| Delicious | Ira Hottenstein | Lehighton RD 3 | Carbon | 2 |
| Grimes | H. R. Worthington | West Chester | Chester | 1 |
| Grimes | Guy L. Hayman | Northbrook | Chester | 2 |
| McIntosh | Geo. Goodling | Loganville | York | 1 |
| McIntosh | Allen Jayne | West Auburn | Susquehanna | 2 |
| N. Spy | Ira Hottenstein | Lehighton RD 3 | Carbon | 1 |
| Paragon | H. R. Worthington | West Chester | Chester | 1 |
| Rome | Walter D. Robinson | Elliottsburg | Perry | 3 |
| Rome | Guy L. Hayman | Northbrook | Chester | 2 |
| Rome | Geo. A. Goodling | Loganville | York | 1 |
| Smokehouse | H. R. Worthington | West Chester | Chester | 2 |
| Smokehouse | C. B. Snyder | Ephrata | Lancaster | 3 |
| Smokehouse | Geo. A. Goodling | Loganville | York | 1 |
| Stark | H. R. Worthington | West Chester | Chester | 3 |
| Stark | D. A. Brubaker | Ephrata | Lancaster | 2 |
| Stark | Geo. A. Goodling | Loganville | York | 1 |
| Stayman | H. R. Worthington | West Chester | Chester | 3 |
| Stayman | C. B. Snyder | Ephrata | Lancaster | 2 |
| Stayman | Guy L. Hayman | Northbrook | Chester | 1 |

**CLASS 68—For best single box, any variety not mentioned in Class 67:**

| | | | | |
|---|---|---|---|---|
| Nero | H. R. Worthington | West Chester | Chester | 2 |
| Opalescent | Geo. Goodling | Loganville | York | 3 |
| Wagner | Allen Jayne | West Auburn | Susquehanna | 1 |

**CLASS 69—For best Bushel, Standard Commercial Varieties.**

| | | | | |
|---|---|---|---|---|
| Baldwin | Trexler Farm | Allentown | Lehigh | 2 |
| Baldwin | Ira Hottenstein | Lehighton | Carbon | 3 |
| Baldwin | Allen Jayne | West Auburn | Susquehanna | 1 |

| Variety | Exhibitor | Address | County | Place |
|---|---|---|---|---|
| Gano | Guy L. Hayman | Northbrook | Chester | 1 |
| Cortland | W. E. Bates | Stevensville | Bradford | 2 |
| Cortland | Masonic Homes | Elizabethtown | Lancaster | 3 |
| Delicious | H. S. Nolt | Columbia | Lancaster | 1 |
| Delicious | Guy L Hayman | Northbrook | Chester | 2 |
| Grimes | H. R. Worthington | West Chester | Chester | 3 |
| Grimes | Guy L. Hayman | Northbrook | Chester | 2 |
| Grimes | Geo. Goodling | Loganville | York | 1 |
| G. Del. | Treesdale Farm | Mars | Allegheny | 1 |
| G. Del. | John Lucabaugh | Hanover | Adams | 2 |
| G. Del. | Stewart Lucabaugh | Hanover | Adams | 3 |
| Jonathan | Treesdale Farm | Mars | Allegheny | 1 |
| Jonathan | Guy L. Hayman | Northbrook | Chester | 3 |
| Jonathan | Stony Ridge Orchards | Dryville | Berks | 2 |
| McIntosh | Geo. Goodling | Loganville | York | 1 |
| McIntosh | Allen Jayne | West Auburn | Susquehanna | 2 |
| McIntosh | Shaffer Bros. | Gravity | Wayne | 3 |
| N. Spy | Shaffer Bros. | Gravity | Wayne | 1 |
| Paragon | H. R. Worthington | West Chester | Chester | 1 |
| Paragon | Trexler Farm | Allentown | Lehigh | 2 |
| R. I. Green. | D. L. Wagner | Easton | Northampton | 1 |
| R. I. Green. | Shaffer Bros. | Gravity | Wayne | 2 |
| Rome | Trexler Farms | Allentown | Lehigh | 1 |
| Rome | Guy L. Hayman | Northbrook | Chester | 3 |
| Rome | Hershey Estate | Hershey | Dauphin | 2 |
| Smokehouse | H. R. Worthington | West Chester | Chester | 1 |
| Smokehouse | S. L. Smedley, Jr. | Newtown Square | Delaware | 3 |
| Smokehouse | Geo. Goodling | Loganville | York | 2 |
| Stark | H. W. Worthington | West Chester | Chester | 1 |
| Stark | Geo. Goodling | Loganville | York | 3 |
| Stark | Hershey Estate | Hershey | Dauphin | 2 |
| Stayman | H. R. Worthington | West Chester | Chester | 2 |
| Stayman | Trexler Farms | Allentown | Lehigh | 3 |
| Stayman | C. P. Barnard | Kennett Square | Chester | 1 |
| Winesap | H. R. Worthington | West Chester | Chester | 2 |
| Winesap | S. L. Smedley, Jr. | Newtown Square | Delaware | 3 |
| Winesap | R. C. McDonald | Shippensburg | Franklin | 1 |
| Wagener | Allen Jayne | West Auburn | Susquehanna | 1 |
| York | H. R. Worthington | West Chester | Chester | 1 |
| York | D. L. Wagner | Easton | Northampton | 2 |

**CLASS 70—For the best exhibit of one bushel basket, variety not mentioned 69:**

| | | | | |
|---|---|---|---|---|
| Vandivere | C. B. Snyder | Ephrata | Lancaster | 1 |
| McCoun | Shaffer Bros. | Gravity | Wayne | 2 |
| Linde | Trexler Farms | Allentown | Lehigh | 3 |

**CLASS 71—For best plate of 5 Specimens of Standard Commercial varieties:**

| | | | | |
|---|---|---|---|---|
| Baldwin | Trexler Farms | Allentown | Lehigh | 2 |
| Baldwin | Ira Hottenstein | Lehighton | Carbon | 1 |
| Baldwin | John Derr | Catawissa | Columbia | 3 |
| Ben Davis | Chas. Dixon | St. Thomas | Franklin | 1 |
| Ben Davis | W. O. Bingham | St. Thomas | Franklin | 3 |

| Variety | Exhibitor | Address | County | Place |
|---|---|---|---|---|
| Ben Davis | Billie Dixon | St. Thomas | Franklin | 2 |
| Gano | A. H. Bingham | St. Thomas | Franklin | 1 |
| Gano | Chas. Dixon | St. Thomas | Franklin | 2 |
| Gano | C. F. Gillan | St. Thomas | Franklin | 3 |
| Cortland | Treesdale Farm | Mars | Allegheny | 1 |
| Cortland | Shaffer Bros. | Gravity | Wayne | 3 |
| Cortland | John Derr | Catawissa | Columbia | 2 |
| Delicious | Masonic Homes | Elizabethtown | Lancaster | 3 |
| Delicious | Guy L. Hayman | Northbrook | Chester | 2 |
| Delicious | John T. Mitterling | Mt. Pleasant Mills | Snyder | 1 |
| G. Del. | B. M. Kleppinger | Zionsville | Lehigh | 3 |
| G. Del. | Stewart Lucabaugh | Hanover | Adams | 2 |
| G. Del. | Treesdale Farms | Mars | Allegheny | 1 |
| Grimes | W. O. Bingham | St. Thomas | Franklin | 2 |
| Grimes | Geo. Goodling | Loganville | York | 1 |
| Grimes | A. L. Kauffman | Bird-in-Hand | Lancaster | 3 |
| Jonathan | Trexler Farms | Allentown | Lehigh | 2 |
| Jonathan | Treesdale Farms | Mars | Allegheny | 1 |
| Jonathan | W. O. Bingham | St. Thomas | Franklin | 3 |
| McIntosh | P. R. Seifert | Nazareth | Northampton | 2 |
| McIntosh | Trexler Farms | Allentown | Lehigh | 1 |
| McIntosh | Allen Jayne | West Auburn | Susquehanna | 3 |
| N. Spy | Treesdale Farms | Mars | Allegheny | 1 |
| N. Spy | Dr. J. S. Kendig | Salunga | Lancaster | 3 |
| N. Spy | Shaffer Bros. | Gravity | Wayne | 2 |
| Paragon | H. R. Worthington | West Chester | Chester | 2 |
| Paragon | Chas. Dixon | St. Thomas | Franklin | 3 |
| Paragon | W. O. Bingham | St. Thomas | Franklin | 1 |
| R. I. Green. | P. R. Seifert | Nazareth | Northampton | 2 |
| R. I. Green. | Wm. H. Schwartz | Hegins | Schuylkill | 3 |
| R. I. Green. | Shaffer Bros. | Gravity | Wayne | 1 |
| Rome | Trexler Farms | Allentown | Lehigh | 1 |
| Rome | R. C. McDonald | Shippensburg | Franklin | 3 |
| Rome | Billie Dixon | St. Thomas | Franklin | 2 |
| Smokehouse | Treesdale Farms | Mars | Allegheny | 2 |
| Smokehouse | Daniel Rice & Son | Elliotsburg | Perry | 3 |
| Smokehouse | Geo. Goodling | Loganville | York | 1 |
| Stark | H. R. Worthington | West Chester | Chester | 1 |
| Stark | Trexler Farms | Allentown | Lehigh | 3 |
| Stark | Daniel Brubaker | Ephrata | Lancaster | 2 |
| Stayman | Guy L. Hayman | Northbrook | Chester | 1 |
| Stayman | C. P. Barnard | Kennett Square | Chester | 2 |
| Stayman | Richard Barnard | Kennett Square | Chester | 3 |
| Winesap | R. C. McDonald | Shippensburg | Franklin | 2 |
| Winesap | McDonald Orc'rd Co. | Shippensburg | Franklin | 1 |
| Winesap | D. M. Wertz | Waynesboro | Franklin | 3 |
| Wagener | Wm. H. Schwartz | Hegins | Schuylkill | 2 |
| Wagener | Allen Jayne | West Auburn | Susquehanna | 1 |
| Wagener | John Derr | Catawissa | Columbia | 3 |
| W. Banana | C. B. Snyder | Ephrata | Lancaster | 2 |
| W. Banana | Guy L. Hayman | Northbrook | Chester | 1 |
| W. Banana | Ira Hottenstein | Lehighton | Carbon | 3 |
| York, | Ira Hottenstein | Lehighton | Carbon | 1 |
| York | Taylor Goshorn | Quincy | Franklin | 2 |
| York | Owen Morgentahl | Quincy | Franklin | 3 |

**CLASS 72—For the best plate of 5 specimens of each of following varieties:**

| | | | | |
|---|---|---|---|---|
| Belleflower | P. R. Seifert | Nazareth | Northampton | 2 |
| Fallawater | Kleppinger Orchards | Zionsville | Lehigh | 3 |
| Fallawater | A. E. Reist | Palmyra | Lebanon | 1 |



| Variety | Exhibitor | Address | County | Place |
|---|---|---|---|---|
| Fallawater | P. R. Seifert | Nazareth | Northampton | 2 |
| Fall Pippin | C. B. Snyder | Ephrata | Lancaster | 1 |
| Fameuse | John Derr | Catawissa | Columbia | 1 |
| Hubbardston | Daniel Rice & Son | Elliotsburg | Perry | 3 |
| Hubbardston | R. J. Gillan | St. Thomas | Franklin | 2 |
| Hubbardston | G. G. Gillan | St. Thomas | Franklin | 1 |
| Nero | H. R. Worthington | West Chester | Chester | 1 |
| N.W.Green. | P. R. Seifert | Nazareth | Northampton | 2 |
| N.W.Green. | R. C. McDonald | Shippensburg | Franklin | 1 |
| N.W.Green. | W. O. Bingham | St. Thomas | Franklin | 3 |
| Oliver | Masonic Homes | Elizabethtown | Lancaster | 1 |
| Opalescent | Geo. Goodling | Loganville | York | 1 |
| Opalescent | A. E. Reist | Palmyra | Lebanon | 2 |
| Opalescent | Geo. Lincoln | Clarks Summit | Lackawanna | 3 |
| Paradise S. | C. B. Snyder | Ephrata | Lancaster | 1 |
| Paradise S. | R. J. Gillan | St. Thomas | Franklin | 2 |
| Paradise S. | C. F. Gillan | St. Thomas | Franklin | 3 |
| Rambo | J. W. Bruckhart | Lititz | Lancaster | 2 |
| Rambo | C. B. Snyder | Ephrata | Lancaster | 1 |
| Rambo | Wm. Lott | Gardners | Adams | 3 |
| Sutton | J. N. Hainley | Ephrata | Lancaster | 2 |
| Sutton | Daniel Brubaker | Ephrata | Lancaster | 3 |
| Sutton | John Derr | Catawissa | Columbia | 1 |
| King | J. N. Hainley | Ephrata | Lancaster | 3 |
| King | D. L. Wagner | Easton | Northampton | 2 |
| King | John Derr | Catawissa | Columbia | 1 |
| Mann | John Derr | Catawissa | Columbia | 1 |
| Wealthy | C. B. Snyder | Ephrata | Lancaster | 2 |
| Wealthy | Shaffer Bros. | Gravity | Wayne | 3 |
| Wealthy | Wm. Lott | Gardners | Adams | 1 |

**CLASS 73—For best 16 apples of each variety mentioned in Class 69:**

| | | | | |
|---|---|---|---|---|
| Baldwin | Trexler Farms | Allentown | Lehigh | 1 |
| Baldwin | Ira Hottenstein | Lehighton | Carbon | 3 |
| Baldwin | Allen Jayne | West Auburn | Susquehanna | 2 |
| Ben Davis | L. F. Graver | Lehighton | Carbon | 2 |
| Ben Davis | W. O. Bingham | St. Thomas | Franklin | 1 |
| Cortland | Shaffer Bros. | Gravity | Wayne | 1 |
| Delicious | Kleppinger Orchards | Zionsville | Lehigh | 2 |
| Delicious | Guy L. Hayman | Northbrook | Chester | 1 |
| Delicious | C. P. Barnard | Kennett Square | Chester | 3 |
| Grimes | Guy L. Hayman | Northbrook | Chester | 3 |
| Grimes | D. L. Wagner | Easton | Northampton | 2 |
| Grimes | Trexler Farms | Allentown | Lehigh | 1 |
| G. Delicious | John Lucabaugh | Hanover | Adams | 1 |
| G. Delicious | Stewart Lucabaugh | Hanover | Adams | 3 |
| G. Delicious | A. L. Kauffman | Bird-in-Hand | Lancaster | 2 |
| Gano | W. O. Bingham | St. Thomas | Franklin | 2 |
| Gano | G. G. Gillan | St. Thomas | Franklin | 3 |
| Gano | B. E. Benner | Iron Springs | Adams | 1 |
| Jonathan | Treesdale Farms | Mars | Allegheny | 1 |
| Jonathan | Guy L. Hayman | Northbrook | Chester | 2 |
| Jonathan | B. E. Benner | Iron Springs | Adams | 3 |
| Rome | Trexler Farms | Allentown | Lehigh | 3 |
| Rome | Guy L. Hayman | Northbrook | Chester | 2 |
| Rome | Ira Hottenstein | Lehighton | Carbon | 1 |
| R.I. Green. | McIntosh Farms | Stroudsburg | Monroe | 2 |
| R.I. Green. | Shaffer Bros. | Gravity | Wayne | 1 |
| Smokehouse | Allen Jayne | West Auburn | Susquehanna | 1 |
| Smokehouse | Geo. Goodling | Loganville | York | 2 |
| Smokehouse | S. L. Smedley, Jr. | Newtown Square | Delaware | 3 |

| Variety | Exhibitor | Address | County | Place |
|---|---|---|---|---|
| Stark | P. R. Seifert | Nazareth | Northampton | 1 |
| Stark | Trexler Farms | Allentown | Lehigh | 3 |
| Stark | Daniel Brubaker | Ephrata | Lancaster | 2 |
| Stayman | C. B. Snyder | Ephrata | Lancaster | 1 |
| Stayman | Guy L. Hayman | Northbrook | Chester | 3 |
| Stayman | Samuel Eckert | Fleetwood | Berks | 2 |
| Winesap | McDonald Orchards | Shippensburg | Franklin | 2 |
| Winesap | H. R. Worthington | West Chester | Chester | 3 |
| Winesap | Trexler Farms | Allentown | Lehigh | 1 |
| Wagener | Allen Jayne | West Auburn | Susquehanna | 2 |
| Wagener | John Derr | Catawissa | Columbia | 1 |
| Wagener | A. E. Reist | Palmyra | Lebanon | 3 |
| McIntosh | Allen Jayne | West Auburn | Susquehanna | 1 |
| McIntosh | Shaffer Bros. | Gravity | Wayne | 2 |
| McIntosh | Wm. Lott | Gardners | Adams | 3 |
| N. Spy | Treesdale Farms | Mars | Allegheny | 1 |
| N. Spy | Ira Hottenstein | Lehighton | Carbon | 3 |
| N. Spy | Shaffer Bros. | Gravity | Wayne | 2 |
| Paragon | H. R. Worthington | West Chester | Chester | 3 |
| Paragon | R. J. Gillan | St. Thomas | Franklin | 2 |
| Paragon | W. O. Bingham | St. Thomas | Franklin | 1 |
| York | H. R. Worthington | West Chester | Chester | 1 |
| York | Elmer R. Snyder | Florin | Lancaster | 2 |
| York | C. F. Gillan | St. Thomas | Franklin | 3 |

**CLASS 74—Best 16 apples, any variety not mentioned in Class 69:**

| | | | | |
|---|---|---|---|---|
| Arkansas | Dr. J. S. Kendig | Salunga | Lancaster | 1 |
| McCoun | Shaffer Bros. | Gravity | Wayne | 2 |
| Oliver | Masonic Homes | Elizabethtown | Lancaster | 1 |

**CLASS 75—For best tray of each variety mentioned in Class 69:**

| | | | | |
|---|---|---|---|---|
| Baldwin | Ira Hottenstein | Lehighton | Carbon | 2 |
| Baldwin | Allen Jayne | West Auburn | Susquehanna | 1 |
| Delicious | Guy L. Hayman | Northbrook | Chester | 3 |
| Delicious | S. L. Smedley, Jr. | Newtown Square | Delaware | 2 |
| Delicious | A. L. Kauffman | Bird-in-Hand | Lancaster | 1 |
| Grimes | C. B. Snyder | Ephrata | Lancaster | 1 |
| Grimes | Guy L. Hayman | Northbrook | Chester | 3 |
| Grimes | S. L. Smedley, Jr. | Newtown Square | Delaware | 2 |
| G. Delicious | John Lucabaugh | Hanover | Adams | 1 |
| G. Delicious | Stewart Lucabaugh | Hanover | Adams | 2 |
| G. Delicious | A. L. Kauffman | Bird-in-Hand | Lancaster | 3 |
| Gano | Guy L. Hayman | Northbrook | Chester | 1 |
| Jonathan | C. B. Snyder | Ephrata | Lancaster | 1 |

| Variety | Exhibitor | Address | County | Place |
|---|---|---|---|---|
| Jonathan | Guy L. Hayman | Northbrook | Chester | 3 |
| Jonathan | S. L. Smedley, Jr. | Newtown Square | Delaware | 2 |
| McIntosh | Allen Jayne | West Auburn | Susquehanna | 1 |
| McIntosh | Shaffer Bros. | Gravity | Wayne | 3 |
| McIntosh | Wm. Lott | Gardners | Adams | 2 |
| N. Spy | Ira Hottenstein | Lehighton | Carbon | 3 |
| N. Spy | Shaffer Bros. | Gravity | Wayne | 2 |
| N. Spy | John Derr | Catawissa | Columbia | 1 |
| Paragon | H. R. Worthington | West Chester | Chester | 2 |
| Paragon | R. J. Gillan | St. Thomas | Franklin | 1 |
| Paragon | Elmer Snyder | Florin | Lancaster | 3 |
| R.I. Green. | Shaffer Bros. | Gravity | Wayne | 1 |
| Rome | H. R. Worthington | West Chester | Chester | 2 |
| Rome | Elmer Snyder | Ephrata | Lancaster | 3 |
| Rome | Guy L. Hayman | Northbrook | Chester | 1 |
| Smokehouse | Allen Jayne | West Auburn | Susquehanna | 1 |
| Smokehouse | C. B. Snyder | Ephrata | Lancaster | 2 |
| Smokehouse | Geo. Goodling | Loganville | York | 3 |
| Stark | Ira Hottenstein | Lehighton | Carbon | 3 |
| Stark | Daniel Brubaker | Ephrata | Lancaster | 1 |
| Stark | Geo. Goodling | Loganville | York | 2 |
| Stayman | C. B. Snyder | Ephrata | Lancaster | 3 |
| Stayman | Guy L. Hayman | Northbrook | Chester | 2 |
| Stayman | C. P. Barnard | Kennett Square | Chester | 1 |
| Wagener | Allen Jayne | West Auburn | Susquehanna | 1 |
| Wagener | John Derr | Catawissa | Columbia | 2 |
| Winesap | H. R. Worthington | West Chester | Chester | 2 |
| Winesap | Ira Hottenstein | Lehighton | Carbon | 1 |
| Winesap | S. L. Smedley, Jr. | Newtown Square | Delaware | 3 |
| York | H. R. Worthington | West Chester | Chester | 1 |

**CLASS 76—For the best tray and variety not mentioned in Class 69:**

| | | | | |
|---|---|---|---|---|
| McCoun | Shaffer Bros. | Gravity | Wayne | 1 |
| Nero | H. R. Worthington | West Chester | Chester | 3 |
| Sut. Beauty | John Derr | Catawissa | Columbia | 1 |
| Rambo | J. W. Bruckhart | Lititz | Lancaster | 2 |
| Rambo | Geo. Goodling | Loganville | York | 1 |
| Willow Twig | Walter D. Robinson | Elliotsburg | Perry | 1 |
| Vandivere | C. B. Snyder | Ephrata | Lancaster | 2 |
| Wealthy | Shaffer Bros. | Gravity | Wayne | 1 |
| W. Banana | Guy L. Hayman | Northbrook | Chester | 1 |
| Opalescent | Geo. Goodling | Loganville | York | 1 |

**CLASS 77—Commercial Barrel Exhibit:**

| | | | | |
|---|---|---|---|---|
| Gano | Ontelaunee Orchards | Leesport | Berks | 2 |
| Gano | Fred Glaze | Bowmansdale | Cumberland | 3 |
| Winesap | J. W. Thomas | Dauphin | Dauphin | 1 |
| Gano | R. T. Criswell | Chambersburg | Franklin | 1 |
| York | J. W. Thomas | Dauphin | Dauphin | 1 |
| York | D. M. Wertz | Waynesboro | Franklin | 2 |
| York | C. J. Tyson | Gardners | Adams | 3 |
| Delicious | C. J. Tyson | Gardners | Adams | 2 |
| Delicious | Fred C. Tyson | Gardners | Adams | 3 |
| Delicious | Geo. Goodling | Loganville | York | 1 |
| Stayman | C. J. Tyson | Gardners | Adams | 3 |
| Stayman | Donald Tyson | Gardners | Adams | 1 |
| Stayman | Geo. Goodling | Loganville | York | 2 |
| Baldwin | Fred Glaze | Bowmansdale | Cumberland | 2 |
| Baldwin | C. J. Tyson | Gardners | Adams | 1 |
| Baldwin | Fred C. Tyson | Gardners | Adams | 3 |



| Variety | Exhibitor | Address | County | Place |
|---|---|---|---|---|
| Ben Davis | W. E. Grove | York Springs | Adams | 1 |
| Ben Davis | C. J. Tyson | Gardners | Adams | 3 |
| Stark | Donald Tyson | Gardners | Adams | 2 |
| Stark | Fred Glaze | Bowmansdale | Cumberland | 1 |
| Stark | Fred C. Tyson | Gardners | Adams | 2 |
| Stark | Geo. Goodling | Loganville | York | 3 |
| Rome | Fred C. Tyson | Gardners | Adams | 1 |
| Rome | Donald C. Tyson | Gardners | Adams | 2 |
| Rome | Geo. Goodling | Loganville | York | 3 |
| Paragon | E. B. Mitchell | Harrisburg | Dauphin | 2 |
| Paragon | J. W. Thomas | Dauphin | Dauphin | 1 |
| Paragon | C. J. Tyson | Gardners | Adams | 3 |

**CLASS 78—Commercial Bushel Exhibit:**

| | | | | |
|---|---|---|---|---|
| Baldwin | Fred Glaze | Bowmansdale | Cumberland | 1 |
| Baldwin | C. J. Tyson | Gardners | Adams | 2 |
| Baldwin | Fred C. Tyson | Gardners | Adams | 3 |
| Ben Davis | W. E. Grove | Chambersburg | Franklin | 2 |
| Ben Davis | R. T. Criswell | Chambersburg | Franklin | 1 |
| Ben Davis | W. H. Horn | Chambersburg | Franklin | 3 |
| Gano | C. F. Gillan | St. Thomas | Franklin | 3 |
| Gano | Bowmansdale P. Co. | Bowmansdale | Cumberland | 2 |
| Gano | B. E. Benner | Iron Springs | Adams | 1 |
| Gano | R. C. McDonald | Shippensburg | Franklin | 4 |
| Delicious | Geo. Goodling | Loganville | York | 4 |
| Delicious | S. A. Heisey | Upton | Franklin | 2 |
| Delicious | Lorane Orchards | Lorane | Berks | 1 |
| Delicious | Ontelaunee Orchards | Leesport | Berks | 3 |
| Delicious | Norman S. Passmore | Glen Mills | Delaware | 5 |
| Paragon | E. B. Mitchell | Harrisburg | Dauphin | 4 |
| Paragon | J. W. Thomas | Dauphin | Dauphin | 2 |
| Paragon | Elmer R. Snyder | Florin | Lancaster | 3 |
| Paragon | G. G. Gillan | St. Thomas | Franklin | 1 |
| Paragon | Meyer Milling Co. | Lebanon | Lebanon | 5 |
| Willow Twig | Trexler Farms | Allentown | Lehigh | 1 |
| N. Spy | Meyer Milling Co. | Lebanon | Lebanon | 1 |
| N. Spy | J. Morris Horst | Lebanon | Lebanon | 2 |
| McIntosh | G. G. Gillan | St. Thomas | Franklin | 1 |
| Nero | R. J. Gillan | St. Thomas | Franklin | 1 |
| Nero | H. R. Worthington | West Chester | Chester | 2 |
| Rome | N. H. Davidson | Chambersburg | Franklin | 1 |
| Rome | C. F. Gillan | St. Thomas | Franklin | 2 |
| Rome | H. R. Worthington | West Chester | Chester | 5 |
| Rome | Ontelaunee Orchards | Leesport | Berks | 3 |
| Rome | Snyder, Fry and Rick | Reading | Berks | 4 |
| Stark | Geo. Goodling | Loganville | York | 2 |
| Stark | J. Morris Horst | Lebanon | Lebanon | 1 |
| Stark | Taylor Goshorn | Quincy | Franklin | 3 |
| Stark | Rice Products Co. | Biglerville | Adams | 4 |
| Stark | Donald C. Tyson | Gardners | Adams | 5 |
| Stayman | H. R. Worthington | West Chester | Chester | 3 |
| Stayman | Ontelaunee Orchards | Leesport | Berks | 2 |
| Stayman | J. W. Thomas | Dauphin | Dauphin | 1 |
| Stayman | S. L. Smedley, Jr. | Newtown Square | Delaware | 4 |
| Stayman | Trexler Farms | Allentown | Lehigh | 5 |
| York | N. H. Davidson | Chambersburg | Franklin | 1 |
| York | W. E. Grove | Chambersburg | Franklin | 5 |
| York | R. J. Gillan | St. Thomas | Franklin | 2 |
| York | C. J. Tyson | Gardners | Adams | 4 |
| York | Donald C. Tyson | Gardners | Adams | 3 |
| Smokehouse | H. R. Worthington | West Chester | Chester | 2 |
| Smokehouse | Bowmansdale P. Co. | Bowmansdale | Cumberland | 1 |
| Winesap | Lorane Orchards | Lorane | Berks | 3 |

| Variety | Exhibitor | Address | County | Place |
|---|---|---|---|---|
| Winesap | J. W. Thomas | Dauphin | Dauphin | 4 |
| Winesap | R. T. Criswell | Chambersburg | Franklin | 5 |
| Winesap | R. C. McDonald | Shippensburg | Franklin | 2 |
| Winesap | R. J. Gillan | St. Thomas | Franklin | 1 |

### COUNTY ASSOCIATION EXHIBIT

First Prize—Franklin County
Second Prize—Snyder County
Third Prize—Chester County
Fourth Prize—Lancaster County
Fifth Prize—Lehigh County
Sixth Prize—Delaware County.

## CODLING MOTH RESEARCH IN 1934[1]

**H. N. WORTHLEY, Pennsylvania Agricultural Experiment Station, and L. C. MARSTON, Jr., University of Tennessee, Summer Assistant.**

### Spraying Experiments—Adams County

This work was enlarged in 1934. Complete records of codling moth injury to drop and picked fruit were taken on 92 trees. In all tests the theory was to reduce the necessity for heavy second brood spraying by maintaining complete coverage during attack by the first brood of larvae, and by scraping and banding the trees with chemically treated bands. Moth catches in bait pails were used to time the spray applications. The success of this effort in comparison with former years is shown in Table 1, which presents figures from plots sprayed each year with lead arsenate and lime sulphur.

Table 1.—Trend of Codling Moth Population and Damage, Adams County, Pennsylvania, 1931-1934

| Variety | Year | No. Cov. Spr. | Lead Arsen. Total lbs. | Apples per Tree | Injured per cent | Worms per Tree | Residues Grs. per Lb. | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Pb | $As_2O_3$ |
| Grimes | 1931 | 4 | 12 | 719 | 93.4 | 751 | — | .017 |
| Grimes | 1932 | 5 | 14 | 2359 | 32.9 | 243 | — | .025 |
| Grimes | 1933 | 3 | 6 | 695 | 94.3 | 1092 | .005 | .002 |
| Grimes | 1934 | 6 | 18 | 2510 | 28.0 | 144 | .030 | .014 |
| Rome | 1932 | 5 | 15 | 3101 | 15.7 | 132 | — | .006 |
| Rome | 1933 | 3 | 7 | 840 | 80.5 | 589 | .011 | .002 |
| Rome | 1934 | 8 | 24 | 2380 | 25.8 | 39 | .096 | .036 |

[1]Publication authorized by the Director of the Pennsylvania Agricultural Experiment Station February 11, 1935, as Technical Paper No. 681.



The intensive spraying of 1934, together with the heavy crop, resulted in a marked reduction in the percentage of injured fruit. More significant, however, is the fact that in 1934 the actual number of worms produced was cut to 13 per cent of the 1933 figure in the Grimes, and to 7 per cent in the Rome. Thus the chances for adequate codling moth control in 1935 are much brighter than they were at the beginning of 1934.

**Increasing the Effectiveness of Lead Arsenate.** Six different spray mixtures containing lead arsenate at 3 pounds per 100 gallons plus various added materials were tested in the Grimes Golden block of the Heacock orchard at Biglerville. As in the Jonathan and Rome Beauty blocks to be discussed later, the treatments were so arranged as to smooth out errors due to location of the trees and variations in the load of fruit, and to allow a close estimate of the true significance of the differences observed.

The comparisons involved six cover sprays, applied on the following dates; May 23 and 31, June 11 and 21, July 3 and 18. All spraying was done with a single nozzle spray gun from the ground alone, at a pressure of 400 pounds per square inch, and each tree was sprayed completely, from beneath as well as from the outside, before moving to the next.

Table 2 presents the results of the spraying experiments on Grimes Golden. The ingredients of each spray mixture are given at the left of the table. Where a given ingredient was not included in all sprays the numbers of the applications in which it was used are given in parenthesis. At the bottom of the table is indicated the least difference between any two of the treatments that can be attributed clearly to the effect of the treatments themselves. The first column of figures gives the average per cent of injured fruit—all drop and picked apples included—for the six trees receiving each treatment. The least codling moth injury occurred where fish oil was added to all sprays.

The addition of fish oil also gave best results in preventing actual entry and development of worms in the fruit, as shown in column 2. There is little doubt, therefore, that treatment 3 gave superior codling moth control, though from the standpoint of total injury and of worminess the figures for "least significant difference" indicate that treatment 2 was a close second.

The remaining treatments gave definitely poorer results. In treatments 4 and 5 the inclusion of 2 pounds of skim milk powder per hundred gallons of spray gave good coverage. Analyses made for lead and arsenic following the fifth cover spray, however, indicated that the runoff in these treatments was excessive, and resulted in the deposition of less lead arsenate than in treatment 1, where no sticker was employed. The further addition of contact poisons in the first and fourth cover sprays was without benefit, so far as codling moth control was concerned.

Spray injury was of considerable importance in the Grimes Golden block, which had not fully recovered from the effects of drought, and much russeted fruit was present in all the treatments. Figures in the third column of Table 2 give the percentages of fruit in the different treatments exhibiting any noticeable degree of roughness or "russeting" of the finish. In the absence of unsprayed trees it was impossible to tell how much of this injury actually was caused by the spray treatments applied, but the differences indicated as significant may properly be attributed to differences in treatment. Treatment 1, containing no sticker, gave the least russeting, and treatments 4 and 5, containing skim milk powder, were definitely the worst in this respect.

Table 2.—Codling Moth Control Adams Co. 1934

Heacock Orchard—Grimes
Latin Square—6 Treatments

| 6 cover sprays<br>Lead arsenate,<br>3 lbs. per 100 gals.<br>plus | Fruit counts—drops and picked—6 trees | | | | |
|---|---|---|---|---|---|
| | Injured % | Wormy % | Spray-burned % | Residues Grains per lb. Pb | Residues Grains per lb. $As_2O_3$ |
| 1. Lime sulphur, 2 gals (1-3)<br>1 gal (6) | 28.0 | 4.8 | 45.6 | .030 | .014 |
| 2. Lime sulphur as in 1.<br>Hydrated lime, 0.5 lb* | 27.1 | 3.6 | 51.8 | .049 | .019 |
| 3. Flotation sulphur, 5 lbs<br>(1-3) (6)<br>Fish oil, 1 quart | 19.9 | 1.7 | 49.5 | .083 | .033 |
| 4. Lime sulphur as in 1.<br>Lethane 410—8.5 fl. oz.<br>(1) (4)<br>Skim milk powder, 2 lbs. | 38.1 | 3.7 | 67.1 | .066 | .026 |
| 5. Lime sulphur as in 1.<br>Black leaf 40—1 pint<br>(1) (4)<br>Skim milk powder—2 lbs<br>Hydrated lime, 0.5 lb (6) | 35.5 | 5.5 | 61.6 | .059 | .021 |
| 6. Lime sulphur as in 1.<br>Pine tar soap—1 pint | 27.6 | 6.3 | 50.6 | .038 | .014 |
| Least significant difference | 8.0 | 2.8 | 11.6 | | |

*Latimer Dry lead arsenate, a brand containing casein, was used in treatment 2. A brand containing no modifier was used in all other treatments.

In columns 4 and 5 of Table 2 are recorded the amounts of lead and arsenic found on fruits taken from the lower branches of trees in each treatment at picking time. Treatment 3, which gave superior codling moth control, retained by far the most



residue. Treatment 2, which gave second best control, retained less residue than treatments 4 and 5. Comparing treatments 4 and 5 it appears that the addition of hydrated lime in the last cover spray to treatment 5 increased the weathering away of both lead and arsenic. Residues in all but treatments 3 and 4 were brought below tolerance by washing with cold 1% HCl for 1 minute in a flotation washer. Cold 2 per cent acid brought arsenic below tolerance in these treatments, and brought lead

Table 3—Codling Moth Control Adams Co. 1934

Heacock Orchard—Rome Beauty
Randomized blocks—Five replicates

| • 8 cover sprays<br>Amounts per 100 gals. | Fruit count—drops and picked—5 trees | | | | |
|---|---|---|---|---|---|
| | Injured % | Wormy % | Spray-burned % | Residues Grains per lb. Pb | Residues Grains per lb. $As_2O_3$ |
| 7. Lead arsenate, 3 lbs<br>Skim milk powder, 2 lbs<br>Lime sulphur, 2 gals (1-2),<br>2 qts (3-4), 1 gal (6)<br>Black leaf 40, 1 pint (4)<br>Hydrated lime, 0.5 lb (8) | 25.8 | 1.2 | 14.2 | .096 | .036 |
| 8. Black leaf 40, 1 pint<br>Kolofog, 6 lbs<br>Sulphur ammonium soap<br>2 lbs, 1 lb (7-8) | 16.0 | 8.6 | 2.4 | .005 | .001 |
| 9. Black leaf 155, 5 lbs<br>Flotation sulphur, 5 lbs,<br>(1-3) (6)<br>Fish oil, 1 pint (7-8) | 18.0 | 11.0 | 4.0 | .003 | .002 |
| 10. First three cover sprays<br>Calcium arsenate, 3 lbs<br>Sulfocide, 2 qts<br>Summer Scalecide, 1 gal<br>Last five cover sprays<br>Black leaf 40, 1 pint<br>Summer Scalecide, 1 gal<br>(4-6), 3 qts (7-8)<br>Sulfocide, 2 qts (6) | 29.2 | 15.0 | 30.0 | .003 | .002 |
| 11. First two cover sprays<br>Lead arsenate, 3 lbs<br>Ortho Dry Spreader,<br>0.5 lb<br>Coposil, 1.5 lbs<br>Last six cover sprays<br>Black leaf 40, ¾ pint<br>Orthol-K medium, 1 gal<br>Ortho Dry Spreader,<br>0.5 lb<br>Coposil, 1.5 lbs (3) (6) | 11.8 | 5.2 | 16.2 | .015 | .007 |
| Least significant difference | 7.4 | 3.6 | 13.3 | | |

to 0.02 grains per pound. Heating the acid bath or the employment of an underbrush washer would have cleaned this fruit successfully.

**Study of Substitutes for Lead Arsenate.** Five different combination treatments were applied alike in blocks of Rome Beauty and Jonathan trees in the Heacock orchard. In this experiment eight cover sprays were applied, on the following dates: May 24, June 1, 13, and 22, July 2, 17, and 26, and August 3. All spraying was done by the author as explained for the experiment in the Grimes. Lead arsenate throughout was compared with nicotine in two combinations, and with schedules containing arsenicals early and oil-nicotine later. The aim here was to discover, if possible, a schedule of materials that would be as effective as lead arsenate in codling moth control, that would leave residues well below the tolerance at harvest, and that would be less injurious to foliage and fruit.

The Jonathan block, under experimental treatment for the first time in 1934, was more heavily infested than the Rome Beauty, and all treatments showed more codling moth damage than in the latter variety. Jonathan is a more tender-skinned variety than Rome Beauty, and exhibited more spray burning. In addition, the Jonathan trees were found to vary widely in vigor and in set of fruit, and the differences were not entirely eliminated by the arrangement of treatments. For this reason a large margin for experimental error appeared, amounting to more than 14 per cent. In other words, differences less than 14 per cent between treatments cannot be attributed definitely to the treatments applied, but may have been caused by the variables mentioned. The Rome Beauty block was more uniform, and better suited to the comparisons attempted.

The treatments employed and the results obtained are given in Tables 3 and 4.

Table 4.—Codling Moth Control Adams Co. 1934

Heacock Orchard—Jonathan
Latin Square—5 treatments

| 8 cover sprays See Table 3 for Treatments | Fruit counts—drops and picked—5 trees | | | | |
|---|---|---|---|---|---|
| | Injured % | Wormy % | Spray-burned % | Residues Grains per lb | |
| | | | | Pb | $As_2O_3$ |
| 7. | 42.0 | 4.0 | 55.6 | .140 | .060 |
| 8. | 39.0 | 27.6 | 12.8 | .001 | trace |
| 9. | 37.0 | 28.8 | 29.8 | .004 | .001 |
| 10. | 44.0 | 20.2 | 54.4 | .001 | .002 |
| 11. | 20.0 | 11.4 | 57.8 | .014 | .008 |
| Least significant difference | 14.6 | 14.2 | 14.2 | | |

A glance at the first column of figures in Tables 3 and 4 shows that treatment 11, which comprised two cover sprays of lead arsenate followed by six of oil-nicotine, produced the cleanest total crop. In the Rome Beauty block the fixed nicotine compounds employed in treatments 8 and 9 were not significantly worse, but in the more heavily infested Jonathan block results with these materials were not so encouraging. Lead arsenate as used in treatment 7 allowed a large amount of stinging, and in consequence total injury was high.

The second column of figures tell a different, and more significant, story. Only treatments that allow the least entry of larvae into the fruit offer promise of reducing the severity of the codling moth infestation from one brood to the next, and from one season to another, with consequent lessened intensity of control efforts. In both blocks lead arsenate throughout (treatment 7) was superior to all other treatments in preventing worm entry, though treatment 11 gave nearly as good results in the Jonathan block. The fixed nicotines fell down in stomach poison effect, and in the Jonathan block became the wormiest of all. In this connection it may be said that the sulphur ammonium soap used as a spreader and sticker in treatment 8, and incorporated into the Black leaf 155 used in treatment 9 in the process of manufacture was suspected of causing excessive run-off and poor retention of the nicotine. Reduction in the amount of sulphur ammonium soap in treatment 8, and the addition of fish oil in treatment 9 in the last two cover sprays was intended to help correct this difficulty. If these changes were of any benefit, they were made too late for this to be apparent.

Spray injury, as recorded in the third column of Tables 3 and 4, took different forms in the different treatments. In treatments 7, 8, and 9 it showed rough and russeted areas on the skin of the fruit, of the type often referred to as "sulphur injury." In treatment 10 it took the form of "calyx end arsenic injury," a black, sunken ring in the calyx basin. In treatment 11 it was a slight but widespread granulating or dulling of the finish, typical "copper injury" which was little noticed during the early sprays, becoming more pronounced as the season advanced. As affecting the grade of fruit the type of injury in treatment 10 was most serious, followed by that in treatment 7. Spray injury in treatment 11 was less serious, and was of a mild form in treatments 8 and 9. The percentages show that treatment 8 was definitely superior to all others from the standpoint of spray burning in Jonathan, though not significantly better than treatment 9 in Rome. Records of foliage injury were not taken, but the leaves in treatments 8 and 9 remained in better condition than in the other treatments. Records of the June drop taken in the Jonathan block showed that treatment 10, in addition to severe arsenic injury both to fruit and foliage, caused an excessive shedding of fruit. This effect was lacking in other treatments.



The residues of lead and arsenic remaining on the fruit at harvest are of interest. In treatment 7, where 8 cover sprays, each containing 3 pounds of lead arsenate and 2 pounds of skim milk powder per hundred gallons, ending on August 3 were used, residues were extremely high. The lead retained was not removed below tolerance by any of the washing treatments tried, though it is possible that a lengthened exposure to heated 2 per cent HCl migth have accomplished this result. The analyses of fruit from treatments 8 and 9 illustrate the amounts of lead and arsenic that may be found on fruit that received no lead arsenate later than the petal-fall application. In both these treatments, however, the amounts found were well within established tolerances. It is evident that the employment of summer oil following calcium arsenate in treatment 10 interfered little with the weathering away of arsenic. This was without doubt a contributing factor to the high percentage of worminess in this treatment. In treatment 11 it appears that the necessity for fruit washing was avoided by using lead arsenate in the first two cover sprays only, but that the later use of summer oil acted to stick the lead arsenate to the fruit. A third application of lead arsenate, if followed by oil, would doubtless have brought residues above the tolerance.

**Discussion of Results.** Certain conclusions seem justified from examination of the results here reported. Lead arsenate remains the most effective material for codling moth control. Its use in more than 6 cover sprays, however, may produce residues very difficult to remove from some varieties of apples. The high degree of protection against worm entry afforded by complete coverage with lead arsenate during periods of attack may be definitely increased by the addition of choice light pressed menhaden fish oil at the rate of 1 quart per 100 gallons of spray. Due to the unpleasant nature of the mixture resulting when lime sulphur is employed, fish oil should be used with flotation sulphur or no fungicide. Definite reduction in the amount of stinging with slight increase in worminess may be obtained by using lead arsenate in the early cover sprays followed by summer oil emulsions plus nicotine sulphate in later applications[1]. This combination treatment has produced the highest percentage of clean fruit, but it will complicate the residue removal problem if more than 3 cover sprays contain lead arsenate. Because applications of mineral oil should not follow sulphur sprays within three weeks, and because copper fungicides have not been adjusted to apple disease control requirements under Pennsylvania conditions, the use of oil-nicotine should be avoided where disease problems exist.

Heavy and continued application of lead arsenate is attended by considerable danger of injury to the foliage and fruit of apple, particularly if used in combination with fungicides or on

[1]Support for these conclusions is contained in previous studies reported by the author in Pa. Agr. Exp. Sta. Bull. 285, March, 1933, and Pa. State Hort. Ass'n News, Vol. XI No. 1, March, 1934.

trees of less than normal vigor. Further study of the causes contributing to this injury, and of its correction without loss of insecticidal or fungicidal efficiency, are urgently needed.

Fortunately, it would appear that the codling moth and its attendant problems will be somewhat lessened for 1935 due to the great reduction in populations produced by the general adoption of the extended spraying schedule recommended in 1934.

## SUPPLEMENTARY CONTROL MEASURES

**Chemically Treated Bands.** All trees in the experimental spraying blocks were banded. Conditions favoring a high catch of worms were best on the comparatively small, smooth barked Rome Beauty trees, next best on the rougher, larger Jonathans, and least favorable on the Grimes Golden trees, where wounds among the upper branches had been shown previously to attract large numbers of cocooning larvae. Expecting that the emergence of summer brood moths might be lightest where the highest proportion of first brood larvae were trapped in the bands, it was of interest to compare conditions with respect to the prevalence of moths during the season in the three blocks of trees. The records of bait pail catches served this purpose. Of all moths trapped during the season, 30 per cent were of the summer brood in the Rome Beauty block, 44 per cent in the Jonathan block, and 53 per cent in the Grimes block. The conclusion that summer moth emergence will be reduced to a minimum on trees that can best be prepared for banding is strengthened by this observation.

Bands applied during the blooming period were compared with bands of the same manufacture applied a month later. The increased weathering of the bands applied a month earlier than necessary more than doubled the percentage of summer moth emergence. It is best, therefore, to delay placing the bands until mid-June.

Both hot-dipped and cold-dipped bands were received from manufacturers in 1934. Some of these were quite satisfactory, but in others improper treatment had clogged too many of the tunnels, and the catch was low. Most of the trouble appeared to have been caused by the corrugated strawboard employed, which was too light and flimsy, with shallow, crowded corrugations. Trade specifications of the proper material are as follows: single-faced, .016 inch jute facing, .009 inch straw corrugations, 4 corrugations per inch.

In treating bands it is important that freedom from clogging be obtained without sacrifice in weight of the chemical coating applied. Results of field tests have been rather variable, but typical records taken from the work of the past three years show an upward trend in effectiveness with increase in weight. These records are given in Table 5.

Table 5.—Chemical Weight and Effectiveness of Codling Moth Bands

| Bands Dipped | Cold-Dipped | | Hot-Dipped | |
|---|---|---|---|---|
| | Chemical per 250-ft. roll lbs. | Summer moth emergence % | Chemical per 250-ft. roll lbs. | Summer moth emergence % |
| Once | 5.0 | 4.1 | 5.3 | 3.0 |
| Once | 5.6 | 2.7 | 7.1 | 1.8 |
| Twice | 7.9 | 0.0 | 11.7 | 2.3 |
| Twice | 8.2 | 0.0 | 12.8 | 0.5 |
| Twice | 8.9 | 0.3 | 14.4 | 0.2 |

They suggest that hot-dipped bands require a somewhat heavier coating than cold-dipped bands, and that the latter should contain about 8 pounds of the chemicals per 250-ft. roll to reach maximum effectiveness. In our tests this weight has best been obtained without undue clogging of tunnels by the following procedure:

1. Agitate the commercial mixture of oil and beta-naphthol in gasoline thoroughly both before and during immersion of the bands.
2. Lower the roll of band flat side down into the mixture to one-half its width, lift out, turn over, and dip to one-half its width from the opposite side. Lift and drain until it stops dripping, turn over and place on narrow supports to dry for about an hour.
3. Repeat the process given under 2, and allow one week for the gasoline to evaporate and the bands to harden before they are placed on trees or wrapped in oiled paper for storage or shipment.

Prices for manufactured bands did not exceed the cost of home treatment in 1934, and it is felt that few growers will be interested in making bands if quality is maintained in the commercial product.

**Trapping of Adult Moths.** Increases in the catch of codling moths in bait pails containing 1 part cooking molasses to 10 parts water were sought by various means. The addition of 1 c. c. of anethol per trap, as used by Dr. S. W. Frost in studies of Oriental fruit moth control, and the placing of baffles at right angles above the rims of the traps, gave increased catches. These results will be useful in trapping to indicate moth flight periods in lightly-infested orchards, but the catches were still too low to indicate marked reduction of orchard populations.

In preliminary tests traps equipped with 75 watt inside frosted Mazda lamps caught far more moths than the bait pails. In one series of trials the expensive electrocuting type of trap light was the most effective, while in another series a simple light with reflector suspended above a water surface trapped the most moths. Such a device might be useful during spring



moth emergence in an infested packing shed, but its application to population reduction in the orchard needs further study.

## SUMMARY

Spraying experiments in 1934 showed that lead arsenate remains the best material for use in reducing large populations of codling moth, that its efficiency is increased by the addition of fish oil, and that its use in 6 or more cover sprays may lead to difficulty in residue removal and excessive injury to foliage and fruit. The cleanest crop, i.e., showing the least "worms" and "stings," were produced by 2 cover sprays containing lead arsenate followed by oil-nicotine in later applications, without exceeding residue tolerances. Fixed nicotine compounds gave too much wormy fruit, but were encouraging from the standpoint of "stinging" and spray injury. Certain precautions are indicated in the use of fish oil and oil-nicotine.

Tests of chemically-treated bands revealed weak spots in the processes of some manufacturers who apparently entered this field in 1934. It appears that cold-dipped bands should contain about 8 pounds of the betanaphthol-oil mixture per 250-foot roll for maximum effectiveness. A method for obtaining this weight without undue clogging of tunnels is given.

In preliminary tests light traps caught more moths than bait pails. Their possible use in heavily infested packing sheds is indicated.

# DORMANT AND DILUTED DORMANT SPRAYS FOR APHIDS AND RED-SPIDERS

**S. W. FROST, The Pennsylvania State College**

The following notes are based on experiments conducted during the spring of 1934 and the figures should be taken as indicative rather than conclusive.

Two insects have been considered—aphids and red-spiders. Although aphid eggs were abundant during the winter and spring of 1933-1934, certain conditions had checked the deposition of rosy aphid eggs and favored the deposition of grain aphid eggs during the fall of 1933, with the result that the season of 1934 was characterized by an abundance of grain aphids and a scarcity of rosy aphids. The figures in Table 1 clearly indicate that the rosy aphid was not a problem in 1934. The counts in the experimental blocks were made chiefly on the grain aphid.

The figures in Table 2, taken from seven counties in Pennsylvania, show the mortality of aphid and red-spider eggs during the winter of 1933-34. It will be noted that a rather large percentage of eggs were killed by severe conditions during the winter. In computing the figures in Table 7, which are based

Table 1.—Comparative Abundance of Apple Aphids, Adams County, Pa. Spring of 1934

| Orchard | Number aphids counted | Per cent grain aphids | Per cent green aphids | Per cent rosy aphids |
|---|---|---|---|---|
| No. 1a | 389 | 94.3 | 5.3 | .4 |
| No. 1b | 787 | 99.3 | | .7 |
| No. 2 | 967 | 100.0 | | |
| No. 3 | 935 | 80.3 | 19.9 | .5 |

on the counts of living and dead eggs, allowance has been made for the reduction in actual percentage of living eggs at the time the counts were made.

Table 2.—Winter Mortality of Aphid and Red-spider Eggs*—1933-34.

| Insect | Number samples | Per cent mortality | | |
|---|---|---|---|---|
| | | Max. | Min. | Average |
| Red-spider | 17 | 39 | 9 | 29 |
| Aphids | 25 | 64 | 25 | 42 |

*Data furnished by H. N. Worthley, State College, Pa.

The predacious insects developed later in the season to considerable proportions and cleaned up a large part of the aphid population. On April 23, a count showed syrphus fly larvae present on 1.5 per cent of the buds in certain orchards. These increased in numbers as the season advanced.

With a winter mortality of 42 per cent, with rosy aphids only 5.5 per cent of the total population and with predacious insects abundant, little credit can be given to any spray material applied during the spring of 1934, unless careful counts were made. At best, it was a poor season to obtain figures on aphid control. Aphid counts were made between April 9 and 26; red-spider counts between May 7 and 28.

Three commercial orchards were selected for conducting tests with various dormant and delayed dormant oil sprays. These materials were duplicated, as far as possible, in the three orchards. The methods of treatment varied considerably, as is evident from table 3. These applications were made by fruit growers and show considerable lack of uniformity as to the amount of material applied per tree, the pressure used, and the manner in which the spraying was done. Orchard number 1 received sufficient spray material to give satisfactory results. Orchard number 2 probably received enough spray material but orchard number 3 was certainly undersprayed. There are other conditions involved such as temperature, see Table 4. The results



in Tables 5 and 6 show how fruit growers can fall down by not applying sufficient spray materials.

Table 3.—Analysis of Spray Treatments, Adams County, 1934

| Orchard Variety | Pressure lbs. | Gals. per tree | Method | Date of dormant spray | Date of D. dormant |
|---|---|---|---|---|---|
| No. 1 Maiden Blush | 400 | 7.8 | 1 man on ground<br>1 man on tower<br>spray with wind | March 29<br>April 2 | April 10<br>April 17 |
| No. 2 York Imperial | 400 | 4.7 to 6.6 | 1 man on ground<br>1 man on tower<br>spray with wind | March 22<br>March 30<br>April 2 | April 17<br>April 18 |
| No. 3 Black Twig<br>Rome<br>Stayman | 300 | 2.7 to 2.9 | 1 man on ground<br>both sides of tree sprayed at the same time. | March 29 | April 17 |

Table 4.—Temperatures at the Time of the Dormant Applications

| Date of applications | Temperatures between 8 A. M. and 5 P. M. | Minimum temperature on evening following applications |
|---|---|---|
| March 22 | 40-60° F | 15° F |
| March 29 | 25-67° F | 26° F |
| March 30 | 32-65° F | 33° F |
| April 2 | 25-67° F | 40° F |

Table 5.—Dormant Oil Sprays Applied to Apple[3] March 22 to April 2, 1934, Adams County, Pa.

| Treatment | [1]Stock emul. | [2]Dilution | Gals. per tree | Red-Spider | | Aphids | |
|---|---|---|---|---|---|---|---|
| | | | | Number eggs counted | % kill | Number buds examined | % buds infested |
| Tar oil | 36–44 | 7 | 4.7 | 1697 | 48.2 | 350 | 8.2 |
| Tar oil | 36–44 | 7 | 2.9 | 6415 | 51.7 | 1430 | 15.3 |
| Tar oil | 50–33 | 6 | 7.8 | 5329 | 82.1 | 1614 | 5.8 |
| Tar oil | 50–33 | 5 | 4.5 | 5066 | 62.4 | 222 | 10.3 |
| Tar oil | 50–33 | 5 | 4.5 | 3884 | 54.6 | 254 | 13.7 |
| Tar oil | 50–33 | 5 | 2.7 | 3757 | 55.2 | 1690 | 30.2 |
| Tar oil | 50–33 | 5 | 2.9 | 2760 | 66.3 | 1340 | 42.5 |
| Tar oil | 60– 0 | 4 | 4.7 | 1285 | 37.8 | 258 | 5.4 |
| Tar oil | 60– 0 | 4 | 2.7 | 5464 | 61.2 | 1500 | 17.3 |
| Check | | | | | | 2275 | 77.1 |
| Check | | | | 3447 | 16 7 | 199 | 82.9 |
| Check | | | | 4280 | 7.8 | 1367 | 85.6 |

[1]The first figure represents the per cent creosote oil, the second figure the per cent lubricating oil in the tar oil emulsion.
[2]In gallons of oil per 100 gallons of diluted spray.
[3]The variety and treatment can be determined by comparing the number of gallons of spray applied as indicated in Table 3.

Discrepancies indicated in Table 5 can be accounted for, in part, by the difficulties experienced in finding suitable days for the application of dormant oil sprays. Temperatures were barely above freezing at the time of the dormant applications and the thermometer often fell rapidly after the sprays were applied, and in some cases freezing occurred in less than ten hours after the applications. Under these conditions, oil sprays of course are not effective.

Table 6.—Delayed Dormant Sprays Applied to Apple[3] April 10-18, 1934, Adams County, Pennsylvania

| Treatment | [1]Stock emul. | [2]Dilution | Gals. per tree | Red-spider | | Aphids | | |
|---|---|---|---|---|---|---|---|---|
| | | | | No. eggs counted | % kill | No. buds examined | % buds infested | % kill |
| Lub. oil | 83 | 3 | | 5444 | 78.1 | | | |
| Lub. oil | 83 | 3½ | 2.9 | 5392 | 85.3 | 1230 | 15.1 | 65.8 |
| Lub. oil | 83 | 3½ | 6.6 | | | 356 | .0 | 100.0 |
| Lub. oil | 83 | 3 | | | | | | |
| L. sulphur | | 3 | | 5399 | 86.6 | | | |
| Lub. oil | 83 | 3 | | | | | | |
| L. sulphur | | 3 | 7.4 | 4842 | 85.0 | | | |
| Lub. oil | 83 | 3½ | | | | | | |
| L. sulphur | | 3 | 6.6 | 4413 | 90.9 | | | |
| Lub. oil | 83 | 3½ | | | | | | |
| L. sulphur | | 3 | 3.1 | | | 1218 | 4.7 | 73.9 |
| Nic. sulphate | | 1 | | | | | | |
| L. sulphur | | 3 | 6.6 | 6020 | 85.2 | 390 | 1.1 | 97.4 |
| Nic. sulphate | | 1 | | | | | | |
| L. sulphur | | 3 | 2.9 | 3547 | 51.5 | 1214 | .4 | 93.4 |
| Lethane | | 1 | | | | | | |
| L. sulphur | | 3 | 6.6 | | | 3960 | .0 | 100.0 |
| Lethane | | 1 | | | | | | |
| L. sulphur | | 3 | 2.9 | | | 1257 | 8.1 | 40.1 |
| Check | | | | | | 2275 | 77.1 | |
| Check | | | | 3447 | 16.7 | 199 | 82.9 | |
| Check | | | | 4280 | 7.8 | 1367 | 85.6 | |

[1]The percentage of lubricating oil in the emulsion.
[2]Gallons of oil and lime sulphur, pints of nicotine and lethane.
[3]The variety and treatment can be determined by comparing the number of gallons of spray applied as indicated in Table 3.

The following abbreviated Table shows the percentages of creosote and lubricating oils in spray mixtures made from stock emulsions of varying amounts of these oils. Remembering that 2.4 per cent actual tar oil (creosote oil) is necessary to kill rosy aphids and that 3 per cent actual lubricating oil is necessary to kill red-spider eggs, it is very evident that a 40-43 stock emulsion, diluted 7 gallons to 100, or a 36-44 stock emulsion, at the same dilution, is required to kill red-spiders and aphids, with one application, with an excess of creosote oil in each case. A 37-46 stock emulsion, diluted 6.5 gallons to 100, gives 2.4 per cent creosote oil and 2.99 per cent lubricating oil..

Table 7.—Results of Tests with Seven Commercial Brands* of Tar Distillate Sprays on Aphids and Red-spiders

| Per cent oils in stock emulsions | Dilution | Aphid counts | | Red spider counts | |
|---|---|---|---|---|---|
| | | No. eggs counted | Per cent control[1] | No. eggs counted | Per cent control[1] |
| 83– 0 | 3– 100 | 353 | 75.0 | 490 | 73.7 |
| 85– 0 | 3– 100 | 166 | 77.5 | 335 | 45.8 |
| 50–33 | 5– 100 | 293 | 91.2 | 525 | 93.9 |
| 50–33 | 5– 100 | 250 | 90.0 | 514 | 84.7 |
| 37–46 | 6½–100 | 160 | 100.0 | 813 | 93.9 |
| 37–46 | 6½–100 | 319 | 72.5 | 400 | 91.2 |
| 36–44 | 7– 100 | 286 | 71.2 | 545 | 89.9 |
| Check | | 375 | .0 | 389 | .0 |

*Data furnished by H. N. Worthley, State College, Pa.

[1]Figured from formula $\left(\frac{X-y}{X}\right) 100 = \%$ control, where $X = \%$ alive in check, $+y = \%$ alive in treatment.

Table 8.—Dilution Table for Tar Oil Emulsions

| Stock* emulsion | Per cent actual oil in spray solution 17% water and inert materials | | |
|---|---|---|---|
| Per cent C—L | Dilution 5–100 C—L | Dilution 6–100 C—L | Dilution 7–100 C—L |
| 50—33 | 2.50—1.65 | 3.00—1.98 | 3.50—2.31 |
| 49—34 | 2.45—1.70 | 2.94—2.04 | 3.43—2.38 |
| 48—35 | 2.40—1.75 | 2.88—2.10 | 3.36—2.45 |
| 47—36 | 2.35—1.80 | 2.82—2.16 | 3.29—2.52 |
| 46—37 | 2.30—1.85 | 2.76—2.22 | 3.22—2.59 |
| 45—38 | 2.25—1.90 | 2.70—2.28 | 3.15—2.66 |
| 44—39 | 2.20—1.95 | 2.64—2.34 | 3.08—2.73 |
| 43—40 | 2.15—2.00 | 2.58—2.40 | 3.01—2.80 |
| 42—41 | 2.10—2.05 | 2.52—2.46 | 2.94—2.87 |
| 41—42 | 2.05—2.10 | 2.46—2.52 | 2.87—2.94 |
| 40—43 | 2.00—2.15 | 2.40—2.58 | 2.80—3.01 |
| 37—46 | 1.85—2.30 | 2.22—2.76 | 2.59—3.22 |
| | 20% water and inert materials | | |
| 50—30 | 2.50—1.50 | 3.00—1.80 | 3.50—2.10 |
| 36—44 | 1.80—2.20 | 2.16—2.64 | 2.52—3.08 |

*C—Per cent creosote oil.
L—Per cent lubricating oil.

Recommendations for the application of tar oil emulsions generally read thus—select a quiet balmy day when the temperature is 45° F or higher. Rainy days and Sundays must of course be avoided. This allows a short period during any year and it left an especially short period during 1934 for the application of such sprays.

A summary of available days for the application of dormant oils is shown in Table 9. The number of days between March 15 and April 10 with average temperatures of 45° F. or higher are listed. Deductions are made for Sundays and rainy days.



Records show that there are rarely a sufficient number of consecutive days preceding March 15 with temperatures above 45° F suitable for the application of dormant oils. Therefore the period from March 15 to April 10, must be accepted as the proper time for the spring application of dormant oils. When prolonged periods of temperatures higher than 45° F occur during the middle of March, then the time for the delayed dormant application comes earlier in April and the dormant period is much shortened. A study of these conditions (Table 9) with no allowance for strong winds or wet ground to prevent the fruit grower from getting into the orchard, shows that 1919 was the only year during the past ten when there was ample time for the spring application of dormant oils.

Table 9.—Calculation of Period for Application of Dormant Oils — Based on Period Between March 15 and April 10. State College, Pa.

| Year | Days with average temp. 45° or higher | Days with ¼ inch or more of precipitation | Number of* Sundays | Actual spraying days |
|---|---|---|---|---|
| 1925 | 10 | 1 | 0 | 9 |
| 1926 | 7 | 2 | 0 | 5 |
| 1927 | 8 | 2 | 0 | 6 |
| 1928 | 9 | 2 | 1 | 6 |
| 1929 | 19 | 3 | 3 | 13 |
| 1930 | 8 | 1 | 1 | 6 |
| 1931 | 4 | 1 | 0 | 3 |
| 1932 | 9 | 3 | 0 | 6 |
| 1933 | 10 | 4 | 2 | 6 |
| 1934 | 14 | 4 | 2 | 8 |
| | | | Average | 6.8 |

*Rainy Sundays excluded.

Safe Days for Application of Dormant Oils 1934[1] Adams County, Pa.

| Variety | March 26 | 27 | 28 | 29 | 30 | 31 | April 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | No. of safe days |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Smoke House | * | * | * | | | * | † | ‡ | | | | | * | † | | | 3 |
| Maiden Blush | * | * | * | | | * | † | | | ‡ | | | * | † | | | 5 |
| Yellow Trans. | * | * | * | | | * | † | | | | ‡ | | * | † | | | 6 |
| Stayman | * | * | * | | | * | † | | | | | ‡ | * | † | | | 7 |
| Rome | * | * | * | | | * | † | | | | | | * | † | ‡ | | 8 |
| Wealthy | * | * | * | | | * | † | | | | | | * | † | ‡ | | 8 |
| York Imperial | * | * | * | | | * | † | | | | | | * | † | ‡ | | 8 |

*Rainy days.
†Sundays.
‡End of dormant period for variety indicated.
[1]Only days with temperatures of 45° F. or higher between the hours 8 A. M. and 5. P. M. are included in this table.

## Remarks on Dormant Applications

(1) It is more difficult to kill aphids in the dormant stage because the eggs at this time are covered with a hard shell and they are scattered over the trees, often in deep crevices in the bark.

(2) Safe days for the application of dormant sprays in the spring—that is when temperatures are 45° F or higher—are very limited during most years and rarely sufficient for satisfactory coverage.

(3) Tar distillate sprays give a high percentage of kill of aphids when properly applied. The spray must contain at least 2.4 per cent actual creosote oil, and must be applied at the rate of 8 or preferably 10 gallons to average 15 year old trees.

(4) If the tar distillate spray contains 3 per cent actual lubricating oil, a high percentage of red-spider eggs will apparently be killed. Many commercial brands of tar oils do not contain sufficient lubricating oil to kill red-spiders.

## Remarks on Delayed Dormant Applications

(1) Aphids are more susceptible to oil sprays in the delayed dormant period. By this time they have hatched and are easier to reach because they are congregated on the tips of the buds. Lubricating oil emulsions must, of course be used at this time. Tar oils cannot be applied at the time of the delayed dormant.

(2) The period for the application of the delayed dormant spray is somewhat limited, but on the whole, more extended than the dormant, and the temperatures are usually above 45° F.

(3) The figures presented in this paper and elsewhere by the writer, indicate that 3 per cent actual lubricating oil will kill the unhatched eggs of the red-spider as well as the aphids which have hatched at this time. Lime sulphur at the rate of 3 gallons to one hundred can be added as a fungicide to lubricating oil emulsions. This apparently increases the ovicidal value of the spray.

## ALTERNATE BEARING AND ITS RELATION TO ORCHARD CULTURE

**F. N. FAGAN, State College, Pa.**

The subject "alternate bearing of the apple" has been a topic for many discussions at fruit growers' meetings in past years. It has been the subject of much investigation in State and Federal Experiment Stations in the United States as well as in foreign countries.

In reading through the literature in horticulture we will find many published papers on alternate bearing. Many of these



papers treat on pruning and its relation, thinning and its relation, application of manures or fertilizers and their relation to alternate bearing. After viewing the various suggested causes and suggested remedies for alternate bearing, I think most fruit growers would agree with the following statement: It is likely that no one orchard operation will overcome alternate bearing and all orchard operations together could not overcome the effect of a weather condition that might throw trees into a state of alternate bearing.

In The Pennsylvania State College Agricultural Experiment Station apple orchard, now 26 years old, the yield records for 20 years—1914-34 are interesting. The soil treatments such as fertilizers, manure, culture and cover crops are the various factors in different blocks of trees. The other treatments such as pruning, spraying, thinning, and harvesting, have been held as constant as possible.

A study of the following condensed report of five blocks of trees and seven groups of trees (groups 6 to 12 inclusive) shows that food and soil treatments have caused an average range of total yield per tree in 20 years of from 61.62 bushels in the lowest yielding block to 117.35 bushels in the highest group.

Block 1 is the lowest yielding block. This block of 45 trees received clean cultivation, no fertilizers, no manure, and no cover crops, during the first eleven years of its growth. The

soil was depleted of organic material during this period of 11 years and we have not been able to bring this soil back into a good condition. We have been giving it the best possible treatment since 1919, except applying manure or other organic material. All but nine trees in this block have received five or ten pounds of nitrate of soda each year for the past fifteen years. In the following condensed report the three trees indicated as Row 3—Trees B, C, and D are three of the trees in this block that have received five pounds of nitrate of soda for fifteen years. The alternate bearing condition is reponsible for the low total yields for in a number of "on years" these trees have equaled the yields of trees in the highest yielding group which has yielded an average of 117.35 bushels for the 20 years. This high yielding group, No. 8, is made up of 96 trees. Of this number 72 of these have always received added food as follows: Nitrogen; nitrogen and phosphate; nitrogen, phosphate and potash; and manure. Since 1928 the added food has been applied to all 96 trees and a good short sod rotation has been maintained. I have picked for study and comparison with Row 3—trees B, C, and D, the highest yielding tree and its adjacent York in any of the blocks or groups—Row 29—tree K and its adjacent York. This Row 29 is in a block where only two Yorks are planted per row while Row 3 is in a block where three Yorks are planted per row.

A study of the 20-year yield record of trees K and L will show that many of these high total records are due to the yields these trees had during their "off years."

Orchard Planted 1908—Fruit yield records are reported for the 20 years from 1914 to 1934 inclusive. The varieties are York, Stayman and Baldwin in equal numbers in each block. The lime requirement is maintained.

**Project 331:**

Block No. 1—45 trees—average tree yield in the 20 years—61.62 bu. Clean culture 1908-1919, no covers seeded, no added food. A blue grass sod short rotation was started in 1919 using some phosphate for the benefit of the grass. Thirty-six of these trees have had five or ten pounds of nitrate of soda each year since 1919; nine have had no nitrogen. Some phosphate has been used for the benefit of the grass.

Block No. 2—45 trees—average yield in 20 years—70.12 bu. 1908-1934 sod mulch type, grass cut and placed around trees 1908-1919; 1919-1934 grass cut and not raked. 1919-1934 five or ten pounds of nitrate of soda used per tree with some phosphate for the benefit of the grass. Nine trees have had no added nitrogen.

Block No. 3—45 trees—average yield in 20 years—83.07 bu. Clean culture with mixed legume and non legume covers. No added food. 1908-1920 covers seeded after August 15; 1920-1929, covers seeded earlier until 1929 when seedings were made



June 1. Covers have been rye and vetch; oats and field peas; millet and soy beans; oats and cow peas; millet, clovers and soy beans.

Block No. 4—27 trees—average yield 107.22 bu. Tillage—intercrops and cover crops after intercrop each year—1908-1919. Complete fertilizers used each year for intercrop 1908-1919; complete fertilizers used each year since 1919 plus a mixed cover crops each year seeded since 1929 June 1.

Block No. 5—72 trees—average yield 101.69 bu. Treatment of 72 trees 1908-1928: Tillage and intercrop as in Block 4—18 trees; tillage and manure and mixed cover crops—27 trees. Treatment of 72 trees since 1928: Grass sod established. Has been of short rotation with one millet cover crop grown. Since 1931 grass sod disced or worked with "weed hog" type harrow each late fall or early spring. There are eight rows of nine trees each; since 1928 all trees have had ten pounds of nitrate of soda but every other row has had ten pounds of phosphate (16%) to each tree square.

**Project 332:**

Group No. 6—48 trees—average 93.05 bu. Check blocks—no added food. Covers always non legume—rye, oats, millets, buckwheat. 1908-1929 covers seeded last half of summer, since 1929 covers seeded June 1.

Group No. 7—24 trees—average 81.48 bu. No added nitrogen but phosphate and potash, 1908-1934. Covers same as in Group 6.

Group No. 8—96 trees—average 117.35 bu. Added food as complete NPK or N and P; 12 trees had manure 1908-1928. Of the 96 trees, 24 were check trees 1908-1928. Since 1928 a short sod rotation has been used on 48 of the 96 trees. All covers used were non legume. Since 1928 all trees have received NPK or N and P.

Group No. 9—12 trees—average 103.23 bu. Nitrogen alone; non legume covers used.

Group No. 10—24 trees—average 86.03 bu. Nitrate and potash; non legume covers.

Group No. 11—72 trees—average 105.04. Legume covers, no added nitrogen. Phosphate was used twice in 26 years for benefit of the cover.

Group No. 12—48 trees—average 80.43. Non legume covers. No added nitrogen. Phosphate was used twice in 26 years for benefit of the covers.

INDIVIDUAL YIELDS OF CERTAIN YORK TREES, DEPARTMENT OF HORTICULTURE, PENNSYLVANIA STATE COLLEGE FROM 1914 TO 1934, INCLUSIVE

| | Project 331 In Pounds | | | | Project 332 In Pounds | | |
|---|---|---|---|---|---|---|---|
| Row 3 | B | C | D | Row 29 | K | L | |
| 1914 | ..... | ..... | | 1914 | ..... | ..... | |
| 1915 | | | | 1915 | 1.00 | ..... | |
| 1916 | 3.00 | ..... | 2.00 | 1916 | 40.00 | 8.00 | |
| 1917 | ..... | ..... | ..... | 1917 | 8.00 | 6.00 | |
| 1918 | 5.00 | 15.00 | 2.00 | 1918 | 83.00 | 21.00 | |
| 1919 | ..... | 6.00 | ..... | 1919 | ..... | ..... | |
| 1920 | 42.00 | 210.00 | 5.00 | 1920 | 126.00 | 63.00 | |
| 1921 | 168.00 | 252.00 | 84.00 | 1921 | 840.00 | 672.00 | |
| 1922 | 21.00 | 137.00 | 5.00 | 1922 | 576.00 | 273.00 | |
| 1923 | 396.00 | 836.00 | 550.00 | 1923 | 529.00 | 606.00 | |
| 1924 | 22.00 | ..... | ..... | 1924 | 132.00 | 99.00 | |
| 1925 | 352.00 | 540.00 | 176.00 | 1925 | 979.00 | 782.00 | |
| 1926 | 33.00 | 0.00 | 66.00 | 1926 | 880.00 | 737.00 | |
| 1927 | 66.00 | 72.00 | 6.00 | 1927 | 748.00 | 594.00 | |
| 1928 | 198.00 | 308.00 | 88.00 | 1928 | 297.00 | 319.00 | |
| 1929 | 242.00 | 154.00 | 99.00 | 1929 | 391.00 | 182.00 | |
| 1930 | 66.00 | 231.00 | 44.00 | 1930 | 913.00 | 638.00 | |
| Total | 1614.00 | 2761.00 | 1127.00 lbs. | Total | 6543.00 | 5000.00 lbs. | |
| | 36.68 | 62.75 | 25.61 bu. | | 148.71 | 113.63 bu. | |
| 1931 | 16.00 | 8.00 | 8.75 | 1931 | 5.25 | 6.50 | |
| 1932 | ..... | .87 | .06 | 1932 | 19.50 | 12.00 | |
| 1933 | 25.00 | 26.75 | 25.00 | 1933 | 22.00 | 19.25 | |
| 1934 | ..... | ..... | ..... | 1934 | 30.00 | 21.25 | |
| G. Total | 77.68 | 98.37 | 59.42 bu. | Grand Total | 225.46 | 172.63 bu. | |

## DISEASE CONTROL AS INFLUENCED BY SPRAY METHODS

**R. S. KIRBY, State College, Pa.**

Each year the question is again and again asked, why do certain growers continually have almost perfect disease control on all their apples while other growers applying the same fungicide sprays, at the same time have parts and even all of their trees with apples having mediocre to poor control of scab, sooty blotch and Brooks spot? The answer has seemingly been thoroughness of coverage. If the thoroughness of coverage is the remedy, what does the successful grower do in spraying that his more unfortunate neighbor fails or neglects to do?

In an effort to find the answers to these important questions, 150 orchards were visited during the summer and fall of 1934 and the percentage of diseased apples determined in the different parts of the unsprayed and sprayed trees.

Unsprayed trees were first studied to find if any one or all diseases are more severe in certain parts of these trees. In figure 1, the average percentage of the occurrence of each of the three most important diseases is given for the outside bottom,



inside or center of the tree, up to ten feet and the top of the tree. From this chart, it is seen that scab is a disease that is severe in all parts of trees, but that it is most severe on apples growing in the inside center, and least severe on the lower outside. Brooks spot is observed to be a disease that is far more serious on the apples growing on the lower parts of a tree than those growing in the top and to be most severe on the apples growing on the lower inside part of a tree. Sooty blotch is found to be severe in all parts of an apple tree, but to be most severe on the apples growing on the inside center and least severe on apples in the top of a tree.

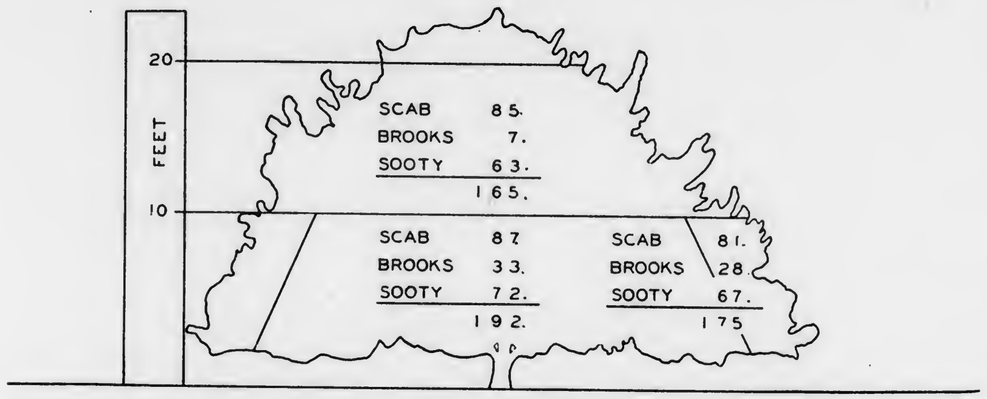


FIGURE 1 Occurence of the Percentage of Apples Infested with Different Diseases in the Different Parts of Unsprayed Apple Trees

The total of the percentages of scab, Brooks spot and sooty blotch indicates that apples growing on the inside center of a tree have a greater likelihood of being diseased than those on the outside lower branches and a still greater chance than growing in the tops of the trees. These variations in the amount of disease in various parts of apple trees is probably due to differences in air movements which determine the length of time that it takes wet foliage to dry. The longer the period of wet foliage, the greater the chance of infection.

These figures on the occurrence of disease in the various parts of unsprayed trees indicates that it is important to spray all parts thoroughly, but that the foliage and apples growing on the inside should have a little extra attention to offset the more favorable conditions for disease development in that part. If spraying was equally efficient in all parts of a tree, we may assume that the same relationship exists as in the unsprayed trees. Therefore, if five per cent disease is found on the apples on the outside lower branches we can expect approximately five and one-half per cent on the apples from the lower inside and four and one-half per cent on the apples in the top of the tree.

The slower drying of the foliage on the inside of the tree seems to increase the difference to a small extent.

In order to find any relationship that may exist between the spraying method and the occurrence of disease in different parts of trees, it seemed fairest to include all orchards where the use of any number of sprays or the use of any spray material had held the total percentage of diseased apples on the outside lower branches to five per cent or less. The figure five per cent or less was taken since that is the aim of spraying information. The outside lower branches were selected as the criterion, since they are usually closest to the person applying the spray and in nearly all orchards, the most thoroughly sprayed part of the trees.

In making the counts, average sized and averaged pruned trees of that orchard were taken. Most of the counts were made on trees from 12 to 25 years old and from 17 to 24 feet high, having a limb spread of 2 to 7 feet greater than the height of the trees.

Figure 2 gives the total average percentage of disease occurring in the three different parts of the tree in eleven different spray methods.

## Spraying With One Single Nozzle Gun

In the first four methods a single nozzle spray gun was used. The first method included orchards where the sprayer went under the tree and sprayed the underside of lower branches and made a special effort to spray up through the center to thoroughly cover the underside of the top branches, then spraying the outside.

Thirty-one orchards following this method had an average of one per cent diseased apples on the lower outside of the trees, two per cent in the inside and top. The slight increase that occurred on the apples in the lower inside and top when growers used this method is near normal for sprayed trees because of the slower drying in these parts of the tree. Ninety-four per cent of the thirty-one growers using this method had an average of less than five per cent total disease. Even on large thick trees this method gave good control in all parts of the trees.

In the second method with a single nozzle gun, the spraying was done in the same way as the first method with the exception that a special effort was not made to spray through the center of the tree to cover the underside of the top branches. The orchards following this method had an average of two per cent diseased apples on the outside of the trees, four per cent on the inside lower part and 18 per cent in top.

The importance of making a special effort to spray up through the center of the tree to cover the underside of the top branches is definitely shown.



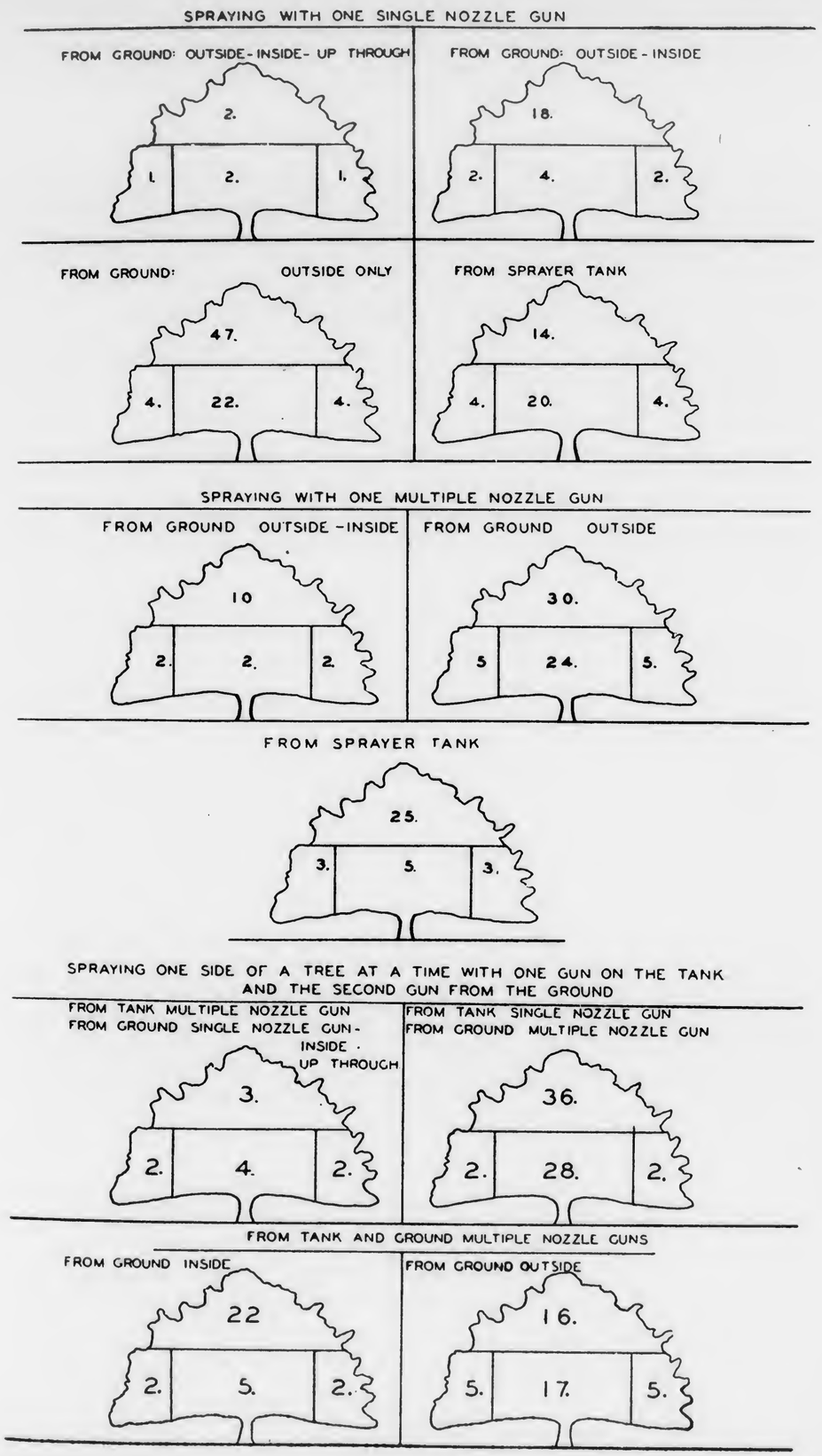


**Figure 2**

The third and fourth methods where the spraying was all from the ground or tank from the outside of the tree, shows the definite need for inside and up through the center spraying.

Spraying with one single nozzle spray gun is effective only when used in a manner to get complete coverage. With small or very open trees successful control may be obtained with less inside spraying. The only growers in this survey having an average of less than five percent total disease were those using the first method, from ground-outside-inside, and up through.

## Spraying With One Multiple Nozzle Gun

Spraying with one multiple nozzle gun was carried on in three different ways.

The first method included orchards where the sprayer went under the trees and sprayed the inside as thoroughly as possible, then sprayed the outside. The orchards following this method had an average of two per cent total disease outside and inside and ten per cent in the top of the tree. Only fifty per cent of the growers using this method had an average of less than five per cent total disease.

The second method with one multiple nozzle gun the spraying was done from the ground on the outside of the trees. This method, like the single nozzle gun spraying from the outside only was ineffective. There was an average of five per cent disease on the outside, 24 per cent on the lower inside and 30 per cent in the top.

The third method with one multiple nozzle gun the spraying was done from a sprayer tank. This angle of spraying was apparently better than that where the spraying was done from outside only on the ground. The 25 percentage of disease in the tops of the trees must be considered poor control.

Spraying with one multiple nozzle gun did not give growers as effective control as spraying with single nozzle guns. Some growers feel that it is easier and faster to spray their apples with multiple nozzle guns. When growers get larger spraying equipment to properly handle multiple nozzle guns and are able to use them more effectively, they may give better control. The results in the present check up show that growers using multiple nozzle guns should put forth greater effort to get better coverage in the tops of the tree.

## Spraying With 2 Guns, Multiple or Single Nozzle and Combinations of Both

In some of the larger orchards where bigger sprayers are used, growers are using two guns on each tree to speed up the spraying operation.

Four ways or combinations of this type of spraying are given.



The first method has a multiple nozzle gun spraying from the tank and a single nozzle gun used to spray both the inside and spraying up through the inside of the tree to cover the underside of the top branches. The orchards following this method had an average of two per cent diseased apples on the outside of the lower part of the tree, four per cent on the inside and three per cent in the top. With this method growers apparently obtained good coverage in all parts of the tree, preventing disease from becoming severe in any part of the tree. Sixty-six per cent of the growers in this check up who used this method had an average of less than five per cent total disease.

The second method wherein the position of the guns was reversed and the ground sprayer with the multiple gun did not regularly go under the tree. The total average percentage of disease was two per cent on the outside, 28 per cent on the inside, and 36 per cent in the top. This again indicates the need of thorough inside and up through spraying.

The third method where one multiple nozzle gun sprays from the tank and one sprays from the ground inside. The results are similar to those obtained with one multiple gun spraying from the ground outside and inside and give an average of 22 per cent diseased apples in the top of the tree.

The fourth method which differs from the third in that the gun on the ground does not go inside the tree. Trees sprayed in this manner show poor control in the lower center (17 per cent disease) and top of the tree which had 16 per cent diseased apples.

## Summary

The outstanding fact in the entire check up is that spraying inside and up through the tree is the only method that regularly gives satisfactory disease control in all parts of a mature apple tree.

Single nozzle guns used to cover all parts of the tree gives the grower better control than do multiple nozzled guns as used in Pennsylvania in 1934.

Growers spraying their trees from both the inside and outside have less spray burn of the mechanical type than those who do all their spraying from the outside.

## REPORT OF THE AGRICULTURAL COUNCIL AND LEGISLATIVE COMMITTEE

C. J. TYSON, Gardners

The annual meeting of the Agricultural Council was better attended than usual by delegates meeting during the Farm Show. Rural Electrification, Study of the Tax Situation in Pennsylvania, and a Report on the Financial Needs of State College and the Other Agricultural Agencies, with recommendations were the chief items of business.

A bill has been prepared licensing and bonding commission merchants doing business in Pennsylvania. Senator John S. Rice of Adams-Franklin County District will sponsor this bill.

A bill proposing compulsory grade marks, changes of grade marks and other things as applying to fruits and vegetables, whether in open or closed packages, was referred to your committee for recommendations. Because of substantial differences of opinions as to the merits of the bill and because it did not seem likely that funds for enforcement would be available, it was decided best to continue study of this measure for at least another year.

### SECRETARY'S NOTE:

Since the Annual meeting of the Association, The Pennsylvania State College has taken the following action:

"1. Hereafter the spray program in the College orchards will be determined each season by the Departments of Zoology and Entomology and Botany after conference with the Department of Horticulture, and the recommendations of these two departments will be followed explicitly by the Department of Horticulture.

"2. That in order to meet so far as is now practicable with our present budgetary limitations the request of the State Horticultural Association that more attention be given to experiments with spray materials, the 10-acre block of Stayman and McIntosh in the "Student Orchard" will be used for this purpose in the seasons of 1935 and 1936. The primary object of these tests will be to secure definite experimental evidence on the major points now at issue, particularly as to the practicability of using milder fungicides in the summer sprays and of dispensing with nicotine through the use of oil sprays. The Department of Horticulture will continue to care for this block of trees in all respect other than spraying, to supply the necessary spray materials and to harvest and sell the fruit after the experimental records have been made. The Departments of Zoology and Entomology and Botany will apply the sprays using their own equipment and labor and record the results of the tests.

"3. The sum of $200 is added to the budget of the Department of Botany to be used for conducting tests with fungicides in some part of the State other than State College, preferably in association with the tests of insecticides which are being made in Adams County. This provision is made for the current fiscal year only, which closes June 30, 1935."

"3. The sum of $200 is added to the budget of the Department of Botany to be used for conducting tests with fungicides in some part of the State other than State College, preferably in association with the tests of insecticides which are being made in Adams County. This provision is made for the current fiscal year only, which closes June 30, 1935."

Whereas fruit and vegetable growing is one of the major industries of Pennsylvania, totalling, fresh and canned over $50,000,000 annually, constituting one of the largest employers of agricultural labor and whereas the Federal-State inspection of fruits and vegetables at the farms, orchards, storage houses, canning plants and in the markets is of greatest importance to the industry as well as to the consuming public, and whereas the responsibility for carrying out this work is placed by law in the State Bureau of Markets.

Therefore be it resolved that the Legislature be urged to support this work undiminished and to take care of the steadily increasing demand for standard grades and honest packing.



STATE HORTICULTURAL ASSOCIATION
OE PENNSYLVANIA

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| Hutchison, J. D. | Rear 84 Scott St., Wilkes-Barre | Luzerne |
| Hutt, Warren | Boyertown, R. D. | Berks |
| Hykes, E. S. | York, R. 5 | York |
| Ingham, M. M. | New Castle, R. 5 | Lawrence |
| Irey, Allen M. | Boyertown | Berks |
| Jacobs, D. C. | Arendtsville | Adams |
| Jacoby, Eric | Clarks Summit, R. 2 | Lackawanna |
| James, D. M. | Bureau of Markets, Harrisburg | Dauphin |
| Jayne, Allen | West Auburn | Susquehanna |
| Jefferson, Thomas H. | Wycombe | Bucks |
| Jermyn, E. B. | Clarks Summit | Lackawanna |
| Johnston, R. S. | New Wilmington, R. 1 | Lawrence |
| Johnston, J. H. | New Wilmington, R. 1 | Lawrence |
| Johnston, Rolland G. | Hereford | Berks |
| Johnston, M. E. | Connoquenessing | Allegheny |
| *Johnston, F. C. | Dallas | Luzerne |
| Jones, Wm. | 5500 Lancaster Ave., Philadelphia | |
| June, L. T. | Dalton, R. D. | Lackawanna |
| Kaiser, Frank A. | 1031 Capouse St., Scranton | Lackawanna |
| Kalo Company | Quincy, Ill. | |
| Kauffman, A. L. | Bird-in-Hand | Lancaster |
| Karns, J. H. | Chambersburg | Franklin |
| Kauffman, E. F. | York, R. 7 | York |
| Kauffman, C. B. | Bird-in-Hand | Lancaster |
| Kauffman, J. B. | York, R. 7 | York |
| Keim, Milton W. | Boyertown, R. 2 | Berks |
| Keller, Adam | Clarks Summit | Lackawanna |
| *Keller, Paul J. | Alder Run Orchards, Tyrone | Blair |
| Kellow, Geo. H. | Scranton, R. 1 | Lackawanna |
| Kelso, James | Enon Valley | Lawrence |
| Kendig, Dr. J. S. | Salunga | Lancaster |
| Kerchner, Harvey T. | Lenhartsville | Berks |
| *Kessler, George W. | Tyrone | Blair |
| Kibler, T. F. | North Girard | Erie |
| Kindred, C. F. | Ivyland | Bucks |
| Kintner, G. H. | Mehoopany | Wyoming |

* Life Members.



| Name | Address | County |
|---|---|---|
| Killian, Lewis E. | Kirkwood | Lancaster |
| *Kister, U. G. | Etters | York |
| Klein, Jack | 404 New Market St., Philadelphia | Lancaster |
| Kleppinger, B. M. | Coopersburg, R. 2 | Lehigh |
| Knappenberger, Thomas | Zionsville | Lehigh |
| Knouse, M. E. | Peach Glen | Adams |
| Knox, H. C. | 2002 W. 21st St., Erie | Erie |
| Koch, C. H. | McKeansburg | Schuylkill |
| *Koehler, Paulus E. | 826 Washington Ave., Monaca | Beaver |
| Koser, G. W. | Biglerville | Adams |
| Kraybill, S. S. | Mt. Joy | Lancaster |
| Krebs, H. B. | Mercersburg | Franklin |
| Kreidweis, John | Bridgeville | Allegheny |
| Kuhns, Victor | Allentown, R. 2. | Lehigh |
| Kuntz, Parker L. | Gardners, R. D. | Adams |
| Kyle, Wm. B. | Zionsville | Lehigh |
| Lacoe, John F. | Clarks Summit, R. 2 | Lackawanna |
| Ladd, M. S. | Waverly | Lackawanna |
| Landis, H. D. | Girard | Erie |
| Landseidel, L. A. | Ransom | Lackawanna |
| Lapp, John F. | Ronks, R. 1 | Lancaster |
| Latshaw, J. E. | Marion | Franklin |
| Lau, L. B. | East Berlin, R. 2 | York |
| Lau, Rev. I. M. | 715 Manor St., York | York |
| Lau, L. E. | East Berlin, R. 2 | York |
| Laub, H. H., Jr. | 77 Chestnut St., Lewistown | Mifflin |
| Laudenslager, Martin | Orefield, R. 1 | Lehigh |
| Lehman, R. M. | Mt. Wolf, R. 1 | York |
| Lehman, S. S. | Girard | Erie |
| Lehman, G. E. | Wrightsville, R. 2 | York |
| Lehman, Sylvester | York, R. 9 | York |
| Leibhart, Samuel H. | Wrightsville, R. 1 | York |
| Lemmon, D. R. | North Girard | Erie |
| Lengle, Paul H. | Pine Grove | Schuylkill |
| *Leonard, F. E. | Carlisle, R. 1 | Cumberland |
| Lepole, Walter | Akron | Lancaster |
| Lesher, H. V. | Northumberland, R. 1 | Northumberland |
| Lewis, Nelson H. | Pittston, R. 1 | Luzerne |
| Lewis, Russell | Pittston, R. 1 | Luzerne |
| Lewis, S. V. | Wyoming, R. 1 | Luzerne |
| Linde, J. Eric | Orefield, R. 1 | Lehigh |
| Linville, Arthur S. | Media, R. 2 | Delaware |
| Long, D. Edward | Fayetteville | Franklin |
| Longenecker, Howard G. | 127 E. Main St., Manheim | Lancaster |
| *Loop, A. I. | North East | Erie |
| Loop, H. S. | North East | Erie |
| Loose, H. H. | Menges Mills | York |
| *Lord, John | Wyoming, R. 1 | Luzerne |
| Lott, R. C. | Gettysburg | Adams |
| Lott, William M. | Gardners | Adams |
| *McLelland, J. B. | Canonsburg | Washington |
| McClung, Lewis | 429 Sheridan Ave., New Castle | Lawrence |
| McClure, Frank | New Castle, R. 5 | Lawrence |
| McCormick, C. M. | New Castle, Knox Ave. | Lawrence |
| *McCormick, James | Harrisburg | Dauphin |
| McCreary, R. S. | Erie, R. 2 | Erie |
| McDonald, R. C. | Shippensburg | Cumberland |
| McFadden, E. C. | 74 W. Washington St., Hagerstown, Md. | |
| *McFarland, J. Horace | Harrisburg | Dauphin |
| McGinnis, C. R. | Reading, 523 Oley St. | Berks |
| McHenry, Clarence | Indiana | Indiana |
| *McKee, J. M. | Dept. of Agr., Harrisburg | Dauphin |

* Life Members.

| Name | Address | County |
|---|---|---|
| McKinney, D. L. | Lake Ariel, R. 3 | Wayne |
| *MacNeal, William H. | Parkesburg | Chester |
| McPherson, Roy P. | New York State Hort. Soc., LeRoy, N. Y. | |
| McWhorter, O. T. | Ore. State Hort. Soc., Corvallis, Ore. | |
| Mack, J. S. | Indiana, R. 4 | Indiana |
| MacVeagh, W. F. | Muncy, R. 3 | Lycoming |
| Marvil Package Co. | Laurel, Del. | |
| Mason, J. A. | North Girard | Erie |
| Mattern, Jos. C. | 310 Newry St., Hollidaysburg | Blair |
| Mattes, Paul | Emaus, R. 1 | Lehigh |
| Matthews, W. H. | Box 313, Salem, Ohio | Lawrence |
| Maurer, D. Edward | Selinsgrove | Snyder |
| Mauger, Maurice | Boyertown, R. 2 | Berks |
| *Mayer, Guy S. | Willow Street, R. 1 | Lancaster |
| Mecartney, J. L. | State College | Centre |
| Mechling, Edward A. | Moorestown, N. J. | |
| Meeder, J. V. | North Girard | Erie |
| *Meehan, S. Mendelson | Newtown Square | Chester |
| Mesta Brothers | Finleyville, R. 1 | Washington |
| Meyer, Allen J. | Annville | Lebanon |
| Miles, H. C. C. | Connecticut Pom. Soc., Milford, Conn. | |
| Miller, Frank M. | 42 W. Main St., Waynesboro | Franklin |
| Miller, H. W. | Paw Paw, W. Va. | |
| Miller, John W. | Ephrata, R. 2 | Lancaster |
| Miller, Harvey H. | Loganville | York |
| Miller, A. B. | Ransom | Lackawanna |
| Miller, Edward W. | Romney, W. Va. | |
| Miller, L. P. | Paw Paw, W. Va. | |
| Miller, Blaine | Indiana, R. 4 | Indiana |
| Miller, Harvey | Loganville | York |
| *Miller, Amos | Hanover, R. 4 | York |
| Miller, W. C. | Catawissa, R. 1 | Columbia |
| Miller, J. L. | York, R. 9 | York |
| Miller, Carroll R. | West Virginia Hort. Soc., Martinsburg, W. Va. | |
| Miller, Marvin | Clarks Summit, R. 1 | Lackawanna |
| Miller, C. M. | Newville | Cumberland |
| Miller, C. Clayton | Marion | Franklin |
| Miller, Clement R. | Orefield | Lehigh |
| Minnich, C. S. | Leesport, R. 1 | Berks |
| Mitchell, W. T. & Son | Beverly, Ohio | |
| Mitterling, John T. | Mt. Pleasant Mills | Snyder |
| Mohr, Frank J. | Fogelsville | Lehigh |
| Mohring, F. G. | North Girard | Erie |
| Montgomery, L. M. | Farm School | Bucks |
| *Moon, Henry T. | Morrisville | Bucks |
| Moore, M. A. | Lititz | Lancaster |
| Morse, Carl | New Wilmington | Lawrence |
| Moss, Harvey | Dallas, R. 4 | Luzerne |
| Mt. Olivet Fruit Co. | New Windsor, Md. | |
| Mowery, N. E. | Mechanicsburg | Cumberland |
| Moyer, B. J. | Middleburg | Snyder |
| Moyer, J. Calvin | Middleburg, R. 4 | Snyder |
| Moyer, Lee | Freeburg | Snyder |
| Murdock, T. | Malvern | Chester |
| Murray, Edward A. | Punxsutawney | Indiana |
| Murtoff, J. C. | Gardners | Adams |
| Musselman, I. Z. | Orrtanna | Adams |
| Musselman, Glenn | Orrtanna | Adams |
| Musselman, C. H. Co. | Biglerville | Adams |
| Musser, C. B. | Mt. Wolf, R. 1 | York |

* Life Members.



| Name | Address | County |
|---|---|---|
| Musser, W. E. | New Bethlehem, R. 3 | Clarion |
| Myers, George | Aspers, R. 2 | Adams |
| Myers, Paul M. | Lancaster, R. 8 | Lancaster |
| *Myers, Levi M. | Bowmansdale, R. 1 | York |
| Nagel, George R. | Ellwood City, R. 1 | Lawrence |
| Nash, Duane H. | Haddonfield, N. J. | |
| National Sulphur Co., Inc. | 420 Lexington Ave., New York City | |
| Neiman, Otto | Dover, R. 3 | York |
| Newman, H. W. | New Castle, R. 4 | Lawrence |
| Newton, E. M. | New Wilmington, R. 1 | Lawrence |
| Nibert, William | Indiana, R. D. | Indiana |
| Nichols, Oliver T. | Downingtown | Chester |
| Nicodemus, Ed. | Waynesboro | Franklin |
| Niles, Ben E. | Kentucky State Hort. Soc., Henderson, Ky. | |
| Nissley, D. H. | Lancaster, 142 E. Chestnut St. | Lancaster |
| Nolt, Melvin O. | Lancaster, R. 7 | Lancaster |
| Nolt, Harrison S. | Columbia | Lancaster |
| Northup, H. J. | Dalton | Lackawanna |
| Norton, Carlos E. | Sewickley | Allegheny |
| Ober, Dr. H. K. | College Ave., Elizabethtown | Lancaster |
| *O'Conner, Haldeman | 13 N. Front St., Harrisburg | Dauphin |
| Omwake Brothers | Greencastle | Franklin |
| Orton Brothers | North East | Erie |
| Oyler, H. J. | Gettysburg, R. D. | Adams |
| Oyler, George | McKnightstown | Adams |
| Oyler, William | Arendtsville | Adams |
| *Page, C. M. | Etters | York |
| *Pannebaker, Wm. M. | Virgilina, Va. | |
| Parker, Capt. H. B. | 261 Newbury St., Boston, Mass. | |
| Parks, Milson | Canonsburg, R. 3 | Allegheny |
| Parthemer, J. C. | Lewisberry | York |
| Paschal, John | Kennett Square | Chester |
| Passmore, S. S. | Mendenhall | Chester |
| Passmore, Norman S. | Glen Mills, R. 1 | Delaware |
| Patterson, James W. | Apollo | Indiana |
| Paxson, Samuel L. | Lumberville | Bucks |
| Paxson, Edw. M. | Lumberville | Bucks |
| Pedrick & Roemhild | 122 Dock St., Philadelphia | |
| Pennock, George S. | 165 W. Essex Ave., Lansdowne | Delaware |
| Peters, Curtis | Biglerville | Adams |
| Peters, John B. | Gardners | Adams |
| Pherson, J. L. | Volant | Lawrence |
| Phillips, M. D. | North East | Erie |
| Philp, George | 1700 McFarland Rd., South Hills Branch Pittsburgh | Allegheny |
| Pollock, G. B. | Wyoming, R. 3 | Luzerne |
| Poor, D. W. | Narrowsburg, N. Y. | Wayne |
| Powers, R. A. | Sharpsburg, R. 2 | Allegheny |
| Prather, E. M. | Tenn. Hort. Soc., Nashville, Tenn. | |
| *Pratt, B. G. | 50 Church St., New York City | |
| Raffensberger, Luther | Arendtsville | Adams |
| Raffensberger, H. B. | Arendtsville | Adams |
| Raine, Tom W. | Fairview | Erie |
| Rankin, P. L. D. | 99 Hudson St., New York City | |
| *Rankin, Chas. C. | The Kenilworth, Alden Park, Germantown | |
| Rapp, Dr. Ira M. | 235 N. 6th St. | Reading |
| Rebennack, John | Dallas, R. 2 | Luzerne |
| Reichard, Chas. W. | Waynesboro | Franklin |
| Reinhold, E. C. | Elizabeth, R. 1 | Allegheny |
| Reist, Clarence J. | Landisville | Lancaster |
| Reist, Henry G. | 1166 Avon Rd., Schenectady, N. Y. | |

* Life Members.

| Name | Address | County |
|---|---|---|
| Reiter, Raymond F. | Mars | Allegheny |
| Reiter, F. G. | Mars | Allegheny |
| Reynolds, Milo | Factoryville, R. 2 | Lackawanna |
| Rhine, H. L. | McClure | Snyder |
| Rice, A. E. | Biglerville | Adams |
| Rice, J. S. | Biglerville | Adams |
| Rice, Daniel | Elliottsburg | Perry |
| Richards, Frank E. | Ransom | Lackawanna |
| Richardson, W. T. & Son | Whiteford, Md. | York |
| Rick, John M. | Ellwood City | Lawrence |
| Rick, Charles M. | 431 Windsor St., Reading | Berks |
| *Rick, John | c/o C. K. Whitner Co., Reading | Berks |
| Riley, Raymond G. | North Girard | Erie |
| *Rinehart, E. S. | Mercersburg | Franklin |
| Rinn, J. Cloid | Indiana | Indiana |
| Ritter, Elias | Selinsgrove | Snyder |
| Ritter, Astor | Allentown, R. 3 | Lehigh |
| Ritter, Arthur | Allentown, R. 3 | Lehigh |
| Rittenhouse, S. B. | Lorane | Berks |
| Rittenhouse, Dr. J. S. | Lorane | Berks |
| Roberts, John W. | Cranesville | Erie |
| Roberts, J. Earle | 220 Dock St., Philadelphia | |
| Roberts, Preston T. | Moorestown, N. J. | |
| Roberts, Byron | Moorestown, N. J. | |
| *Roberts, Horace | Moorestown, N. J. | |
| *Rohde, William | Johnstown | Cambria |
| Rohlfing, F. F. | Myerstown, R. 1 | Dauphin |
| Rohrer, Geo. H. | Dryville | Berks |
| Romig Brothers | Downingtown | Chester |
| Root, J. W. | Manheim, R. 1 | Lancaster |
| Rose, C. S. | Lititz | Lancaster |
| Rosensteel, L. C. | Edri | Indiana |
| Roth, T. M. | Clarks Summit, R. 3 | Lackawanna |
| Rozelle, H. E. | Pittston, R. D. | Luzerne |
| Ruef, John U. | State College | Centre |
| Ruhl, Dr. H. F. | Manheim, Box 236 | Lancaster |
| *Runk, John A. | Huntingdon | Huntingdon |
| Russel, N. W. | Erie, R. 6 | Erie |
| Rutter, Walter W. | New Holland, R. D. 2 | Lancaster |
| Sachs, Edward H. | Biglerville | Adams |
| Salsgiver, Andrew | Indiana, R. 7 | Indiana |
| Satterthwaite, Lewis P. | Newtown | Bucks |
| *Satterthwaite, F. G. | Yardley | Bucks |
| Sceiford, P. G. | North East | Erie |
| Schantz, H. A. | 538 Hamilton St., Allentown | Lehigh |
| Schantz, L. M. | Orefield, R. 1 | Lehigh |
| Schieferstein, William | Leesport | Berks |
| Schmidt, William | Berwick, R. 2 | Columbia |
| Schoelkopf, Carl | Wernersville, R. 3 | Berks |
| Scholl, W. J. | Barto | Berks |
| Schoonover, W. E. | Dallas, R. 3 | Luzerne |
| Schreiber, Harry F. | Zionsville | Lehigh |
| Schriver, Geo. | Bendersville | Adams |
| Schrope, John | Hegins | Schuylkill |
| Schuldt, J. Carlton | Elizabethtown | Lancaster |
| Shultz, Chester K. | Barto | Berks |
| Seachman, George E. | Red Lion, R. 1 | York |
| Seaman, George | Honesdale | Wayne |
| *Searle, Alonza T. | Honesdale | Wayne |
| Seitz, John B. | Rohrerstown | Lancaster |

* Life Members.



| Name | Address | County |
|---|---|---|
| *Settlemeyer, C. T. | Wilmore, R. D. | Cambria |
| Shaffer, Harry | Penn Run | Indiana |
| Shaffer Brothers | Ariel | Wayne |
| Shaffner, Harvey E. | Dover, R. 3 | York |
| *Shank, H. L. | Lancaster, R. 7 | Lancaster |
| Shattuck, J. H. | Erie, R. 6 | Erie |
| Shaw, R. C. | Stewartstown | York |
| Sheadle, Misses Adele and Lydia | Jersey Shore, R. 4 | Lycoming |
| Shearer, Walter J. | Vinemont | Berks |
| Sheble, Earl | Hamburg, R. 2 | Berks |
| Sheely, A. D. | Arendtsville | Adams |
| Shenk, D. W. | Lancaster, R. 7 | Lancaster |
| Showers, Lloyd | Bethel | Berks |
| Shenot, Edward | Wexford | Allegheny |
| Shenot, C. P. | Wexford | Allegheny |
| Sidler, Anton | York, R. 9 | York |
| Siegfried, A. H. | Selinsgrove | Snyder |
| Simmons, S. L. | Pittsburgh, R. 6 | Allegheny |
| Simpson, J. A. | Indiana, R. 5 | Indiana |
| Skinner, H. W. | Chambersburg | Franklin |
| Slade, J. E. | 25 N. 14th St., Allentown | Lehigh |
| Slade, Martin | Biglerville | Adams |
| Smedley, S. L., Jr. | Newtown Square | Delaware |
| *Smedley, Samuel L., Sr. | Newtown Square | Delaware |
| Smith, Leonard R. | Garden St., Mt. Holly, N. J. | |
| Smith, Philip S. | Laughlintown | Westmoreland |
| Smith, Roland M. | Marion Center, R. 2 | Indiana |
| Smith, A. Woodward | Blairsville, R. 1 | Indiana |
| Smith, W. G. | Trucksville, Box 36 | Luzerne |
| Smith, G. C. | Fairview | Erie |
| Smith, Wm. M. | Orefield, R. 1 | Lehigh |
| Smith, S. A. | Yoe | York |
| Smith, G. E. | Bethlehem, R. 4 | Lehigh |
| Snavely, Misses | Lebanon, R. 5 | Lebanon |
| *Snavely, H. H. | Willow Street | Lancaster |
| Snyder, Fred | Avonmore, R. 1 | Indiana |
| Snyder, Fry and Rick | Reading, R. 2 | Berks |
| Snyder, T. S. | Brodbecks | York |
| Snyder, Simon | Ephrata, R. 1 | Lancaster |
| Snyder, C. B. | Ephrata, R. 1 | Lancaster |
| Snyder, Elmer R. | Florin | Lancaster |
| Snyder, C. E. | Valley View | Schuylkill |
| Soergel, Alfred | Wexford | Allegheny |
| Spangenberg, M. T. | Waymart | Wayne |
| Spatz, Chames M. | Stony Creek Mills | Berks |
| Spencer, Glenn | Dalton, R. 3 | Lackawanna |
| Spencer, R. T. | Shanesville | Berks |
| Spiegelmyer, S. H. | McClure | Snyder |
| Sprankle, Kemp | Punxsutawney, R. 1 | Indiana |
| Stahle, Carl | Manchester, R. 1 | York |
| Stark Brothers Nurseries | Louisiana, Mo. | |
| Starry, Norman D. | York Springs | Adams |
| Stauffer, T. H. | Lititz, R. 1 | Lancaster |
| Stauffer, Wallace | Quakertown, R. 3 | Lehigh |
| *Stear, J. R. | Ligonier | Westmoreland |
| Stein, Henry | Woodville | Allegheny |
| Stein, Geo. E. and Son | Wrightsville, R. 1 | York |
| Stephens, A. Woodward | Mooresburg | Montour |
| Stitzer, C. E. | 221 E. Chestnut St., Mifflinburg | Union |
| Stock, Guy | Bendersville | Adams |

* Life Members.

| Name | Address | County |
|---|---|---|
| Stone, Leon | Dalton, R. 3 | Lackawanna |
| Stonebraker, H. W. | Indiana, R. 7 | Indiana |
| Stoner, Bertha | Hellam | York |
| Stoneroad, S. A. | New Providence | Lancaster |
| Stover, Jacob E. | York, R. 9 | York |
| Strawbaugh, Spence | Guernsey | Adams |
| *Strasbaugh, E. F. | Orrtanna | Adams |
| Straub, W. D. | Middleburg, R. 4 | Snyder |
| Strawser, A. A. | Mt. Pleasant Mills | Snyder |
| Strong, T. M. | Blairsville, R. 1 | Indiana |
| Stuffler, Fred | Fogelsville | Lehigh |
| Stuntz, H. E. | Girard | Erie |
| Surface, H. A. Dr. | Selinsgrove | Snyder |
| Sutliff, Dana | Shickshinny, R. D. | Luzerne |
| *Swank, Luke H. | Johnstown | Cambria |
| Swartz, D. H. | Clymer, R. 1 | Indiana |
| Swartz, Emma | Spring Grove | York |
| Swinderman, H. P. | Wexford | Allegheny |
| Syling, E. S. | New Castle, R. 7 | Lawrence |
| Thayer, Paul | Carlisle, R. 6 | Cumberland |
| Thomas, John M. | Dauphin, R. 1 | Dauphin |
| *Thomas, Chas. L. | King of Prussia | Montgomery |
| *Thomas, Edwin W. | King of Prussia | Montgomery |
| Tobacco By-Products Corp. | Louisville, Ky. | |
| Trexler, T. A. | 126 Chestnut St., Sunbury | Northumberland |
| Turrell, Elmore | Noxen | Wyoming |
| *Tyler, W. D. | Dante, Va. | |
| *Tyson, Chester J. | Gardners | Adams |
| *Tyson, Edwin C. | Flora Dale | Adams |
| *Tyson, William C. | Flora Dale | Adams |
| Tyson, Fred | Gardners | Adams |
| Uncle Peter's Fruit Farm | Mt. Carmel | Northumberland |
| Veety, Wm. | Clarks Summit | Lackawanna |
| Vierheller, A. F. | Md. State Hort. Soc., College Park, Md. | |
| Virginia State Hort. Society | Staunton, Va. | |
| Vite, J. C. | Rossiter, R. 1 | Indiana |
| Vogel, E. H. | Lancaster, R. 3 | Lancaster |
| Wagner, C. W. | Selinsgrove, R. D. | Snyder |
| Wagener, D. D. & Co. | Easton, R. 2 | Northampton |
| Wagner, Charles E. | McClure | Snyder |
| Walker, S. B. | Coplay | Lehigh |
| Walker, William | New Castle, R. 1 | Lawrence |
| Walker, F. W. | Connoquenessing | Butler |
| Walp, Charles F. | 401 E. 3rd St., Berwick | Columbia |
| Walter, Martin | Biglerville | Adams |
| Walton, C. Eugene | West Chester, Box 378 | Chester |
| *Walton, Robert J. | Hummelstown | Dauphin |
| Ward, M. R. | East Springfield | Erie |
| Watts, Gilbert S. | Bellwood | Blair |
| Way, D. H. | Port Matilda | Centre |
| Wealand, Harry R. | Denver | Lancaster |
| Weaner, W. C. | Aspers, R. 2 | Adams |
| Weaver, Wm. S. | Macungie | Lehigh |
| *Weaver, Abram | Sclap. Level | Somerset |
| *Weigel, H. M. | Harrisburg | Dauphin |
| *Weimer, E. A. | Lebanon | Lebanon |
| Weinberger, J. H. | Zionsville | Lehigh |
| Welshans, D. C. | Jersey Shore, R. 3 | Lycoming |
| Welshans, M. O. | Jersey Shore, R. 3 | Lycoming |
| Welty, S. N. | Fellam, R. 1 | York |
| Wenger, G. P. | 402 State St., Ephrata | Lancaster |

* Life Members.



| Name | Address | County |
|---|---|---|
| Wernig, Charles M. | York, R. 2 | York |
| Werring, Guy B. | Cortez | Wayne |
| Wertman, Ralph | Quakake | Schuylkill |
| Wertsch, Edwin | Stevens, R. 2 | Lancaster |
| *Wertz, George M. | Johnstown | Cambria |
| *Wertz, D. M. | Waynesboro | Franklin |
| *Westrick, F. A. | Patton, R. 2 | Cambria |
| Wheeler, C. B. | Hunlocks Creek, R. 2 | Luzerne |
| *Whisler, Edgar | Etters, R. 1 | York |
| Whitcomb, Paul | York, R. 4 | York |
| White, Jas. W. | County Home, Indiana | Indiana |
| White, F. Hayes | Liverpool, R. 1 | Perry |
| Wickersham, C. T. | East Springfield | Erie |
| Widders, J. B. | Lancaster, R. 3 | Lancaster |
| Wiggins, A. W. | Clarks Summit, R. D. | Lackawanna |
| Williams, Luther S. | Indiana, R. 1 | Indiana |
| Wills, F. A. | 1515 N. 26th St., Philadelphia | |
| Wilson, H. H. | Indiana, R. D. | Indiana |
| Wingate, C. A. | Chambersburg | Franklin |
| Winter, L. M. | Hellam, R. 1 | York |
| Wise, Harvey | Commodore, R. D. | Indiana |
| *Wister, John C. | Clarkson and Wister Sts., Germantown | |
| *Witherow, R. T. | Punxsutawney | Jefferson |
| Witman, John | 434 Windsor St., Reading | Berks |
| Witt, Harry | Pennhurst | Chester |
| Wolfe, Joseph | Allentown, R. 1 | Lehigh |
| Wolfe, C. E. | Gardners | Adams |
| Wolf, D. E. | Dallas, R. 2 | Luzerne |
| Wolff, F. B. | Lima | Delaware |
| Wolfe, Walter | Dallas, R. 2 | Luzerne |
| *Wolfe, Charles | Aspers | Adams |
| Woodward, N. H. | Mendenhall | Chester |
| Worthington, H. R. | West Chester | Chester |
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