THURSDAY AFTERNOON SESSION

October 13, 1966

VICE-PRESIDENT HENRY ISHIDA: Our first panel this afternoon will be on Soils and Fumigation and the Moderator is Dr. Robert Ticknor, from the Northern Willamette Valley Experiment Station, Aurora, Oregon.

MODERATOR TICKNOR: Thank you, Henry. To get started we will have Jerry Hanes of Tri-Cal speak to us on chemical fumigation. This will be for field production, I understand. Jerry:

CHEMICAL FUMIGATION

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Soil fumigation in California has developed very rapidly during the last few years. This recent rapid development has been mainly through the utilization of the very volatile fumigant, methyl bromide. Prior to this time control of weeds, nematodes. and fungi by fumigation was accomplished with the slowly volatilizing chemicals.

There still are large acreages being treated with these less volatile fumigants. Some of the most common chemicals used are dichloropropane-dichloro-propene (D-D), carbon bisulphide, methyl isothiocyanate, chloropicrin, allyl alcohol, and dibromochloropropane (DBCP).

The individual fumigants have their own application techniques and soil requirements, and it is not possible to list a set of rules applicable to them all. Generally, however, they require the following: soil moisture in excess of 40% field capacity but less than 80% field capacity. It is best that the soil be moistened and the moisture maintained ten days before application of the fumigant. The soil should be worked to seed bed condition and rototilled if necessary. The application of fumigants is generally done through chisels mounted on a tractor. The chisel spacing varies from 4″ to 12″, dependent upon the diffusion pattern of the fumigant. Depth of application is also dependent upon the diffusion pattern and is from 4″ to 8″. After application of the fumigant, the soil is usually packed, and in some instances a light water seal is applied. With the increased use of tarp layers some of the slowly volatilizing fumigants are being sealed in with polyethylene film. After lying undisturbed for not less than ten days the soil can be worked. The soil cannot be planted until the fumigant has escaped. This aeration period may vary from 10 to 90 or more days depending upon the fumigant used, the dosage, soil temperature, and soil moisture.

Prior to about 1957, the very volatile material, methyl bromide, had limited use because of its cost and difficult application. Fumigation was accomplished by introducing methyl bromide beneath a gas tight tarpaulin that was slightly raised above the area to be treated and sealed at the edges by soil. This method is still used for fumigating flats of soil or small areas such as golf greens. More fumigant must be used with this method, so the cost of material would be about $400. The cost of labor is also very high. In 1956 work was commenced in introducing methyl bromide into the soil through tractor-mounted chisels and covering the area with a gas-tight tarpaulin by hand after the injection was made. The methyl bromide was diluted with a petroleum hydrocarbon to reduce its vapor pressure, thus slowing its escape from the soil so there was time to spread the tarps over the area.

This method was quite an advancement for several reasons. It reduced by half the amount of methyl bromide required. It was no longer necessary to raise the tarpaulin off the soil and therefore thinner and cheaper tarpaulins could be used. It enabled the utilization of larger tarpaulins. Labor was reduced from $100 per acre to less than $20. The above factors reduced the cost by more than half and thereby made its use on large-scale operations practical.

In 1961 tarp-laying machines came into use. The first models were quite crude, but their effectiveness is proven by the large number of improved machines that are being used today. The major factor in the development of this tarp-laying technique was the plastic film producers ability to produce film thin enough to use once, then throw away. By using tarpaulins that are disposable after using only once, fumigation can be accomplished in a very short period of time, and labor requirements can be drastically reduced. A machine can handle much thinner material without damage than can be handled by men. Also tarpaulins can be laid by machine under weather conditions that would render other methods of application very difficult, if not impossible. The machine application of tarps is now perfected to the extent that it is possible to lay between 10 and 20 acres of tarp per day.

Chloropicrin is used mainly for high activity against soil-borne plant disease organisms. Its weed and nematode control qualities are not satisfactory when its cost is taken into consideration. Methyl bromide, at weed and nematode control dosages, is not satisfactory for control of soil-borne diseases. Methyl bromide, however, has disease control properties, as chloropicrin has weed and nematode control properties. Experimentation was commenced to evaluate mixtures of these two materials. It was found that a mixture of 100 pounds methyl bromide and 200 pounds chloropicrin per acre controlled nematodes, most weeds and most disease organisms. Also a mixture of these fumigants in opposite proportions (100 pounds chloropicrin and 200 pounds methyl bromide) performed nearly as well. Today, if methyl bromide is to be used, chloropicrin is generally added to give disease control as a bonus. If chloropicrin is to be used, methyl bromide is added to give weed and nematode control as a bonus. The added cost by these additions is not excessive because the qualities of each fumigant are enhanced by the action of the other. Aeration of soil for two days is sufficient following methyl bromide fumigation. Ten to 14 days are required for methyl bromide-chloropicrin combinations.

Generally the end result of a fumigation is failure when the principals are not thoroughly familiar with the fumigants they are using, or if they are unaware of the susceptibility of the weed seed or pathogen to be controlled. Failure can and most likely will occur, irrespective of the fumigant used, if improper application techniques are used, or if soil condition requirements are not met, or if an incorrect dosage is applied.

MODERATOR TICKNOR: Thank you, Jerry. Our next speaker is one whom I think most of you know, Mr. O. A. Matkin. He will speak to us on recent developments in soil mixes. Mr. Matkin:

SOIL MIXES

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The term "soil mix" is rapidly becoming a misnomer. In recent years there have been millions of plants sold which never saw "soil" as such. In the past two decades we have seen a radical departure from the old "green thumb" approach to plant production. The beginning of a new philosophy probably had its start with the John Innes approach in England. With the publication by the University of California of Manual 23, titled "The UC System For Producing Healthy Container-Grown Plants", an overall philosophy was outlined which has become an accepted approach throughout the world. In any final analysis of events which have occurred and will occur, economics must be accepted as the dominating factor.

Since the number of potential soil mix preparations is infinite, we should look first at the underlying economic factors which must influence our choice of formulation.

1. Cost of raw materials is an obvious consideration. Why pay $5 for something which can be obtained in equal quality for $2.50? The term "quality" is not always easily defined, but must inevitably show up in some phase of economic evaluation.
2. Cost of mixing can be a substantial factor. Equipment, man-power, and storage areas all have values which can be assigned. Materials which are difficult