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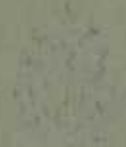
1941 - 1942

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Published by Authority of the Hon. James A. MacKINNON,
Minister of Trade and Commerce.

25 cents per annum

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James Muir,

Editor.

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BIOLOGICAL SURVEY
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No. 183 — Marble

Marble is found in most countries of the world and in most geological formations. Varieties are found in all shades of colour, even to black. An interesting thing about marble is that its colouring is due to the impurities in it, pure marble being snow-white. Parian marble, the famous white marble of the ancients, is quarried in the Island of Paros, and was extensively used for sculpture by the Greeks.

Modern statuary work is now usually made from marble quarried at Carrara, Italy. Pentelic marble from Attica, quarried in ancient and modern times, supplied the stone for the Parthenon which was built between 447 and 438 B.C., and is whiter and more finely grained than Parian marble. The well-known Connemara marble is a beautiful green in colour.

Many highly prized varieties of marble for ornamental building purposes owe their beauty to the presence of fossils on a groundwork of different colour, to stalagmitic formations, etc. The onyx marble of Algeria is stalagmitic, giving concentric rings of colour, when cut, of a delicate clouded yellow and brown, due to the presence of iron oxide. A similar marble is quarried in Mexico.

Canadian resources in marble, especially those for building purposes are abundant and include a wide range of types. In respect to beauty of colour and marking, Canadian marble compares favourably with any produced in the world. There are white marble, a laminated green variety, a green variety with bands and clouds of white and pink, a pink ground with green, blue and white foliated bands, and a blue variety with fine white veins, dark red, buff and black.

Canadian marbles have been used in the construction of some of the Dominion's finest edifices and in 1940 was produced in Quebec, Ontario, Manitoba and British Columbia to the value of \$75,000, having been a considerable reduction from 1939. The 1940 output included squared blocks for sawing into slabs and for making monuments, and broken marble for rubble and for making terrazzo, stucco dash, whitening substitute, marble flour and artificial stone. Waste from some quarries is sold for chemical uses, road metal and as poultry grit.

No. 184 — Farm Horse Coming Back

It now looks due to conditions caused by the war as if horses are going to return to the farm as an indispensable source of farm power.

J. W. Ste. Marie, Superintendent of the Dominion Experimental Station, Lennoxville, Que., says that in recent years due to the increased use of tractors there has been decreased interest in the breeding of mares and the raising of foals. Now with gas rationing, the difficulties of getting tractor parts and rubber tires, it would be a good thing to give more attention to the breeding of horses.

This is the time of the year for breeding mares, says Mr. Ste. Marie. The nearest Dominion Experimental Farm or representative of the provincial department of agriculture will be glad to tell farmers of the good pure-bred stallions in their localities. If a farmer does not have good mares that can be bred and knows that some of his work horses will have to be replaced in a year or so, he should get in touch with the secretary of one of the horse-breeding clubs in his district and get a weaning or yearling colt.

Horsemanship, which included the care and management of horses in its original

meaning, is a lost art on many farms and industrial undertakings in Canada, but the topsy-turvydom of war indicates that a general return to the knowledge of horses may be of great importance. When a normally quiet work horse suddenly becomes unmanageable, it may not be a matter of temper but terror through the savage impact-attack of a nose bot fly. Also when a horse keeps moving his head up and down, again it may not be approval of his job. The experienced horseman knows at once he should look for infestation by the throat bot fly. The third species of bot fly, and the largest of the three, known just as the horse bot fly, is more diplomatic in his approach, and lays her eggs on the hairs of the forelegs, or shoulders, or mane.

All three species of bot flies—somewhat resembling bumble bees but each distinguishable from the other—not only cause serious annoyance to the horses, but through their egg-laying capacity, create very great injury, resulting in malnutrition, stomach inflammation, ulcers, colic, and other digestive troubles, and even death.

Control measures are explained in the Wartime Production Series special pamphlet No. 16, entitled "Control of Horse Bots". General information on health precautions and diseases of farm animals is given in the special pamphlet No. 38. Other specific knowledge on the care of horses is contained in Circular No. 656 on the feeding of horses, and in Circular 607, Parasites of horses. These publications may be obtained free by writing to the Publicity and Extension Division, Dominion Department of Agriculture, Ottawa.

No. 185 — More Wool Needed

Canada needs to produce more wool. With war developments now threatening the supplies from abroad, Canada faces a serious situation. Compulsory reduction in the amount of wool for civilian purposes is necessary. In addition, many more sheep are needed on Canadian farms and ranges in order to augment the wool supply.

One million more sheep are required by 1943. Sheep and lambs on farms in June, 1941, numbered slightly over $3\frac{1}{2}$ million head, rather evenly divided between Eastern and Western Canada. The minimum number of sheep and lambs aimed at for Canada in 1943 is $4\frac{1}{2}$ million—an overall increase of roughly 30 per cent.

Good ewes and ewe lambs should be kept for breeding purposes. If Canada is to have one million more sheep by 1943, every useful ewe and every good ewe lamb, particularly the early ones, should be saved for the owner's flock or sold to someone who wishes to increase his holding or to start a new flock, says the Board.

Before the time comes for marketing lambs and surplus aged stock, farmers should pick out the ewe lambs needed to increase their flocks. If there are still good ewe lambs or useful aged ewes that someone might want for foundation stock, get in touch with the nearest district representative of the Provincial Department of Agriculture before deciding to send potential breeding stock to market.

No. 186 — Honey as a Food

Honey is the only sweet which appears on the breakfast table, unchanged, as it comes from Nature. Honey is primarily a sweet, a carbohydrate belonging to

the alkaline-ash group of foods. This means that honey's chief role is in providing the body with a source of energy.

The carbohydrates in honey, unlike those in most other foods, are in the form of simple sugars which can be used immediately by the body, whereas practically all other carbohydrates must remain in the body some time and be acted upon by secretions from the pancreas before being made available for body energy.

So much for the major part of honey, the sugars. Minor constituents include the minerals, iron, copper, magnesium, calcium and potassium and several other trace elements. There are also a dozen acids, colouring materials, volatile oils, enzymes and undetermined matter which give to honey its flavour, aroma and health giving properties.

Honey finds its best place on the table of the average household, but is used extensively in cooking. As dessert with fresh biscuits, on cereals, pancakes, and fresh fruits, in tea, coffee, and fruit drinks honey is unexcelled.

In Canada nearly all honey can be divided into two categories, light and dark. The darker the honey, the stronger its flavour, but also the higher its food value. These two honeys are available all the year round, and each has its place according to whether it is used in mild or strongly flavoured combinations.

No. 187 — Control of Supplies

Early in January the Wartime Industries Control Board announced that the manufacture of passenger automobiles would stop at the end of March or early in April. The manufacturers of these vehicles will then turn over an even greater proportion of their production facilities to making army vehicles and other direct war equipment.

A reserve or "pool" of passenger automobiles is being established and these will be made available to persons whose duties are of an "essential" nature and require an automobile in their work.

The temporary ban on the sale of tires was replaced by an order restricting their sale entirely (excluding bicycles) except to a small group of individuals such as doctors or for ambulances and fire trucks.

Production of radio receiving sets was halted, except by special permit.

One of the most common of commodities — sugar — has been rationed at three-quarters of a pound a week for each Canadian.

After April 1 motorists who do not get a preferred rating will be allowed between 300 to 380 gallons of gasoline annually, or sufficient to drive approximately 5,400 miles every year. About 1,125,000 drivers will come in this category. However, there may be further restrictions.

Prime Minister Mackenzie King stated on January 26 regarding curtailment measures taken by the Government: "These and many other measures have been taken progressively, in order to make materials available to our war industries as they have expanded. Already the rationing of some commodities for civilian use has begun. If we are to achieve a total war effort, far more drastic curtailments will follow."

No. 188 — Granite

Granite belongs to the well-known family of crystalline-granular rocks composed principally of quartz, feldspar and mica. It is a particularly hard rock which must have been formed deep below the surface of the earth under high temperature and pressure. Its name most likely comes from the Latin word "granum" which means grain. Granites are usually red, pink or gray, depending on the colour of the feldspar found in it. If hornblende or black mica is abundant the rock may be dark green or almost black.

The early Egyptians appreciated the merits of granite and were experts at working with it. In fact so skilled were they at cutting and polishing it that even to our present time all the appliances developed by modern science have not improved on the finished product turned out by them. The work must have been laborious. Today the rough blocks taken from the quarry are cut by special steel saws. The process is long and expensive but is compensated by the durability.

Large areas in Canada are underlain by granite and the prospects of finding stone suitable for its various uses are good. Canadian granite is used for foundations for highways, for the permanent ballasting of railway roadbeds, for heavy aggregate in large concrete structures, for the filling of breakwaters, for bridge piers, monumental work and by the building trades.

Granite for monumental purposes is produced in the Maritime Provinces and in Quebec, Ontario, Manitoba and British Columbia, and is finding a small but steadily increasing market. Early in 1939 an appreciable amount of foreign stone, principally of the black and red varieties, was imported mainly from Finland and Sweden, but this source of supply is now cut off. Aberdeen granite is much used in Canada. Black granite has been quarried in Canada, notably in the vicinity of Lake St. John, Quebec, and from quarries along the north shore of Lake Superior.

In the building trade, coloured granites are being used to an increasing extent in the form of thin polished slabs for trim for buildings in which the main colour scheme calls for contrast. The total production of granite in Canada in 1940 was 1,102,395 tons valued at \$2,119,501.

No. 189 — Fire Hazard Research

Forest protection authorities have long recognized the need of a unit for measuring cumulative forest-fire hazard, which varies with the weather and forest types. There are many things which the forest officer can plan better and more economically if he knows the degree of fire hazard which exists each day in his territory and can predict the probable conditions for the next day.

As a result of research work a method was developed for computing an index of fire hazard from daily records of rainfall, evaporation, wind, and relative humidity. The index is computed from tables which must be prepared for each forest type and climatic area by methods developed by the technical officers engaged on this research work.

This method of computing the daily index of fire hazard and forecasting the hazard for the next day is now in wide use throughout Canada and is known as the Wright System, named after the inventor. Some 150 forest weather stations use the system for the following purposes: Detailing the work of forest employees so they

will be available for fire duty if the fire hazard warrants; determining the number of men to send to a fire; regulating the issuance or cancellation of burning permits issued to settlers and others, so that the burning may be confined to safe periods; regulating and controlling travel in and use of the forest by the public; regulating the frequency of forest patrols in order to know when it is safe to allow lookout tower men to undertake other duties. In the past, decisions on most of the above points have had to depend on individual judgment, and in some cases needless expense has occurred owing to faulty estimates of the degree of hazard which existed.

No. 190 — Plant Invader Proves Useful

The flowering rush, a marsh plant accidentally introduced into Canada from Europe, is spreading widely and is crowding out other marsh plants, but is proving to be a useful food for valuable muskrats.

It was in 1897 that this plant, not previously known in North America, was found growing on the south bank of the St. Lawrence River at Laprairie, near Montreal. How it came there is not known but it has been suggested that it may have been imported incidentally as dried packing material around fragile articles from Europe, and thrown into the St. Lawrence when the articles were unpacked, thus giving its seeds a chance to grow.

It has proved to be very aggressive in its new home, spreading not only by means of seeds, but also by means of long rootstocks and small bulbs. It drives out and replaces much native marsh vegetation and has now become one of the most prominent marsh plants in the Montreal region. It has extended its range downstream to salt water, up branches of the St. Lawrence, including the St. Francis, Nicolet, Richelieu, and Ottawa, and up the St. Lawrence system at least as far as Lake St. Clair. In time it will doubtless extend over much of temperate North America.

The flowering rush is a very handsome plant, with narrow, rush-like green leaves, above which, at a height of two or three feet from the ground, a cluster of attractive pink blossoms is borne upright at the top of a long, slender stem.

At the recent North American Wildlife Conference in Toronto, it was authoritatively reported that in the Lake St. Clair region this graceful plant adventurer is found to be economically useful as food for muskrats. These important furbearers consume both the bases of the leaves and the small bulbs that the plant produces in the mud. The bulbs are also eaten to some extent by waterfowl and may in time become extensively utilized in that way as well.

No. 191 — Nepheline Syenite

Production of nepheline syenite in Canada, which was commenced in 1936, showed an appreciable increase in 1941 as compared with 1939, the previous record year, and was well in excess of the figure for 1940. Extensive deposits of the mineral occur in Peterborough, Hastings, and Haliburton counties in Ontario, but all of the output in 1941 came from a property in Methuen township, Peterborough county. The producing company has a milling plant at Lakefield, Ontario, with a daily capacity of 45 tons of finished product, and in addition ships the ore to a crushing and processing plant at Rochester, New York, designed to handle about 200 tons a day.

According to the Department of Mines and Resources, Canada and Russia are the

only important producers of the mineral. It is used chiefly in the manufacture of glass, where it is replacing feldspar because of its higher content of alumina. Most Canadian glass plants now use nepheline syenite and it is being used in several plants in the United States. It is important also as a body ingredient in a variety of ceramic products and research is proceeding on other ceramic uses.

During 1941 a process was developed for the production of alumina from the nepheline syenite deposits in Ontario, having as by-products, potash and soda ash. Canada has been obtaining its bauxite—the ore of aluminum—from the Guianas in South America, and in the event that these supplies are cut off the nepheline syenite could be used to replace the bauxite as a source material for the production of the metal.

No. 192 — Canada's Industrial Minerals

The production of industrial minerals in Canada—those minerals that are used in industry in the raw or partly processed state—amounted to approximately 82 million dollars in 1941. This was an increase in value of about 13 million dollars over the previous year.

The importance of Canada's industrial minerals cannot be too strongly emphasized, for without them there would be a slow paralysis of almost every industry in the country. As part of its war effort, Canada is producing huge quantities of nickel, copper, lead, zinc, and aluminium, the demand for which is steadily increasing. Not a pound of these metals could be produced without use of the refractory minerals, nor could there be any production of a long list of chemical products if supplies of such minerals as common salt, sodium carbonate, and sodium sulphate were not available. The electrical industry would come to a standstill without supplies of mica, and the production of many of the alloy steels would be impossible without the chromium, tungsten, and manganese minerals.

Although Canada produces a long list of these minerals, and is an exporter of them, here production of other industrial minerals such as fluorspar, graphite, china clays and of the ores of tungsten, chromium, and manganese falls far short of requirements. There is no Canadian production of quartz crystals with piezo-electric properties, nor of Iceland Spar used in optical instruments.

The Department of Mines and Resources at Ottawa has made and is making an effort to obtain much-needed war minerals and this effort compares favourably with the similar program advanced in the United States. For reasons which are evident, much of the Department's activities in this direction have not been publicized.

No. 193 — Beluga or White Whale

Belugas don't know it but Science has recently done them a good turn, though, to be candid, Science didn't have that purpose in mind.

Scientific study initiated last year by the Dominion Department of Fisheries has shown that Hudson Bay belugas, or white whales, are not of value as sources of high potency vitamin oil, and the finding means that a good many belugas will now go free which otherwise would have been sought out and killed. That's where the unintentional good turn to the belugas comes in.

Two possible gains from the investigation were in view when the Department of

Fisheries took action—first, of course, the discovery of an additional source of vitamine oils which are urgently needed by the United Nations and, second, economic benefit to white whale fishermen because of increased demand for their catches.

The beluga, a small type of whale, is abundant in Hudson Bay, occurring, too, in the estuary of the St. Lawrence, and arrangements were made by the department under which Mounted Police officers in the north forwarded samples of beluga liver, blubber oil and jaw oil to the federal Fisheries Experimental Station at Prince Rupert, B.C., for scientific examination. The samples came from belugas caught in the vicinity of Port Churchill. The research at Prince Rupert was carried out by a staff biochemist and he found that the blubber and jaw oils contained approximately 50 international units of Vitamin D to the gram but only a negligible amount of Vitamin A, while the quantities of oil yielded by the livers were only small. To sum up his findings in his own words:

"The vitamin potencies of the blubber and jaw oils are too low to make these oils of any value as vitamin sources. The yields of liver oil are not sufficient as to warrant exploitation. The jaw oils showed some possibilities as sources of oils for lubricating fine instruments but further research on them would be necessary before definite conclusions could be drawn."

No. 194 — Fishermen Rescue Sailors

All landings from Canadian fishing vessels are valuable these days but it fell recently to the lot of one East Coast schooner to bring ashore the most precious cargo it has ever borne—British seamen picked up from the drifting crew of a torpedoed steamer. Just where or when the incident occurred is one of those points which are not to be revealed in print but going about its regular business of catching fish to add to needed food supplies the schooner sighted the boats from a ship which had fallen victim to a "tin fish" from a Nazi submarine. Whether the submarine was still lurking near at hand the fishing captain had no certain means of knowing, but there were seamen to be saved and that was all he needed to know. The schooner went to the rescue and before long the sailors were safely on board. Some time later they had been landed in port where they had a chance to recover from the effects of their long hours of exposure to icy spray and biting wind. What port? Answering questions of that kind is one of those things which just aren't done nowadays.

War has had dislocating effect upon the Canadian fishing industry, of course, but the industry carries on, both east and west, though its people know that adventure and danger may perhaps never be far from them. True, a good many fishermen have left their normal occupation to join the armed services and others are enrolled in war factory personnel; but their brothers and fathers still man fishing boats and schooners, even though the close approach of war to the Dominion has added to the ordinary hazards of their calling, which are risky enough in themselves. Keeping the industry going the fishermen help to support the national economy, produce needed food supplies for Canadian use, and—a very important part of their job in some localities in particular—they help to satisfy British food requirements.

No. 195 — Latest Recruit

Dame Fashion's been drafted!

For years, from the hallowed precincts of numerous salons this female dema-

gogue has been dictating to a so-called **style** conscious populace. Powerless to resist the onslaught of creations conjured up by her fertile imagination, the multitudes fell into line, reflecting her capricious fancy in every sock, shirt and skirt.

Then drums sounded. Men began marching. Wartime economy in its inexorable advance upon luxuries invaded the realm of human vanity, and ~~Dame~~ **Fashion** found herself meekly submitting to higher command. Her new job is to "utilize in the best possible way, in attractive styles, the available supplies of clothing material without encroaching upon those required for war purposes", according to a recent statement by the Wartime Prices and Trade Board.

Simplicity is the order, and we do mean order, of the day. No fancy frills, ruffles or razzle dazzle, dippsie doodle styles. Economy in material and labour is the prime objective. Women's skirts will have a definite maximum length—for size 16 it is 30 inches; no more three-piece suits, or hats of cloth to match suits or coats; no patch pockets except in sports jackets that are yoke lined or unlined. Men will be unable to purchase two-pants suits, double breasted sack coats or vests. Trousers are to be restricted as to length of leg, width of knee, bottom and waistband—no pleats, cuffs or watch pocket. Vests are out as far as high school or prep. school suits are concerned, and zipper pockets will soon be relics of past days.

Both tailors and manufacturers are affected by these new restrictions, so be sure to take them into account when purchasing your Spring wardrobe.

No. 196 --- Asparagus

Asparagus tips are to be found more and more on the Canadian dinner table. It is a taste handed down from generation to generation of mankind, in fact the Greeks and Romans of olden times relished the young, tender shoots. Garden asparagus is a native of the north temperate zone of the old world. The plant grows wild on coasts and sandy areas in the South of England; and on the steppes of Russia it is said to be so abundant that the cattle eat it like grass. Through cultivation it has become extensively naturalized in North America, especially around salt marshes from New Brunswick to Virginia, sparingly along roadsides and fields in the interior and also on the Pacific coast.

Asparagus is grown extensively by market gardeners and in many back-yard plots. If properly treated the beds will continue to bear well for several years. In this connection it should be pointed out that asparagus must not be cut over too long a period. Since the present year's asparagus crop was developed from food stored last year, enough time must elapse from the end of the cutting season for the plants to store food for shoot development next year. Recommendations have been made that cutting should end between June 1 and July 1. A heavy cutting gives higher yields for the first two years but this increased stimulation soon results in a dwarfing of the plant with a subsequent decrease in yield.

Garden asparagus is the most valuable species of some 120 of a genus of plants of the lily family. Several climbing species are grown as house plants and in green-houses for their ornamental foliage. The so-called asparagus fern, native to South Africa, is an especially elegant plant, highly prized for its delicate, feathery branches.

Most of the tender shoots are eaten fresh but large quantities are canned and

otherwise preserved. The pulp is also preserved by canning. Asparagus is also dried, especially in European countries, in which state it may be kept indefinitely. Ontario and British Columbia are the principal asparagus producing provinces here in the Dominion, with 5,030,000 pounds and 1,026,000 pounds respectively listed as their asparagus crop estimates for last year.

No. 197 -- Alfalfa

Alfalfa is a deep-rooted clover-like perennial plant. It is an important forage crop in Canada and its cultivation is carried on in most agricultural areas where conditions are suitable for its growth. In Europe it has been cultivated for more than 2,000 years and in Great Britain it is popularly known as 'lucerne'. In some localities of Ontario, Alberta, Saskatchewan and British Columbia the production of alfalfa seed has become an important industry. In Canada as a whole alfalfa production last year amounted to 2,487,000 tons.

In harvesting alfalfa for hay, care should be exercised if a product of the highest quality is to be obtained. The principal feeding value of alfalfa is contained in the leaves. Serious losses also occur through leaching if alfalfa is lying in the swath during a rain. This increases the difficulty of getting the crop cured without losing part of the leaf as well.

Alfalfa is usually cut when about one-tenth of the flowers are in bloom if two cuts are to be made. In districts of limited moisture in midsummer, the practice of taking one cutting only is usually the best. In such cases cutting is usually delayed until one half of the flowers are in bloom or about the middle of July. This gives a slightly higher yield without impairing the quality of the hay.

Harvesting is usually done with standard haying equipment. The crop should be cut in the morning after the dew has disappeared. If the weather conditions are particularly favourable alfalfa hay may be allowed to complete drying in small bunches with the object of stacking immediately. However, this may result in considerable loss in the event of untimely rainfall.

No. 198 -- Soft Soap

Despite strong and audibly evident indications abroad to the contrary, there's really a serious shortage of the old oil that goes into the making of soft soap. Home production in the past has been far out-distanced by home consumption—a fact which may surprise many—our dependability upon foreign stocks of inedible oils increasing in value in 1941 to something like \$12,260,163 from \$9,253,618 in the previous year.

The problem, in fact, has become serious enough for the Government to commence an intensive research of this commodity upon which the general welfare of the nation depends to such an extent.

There are three sources of vegetable oil in Canada, which hold potentialities in the present crisis. They are flaxseed, soybeans and sunflowers.

The first named is an excellent source, yielding about 40 per cent of an oil which is quick drying. Because of this property, linseed oil is used largely in the

manufacture of paint, varnish, printing ink, linoleum, oil cloth, and soft soap. While this quick drying quality is important in those instances, it makes the oil very impractical for table use because of its tendency to become rancid. Canadian production of flaxseed has been steadily declining for the past 20 years, in 1934 hitting an all time low of less than 1 million bushels. However, recent development of wilt and rust resistant varieties, a greater understanding of successful culture, and a Governmental guaranteed price of \$2.25 a bushel should stimulate interest in its production this year.

Secondly, soybeans. Averaging about 18.5 per cent in oil content, semi-drying and with no evidence of rancidity, soybeans yield an edible oil of high quality. At the present time it's doing an excellent job of taking the place of cocoanut oil, supplies of which have recently been cut off. Soybean oil is invaluable in the manufacture of soft soap and high quality white enamels. This crop has been making rapid strides in Eastern Canada, but the northern nights in the Prairie Provinces seem to be too short for blooming. As a result, there is virtually no commercial production of the plant in Western Canada, although there are two small processing plants in operation in Manitoba and Alberta.

Lastly, sunflowers. Regarded by many as superior to almost any oil on the market in its edible qualities, sunflower oil is comparatively little known in Canada. Because of its quick drying property, it is a potential for the paint industry.

Sunflowers, particularly the tall variety, have long been grown for ensilage purposes. Then Mennonites and other immigrants from Europe brought a semi-dwarf type over from their home land. For years they grew these in their own gardens and ate them like peanuts. Finally field nurseries began experimenting with the seed and have now selected a few strains that combine properties of short growing, early maturing, single stemmed and high oil content. Experiments conducted along this line have proved successful in Western Canada.

No. 199 --- Dried Vegetables

Vegetable dehydration—or the scientific drying of vegetables for domestic use—has travelled far along the path of progress, particularly during recent months. In the last war the dried vegetables served out with the rations were not very favourably received, and justifiably so, because at that time dried vegetables were just vegetables that had been dried. They were tough and tasteless; their vitamin value was probably nil, and, if the vegetables had been kept for a year, only dire necessity compelled consumption. That has all been changed.

Recently, a demonstration was given in Ottawa of dehydrated vegetables processed in Canadian factories for and under the direction of the Agricultural Supplies Board. Carrots, turnips, cabbage, pickled beets, and potatoes (mashed, riced, French fried and pan fried) were served and the consensus was that they could not be distinguished from fresh-cooked vegetables. Some of the persons who tasted them maintained that the dehydrated products were even better than home-cooked vegetables. In the process of dehydration the vegetables had lost but little of their original vitamin content and nutritive value.

What has happened to dehydrated vegetables is this. Formerly, they were just dried to a point where they appeared right, without much attention being paid to temperature and drying periods. Now they are first selected for varietal suitability and maturity fitness. They are then washed, trimmed, and cut into the form in which they can best be pre-processed, dried, and dehydrated. Pre-processing consists of

cooking the vegetables for an exact time in steam or water at an exact temperature. This cooking or blanch, is to preserve the characteristics of the vegetables, or in the language of the scientists "the blanch is for the purpose of inactivating the enzymes which would cause the destruction of vitamins, colour, and flavour, if allowed to remain active".

Following this treatment, the blanched vegetables are spread on trays which are then stacked on trucks and rolled into the dehydrator. In the dehydrator, the vegetables on the trays are subjected to a blast of hot air until they have been dried to an exact moisture content, the velocity of the air-flow, the temperature, and the humidity being carefully controlled. Each species of vegetable requires a different treatment. Some will stand higher temperature, and others require higher humidity in the air, but all are dried as rapidly as possible to a final moisture content of from 4 to 7 per cent.

After the dehydration process, the vegetables are immediately packed into metal containers and hermetically sealed. In the case of some vegetables, the air is exhausted from the sealed containers through small holes punched in the covers and the air replaced with an oxygen-free gas, such as nitrogen. The holes are then "Spotted" with solder to keep the gas in.

A ton of potatoes (26 bags) makes 300 lb. of dehydrated potatoes which may be packed in 15 cans of 5 gallons capacity each. One hundred pounds of cabbage reduced to six pounds which can be packed in a three gallon container. When required for use, the dehydrated vegetables merely have to be soaked in sufficient cold water for a few hours to "refresh them", following which they are cooked as fresh vegetables.

In a country like Canada where there is an abundance of fresh and canned vegetables, dehydrated material is not normally required except in limited quantities for special markets. In time of war, however, dehydrated vegetables have a definite value as emergency rations and ships' stores. The present demand is being catered to with high-quality products manufactured under the watchful eye of officials and technicians of the Dominion Department of Agriculture.

No. 200 — Colorado Beetle Control

Here is some very useful information about the control of the Colorado beetle. Most people here call them potato bugs. They are usually found in the field before the new potatoes have broken the soil. They lay their eggs on the under sides of the leaves. When the yellow egg masses are seen, spraying and dusting operations should be commenced immediately when a number of eggs have been hatched. The best and cheapest poison to use is calcium arsenate at the rate of 1 1/2 to two pounds in 40 gallons of Bordeaux mixture (copper sulphate 4 lb.; lime, 4 lb.; water, 40 gallons).

If the poison is used alone in water, add 2 to 3 lb. of hydrated lime to each 40 gallons. Should arsenate of lead or Paris green be preferred as a poison, two to three pounds of the arsenate, and 1/2 to one pound of the Paris green may be substituted for each 40 gallon barrel of spray.

Growers who prefer to apply the poison in powder form should use a dust composed of one part of calcium arsenate to eight parts of hydrated lime. In dusting, best results will be secured if the application is made in the early morning or late evening, when the vines are wet with dew and the air calm.

In spraying potatoes, the poison should always be mixed with Bordeaux as this material is not only a valuable fungicide but repels the attack of destructive insects like flea beetles and leaf hoppers. Two or three applications in a season should give sufficient protection from all insects, when applied thoroughly and at the time when the new damage first becomes evident. Both the upper and the lower sides of the leaves should be covered and an abundance of material used. When the plants are small, 50 to 75 gallons per acre, and when fully grown, 100 to 120 gallons is not too much at each application.

No. 201 — Forest Products and the War

While war continues the demands on our forests will inevitably remain at a high level. Newsprint paper is the most important manufactured product among our exports, and demand for other papers and for wood pulps is strong both at home and abroad. Canadian lumber is needed in vast quantities by ourselves and our Allies, and woods specially suitable for use in aircraft, such as Sitka spruce and high quality yellow birch, are at a premium. Wood has been proved, under war conditions, to be the most versatile of materials, and is constantly being substituted for other materials which are in short supply.

In view of these heavy war demands on our forest products the need for conservation is of great importance. In the few years preceding 1940 a combination of relatively favourable weather conditions and improvements in methods of detecting and fighting forest fires tended to reduce fire losses in Canada as a whole, although the number of outbreaks remained about the same. More recently, periods of dry weather, the enlistment of key personnel of fire-protection organizations, and shortage of labour available for fire fighting because of high employment in war industries, have resulted in serious losses in several provinces. Under these circumstances, full co-operation by the public in prevention of forest fires becomes a significant duty in connection with national defence.

According to the latest available estimates, Canada possesses 315,140 million cubic feet of standing merchantable timber, of which 211,660 million are considered to be accessible to commercial operations. The accessible timber consists of 252,100 million feet board measure of saw timber and 1,500 million cords of smaller material suitable for pulpwood, fuel, and other products.

In 1940 the total value of products of the Canadian forest aggregated \$194,568,000, an increase of 23 per cent over 1939. The leading products were as follows: pulp-wood \$74,347,000, logs and bolts \$71,817,000, firewood \$33,298,000, round mining timber \$5,708,000, poles \$2,391,000, hewn ties \$1,788,000 and posts \$100,000.

No. 202 — Canadian Reindeer Herds

The reindeer herds in the Canadian Arctic continue to increase. The fawning season is now in progress, and returns received so far show that an estimated 1,000 fawns have been added to the main herd at the government reindeer station, with more yet to come. Fawning usually starts in April and continues into June.

This year's fawn crop will likely boost the reindeer population of the Northwest Territories to above 10,000 animals as compared with the 2,370 reindeer delivered to the reserve in 1935. At the round-up last summer the main herd numbered 5,000 head. In addition were the two herds under native management, one in the Anderson River area

containing 2,000 deer and the other, numbering 1,000 head, in the Horton River area. The total fawn increase of the three herds will be known later in the year.

The stamina of the new born deer is remarkable. The reindeer station is located two hundred miles north of the Arctic Circle and, notwithstanding the low temperatures, the proportion of fawns which survive is usually between 85 and 90 per cent. They are able to walk a few hours after birth and within a few days are scraping about for moss to augment the milk provided by the mothers.

Establishment of additional herds under Eskimo management is planned with a view to expanding the reindeer industry for the benefit of the native population. Young Eskimos are being encouraged to take training in reindeer husbandry. On completion of their apprenticeship they will be entrusted with the management of herds under government supervision, and may eventually secure herds of their own.

Reindeer herding is slowly finding favour with the Eskimos, particularly with the younger family men, and already the industry is proving a factor in increasing the food supply and conserving the game resources of the Far North.

No. 203 -- National Parks Fishing Regulations

The use of live minnows or other small fish for bait is banned in all fishing waters in the national parks. This measure is to safeguard against the possibility of undesirable fish becoming established in park waters. The new regulations set forth the open seasons for the different species, and list the conditions under which nineteen kinds of game fish may be taken.

Creel censuses taken in a number of national parks in western Canada last summer indicate that good fishing awaits the sportsmen this year. Streams and lakes in the mountain parks should provide keen sport, particularly for the anglers who take into consideration the vagaries of the waters and the whims of the fish. Here the fish seem to take on new wariness and fighting qualities which are attributed to their stern struggle for existence in the foaming streams and glacial lakes of the Rockies.

Banff National Park has about 150 larger lakes and 20 streams which provide good fishing, many of them easily accessible from the park townsite. The anglers who can take the time for a day or two of hiking or riding along mountain trails may fish the waters of Baker Lake and others of the Ptarmigan-Skoki area east of Lake Louise, in Marvel Lake at the foot of Mount Assiniboine, or in Egypt Lake near the Simpson Pass.

Anglers in Jasper National Park seeking rainbow, cutthroat, brown and lake trout will find a dozen fine fishing lakes within three miles of the town of Jasper. Eastern speckled trout have been successfully introduced into the Maligne Waters, and the fisherman has his choice of Maligne Lake, Maligne River or Beaver Lake. Amethyst Lake in the Tonquin Valley provides a rare combination of landscape and fishing, where the rainbow trout are plentiful.

Waterton Lakes National Park also provides good sport for the angler. Fighting rainbow trout are taken in Bertha Lake, which is reached after a couple of hours' hike or saddle ride. Fly fishermen match their wits with cutthroat trout in the icy waters of Crypt Lake and the Alderson-Carthew Lakes. Rainbow and speckled trout are numerous in Cameron Lake and in the main Waterton Lake near the townsite lake trout up to forty pounds are taken on the troll.

Rainbow trout are taken in beautiful Lake O'Hara in Yoho National Park, and

Emerald Lake and Wapta Lake in the valley of the Kicking Horse River yield several species of game fish.

In Prince Albert National Park in Saskatchewan, Lake Waskesiu teems with pike and is now being stocked with battling small-mouth black bass. Clear Lake in Riding Mountain National Park in Manitoba also offers good pike fishing, and is at present being stocked with rainbow trout.

Atlantic salmon, speckled trout, and swordfish attract anglers to Cape Breton Highlands National Park in Nova Scotia. Several small lakes and ponds in Prince Edward Island National Park contain brook trout, and afford opportunities for angling as do a number of streams outside the park boundaries.

No. 204 — New Sources of Drugs Sought

In a paper entitled "The Problem of Medicinal Plant Production During Wartime" given before the recent meeting of the Royal Society of Canada, Dr. Harold Senn, Associate Botanist, Division of Botany, Dominion Department of Agriculture, disclosed that the progress of the war has successively eliminated more and more of the usual sources of plant drugs. Since the beginning of the war the Division of Botany has studied the possibilities of increasing the production of certain drug plants already being grown in Canada and of commencing the production of others.

Many plant drugs are used in the manufacture of proprietary medicines, but only relatively few are absolutely essential to the practising physician. Emphasis has been placed on the latter group.

Canada has the only native source of Cascara Sagrada in the British Empire, stated Dr. Senn, and supplies an important part of the world demand for this valuable drug. The drug is obtained from the bark of the Cascara tree which grows in British Columbia. Surveys indicate that the number of trees has been rapidly diminishing due to wasteful methods of cutting. The province of British Columbia has now passed legislation protecting the tree and carefully regulating the methods of harvesting. Methods of growing the Cascara tree in plantations are being studied.

Digitalis, Belladonna and Henbane are other drugs important in wartime. There appears to be adequate supplies of the common Foxglove, *Digitalis purpurea*, available but there is a considerable demand for another species, *Digitalis Lanata*. Seed supplies of this, as well as of Belladonna and Henbane, are very scarce and steps have been taken to increase the amount of seed available as rapidly as possible.

Ergot is a drug obtained from a fungus which grows as a parasite on rye and other grains and grasses. The amount of infested rye varies from year to year with weather conditions. Labour costs have largely prevented Canadian ergot being collected and offered for sale. Experiments are being conducted to determine whether ergot may be economically produced under controlled conditions.

In addition to the work on these few drug plants, important for war-time uses, many others are being grown experimentally and particular emphasis is being placed on the search for strains or varieties with higher drug potencies.

The general public should be warned, urged Dr. Senn, that the growing and harvesting of drug plants is usually a difficult undertaking requiring great care and technical skill if the product is to be of any value. Although prices of some products may now be high the beginner cannot usually hope to receive large financial profits.

No. 205 — Salute the Kernel!

It's rice work if you can get it, but you would probably have to travel half way around the globe to make it a paying proposition. Even then, experienced competition would limit your chances of success to such an extent that it might be more profitable after all to stay in your own back yard and devote your time to cabbages or spinach.

Rice growing is an industry that involves a tiresome amount of "knee bends", "back stoops" and wading. The seeds are either scattered broadcast or allowed to germinate in earthenware pots before transplanting. During the growing season the crop demands a great deal of weeding and careful attention. At certain periods of the year the fields must be entirely flooded. In the world's largest rice producing countries harvesting is done by hand by native labour. Before milling the rice grain is known as rice in the husk or paddy. This husking process reduces the weight of the grain by almost one-quarter and leaves brown rice. A pearling process cleans and polishes the kernels until they emerge as the white rice we're accustomed to seeing in the stores.

Rice vies with wheat for the lead as the world's greatest food crop. Almost the entire supply of rice is grown in Asia, although in recent years it has become a fairly important crop in certain sections of the United States and South America. For thousands of years it has been the staple food in China, where a crop failure would be disastrous. Half the arable land in Japan is devoted to rice growing, and India produces large quantities. Burma, though second to India as an Empire producer, is in normal times the largest exporter in the world. Australia and British Guiana are the only other Empire countries that export rice in appreciable quantities. Brazil is the chief world producer outside Asia.

Canada, although principally a wheat producing and consuming country, imports rice mostly in the paddy or uncleaned state to the value of about \$1,000,000 annually. The largest part of this comes from the United States, Brazil and India, and recently some has been coming in from Mexico.

No. 206 — Colourful Facts

It has been said that there's nothing new under the sun, and a recent investigation into the history of painting prompts us to rise and say "aye".

As far back as the Reindeer Age—if time means that much to you—men knew the art of mixing excellent paint. They took the simple colours found in the earth, red, brown, yellow, and black and mixed the pigments with animal fats and oils to colour the walls of their caves in bright and surprisingly artistic fashions. Bones of the reindeer of a far-off day have been found stained with colours similar to those found on the walls of the caves.

While this affords convincing proof that the manufacture of paint is among the oldest discoveries of the human race, men are still wondering at what unfortunate, psychological moment in history the female of the species managed to get her irresponsible fingers into the paint pot. Then it was, perhaps, that the slogan "Save the Surface and you Save All" originated. It is said that by counting the layers of paint on the walls scientists are able to estimate the age of certain of the earliest American houses, many of which belonged to the prehistoric Hopi Indians. We hasten to point out that any apparent connection between the two trains of thought just expressed is purely coincidental.

As mentioned above, paints are a mixture of pigments and oil. Technically speaking, pigments are dry substances, usually in the pulverized form or in lumps which are easily pulverized. The oil used most generally here in Canada is linseed. However, poppy seed oil from China goes into fine paints for artists colours, and tung oil from the Orient is conceded to be the best for marine paints.

Canada receives the largest part of her paint pigments from the United Kingdom and the United States, with a small amount coming in from India and Australia.

Experts say that the story of paint is really just beginning. Interesting and almost unbelievable facts concerning the various effects of colour are being brought to light almost daily.

Colours create atmosphere. Physicians have found that rooms done in warm pleasing colours have a definitely beneficial effect on patients. Blues and greens have a tendency to calm and soothe jagged nerves; light colours are cooler than dark; rooms done in light shades save electricity bills; the right paint in offices and factories protects the eyesight of workers. Hundreds of other facts about paint could be enumerated, for new uses are being discovered every day.

There are about 93 plants operating in the paints, pigments and varnishes industry in Canada, most of them located in Ontario and Quebec. In 1940 they reported a production valued at \$30,109,000, with ready mixed paints, not including enamels, forming the largest proportion of this amount. Imports in this industry were up about 18 per cent above the 1939 total of \$4,662,000, while exports, consisting chiefly of mixed paints, were valued at over \$2,325,000, a 49 per cent increase over the preceding year. Exports in this year went chiefly to the United Kingdom, United States, British South Africa and British West Indies.

No. 207 -- Take Care of Cooking Utensils

The women on the home front can make their contribution towards relieving the metal situation, now serious as a result of the war, by taking special care of metal cooking utensils and other articles of metal in the home. Everything from pots and pans to flyswatters is now in the critical material class. The wise thing to do is to make every article of metal in the home last as long as possible.

Aluminum is in the precious metal class. Any aluminum pots or utensils can be made to last longer if they are washed as soon as possible after food is cooked in them. Food should not be stored in them. They should not be cleaned with water in which there is soda as it causes aluminum to turn dark and pit.

Brass and copper can be kept clean and in good condition by washing with soap and water. Spots may be removed if rubbed with hot vinegar and salt or lemon rind and salt or hot buttermilk.

Metal polishes should never be used or any kind of cleaning powder on nickel or chromium plating. It can be kept bright by being wiped with a damp cloth or with washing in soapy water, rinsing and drying.

Iron pots should be well dried after washing. An iron utensil used only once in a while should have a thin coat of saltless oil or fat put on it, then put in a dry place, wrapped in paper.

Stainless steel can be kept clean with a gritless cleaning powder or very fine

steel wool, otherwise the usual washing, rinsing and drying.

As to tin, it is now a metal that just cannot be released for household articles while the war continues. Don't try to keep it shiny, or the thin coating of tin will be taken off. To remove burnt food try boiling a little soda and water in the tin pan but don't boil it longer than five minutes.

Conservation of metals means more for armaments and munitions for aeroplanes and for the ships at sea.

No. 208 -- Cyanamid

At peace or at war, food is the most important of the prime necessities of life to the individual and to the nation. An insufficient supply causes hardship, misery, sickness and even crime, whereas a plentiful supply promotes health, strength, efficiency, comfort and happiness.

Just before the turn of the 20th Century, Sir William Crookes, a noted British scientist, startled the world when he predicted ultimate world starvation unless additional sources of combined nitrogen could be discovered. He called attention to the fact that the Chilean deposits of nitrate were limited. Without an adequate supply of plant food nitrogen, the production of crops could not keep up with the steadily increasing world population. This then was a rather gloomy outlook for the world at large.

But science came to the rescue. Now we get nitrogen from the air to feed our crops. The baffling question of fixing or combining the nitrogen of the air by chemical means on a large scale at a sufficiently low cost was solved by two chemists, Professor Dr. Adolph Frank and Dr. Nicodem Caro and is the first process for fixing atmospheric nitrogen that was commercially successful. This is known as the cyanamid process.

The importance of this discovery may be readily visualized by the layman when it is remembered that of the three plant foods, nitrogen is the most important. Cyanamid is made by burning lime and coke together at extremely high temperatures. These two ingredients when burned together form carbide, which when white hot sucks up pure nitrogen from liquid air and combines with it chemically. The farmer uses the mixture as a fertilizer.

One additional way in which atmospheric nitrogen can be converted to fixed nitrogen is by means of bacteria in the roots of leguminous plants such as peas, beans, clover and alfalfa. However, this method is slow and costly.

Cyanamid is made at Niagara Falls, Ontario. It is said to be the largest cyanamid plant in the world and is the only one on the North American Continent.

No. 209 -- Ant Nuisance in the Home

Especially in summer time, ants are frequently unwelcome intruders in homes and gardens. There are many species of them. A common and troublesome household species is the tiny reddish-yellow Pharaoh's ant which originated in the tropics but is now widespread in Canada. Another species is the common black carpenter ant which is normally found outdoor, nesting principally in decaying wood, but frequently

it occurs in dwellings, particularly frame houses and summer cottages, and may cause much damage. A third species is the small yellowish-brown lawn ant which nests in lawns and gardens, and often enters houses in search of food.

According to the Entomologists of the Dominion Government the most satisfactory material for destroying ants is sodium fluoride, sold by drug stores in the form of a fine white powder. This powder should be scattered or blown with an insecticide puffer or dust gun in places where the ants occur and should not be removed until the insects have disappeared. However, sodium fluoride is a poison and should not be exposed in places to which children and pets have access.

Another method recommended as particularly effective against Pharaoh's ants consists in using a poisoned-bait trap. This is made by punching several holes in the sides of a small tin can with a tight lid, and placing in it a small piece of sponge and a quantity of syrup, prepared by mixing 4 ounces of sugar and one ounce of honey in one-half pint of hot water, and adding one-half gram of sodium arsenite. The worker ants are greatly attracted to the bait and carry it to their nests to feed the larvae and the queen. Thus the whole colony is destroyed. In preparing this bait, it must be remembered that sodium arsenite is very poisonous to human beings.

If, due to war conditions, difficulties are experienced in obtaining insecticides, a mixture of equal parts of powdered borax, or boric acid, and pyrethrum powder may be substituted. This has the advantage of being non-poisonous to human beings.

No. 210 — A Good Yoke!

The boys in the R.A.F. aren't the only "birds" laying "eggs" these days. There are a few thousand conscientious biddies setting right here on the home front who have been shelling out pretty generously since the war began. Of course they've been doing the same thing for centuries, so it's really getting to be a habit, this egg laying business, but it's a profitable one.

While it's questionable whether the motive behind the increased egg production of Canadian hens is on their part a patriotic one, the results are worth crowing about. It's only fair, of course, to mention that although egg production is dependent in a large degree upon the caprice of the hens, a good deal of credit must go to the poultrymen who are devoting increased time and energy to obtaining greater and still greater efficiency in feeding and management technique. The combined efforts of both have given rise to a new war industry in the Dominion -- Drying Eggs for Britain.

This is the way it works:- A group of 30 or 40 girls spend eight and a half of their waking hours doing nothing but break eggs, sometimes as many as 14,000 of them! The liquid of the broken eggs is dumped in a huge vat, passed through a filter and finally into a pump which forces it at high pressure through a small pipe to a considerable height from which point it is sprayed down into a large dryer. At the same time hot air enters the dryer and comes into contact with the fluid while it is in mid air, and it falls to the bottom in powder form. A further process of shaking and sifting and evaporating completes the operation and the eggs are packed in wooden barrels of 140 pounds capacity, ready for Britain.

It takes approximately 4 pounds of egg fluid to make one pound of powder, but think of the vital shipping space conserved! John Bull will find difficulty in whipping up an omelette for breakfast, and it may not look much like the eggs of the "good old days", but from a spoonful of the powder he will obtain all the benefits

of the original "fruit"--protein, vitamin A and iron--just the same, for the nutritional qualities are unimpaired.

There are several egg-drying plants in Canada, many of which were once used for the purpose of drying milk. Over 35 carloads of eggs are powdered each week and this total is expected to be more than doubled in the near future. So, although it's a sort of "foul" business, the results are amazing, especially "over there".

No. 211 -- Sawdust and Shavings

Dry sawdust and shavings are used extensively for the insulation of houses and other buildings in some parts of Canada. A survey conducted recently among architects, engineers, builders, and lumbermen throughout Canada established instances where these by-products of the wood-using industries have given efficient insulating service for periods of more than fifty years. It appears that their use for this purpose is increasing, particularly in western Canada.

Although the excellent insulating properties of sawdust and shavings have long been recognized, still further extension of their use has been hindered by various fears and prejudices, which results of the survey do not confirm. It is believed by some that the presence of these materials in walls provides favorable breeding places for vermin but no evidence has been produced to indicate that sawdust and shavings offer any particular attraction to insects or rodents. Similarly, the idea that the use of these materials encourages the decay of timber is not confirmed by the records.

Most serious deterrent to the use of sawdust and shavings in insulation is the alleged fire hazard. It has been shown that a wall properly packed with these materials is a much more effective fire-stop than a hollow frame wall. In this connection one instance was reported of a fire in a printing establishment, which destroyed the machinery in the building as well as the type and other equipment but did very little harm to the walls and roof which were insulated with sawdust and shavings.

Although certain cities have regulations restricting the use of sawdust and shavings in the buildings, it appears that one of the main hindrances to their use lies in the lack of a specification which would ensure that they are satisfactorily prepared for the purpose. Lending force to this statement is the fact that pulverized or screened shavings sold under trade names are used for insulation in some municipalities where sawdust and shavings as such are prohibited.

No. 212 -- Soybeans Valuable to Farmers

The soybean crop is receiving attention at the present time in connection with its high content of valuable oil, but the soybean has other very useful qualities. The most important of these from the farmers' viewpoint is the high protein content of the seeds.

Ripe soybeans contain about 35 per cent protein and 18 per cent oil. From the livestock feeders' point of view, particularly the dairy farmer, this high protein content affords great possibilities. All of the commonly grown grain feeds are rich in carbohydrates or starches. In order to feed a properly balanced grain mixture, protein should be added to these grains. This may be purchased usually in the form of linseed, cottonseed or soybean meal. If the farm is located in an area where soybeans will produce a reasonable yield then soybeans will supply this protein.

In some instances soybeans have replaced linseed meal in the grain ration of dairy cows with excellent results. In addition to the feed value from soybeans, soil benefits are also obtained. Like alfalfa and clovers, soybeans is a legume crop and therefore possesses soil-building properties, and fits quite well into most rotations and when inoculated with the proper bacteria, aids in maintaining the nitrogen supply of the soil. After soybeans have been processed and the oil extracted soybean oil meal remains which is a high protein concentrate feed. Soybean oil meal also has value as a source of organic nitrogen in fertilizers.

When soybean plants are harvested in the green state and cured as hay this approaches alfalfa in feed value. This use of soybeans has not been extensive in areas where alfalfa can be grown successfully but in cases where an emergency hay crop is required soybeans might well be considered. Green soybeans may also be used for mixing with corn for ensilage, increasing the protein content over corn alone.

Soybeans is a crop that merits a place on all farms where protein is purchased to balance feed rations.

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