

head the herd. Grade herds are a sound productive institution on any farm, but they must have the pure-bred bull with character at their head.

FARM.

Some Considerations on the Weed Problem of Canada.

It is unnecessary here to define the term "weed" or to point out in detail the damage done by weeds as this is obvious to all who have ever engaged in cultivation of the soil. Pamnel in a very comprehensive work on "The Weed Flora of Iowa" recently published estimates the loss in that State alone as amounting to \$25,000,000 yearly. Hence it is apparent that the control of weeds is a subject not only of urgent but of vast importance.

Nevertheless the question is not altogether one to be undertaken in a hurry. Panic stricken methods seldom produce permanent results. The case is rather one that calls for calm consideration and patient investigation, and the following suggestions are put forth as a preliminary step in solving the problem of weeds and devising means for holding them in check. For this is all that we can ever hope to do, as anyone who has ever kept even a small garden plot knows perfectly well. You may reduce weeds to a minimum, but you can never get absolutely rid of them as long as seedtime and harvest remain. With resolution you may succeed in extirpating some of the most troublesome species, but other species will as quickly take their place.

Long ages ago when the herds of Buffalo roamed over the prairie and the forests grew up amid primeval stillness there was very little change in the species of plants occupying any particular area from year to year. The struggle for existence among the various species had been prolonged, but each had at length found its settled place in nature, and any change that took place in their distribution was necessarily slow. But when man, especially the white man, came upon the scene all this was changed. He ploughed the prairie and cleared the forest thereby disturbing the balance of nature which it had taken centuries to establish. Thereupon a fierce struggle for existence ensued among the species of plants disturbed which was intensified by the introduction of new species. Not only had the native plants to fight for room among themselves but they had also to hold their ground against the foreign species introduced. In this struggle some of them disappeared while others found the new conditions more favourable to their increase. But not only did civilized man bring with him the useful plants which he desired to propagate—he also, unintentionally, no doubt, brought with him the seeds of noxious plants. These also endeavored to find a place for themselves, and the combat became a triple warfare between the native vegetation, the useful plants, and the introduced but useless species. If left to themselves most of the useful plants would in a few years have succumbed, some of the foreigners would have established a place for themselves, and eventually a balance would have been once more restored between the surviving species. But man took the part of the useful species he had planted, and consequently the struggle between the plants he desired to grow and the plants he did not want—the "weeds"—went constantly on. Every time he ploughed a field he disturbed the balance which nature was as constantly trying to establish, for it is as true that nature abhors a piece of bare soil as it is that nature abhors a vacuum. And precisely the same thing is going on at present. Obviously, therefore, the war between the farmer and the weeds is a never-ending one.

But "knowledge is power," and if a farmer has a clear understanding of the life history of a weed and attacks it at its weakest point the contest will soon be decided in his favor. It should be borne in mind that almost any herbaceous plant may become a weed. The farmer should, therefore, not only know how to deal with the weeds he has already on his farm, but should keep a sharp lookout for the possible arrival of new species. The geographical distribution of many plants is rapidly changing at the present day owing to modern facilities for trade and commerce. As an example the Common Ragweed (*Senecio Jacobaea* L.) was first noticed in New Brunswick shortly before the year 1880, while in 1909 it was found in Nova Scotia, Prince Edward Island, Newfoundland, Quebec, Ontario, and as far south as New Jersey.

In order to be in a position to deal with the question of weeds in a proper and scientific manner, it is obvious that the more one knows about the weed its manner of growth the better fitted will one be to combat it. Good work has been done in Germany along these lines as is attested by the series of monographs on various weeds published in Berlin by the German Agricultural Society. But this is a study that each country

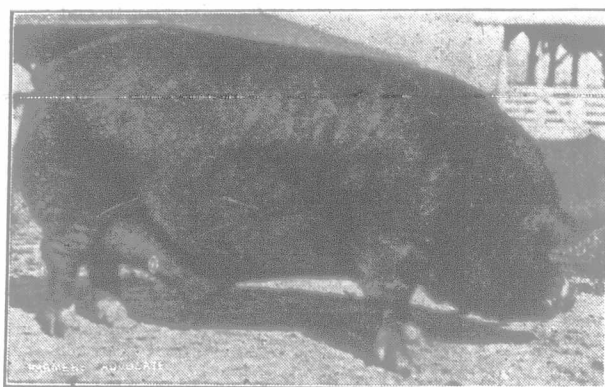
must work out for itself as the mode of life of any particular weed is by no means the same in all countries. For example, Darwin mentions that the English Thistles when introduced, on the Pampas of South America grew so tall that a man on horseback had difficulty in forcing his way through them. In other cases a species that is injurious in one country may be harmless in another. South American Dodder seeds, for example, if sown along with clover in Ireland rarely germinate as the temperature is not sufficiently high. It is further evident that in a country so extensive as Canada where there is great diversity of climatic conditions, investigations to be of much value would require to be carried out in several provinces of the Dominion.

The further consideration of the weed question may conveniently be arranged under three heads: I, Scientific Research; II, Educational Methods; III, Legislative Action.

I. Scientific Research.

I. Geographical Distribution.

Obviously one of the first things to be done will be to ascertain the present distribution of weeds in the various Provinces of the Dominion. As almost any herb growing wild may, after the



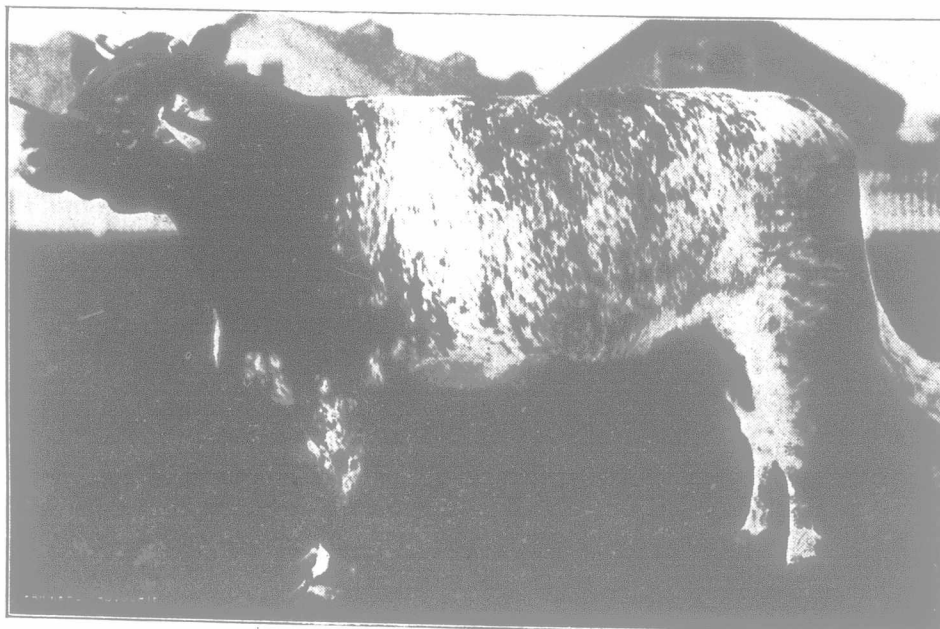
First Prize Berkshire Boar.

This hog won at Toronto for S. Dolson & Son, Norval, Ont.

ground is cleared or broken up become a weed, this will mean a somewhat comprehensive botanical survey of each province, or at any rate of the more settled parts. A list of the weeds of each province should be compiled and tabulated in the order of their importance, the most troublesome being placed first.

2. Whether a native species or introduced.

It would be desirable to know whether each particular species of weed is a native of Canada or has been introduced from some other country. If introduced, the date of its first appearance and the manner of introduction should be known as far as possible and whether it is still being introduced at the present time. Formerly many weeds found their way into this country in the form of impurities in farm seeds. Of the 71



Duchess 50th.

Shorthorn heifer; champion at Toronto and London for J. A. Watt, Elora, Ont.

species of weeds illustrated in Clark & Fletcher's "Farm Weeds of Canada" no less than 50 have been introduced from other countries. Notwithstanding a stringent Seed Control Act, Geo. H. Clark, Seed Commissioner for Canada, recently informed me that from 10 to 12 new species of weeds are being imported into Canada every year. A somewhat similar state of things prevails in the United States. In the list of 200 weeds of the United States published in the Year Book for 1895, 108 species are of foreign origin, while 92 are native. Other possible methods of introduction of weed seeds are in the form of

feeding stuffs, in manure, by threshing machines, or in imported wool.

3. Relation to the chemical composition of the soil.

Some weeds such as Blue Weed (*Echium vulgare* L.) favor a limy soil, while others such as Sheep's Sorrel are characteristic of soils deficient in lime. Many species will thrive equally well on all kinds of soil.

4. Relation to the various crops grown on the farm.

Some weeds, especially annuals, grow best on soil that is cultivated while they disappear or are held in check if a hay crop be grown. Others such as Canada Thistle will grow readily on both pasture land and cultivated ground.

5. Natural means of spreading.

Some weeds spread over the surface of the ground by runners, others by underground creeping stems, while others—the "root-bound" species—such as Dock remain more or less confined to one spot.

6. Dispersal of fruits.

If spread by seeds or fruits the manner of dispersal should be known, whether by wind, or drifting snow, or water, either in the form of flooded streams or by heavy rains running off sloping ground; in other cases the fruits are carried on the wool or hairs of animals, while in a large percentage of weeds there is no special mechanism for dispersal.

7. Time of flowering and time of ripening of the seed.

In some cases the latter will coincide with the harvesting of the crops among which it is growing, while in others it may be earlier or later.

8. Number of seeds produced by a plant of average size each season.

It has been found that weeds which spring up from seeds every year produce seeds in enormous numbers. Weeds such as Great Bindweed and Creeping Thistle which spread so freely by underground organs, produce seeds annually in comparatively small numbers, as there is not the same necessity for the production of seeds to perpetuate the life of the species. At any rate, this is so in other countries and probably the same thing holds good here. In other cases, such as Perennial Sow Thistle, not only is there an abundant production of seeds above ground, but the plant spreads rapidly below ground at the same time.

9. Time of germination of the seeds when self-sown in the ground.

In the majority of cases the seeds lie dormant in the ground during winter and germinate in spring, whereas in a few species such as Pepper-grass the seed germinates shortly after ripening and produces a small plant which survives the winter and continues its further growth in spring.

10. Quality of the seeds when buried in the soil.

Opinions seem to differ as to the length of time during which seeds retain their vitality. Ewart in his first series of experiments gives about 15 years while in a later series he says that some germinated after keeping for half a century. In both cases he appears to have worked with seeds stored in a dry place. But it is well-known that many seeds lose their vitality in a short time after ripening unless they are planted in the soil. Duvel's experiments with seeds in pots buried at different depths, though interesting, probably do not represent the exact condition prevailing in the soil. My own observations have shown that a number of different species of weeds obtained by washing the soil underneath a pasture field which had not been cultivated for at least twenty years germinated readily. Beal, in an important bulletin on Michigan weeds, states that some weed seeds when buried in the soil will retain their vitality for thirty years at least, while Peter of Gottingen states that the seeds of wild Mustard (*Brassica*) can retain their vitality for forty years.

11. Relation to moisture.