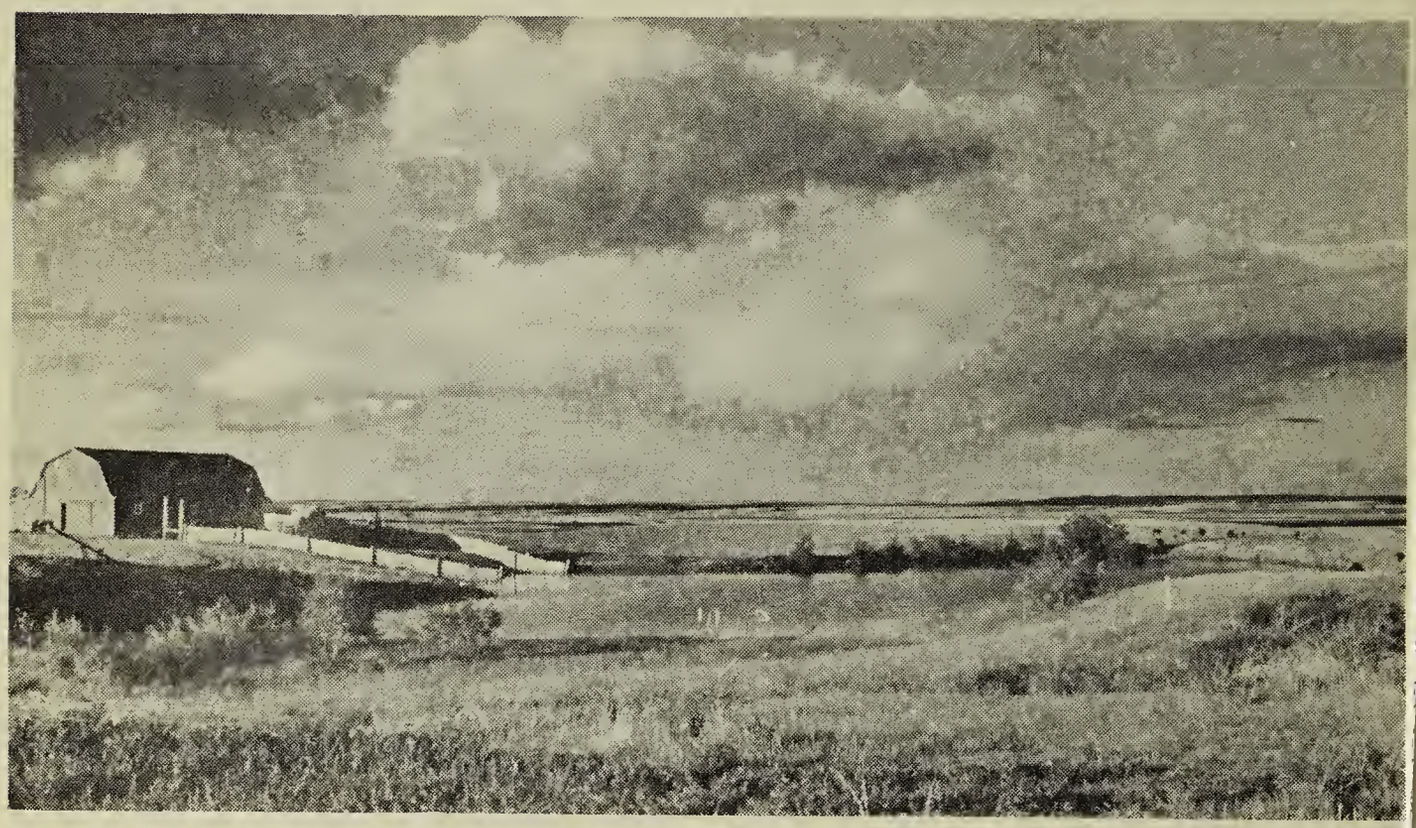
Soil and Water Conservation in Prairie Agriculture

By D. W. KIRK, P.F.R.A., Regina



P. F. R. A. Photo

A small dam built with P. F. R. A. assistance for stockwatering.

The conservation of soil and water can mean different things to different persons and in different places depending upon how the resources are being used and what problems are associated with their use. In prairie agriculture, we speak of it in terms of better land use in which the most pressing problem requiring solution is that of drouth. For the purposes of this article, I shall confine my remarks to this particular aspect of conservation and what is being done to solve it.

Our experiences with drought go back a long way to the time of Palliser in 1857. Captain John Palliser was an officer of the Royal Engineers in His Majesty's Services who had been commissioned in that year to head a scientific expedition to the region. Palliser was directed to explore "that portion of British North America which lies between the North branch of the River Saskatchewan, and the frontier of the United States, between the Red River and the Rocky Mountains." He was specifically directed to explore and examine "the nature of its soil, and its capability for agriculture." Palliser's complete report of his explorations and investigations covering the period 1857 to 1860 was presented to both Houses of Parliament by command of Her Majesty Queen Victoria on May 19, 1863.

Palliser described the open plains of Central North Americа in part as follows: "This central desert extends however, but a short way into British Territory, forming a triangle having as its base the 49th parallel from longitude 100 to 114 west with its apex reaching to the 52nd parallel of latitude." So, nearly 100 years ago, was set down the first delineation of the so-called "drought area," the "Palliser Triangle," embracing approximately 50,000,000 acres.

The Palliser report, however, did not meet with universal acceptance. Later, when building a railway across the country became a matter of public interest and controversy, the Canadian Government decided to make its own investigation. John Macoun, an experienced explorer and scientist, was sent out to examine the "Great Buffalo Plains" and report as to their suitability for settlement. Macoun travelled over, for the most

part, that portion of the prairie region traversed by Palliser twenty years before.

Macoun's report was laid before the Government in the winter of 1879. In his book *Manitoba and the North-West*, Macoun interprets some of the conclusions of his report: "Instead of being an arid desert, as Palliser had described it, we found it covered with tall, rich grass . . . very little observation was necessary to correct Palliser's mistake."

Here, then, were two supposedly eminent authorities whose ability to deal with the matters submitted to them could not be questioned. Yet one flatly contradicts the findings and conclusions of the other. The explanation is, of course, that Captain Palliser visited the region during one of its recurring dry periods, while John Macoun made his survey during a period of wet years.

Our history records another period of dry years at the turn of the century; then 1910 was a very dry year, and 1914 another dry year. Drought struck again in 1917, 1918, 1919—three dry years in a row. During these years, there was crop failure over a wide area. The Federal Government had to supply seed grain and come to the relief of the needy settlers in other ways. The 1920's were good years over most of the prairie region. During this time there was progress and prosperity. Farmsteads dotted the landscape. Towns and cities were being built, and wheat—hard wheat—was King. In 1928 the production of hard spring wheat broke all-time records. Palliser was forgotten. Then came catastrophe. Drought struck again with unprecedented severity. For nine long years it persisted. The once green countryside lay buried in a layer of drifting soil as black blizzards swept over the plains, blocking roads, filling shelterbelts and half burying farm buildings.

Those were terrible years, years that broke the faith and will of all but the most stouthearted. The Palliser report was taken down, dusted off and re-read, and there was no little speculation that maybe Palliser was right after all.

In one simple sentence, then, the problem of agriculture on the open plains can be stated. It is problem of climate—low and variable rainfall. Hundreds of millions, yes billions, of dollars of new wealth have been produced in that section of the country condemned by Palliser; while, during the same period, devastating droughts have also been experienced in the same region, which would have confounded the conclusions of even such a man as Palliser.

The challenge posed to the conservationist by prairie agriculture, therefore, was to evolve a system of farming which would make the most efficient use of the limited water resources at our disposal, and at the same time maintain unimpaired the inherent fertility and productivity of the soil. Under dry land farming conditions, this means developing systems of cropping which will conserve soil moisture and spread its usefulness for growing crops over a longer period without injuring the physical quality of the soil and without creating such hazards to farming as soil drifting.

The "fallow" system is, of course, our most widely used method of conserving soil moisture and while its use leaves much to be desired from a soil-building and soil-conservation standpoint, no better substitute has been found, and it has continued to be used as the lesser of two evils. The introduction of power farming, fortunately, has modified the system to the extent that its most harmful effects on soil have been eliminated. Surface cultivation and the use of "trash cover," as well as strip-farming practices, have all but eliminated the hazards of soil drifting on the heavier lands. The lighter lands, which have a greater tendency to drift, have been withdrawn from cultivation and sown down to permanent grass cover for use as pasturage for livestock.

Research and experimental work has given us a more fundamental knowledge of those factors which influence the conservation of moisture in soil. We know, for example, that through the use of recommended summerfallow practices, it is possible to conserve in the soil 20% to 30% of the rain that falls during one season as a reserve of moisture which can be used for growing crops the following year. We also know that wheat uses less moisture than any

other cereal crop and that a crop of wheat will require about one inch of water in the soil to produce every two bushels of wheat harvested. The type of tillage implement used has no effect on the conservation of soil moisture which depends rather on the ability of the farmer to use his equipment wisely. Again, weeds on fallow or in the crop are efficient users of moisture and reduce the yield accordingly.

With the preceding facts in mind it has been possible to develop definite policies and practices designed to eliminate some of the factors that use soil moisture.

By relating the depth of moisture penetration in a soil to crop yields, we can estimate fairly accurately what chances we have of growing a good crop in any given year. By timing our summerfallow practices properly to control weeds, an increase in crop production of from five to nine bushels per acre can be anticipated. We know that excessively deep cultivation will waste an excessive amount of soil moisture through evaporation and reduce crop yields accordingly, as well as encourage soil drifting. These are but a few illustrations of conservation in action in the plains area as related to dry land farming operations.

It would be wrong, however, to believe that the job has been completed when these practices are adopted and religiously practised. We should be wasting a valuable resource and an effective deterrent against drought if we did not give due consideration to the conservation and use of water unable to find access into the soil and accumulating on the surface of the land. This is usually surface runoff water from melting snow which runs off the surface of the land while the ground is still frozen, to accumulate in low-lying areas or run to waste down streams and rivers to the ocean.

Over most of the drought areas there is insufficient rainfall to maintain natural bodies of water, springs and shallow wells. The use of surface runoff water to supplement this supply is therefore of primary importance. This is particularly true for the livestock industry which depends upon an adequate and dependable water supply and assured feed supplies produced on irrigated land.

In spite of the importance of this surface runoff water, the potentialities of developing its use on prairie farms have been least appreciated. On practically every farm in Saskatchewan suitable sites can be located for the establishment of water development works which can be used to advantage for a multitude of farm purposes.

The two most common types of projects built are the "dugout" (farm pond) and dam. Wherever land with sufficient drainage area slopes toward a focal point in a field, there is an ideal location for a dugout. A dugout 12 feet deep, 65 feet wide and 165 feet long, will store more than one acre-foot of water, or the runoff from about 50 acres. Since 80% of prairie runoff comes from snow, snow traps, tree belts, stubble or anything that catches snow will increase the runoff in any desired area and thereby reduce the size of drainage area necessary.

Many suitable sites can also be located for the construction of small dams on creeks or in coulees. The average-sized farm dam will store about one acre-foot of usable storage. Care must be taken, however, to select a site where there is sufficient bank on both sides of the channel to give good depth to the reservoir—ten feet, or even better fifteen.

Under prairie conditions of sun and wind, runoff water is generally of excellent quality, superior in many instances to that which can be obtained from local wells. In addition to its uses for irrigation and stock-watering, therefore, its use for home consumption is rapidly expanding.

Finally, to complete the soil and water conservation picture, brief reference at least must also be made to the establishment in recent years of large scale irrigation and reclamation projects in Western Canada, involving the development of millions of acres of land. Such developments are in line with Canada's long-range land use plan to provide for expansion and stability in Canada's growing economy. Of an estimated 30,000,000 acres of potentially irrigable land in Western Canada 1,000,000 acres have been, or are in the process of being, developed under this plan. The aim is, when conditions warrant, to develop the remainder of this valuable resource.

P. F. R. A. Photo

Strip farming has become a byword in prairie agriculture as an effective control against soil drifting.

P. F. R. A. Photo

Use of trash cover on summerfallowed land to conserve moisture and reduce the possibility of soil drifting