A STUDY OF LOSSES DUE TO WEEDS IN SEVERAL CROP ZONES OF MANITOBA.

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A THESIS

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C O N T E N T S

INTRODUCTION

The control of weeds is one of the oldest and still one of the most important problems connected with agriculture. Because we have always had weeds with us, there is a tendency to accept the situation as inevitable and one of the necessary evils connected with farming, consequently no sufficient, general, and concerted effort is being made to overcome the great loss which they cause. Yet the weed fight is one of the standard routine operations on the farm, and it represents a large proportion of the labor necessary to produce crops. No other single feature of farming requires such universal and unceasing attention as do weeds.

The annual loss caused by weeds is enormous. As yet only a small amount of work of a definite nature has been done relative to the loss incurred. The following work has been undertaken to ascertain in a limited way the extent of some of these losses.

PREVIOUS INVESTIGATIONS AND ESTIMATES

Barnes and Hopkins (1) in experimental work conducted with tanks found that weeds were responsible for the removal in the first half of the growing season of more than half of the moisture conserved during the previous twelve months' treatment. This loss of moisture

was directly reflected in the following crop of Wheat by reducing the yield over 50%.

Barnes and Hopkins (2) in experiments at Swift Current found that the yield of grain must suffer if the grain plants are obliged to compete with weeds for moisture. Experiments to determine the competitive effect of weeds were carried out by intentionally planting weed seeds with grain. Seeds of Russian Thistle, Stinkweed and Tumbling Mustard were used. The results obtained show a very depressing effect on the yield of grain growing in competition with weeds as compared to the weed free area. Similar results were obtained when weeds were allowed to grow upon land to be summerfallowed.

Barnes and Hopkins (3) found that the yield of Wheat sown the second year on land on which weeds had previously been planted with the Wheat was very greatly reduced. On weedy plots the yield was less than 25% of that on clean stubble land, Tumbling Mustard appearing to depress the yield to a greater extent than Russian Thistle or Stinkweed.

Tinline (4) in spraying Stinkweed with Sulphuric Acid found the yield of Oats on treated plots was increased over that of the check as much as 22.8%. The field on which

the tests were carried out was badly infested with the weed, averaging seventy-nine Stinkweed plants per square foot.

Barnes and Hopkins (5) in experimental work found the loss of moisture in late plowed summerfallow very considerable and this was largely due to weed growth. Similarly they found the yield of grain the following year was in direct relationship with the dates of plowing the previous season.

Barnes and Hopkins (6) found the depressing effect of weeds on Wheat yields to be considerably greater when deficient soil moisture conditions prevail. In experiments carried out with water-tight tanks where the same quantity of water was consumed it was found that there was a considerable reduction in the yield of grain from weed infested soil as compared to the yield on soil free of weeds.

During 1930 the experiment was somewhat modified and seeds of Wild Oats, Stinkweed, Tumbling Mustard and Russian Thistle were seeded with Wheat in field plots. Under these conditions it was found the yield of grain was reduced in some cases over 50%, Wild Oats and Russian Thistle showing a greater depressing effect than Tumbling

Mustard and Stinkweed.

Pieper (7) in an address before the Illinois "Farmers' Institutes" in 1930 quoted the Agricultural Service Department of the United States Chamber of Commerce with the following statement - "The weed tax in America is enormously larger than has been realized. It apparently amounts to as much as three billion dollars annually. This exorbitant tax falls most largely on American agriculture". Continuing he quotes, "The United States Department of Agriculture, Office of Farm Management estimated the loss in yield of Corn from weeds at 10%, Spring Grains 12 to 15%, Winter Grain 7%, Potatoes 6 to 10%, Hay 10%, and Pastures 20 to 25%. Indiana in 1920 estimated the average annual loss per farm caused by weeds at $210.00; Wisconsin in 1927 put their loss at $244.00 per farm." Continuing Pieper says "Millions of dollars are lost annually in the spring grain region of the United States in the threshing and handling costs of dockage and when shipped from the farm, in the feeding and fertilizer value. Many counties show an average of more than 10% dockage in Spring Wheat while some show an average as high as 18%. The dockage in Flax is higher than in Spring Wheat. Minnesota had 16.4%, North Dakota 15.8%, South Dakota 16.9%, and Montana 7.4% dockage for the year 1928."

Further he says "According to the United States Department of Agriculture the threshing bill for four Spring Wheat States in 1923 was $1,048,572 for dockage alone. The cost of transporting this material to market was $1,242,752. It required 13,900 cars to transport 11,650,000 bushels of dockage." He adds further, "A unique experiment was completed at the Illinois Experiment Station a few years ago in which the yield of Corn was reduced more than 80% by omitting cultivation and thereby allowing weeds to grow in the Corn, compared to the ordinary method of cultivation. This same experiment led to the conclusion that we cultivate Corn primarily because of weeds."

F. L. Dickinson, United Grain Growers' Company, Limited (8). This organization, doing a large grain business in Western Canada, estimate that out of a total of 5,648 country elevators, 743 of which are in Manitoba, that 2,500 are equipped with cleaning machinery at an average cost per elevator of $2,000.00. This represents $5,000,000.00 in country elevators. In addition they further estimate that another $5,000,000.00 of machinery is installed in terminal elevators. This tremendous investment is due entirely to weed seeds in grain and their difficulty of removal.

McRostie (9) in experiments on one-eightieth acre plots found a direct relationship between the number of Sow Thistles per plot and the yields of Wheat secured. As the number of Sow Thistle increased there was a corresponding decrease in Wheat yields.

Cates (10) in "The Weed Problem in American Agriculture" points out that tillage is by far the most expensive feature of growing intertilled crops. He says that numerous cost account records collected by the office of Farm Management, United States Department of Agriculture, show that on the average diversified farm the cost of tillage operations comprises 30 to 40% of the total cost of farm operations. Probably half of the total amount of cultivation required is necessary only for controlling weeds and in many instances practically all intertillage could be eliminated without affecting crop yields if weeds by other means were prevented from growing. Cates further adds, "The loss of cattle and sheep due to poisonous weeds is very great. On the United States National Forest Ranges alone, the loss in 1916 amounted to 6,648 cattle and 16,273 sheep besides a number of horses, goats and other animals."

METHODS FOLLOWED

In 1931 the writer undertook to secure information of a definite nature in so far as possible relative to losses from weeds in competition with grain crops under actual field conditions.

This work was largely done in the Red River Valley. Several trials were also located in the South Central section of the province.

In addition to the above an attempt has also been made to show the extent of the dockage on market grain and the resulting direct loss, particularly in respect to freight and threshing charges to the farmers of Manitoba.

The accompanying plan (Page 9) for carrying on the field work was adopted and followed. The outline of this work will first be presented with a discussion on the experimental findings followed by the material relative to dockage losses.

Eight plots were used in each case, four being weeded by hand pulling and in four the weeds were allowed to grow under natural conditions. The experiments were laid out in grain fields after seeding, while the grain plants and weeds were quite small. Experiments were located in places that appeared to be representative of the whole field. The area of ground used was thirty-six

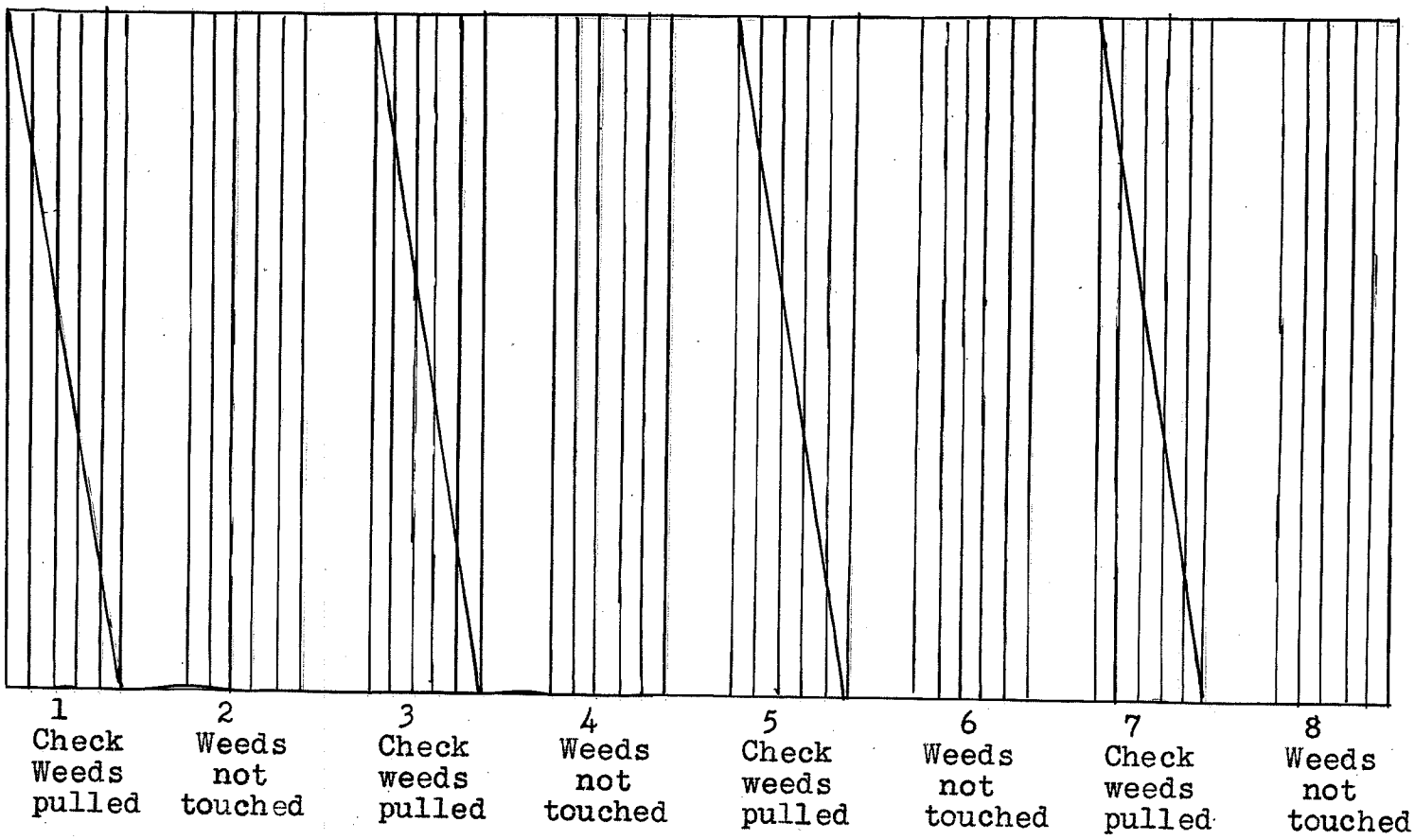
by twenty-two feet, this allowed for a one foot space between plots and a path around the outside as well. The plots were twenty feet long and six drill rows wide. At harvest only sixteen and a half foot portions of the two centre rows were harvested, the ends being discarded. Figure 1 shows a weeded and adjacent weedy plot just before harvest.

Figure 1. Weeded and adjacent weedy plot just before harvest.

PLAN OF EXPERIMENT

Plots - 6 Rows Wide 20 Feet Long 1 Foot Space Between Plots

16½ Feet of Two Centre Rows in Each Plot Harvested



At the time of laying out the experiments the plots were marked with small stakes, the odd numbered plots being weeded and used as checks, the weeds in the even numbered being allowed to grow. The weeding was carefully done by hand at the time of laying out plots and it was found that very few new weeds appeared after the weeding except in a few cases where small plants of Stinkweed were noticed at harvest time. These, however, were too small to be of any great importance.

Weed counts were carefully made on the weedy plots between July 8 and 15. In doing this two counts were made on each plot using a square yard as the unit and taking the average for the two counts. At this time, the number and kinds of weeds were recorded. This is shown in tables presented later dealing with each individual experiment.

In addition to the plots laid out in this manner square yard samples were taken from nine fields with average infestation of perennial Sow Thistle. This was done with a view to securing information on the extent to which this weed may affect yields. The fields chosen might be classed as average in so far as Sow Thistle infestation is concerned. Eight square yard samples were taken from each field, four of these being from areas free of the weed and four from in-

fested areas. The samples were taken in a line down the field in order to eliminate in so far as possible any variations in soil and seeding conditions and in so far as possible samples were only taken where conditions seemed representative of clean and weedy portions. In this part of the experiment only the influence of perennial Sow Thistle was being considered and in practically all cases was the only weed present. Samples were taken at harvest time and a careful count made of the number of Sow Thistle plants in each case.

In taking the samples a square hoop of No.9 wire was used and as each sample was harvested the heads were placed in sacks and properly labelled. Each lot of eight samples from each field were then placed in a large sack and these were stored with the Agronomy Department at the Agficultural College which Department later threshed the samples.

In the case of the plots previously described which were laid out in the spring these were harvested as soon as properly matured. In each case sixteen and a half feet of the two centre rows were harvested, the ends and remaining rows being discarded. Harvesting was done by pulling the plants and then cutting off the heads and placing in properly tagged small sacks. These eight small sacks