year we had an outbreak of cutworms; this year there are very few. It is usually conceded, however, that a spring and fall spraying are necessaries for our condition.

Mr. Cunningham: Can we raise first-class marketable fruit without spraying? If so, where? I don't know. If we are going to compete on the markets, we have to get busy and raise first-class fruit, and this can only be done by spraying. I consider it would be a most unfortunate thing if it gets abroad that the growers are spraying too much. Some men near Vernon have not sprayed for two years. How are they getting along? Are they to remain growing unmarketable fruit? No; get them the machinery and teach them how to spray.

Mr. Taylor: I rather criticize Mr. Winslow if he claims we do not need to spray non-bearing trees.

Mr. Winslow: It is not a question of spraying *versus* non-spraying. It would be most unfortunate if the idea got abroad that I am advocating a cessation of spray application. What I do claim is that a lot of spraying has been misdirected and with consequent discouragement, and how best to find the economic basis.

Mr. Brittain: I think the difference of opinion has arisen from the different view-points taken. I think we can all now gauge the situation.

Mr. Winslow: Lime-sulphur may be made with economy in the valley.

Mr. Taylor: It isn't every one who can make lime-sulphur. The great difficulty is experienced in the resulting varying strength, a variation of 19 to 30 degrees. Another difficulty is the question of the employment of a licensed engineer for small plants.

Professor Wilson: At Corvallis we can make lime-sulphur for $3.75, the retail price being $8.10. It is thus useless paying freight on water.

The Chairman: I think perhaps we had better terminate this excellent discussion, as time is getting on. I am afraid we had better proceed. I will now ask our Secretary, Mr. Treherne, to present his paper.

METHODS OF TAKING INSECT RECORDS IN THE FIELD.

By R. C. Treherne.

In preparing this paper, I had in mind the requirements of the field inspectors working in the various orchards, farms, and nurseries in the Province, with the intention of presenting to them certain ideas in estimating the approximate prevalence of an insect pest and its corresponding injuriousness, so that we may be able to obtain a definite and co-ordinated idea on the nature of our local insect pests one year with another.

In order to determine the present rate of an infestation by any insect pest or fungous disease for comparison with an infestation in past or future seasons or periods, or in order to determine the rate at which an infestation increases in different territories with relation, as well, to dates of migration, emergence, or injuriousness, it is desirable that a definite system of recording the prevalence of an insect pest, one year with another, be employed.

I do not claim originality, altogether, for my suggestions that follow, for, after all, the problems of simple arithmetic are the only ones involved, neither do I wish to force those who are working in the field as inspectors to adopt the systems I propose, but personally I prefer to work with a system when in the field, and the following which I am putting forward as suggestions have been useful.

To determine Percentage of Infestation; Injury observed.

Select five typical locations in the field to be examined. At each of these five locations select a typical row, tree, or plant to be inspected. Emphasis should be laid upon the word "typical," no partiality or impartiality being shown in the selection. When this is done, count fifty plants, buds, fruit, or leaves, as desired, and examine carefully for injury. Then *the total number of injurious marks divided by the total number of objects examined, multiplied by 100, gives the percentage of*

infestation. If it is possible to examine the objects without injuring them in any way, and it is wished to follow the observations by others during the same season to obtain the *progress of infestation*, stakes or markers should be used, so that the same area or ground is covered each time. The number of insect injuries that can be examined in this way are necessarily limited, but we find examples in the stinging of fruits, etc., by such insects as the curculio, capsids, sawflies, and so on.

Progress of infestation can, however, be obtained, when the objects are destroyed, by frequent examination within a certain area. Results then can only be gauged by charting the notes obtained and general survey taken over a greater or lesser period of time.

Let us take the instance of a field of turnips affected with the root-maggots (*Pegomyia (Phorbia) brassicæ*). If before thinning we pulled up fifty young plants in each of five locations in the field and examined for maggots and their injury to the roots, and noted it in the following manner, viz.:—

North	Out of	50	plants,	0	were infested.
South	„	50	„	7	„
Centre	„	50	„	8	„
East	„	50	„	10	„
West	„	50	„	9	„
Total	Out of	250	plants,	34	were infested.

Then 13.6 represents the percentage of infestation.

Determinations of this nature can be made the basis of many series of observations and experiments, and the details can be arranged to suit the requirements of the case at the discretion of the inspector.

To estimate the egg, larval, or adult abundance to an acre when the insect or its stages are observed, we first must know the lineal feet of row per acre. The following table, therefore, is compiled, derived by division of the number of square feet per acre—viz., 43,560—by the width of the row:—

Rows in Feet apart.	Running Feet per Acre.
2½	17,424
3	14,520
3½	12,445
4	10,890
4½	9,680
5	8,712
5½	7,920
6	7,260
6½	6,701
7	6,222
7½	5,808
8	5,445
9	4,840
10	4,356
11	3,960
12	3,630
15	2,904
18	2,420
20	2,178
30	1,452
40	1,089

To put this table into application, let us suppose we wish to determine the egg-abundance of the cabbage-maggot (*Pegomyia (Phorbia) brassicæ*) in a field of turnips, the adult abundance of the strawberry-root weevil (*Otiorhynchus ovatus*), the adults

of which are found on the ground surface in rows of strawberries, or any such insect affecting small fruits or vegetables in cultivated field or garden rows; first stake off 1 foot of row, count the insects or insect forms as desired, and estimate the average per 100 feet of row; then divide the running feet of row per acre, coinciding with the distance of rows apart, by 100, and then with the figure thus obtained (as per table) multiply by the number of insects estimated on the average of 100 feet of row. For example:—

In 1 foot of row	4	insects taken.
„ 1 „	2	„
„ 1 „	0	„
„ 1 „	5	„
„ 1 „	4	„
Thus in 5 feet of row	15	insects were taken.

The average per 100 feet of row is 300. Let rows be 4 feet apart. Thus 300 x 108.90 gives an estimate of insect-abundance of 32,670 to the acre.

Supposing, once more, the above estimate referred definitely to the egg-notes of the cabbage-maggot, by reference to the habits of the insect we know that each female is capable of laying on the average fifty eggs; thus by dividing 32,670 by 50 we estimate with reasonable assurance the number of adult female flies at work on the acre at any specific time.

Of course, in a case like the above the flies may be at work laying eggs at the same time as our records were being taken, and the same might occur with any insect having a continuous generation, consequently our results taken two or three days later might be very different to the first ones taken; thus it is advisable, in order to obtain uniformity, moderate exactness with a minimum of error, to examine the same plants several days in succession or several times during a certain period.

In the case of making estimates on nursery-stock rows, gooseberries, currants, raspberries, or such-like bush-fruits, 1 foot of row is too small an area to obtain results; consequently 100 feet of row or fractions of the same are taken. For example:—

In 100 feet of row	10	insects are observed.
„ 100 „	2	„ „
„ 100 „	0	„ „
„ 100 „	14	„ „
„ 100 „	4	„ „
Total 500 feet of row and	30	insects observed.

Average per 100 feet is 6 insects. Let rows be 4½ feet apart. Thus 6 x 96.80 equals 580.8 insects to the acre.

In the case of young orchard trees set on the square-planting plan, corn-hills, tomato-plants, or any plants grown on the square equidistant hill system, the following computation on the number of square feet of row per acre will be found most useful as a basis for figuring:—

Distance in Feet.	No. of Plants per Acre.
1	43,560
1½	19,360
2	10,890
2½	6,969
3	4,840
3½	3,556
4	2,722
5	1,742
6	1,210

Distance in Feet.	No. of Plants per Acre.
7	889
8	680
9	537
10	435
12	302
15	193
18	134
20	108
24	75
25	69
28	55
30	48
40	27

To obtain records to the acre from this table, the number of insects found infesting a tree or a hill would be multiplied by the number of plants to fill out the acre, coinciding with the width of the rows.

To the working field inspector some sort of system as mentioned would be of value. The tables might be typewritten and pasted in the front of the pocket note-book for ready reference.

The type of note-book of most use, to my mind, is a fling-cover loose-leaf kind, about 7 x 4½ inches to the cover, with pages about 6 x 4½ inches. Each page may be already printed in form somewhat as follows:—

Orchard of .....
Address .....
Name of insect present .....
Prevalence .....
Degree of injury .....
Condition of crop .....
Remarks .....
Inspected by .....
Date .....

Each form is preferably reserved for one insect, and each one, when filled out at the end of the week, is filed away for future reference and report.

However, all these details are merely incidental and subject to individual preference; the main principles, however, are accuracy of report based on a continuous and satisfactory system.

I wish, in conclusion, to say that these various methods of obtaining insect records in the field are far from scientific. The facts obtained are too general in nature and the possibility of error is too great. However, to the working field inspector these may prove of use in his work.

The Chairman: I am sure the schemes suggested will be of use in a general way. I will now ask Mr. Cunningham to give his paper.

THE WORK OF THE INSPECTOR OF FRUIT PESTS.

BY THOS. CUNNINGHAM, INSPECTOR OF FRUIT PESTS.

I have been requested to prepare a paper for this meeting on the work of the Government Entomologist. The title was chosen without my knowledge, and I have therefore taking the liberty of making a slight change which I believe will more fully describe the duties of the Inspector of Fruit Pests. This title is comprehensive and unique; it was chosen in the early pioneer days when the few fruit-growers then in the Province were feeling their way cautiously toward the development of an industry which has since attained such proportions, and now plays such an important part in the settlement and commerce of this country.