

Conservation

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Conservation of Labour

Water-power has Done Much to Improve Living Conditions

In the *Electrical World* of June 23, 1917, Hugh L. Cooper compares figures establishing a comparison between water-powers and other natural resources which are most enlightening and, owing to the already important part played by hydraulic resources in this country, are of particular interest to us. A recent estimate places the amount of developed water-power in Canada at 1,850,000 h.p. If we apply the comparative figures above mentioned to the latter amount we at once realize what the harnessing of our water-powers has done for the conservation of labour and in producing better living conditions. One thousand tons of bituminous coal require yearly 1.26 men for mining operations, 1.02 men for transportation, and 0.5 men for conversion to electric energy, giving a total of 2.78 men per thousand tons, the latter being equivalent to 125 h.p. per year. To replace the 1,850,000 h.p. at present utilized, therefore, would require 15,000,000 tons of coal per annum, which represents the labours of 41,000 men. Allowing for the small amount of labour required in the water-power plants, it represents a saving of the human effort of some 38,000 working men and permits the employment of 38,000 Canadians in other industries. These diverse conditions would be further emphasized in Canada, as more than half the coal used would be imported. Again, every pound of coal used decreases our stock of that valuable fuel and it must be borne in mind that a seam of coal, once mined, can never be replaced. The foregoing figures show the saving of labour, but there is still another important conservation effected that has directly to do with the cost of food and of many other forms of life. Though the cost of power has been steadily reduced during past years, the average selling price of hydro-electric energy per horse-power-year is about \$10 or more than steam, while the threatened coal shortage may increase this expense materially.

Among other benefits may be mentioned the important electro-chemical and metallurgical centres of Niagara Falls and Shawinigan, the nitrogen fixation industry for fertilizers and explosives, the numerous large pulp and paper mills now established from coast to coast, and the recent introduction on a relatively large scale of electric steel and iron furnaces.—L.G.D.

Harvesting the First Necessity

Every Effort Should be Made to Get Labour to the Farm

The extra acreage of beans, corn and potatoes planted in some parts of Canada was put in under difficult conditions as regards labour and in the face of a scarcity of labour for harvesting the crops. The help necessary for harvesting our crops should be organized now. We can live without fashionable clothes, fancy hats, fine boots, frills and shows, but we cannot go long without food. Those employed in handling the less needful things should be employed in producing and helping to save our crops. Thousands of barrels of apples rot upon the trees or upon the ground every year. They should not be allowed to go to waste this year.

National Forests

United States Purchasing Large Tracts for Protection of Watersheds

Nearly 1,500,000 acres of non-agricultural forest land has been purchased by the United States Government in the Southern Appalachians and White mountains. The fundamental idea underlying the establishment of these National Forests in the Eastern states is the protection of the watersheds of navigable streams, with a view to the better regulation of their flow. The situation with respect to fire protection has already been greatly improved as a result of the work of the U. S. Forest Service, which is in charge of the selection and administration of these lands. In both east and west, the United States now has a total of 152 National Forests, with an aggregate net area of more than 155,000,000 acres of Government land.

Waste of Food Stuffs

Odds and Ends Thrown Away Amount to Vast Amount

Do not waste a slice of bread. There is an old saying, "Many mickles mak' a muckle", and, if there are many individual savings the total gain will be great. Do not be too proud to notice whether anything usable is being wasted; do not be too proud to use odds and ends which might, otherwise, be cast into the garbage can. In Chicago, recently, the garbage was reduced from 400 loads per day to 200 loads a day due largely to the precepts of economy. Economy in the use of food stuffs should be practised by those who live in the country as well as by those who dwell in the towns and cities. Get the real vision of economy and put it into daily practice. Every individual must realize the food shortage in all its magnitude and he must realize what want and famine would mean and then he must put forth every effort to prevent it. Do not leave it to the other fellow. *Do Your Part.* In this matter prevention is a thousand times better than cure. Eliminate all waste in your household.

Shortage of Wool

By Saving Rags Canadians Can Help to Avert Serious Shortage

In all the warring countries the demand for wool to supply the world's shortage of wool, is insistent. Canada is no exception, and appeals are being made throughout the country for the savings of rags and old clothes that they may be again used, in the manufacture of shoddy, to relieve the strain upon the wool supply. In Great Britain, the Local Government Board has called attention to the varied means by which this material may be saved, as follows: "On account of the large stocks of clothing needed for the British and allied armies, efforts are being made to save the maximum quantity of rags for use in shoddy mills. The aid of women's societies has been invoked in conjunction with

urban and rural officials. The collection is largely dependent upon the patriotic spirit of the people, but large supplies of old clothes and rags will be called for. Central depots are provided for storage, and when enough rags are on hand for shipment they are forwarded to the district centre, where they are sorted and sold to mill owners, the profits going to the Red Cross or other war charities. An especial appeal is made to the tailors and dressmakers to keep their cuttings for this purpose. Discarded clothing is separated into three classes—all wool, all cotton, and cotton and wool."

This method can be undertaken in Canada by many organizations. Hitherto, owing to our wasteful habits, the saving and collecting of rags has not appealed to us, but the war has brought about many changes, and, it is incumbent upon all Canadians to do their bit toward averting the serious shortages that otherwise are sure to result.

Fire Prevention at Fall Fairs

The fire chiefs of Canada are alive to the necessity for education of the general public in the enormous number of fires in Canada and the consequent heavy monetary losses therefrom. The fall fairs offer a very favourable opportunity for furthering their educational plan and should be utilized. Exhibits of fire-fighting equipment, short talks on the dangers of careless house-keeping, neglected chimneys, carelessness with lights in barns and sheds, etc., will be helpful. Printed notices bearing the information of Canada's annual total of fire losses, as compared with other countries, and the number of lives lost through carelessness in the use of coal oil, gasoline, etc., would be effective.

To-day the fire chief's reputation depends upon his ability to prevent fires, not on his expertness in extinguishing them after they break out. This result can only be achieved by ceaseless education of the public, by continual and rigid inspection of premises for fire risks and by the enforcement of by-laws providing for the abatement of hazardous conditions.

Sulphur as a Fertilizer

Its Importance as a Plant Food is Recognized

Until recent years, sulphur, although considered one of the essential plant-food constituents, has been given a relatively secondary place. Instead of being looked upon as an element of minor importance it is now recognized as an element of the greatest importance.

Experiments to determine the value of sulphur as a plant food, when added to the soil, either as elemental sulphur or in the form of a compound, have been carried out to a considerable extent within recent years. A number of United States experimental stations, such as those of Wisconsin, New Jersey, Ohio, Kentucky, Iowa, Oregon, and California, have made some remarkable discoveries as to the beneficial effects of sulphur when added to the soil as elemental sulphur or as sulphuric acid. Certain European experiment stations have also added to the knowledge of the value of sulphur as a plant-food. During the last three years the American Smelting and Refining Co., on its Utah experimental farm, made a long series of experiments on the effects of sulphur dioxide, elemental sulphur and sulphuric acid on soils and on plant-growth. The experiments were carried out under normal field conditions and the following table shows some of the results obtained:—

INCREASE IN CROP YIELDS FROM TREATMENT WITH SULPHUR AND SULPHURIC ACID COMPARED WITH UNTREATED SOILS

Crop.	Planted	Harvested	GAIN	
			Sulphur treatment	Sulphuric acid treatment
Alfalfa	April 20	Aug. 7	% 26.8	% 8.5
Barley	" 20	" 7	32.6	8.4
Beets (sugar)	" 20	Sept. 28	3.7	2.1
Corn	May 17	" 16	13.1	20.3
Kaffir corn	April 20	" 30	43.9	58.9
Millet	" 20	Aug. 12	41.4	96.4
Milo maize	" 20	Sept. 30	182.6	172.6
Oats	" 20	Aug. 11	57.3	72.9
Peas (Canadian field)	" 20	Sept. 26	383.3	95.1
Potatoes	May 17	Oct. 4	63.0	2.2
Squash (Uth giant)	" 17	Sept. 22	152.7	59.5
Squash (Hubbard)	" 17	" 22	187.9	42.4
Sudan grass	April 20	" 30	23.9	18.1
Turnips	" 20	July 28	10.4	50.4
Wheat	" 20	Aug. 7	127.8	80.6

The sulphur was spread over the surface at the rate of 400 lbs. per acre and was then harrowed into the soil. The sulphuric acid, 46° Baumé, was placed on the soil at the rate of 2,172 lbs. per acre, the acid having a sulphur equivalent of 400 lbs. per acre.

Work done in Oregon by the United States Experiment station has indicated that yields of alfalfa may be increased up to 500 per

cent by the use of sulphur compound.

Sulphur not only renders available approximately 20 per cent more potash in the soil, but the water solubility of the alkali is reduced about 20 per cent in soils thus treated.

The fact that alkali soils somewhat above the limit for general agricultural purposes may be brought under cultivation by this treatment means that vast areas of now useless land may be profitably farmed. An extensive use of sulphur for fertilizer purposes would provide a market for the large amount of sulphur thrown away by smelters as a useless product as there is no market for it.—Condensed from an article on "American Smelting and Refining Co's Tests With Sulphur and Sulphuric Acid on Soils," in *Mining and Scientific Press*, June 16, 1917, by W. J. D.

Women Can Help

The Harvest Field Offers Many Opportunities for Them to Aid

Women should help harvest the bush and small tree fruit crops this year. A mobilization of available women for this work would be of great assistance. The women of Europe are now working regularly in the fields. They have planted and harvested crops ever since the war started. Are the women of Canada willing to do as much? If we wait until the fields are yellow we will be too late. The various women's organizations could do much if they would organize immediately.—*F.C.N.*

Co-operation and its Results

Getting Together of Material Advantage to Producer and Consumer

Harris Weinstock, state market director of California, in his annual report for 1916, gives the following instance of the advantages of co-operation in marketing by the California peach growers:

"Last January while East, as the result of an investigation, I found that the average price for dried California peaches in New York at retail was about 17 cents per pound. The California grower at that time was getting about 2½ cents per pound. It was said to cost him between 4 cents and 5 cents a pound to produce them. That meant that out of every dollar paid by the Eastern consumer for California dried peaches, the California peach grower was getting 14 cents, making a cost of 86 cents for distribution, showing clearly a great waste in the cost of such distribution and making it further plain that there was ample room for reducing the price to the consumer and raising the price to the producer. Meanwhile, the peach growers of California have organized, with the result that this year they are quoting a price between 5½ cents and 8 cents per pound, which to them is a remunerative price, whereas the price to the consumer has been lowered about 16 per cent as compared with a year ago. This change has been brought about to the advantage of both, by the growers collectively being in a position to minimize speculation and to have a voice in stabilizing prices."

Gifford Pinchot, one of the foremost conservationists of the United States, says of that country: "The clear duty of the nation is to guarantee the farmers a fair price for their crops when grown, and a reasonable supply of labour at harvest. The clear duty of the farmer is to raise food enough to win this war for democracy against Kaiserism." This applies with equal force in Canada.

Fires in Grand Stands

Dangerous Conditions Caused by Careless Smokers

Throughout Canada the autumn fairs will soon be held. The attractions before the grand stand is a prominent feature, and the stand is usually crowded with people. The stands are almost invariably of wood construction, and, as paper wrappers from candy, luncheons, etc., are frequently thrown under the tiers of seats on the floor, great care must be taken that the danger from fire is thoroughly provided against. The careless smoker who throws unextinguished matches, cigarettes or cigar stumps on the floor may easily start a fire resulting in panic and loss of life. Smoking in grand stands should be prohibited.

Climate and Fertility

Canada's Winters Conserve the Fertilizers in the Soil

The influence of climate on fertility is frequently overlooked, but it has a more or less direct bearing on the fertilizer question in Canada. It is realized by few that climatic conditions—rainfall, temperatures, etc.—exert a profound influence on the nature and composition of soils, both in their origin and in the power to conserve their fertility. These influences may tend to the accumulation of the dissipation of those elements of soil constituents which make for fertility. In this regard, save our coastal lands with excessive rainfall, which may keep the lighter soils poor in available plant food, our country is singularly blessed. We cannot now elaborate this question, but one instance may be cited that may serve as an illustration—one which undoubtedly influences in a beneficial way the fertility of our soils. The rigorous winter that prevails over the greater part of Canada locks up for several months—practically from harvest to seeding time—the soil's fertility. The plant food that has been converted into available forms during the preceding summer and autumn, and which is left over after the season's growth, is conserved for the crop of the succeeding year. The frost holds tight within its grasp plant food of untold values—especially the most valuable nitrates, so necessary for stimulating the growth of the young crop. In regions enjoying a more open winter, this soluble plant food would be lost by leaching. With all their drawbacks, our severe winters, with their almost continuous low temperatures, must be regarded, in their rôle as conservers of fertility, as an agricultural asset of no small value, one which must profoundly affect in a beneficial way our dependence upon purchased fertilizers for satisfactory yields.—*Dr. F. T. Shutt, 8th Annual Meeting of Commission of Conservation.*

SWEDEN'S WATER-POWER

One of Canada's chief competitors in industries requiring large amounts of power will be Sweden. That country is estimated to have available water-power equal to 6,000,000 horsepower, of which approximately 15 per cent is in use. In 1915, timber and pulp industries used 260,000 h.p.; iron, 235,000 h.p.; electro-chemical, 90,000 h.p.; and textile, 40,000 h.p. The total power developed from coal and oil for industrial purposes is approximately 400,000. Of the installed water and steam power, about 60 per cent is transformed into electric power.

Commission of Conservation

CANADA

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CONSERVATION is published the first of each month. Its object is the dissemination of information relative to the natural resources of Canada, their development and the proper conservation of the same, together with timely articles covering town-planning and public health.

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OTTAWA, AUGUST, 1917

Future Timber

Actual Practice of Forestry Principles
Necessary to Assure Supply

The ultimate goal of all silvicultural work is to secure on a given area a high production of valuable material, in order that the owner may secure the largest possible returns in the long run. More specifically the objects are:

1. To secure quick reproduction after the removal of timber.
2. To produce valuable species instead of those having little or no market value.
3. To secure a full stock, in contrast to stands of small yield.
4. To produce trees of good form and quality.
5. To accomplish the most rapid growth compatible with a full stand and good quality.

Relatively little progress has been made, as yet, in the actual application of these principles in Canada. In practically all of the regulations affecting Crown timber in the various provinces, provisions have been inserted, usually specifying diameter limits for the various species. Not only are these restrictions generally insufficient, but, as a general rule, the provision made for enforcement is wholly inadequate. If the interests of the future are to be properly safeguarded, it will be necessary for every administrative organization having to do with Crown lands in Canada to provide, to a materially larger extent than at present, for the employment of trained foresters, and for putting forestry principles into actual practice in connection with logging operations.—C.L.

New Zealand has seven government forest nurseries, the output of which varies from 2,600,000 to 3,000,000 trees annually.

Our Northern Water Powers

May be Utilized for the Making of Nitrates from the Air

Canada must, to a great extent, look to the electro-chemical and metallurgical industries for the beneficial utilization of its water-power resources. Particularly is this the case with our abundant northern water-powers, where many attractive sites afford natural facilities for low development costs and cheap production of power. While at present these sites are remote from settlement and transportation is sometimes difficult, their utilization appears feasible in some of the processes now being used for making nitric acid and nitrates from atmospheric nitrogen.

In this connection, some of the principal features of the various methods at present in use are of interest. Nitric acid from the atmosphere can be produced with the aid of electricity in two different ways. One of these, the indirect method, is the only one so far employed in Canada, where works of considerable size have been in operation for some years. This method combines a number of separate operations, carried out in separate plants or factories. These operations comprise the making of calcium carbide from coke and lime, and a combination of the carbide with nitrogen gas to form calcium cyanamide. The latter may be used directly as a fertilizer, but for explosives or other industries using nitric acid the acid is obtained by a third operation involving a treatment with superheated steam and air.

In the direct method air is blown through a long electric flame, forming nitric oxide gas which, on cooling, takes up more oxygen and becomes nitrogen peroxide. When the latter is brought in contact with water it gives nitric acid. The process is a simple one, requiring only a single factory and a simple plant, and, as the raw materials consist merely of air and water, such works can be established in the most remote location, cheap electricity being the great essential.

It will be thus seen that for the indirect method raw materials and transportation facilities are important questions, while, as just stated, the only raw materials required in the direct method are air, water and cheap electric energy. It would therefore appear that much should be expected from this direct method in the utilization of our northern water powers.

Nor need this industry be confined to large organizations and the utilization of new water-power sites. Mr. E. K. Scott, after whom a nitrogen furnace of the direct type is named, suggests the erection of

plants of as low as 1,300 h.p. size as adjuncts to central stations, to secure a better load factor, under which conditions the electric energy used may be figured at an extremely low cost.—L.G.D.

Conservation of Platinum

Its Use in Jewelry to be Discouraged, to Save the Metal for War Purposes

Platinum is a metal which is essential to certain chemical and other industries. Owing to the great demand for this metal, incident to the war, and the scarcity of the supply, which is derived largely from Russia, the price is increasing rapidly. Having in mind the present needs for platinum in the United States, the Jewelers' Vigilance Committee has adopted the following resolutions: "Whereas, the Secretary of Commerce has requested the platinum committee of the Jewelers' Vigilance Committee to bring to the attention of the jewelry trade of the United States the advisability of conserving platinum in order that our Government may have larger supplies to draw upon for war purposes, and

"Whereas, the jewelry trade has already clearly expressed its desire and determination to assist our Government to the extent of its ability in bringing the war to a successful termination: be it

"Resolved, that we pledge ourselves to discontinue and strongly recommend to all manufacturing and retail jewelers of the United States that they in a truly patriotic spirit discourage the manufacture, sale, and use of platinum in all bulky and heavy pieces of jewelry. Be it further

"Resolved, that during the period of the war or until the present supplies of platinum shall be materially augmented, we pledge ourselves to discontinue and recommend that the jewelry trade discourage the use of all nonessential platinum findings or parts of jewelry, such as scarfpin stems, pin tongues, joints, catches, swivels, spring rings, ear backs, etc., where gold would satisfactorily serve. Be it further

"Resolved, that the jewelry trade encourage by all means in their power the use of gold in combination with platinum wherever proper artistic results may be obtained. Be it further

"Resolved, that copies of these resolutions be handed to the Secretary of Commerce, to the trade press, and be sent to all our trade organizations, and to the daily press, in order that they may have the widest possible dissemination."

This a commendable action and one that should also be taken in Canada.—W.J.D.

Water-powers Appreciated

Their Use has Minimized the Effect of Fuel Shortage

The inestimable value of Canada's water power resources is being more and more emphasized, and the large amount at present developed and utilized is attracting much attention outside the Dominion. A recent article in a New York technical journal pays a high tribute to this wealth, stating that, while electrical central station managers in the United States have been rather restive since the war was declared, wondering how they would weather the approaching storm, Canadians have passed through the crisis unscathed. The principal difficulties feared were that of financing and of securing coal. In Canada, however, as almost all the electric energy is generated from water-power, the scarcity and high price of fuel have not affected the industry materially. The low hydro-electric rates prevailing are a strong incentive to industrial extension and the per capita consumption of electricity in Canada is enormous. While the manufacture of munitions has helped to swell the figures, the total, exclusive of munition manufacture, is still very large.—J.G.D.

THE DUTY OF THE INDIVIDUAL

Strict economy is needed in the use of all food stuffs by each and every individual householder. Our food supplies must be conserved, but they should not be hoarded. Of what use is a mine unopened, a forest untouched or land untilled? By the conservation of our food supplies, we mean that they should be used in the wisest possible way and shared equitably. We should eliminate superfluities and luxuries and eat the things that are substantial, plain and nourishing. There are many foods produced in Canada, such as corn, peas, beans, oats and barley, which are not used as much as they could and should be. Unless provision is made to care for and properly use the garden vegetables, much of this material will be wasted. Perishable things should be canned wherever possible. Rhubarb, tomatoes and other vegetables should be put away for winter use.—F.C.N.

In 1913, South Africa imported 21,263,000 eggs. This year it will be found that over 2,000,000 have been exported, after local requirements had been filled.

This year there are in South Africa, as nearly as can be estimated, 31,424,680 sheep and 8,920,270 goats.

Woodlots and Their Value

By Proper Utilization a Permanent Fuel Supply is Assured

Woodlots on the farms can be made an important factor in the relief of the threatened fuel shortage. Farmers and the residents of smaller towns and villages situated within hauling distance of woodlots, should, as a measure of practical patriotism, use wood in preference to coal.

Few farmers realize the value of the crop which can be obtained from their woodlots. If even a small proportion of the attention given to other crops were devoted to the protection and improvement of the "bush" a good financial return could be secured. Aside from its value in affording protection against wind and storms, its importance in the conservation of soil moisture and its aesthetic value, the woodlot has a considerable value for the crops which can be harvested from it every year at a minimum expense. It should have a place on every farm.

Live stock should be excluded as they destroy the natural reproduction, injure the larger trees and pack the soil so that the growth of the trees is retarded. Defective and diseased trees should be removed first; then those of poor form, such as very crooked or very branchy ones which interfere with the growth of better formed neighbours. The trees of the less valuable species such as dogwood, ironwood and hornbeam should then be removed. Every effort should be made to secure natural reproduction but, if that be impossible, planting will be found profitable.

The tendency has been to encourage the growing of soft-woods suitable for lumber, such as pine, spruce and cedar, but the function of a farmer's woodlot is better fulfilled by producing hardwoods for fuel.

The fuel value of one cord of several of the common kinds of wood is equal to the following quantities of anthracite coal:

Hickory and hard maple 1,800 to 2,000 lbs. of coal; white oak, 1,540 to 1,715 lbs. of coal; red oak, black oak and beech, 1,300 to 1,450 lbs. of coal; poplar, chestnut and elm, 940 to 1,050 lbs. of coal; pine, 800 to 925 lbs. of coal.

Therefore, hardwood is worth, to the owner of the woodlot, from \$6.00 to \$9.00 per cord, as compared with coal at \$10 per ton, plus the cost of hauling it out to his farm.

If a yield is to be sustained permanently, it should not exceed the annual growth which, in unmanaged woodlots, probably does not exceed $\frac{3}{4}$ cord per acre. This production can be considerably in-

creased by careful management. A woodlot may be considered as similar to a savings' bank account from which the annual interest, represented by the growth, may be taken out or allowed to accumulate. In the case of the woodlot, however, the withdrawals can be so made as to greatly benefit the condition of the stand and improve its productivity.

The Dominion Forestry Branch and the various provincial forestry organizations have done much to encourage farm forestry by sup-



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THE WOODLOT COMES INTO ITS OWN

The shortage of fuel problem has no terrors for the farmer who has a woodlot on his farm.

plying advice and assistance. The Dominion Government distributes annually between 3,000,000 and 3,750,000 seedlings and cuttings among the farmers of the prairie provinces. In Ontario, the Forestry Branch of the Department of Lands, Forests and Mines also supplies seedlings for planting in farmers woodlots.—R.D.C.

Organization Needed

High Prices Due in Great Part to Speculation and Manipulation

High prices of food stuffs are due, partly, to the shortage of food, partly to waste in handling and, partly, to manipulation of the markets and to speculation. It is estimated that 80 per cent of the Canadian farmers sold their wheat last fall at \$1.40 per bushel. Who received the difference between that price and \$2.80 per bushel, the price which recently prevailed? Here is work for the food controller or a food dictator. The people are becoming restive respecting the speculation in wheat and in all other food products and would be glad to see the elimination of the speculator. Wherever profits are abnormal and unreasonable they should be confiscated.

The raising of cattle in Rhodesia has now reached the stage where meat canning plants must be provided to care for the excess output.

Douglas fir has been recommended for the reforestation of western Norway by the chief forester of that country.

Fertilizers and Farming

Fertilizers have a place in a rational system of farming; but farmers should first clearly understand what that place is, if our land is to improve rather than to deteriorate, and if financial loss, due to judicious purchase of fertilizers, is to be avoided. We must first have sound education, the outcome of science with practice, on the principles involved in the up-

clusive use. I feel assured we will never see the time when fertilizer can be profitably used as a substitute for those means which science and practice alike have shown to be necessary for the economic keep and increase of soil fertility.

But there is a place for fertilizers in farming, and we are asking our farmers to find it. There are those of the old school still on the land, however, who have faith in fertilizers, those who delegate them to the class of quack medicines, as frauds and fakes, who say they act merely as a stimulant to a tired horse—as stimulants, not food. The number of persons is happily decreasing. Again, there are others who, although ignorant of the principles of agriculture as those just referred to, argue that if fertilizers are sources of available plant food that is necessary to increase crop yields is to apply them generously. These persons are ignorant of the fact that there are limiting factors to crop growth other than the presence of available plant food. We may enumerate them. First, there is the nature of the physical condition of the soil, its capacity for holding moisture (dependent upon its texture and humus content), in other words its power to withstand drought, its degree of aeration, its drainage, etc.—all those qualities of a physical character which make for easier development of the root system. Second, the character of the season, by which I mean amount and distribution of temperature, hours of sunshine, etc. So far as we can see to seasonal conditions are the most potent of all determinative factors in crop yields in Canada, as probably, also, all over the world. Thirdly, there is the inherent capacity for growth and reproduction in the crop sown. All these, with some others, are limiting factors that cannot be overlooked. They are factors which may and profoundly modify the effect of fertilizers. For instance, on heavy undrained clays, the chance is there that fertilizers will play their part in nourishing crops? On the other hand, if plants can only absorb their food in the form of a solution, how can fertilizers feed the crop, if, on top of lack of humus or want of surface cultivation the light is readily dry up with a few days drought? Or, again, if we are sowing a variety of oats, the prolificness of which is measured at 40 bushels per acre, can we make yield 60 bushels by simply fertilizing? Many of these limitations may be in some degree overcome through the application of the teaching of science—of chemistry, physics and biology, but they will not be overcome simply by application of fertilizers.—Dr. T. Shutt at Annual Meeting of Commission of Conservation.

keep of soil fertility, on the composition, value, care and application of farm manures, on the desirability of moving live stock on the farm of the land's produce; on the importance of rotations; and especially the value of clover and other legumes in the rotation for maintaining the humus and nitrogen of a good seed bed. When all these matters are correctly understood and practised, then and not before, may we advocate the judicious employment of fertilizers with advantage, in general farming. Fertilizers are no panacea for the evils of poor farming—they cannot be depended on solely to give profitable yields, to leave the land richer for posterity than when first broken, or entered upon. That is what we ought to aim at, for our native fertile soils are a great and important national asset and inheritance. Our experience has shown that fertilizers cannot profitably be used as substitutes for manure, for the growing of clover, or for good soil management, but that their rôle is rather supplemental to all these rational means for the up-keep of soil fertility. I make this statement for two reasons. First: At the present time, those who are urging us to a large and practically universal, almost indiscriminate, use of fertilizers; and second, from our voluminous correspondence on the subject, it is evident that, for the most part, it is the man using poor farming methods who is clamoring for cheaper fertilizers, and who practically expects to conduct his farming profitably from their ex-