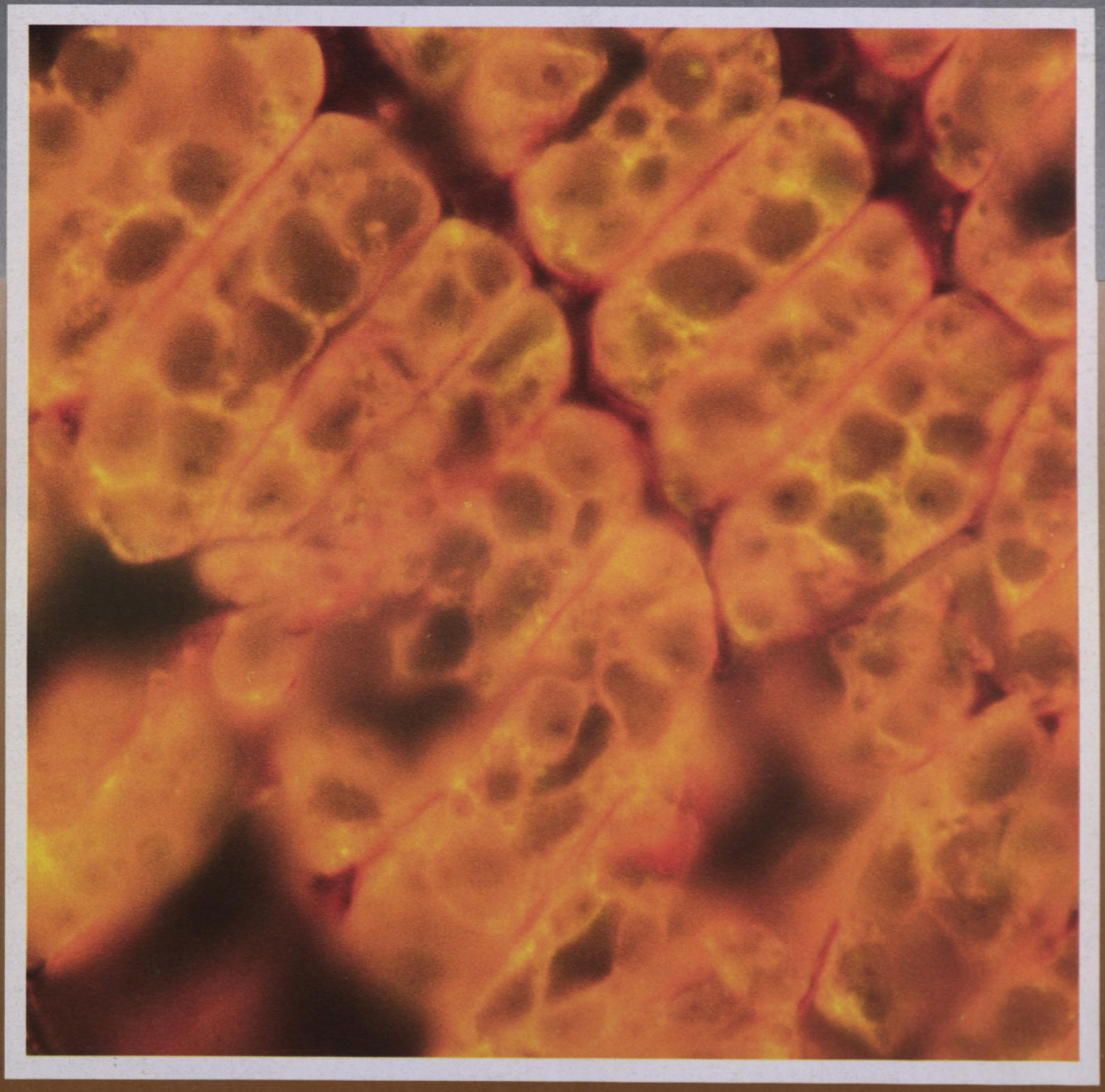
RICULTURAL TECHNOLOGY: THE CANADIAN EXPERIENCE



Canada

Mixed farming in Nova Scotia. (Photo courtesy of Communications Branch, Agriculture Canada)

Cover photo:

Colour micrograph of a canola seed depicting the interior oil content.
(Photo courtesy of Dr. S.H. Yiu, Food Research Centre, Agriculture Canada)

External Communications Division (BFE)
Communications and Culture Branch
Department of External Affairs
Ottawa, Ontario
Canada K1A 0G2

The companies and products depicted in this publication are intended to be representative. Space limitations do not permit the portrayal of all new Canadian developments in agriculture or mention of all Canadian companies engaged in the design, development or production of Canadian agricultural equipment or the development of new technology.

(Publié également en français)

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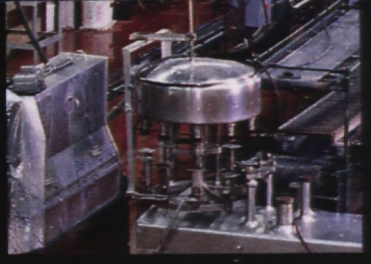
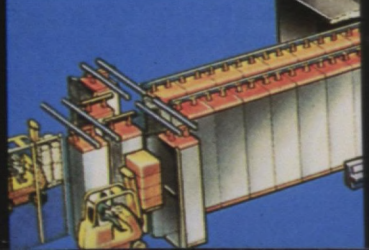


The purpose of this series is to inform readers of current trends in Canadian technology.

Canada, 1988



Introduction

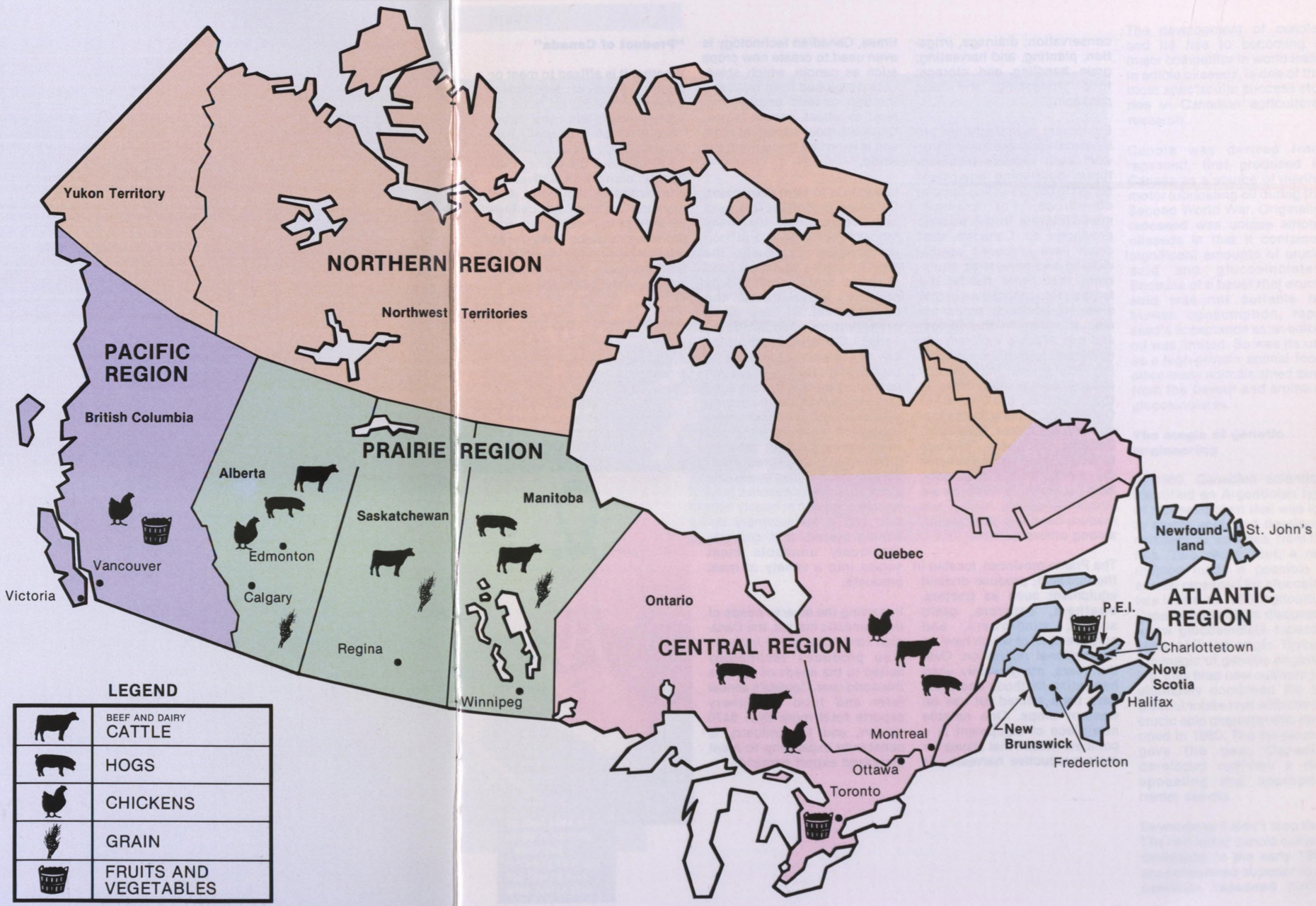
On a site near present-day Quebec City, one day in 1617, a Frenchman named Louis Hébert cleared land and began growing grain, pumpkins, and beans. Hébert didn't know it at the time, but he was the first settler to make his living from farming in what would later become Canada.

In the following 370 years, farms have grown from small plots of land to 70 million ha of fertile soil spanning the second-largest nation in the world. Canadian farmers, in the same time, have gone from growers of bare necessities to being among the world's foremost food producers and exporters.

Canada's land mass stretches 5 500 km, from the Atlantic Ocean to the Pacific, and from the same latitude as northern Italy to the high Arctic. As a result, the country's five major geographic regions — Atlantic, Central, Prairie, Pacific, and Northern — encompass widely varying land and climatic conditions. Each region has special features that make it different from the others. Together, these features also make Canadian agricultural products and techniques among the world's most diverse.

Canadian processes meet new challenges

In order to adapt to Canada's agricultural conditions, the Canadian farm equipment industry has had to devise a variety of new farming techniques. Since its roots in the nineteenth century, this industry has continually met new challenges by developing methods and technology to suit the land, climate, and needs of the people. The result is equipment for a multitude of applications: land clearing and soil



LEGEND

	BEEF AND DAIRY CATTLE
	HOGS
	CHICKENS
	GRAIN
	FRUITS AND VEGETABLES

The above symbols indicate the predominance of particular agriculture products throughout Canada.

conservation; drainage, irrigation, planting, and harvesting; grain handling and storage; food processing; and food packaging.

Equipment manufacturers are located throughout the country, with each region's manufacturers developing equipment suited to the prevailing farming conditions. For example, manufacturers in the Atlantic provinces on Canada's east coast have produced special digging and harvesting equipment that helps handle the large potato crop grown in that area. Horticultural crops are also abundant in this region, and one Atlantic firm recently developed revolutionary blanching equipment that greatly reduces energy input costs. In the Central provinces of Ontario and Quebec, firms produce forage boxes, feed carts, bedding choppers, storage bins, and farm wagons to serve the needs of animal husbandry. Also produced in this area are combines, plows, haying and manure-handling equipment, among others.

The Prairie provinces, located in the midwest, produce dryland equipment such as tractors, swathers, sprayers, grain augers, windrowers, and spreaders, all of which have an international reputation. Over the years, many widely used harvesting methods and tools have been refined for use on western crops. One notable new piece of equipment is a combine header that allows for more productive harvests. At times, Canadian technology is even used to create new crops such as canola, which scientists developed from rapeseed through genetic engineering. Next to wheat, canola is now Canada's most important crop, and is exported throughout the world.

In addition to farm equipment, Canadian manufacturers have been responsible for many innovations in the area of food preservation. Originally, the time it took to transport food products across such a large country necessitated the development of new food preservation techniques. Today, Canadian companies are still making advances in preservation technology, such as equipment that freezes eggs into pellets, and are conducting research into processes, like irradiation, that prevent food from spoiling. Other recently developed food treatment equipment includes a versatile apparatus that measures food texture, valuable in quality control; and a revolutionary deboning system that converts previously unusable meat scraps into a variety of meat products.

In serving the diverse needs of the domestic market, the Canadian farm equipment industry also produces technology suited to the needs of farmers the world over. Canada's annual farm and food machinery exports total more than $470 million, and the industry is constantly expanding to meet increased export demands.

"Product of Canada"

Whether it is affixed to meat or poultry, fruits or vegetables, grains or seeds, or fresh or processed foods, the label "Product of Canada" has become synonymous with quality throughout the world. That quality, along with a diversity unmatched in the world, has marked Canadian agriculture for almost four centuries, and promises to keep Canada an international leader in agricultural products, methods, technology, and equipment.

Genetic Engineering Leads to $1 Billion Industry

A field of canola in bloom. (Photos courtesy of the Canola Council of Canada)

An ideal salad oil, canola is naturally "winterized," remaining clear and free-flowing even when refrigerated.

The development of canola, and its rise to becoming a major competitor in world trade in edible oilseeds, is one of the most spectacular success stories in Canadian agricultural research.

Canola was derived from rapeseed, first produced in Canada as a source of marine motor lubricating oil during the Second World War. Originally, rapeseed was unique among oilseeds in that it contained significant amounts of erucic acid and glucosinolates. Because of a belief that erucic acid was not suitable for human consumption, rapeseed's acceptance as an edible oil was limited. So was its use as a high-protein animal food, since many animals shied away from the flavour and aroma of glucosinolates.

The magic of genetic engineering

In 1960, Canadian scientists identified an Argentinian type of rapeseed plant that was low in erucic acid, and developed cultivars, or varieties, from the line. Two years later, a new method made it possible to screen rapeseed for glucosinolate levels. In 1968, Agriculture Canada researchers discovered a low glucosinolate rapeseed strain of Polish origin. Through the magic of genetic engineering, they bred new cultivars that ultimately combined the low glucosinolate trait with the low erucic acid characteristic developed in 1960. The researchers gave the new, Canadian-developed cultivars a more appealing and appropriate name: canola.

Development didn't stop there. The two latest canola cultivars, developed in the early 1980s, are considered superior to any previous rapeseed cultivar

Canadian agricultural scientists originally developed canola and its high-quality oil from rapeseed. This feat of genetic engineering has led to a $1-billion industry. (Photo courtesy of Communications Branch, Agriculture Canada)

because of their high protein yield and resistance to disease. Today, these two strains occupy approximately 90 per cent of the Canadian land seeded to canola.

A versatile food product

Canola oil is a high-quality, exceptionally clear vegetable oil that can be used as salad or cooking oil, as shortening, or as margarine. Liquid canola oil is an ideal salad oil, having light colour, bland flavour, and delicate aroma. The oil has an excellent shelf life, flows easily when refrigerated, and helps emulsify or blend ingredients when mixed with other foods. In frying, liquid canola oil drains off readily and leaves foods 5 to 10 per cent lower in calories than those fried in melted shortening. Canola oil doesn't smoke under normal frying temperatures or transfer flavours from one food to another, making it re-usable if strained after each use. As a shortening, solid canola oil can be creamed and cut into flour easily, resulting in light cakes with moist, fine texture, and tender, flaky pastry. And as a soft margarine, it spreads so smoothly that it will go twice as far as the same amount of hard margarine or butter.

Canola's versatility and nutritional benefits have made it popular throughout Canada. The oil captures 75 per cent of Canada's liquid edible-oil market, and 54 per cent of the total edible-oil market. And canola's meal, the residual crushed canola seed used in cattle rations, accounts for 37 per cent of the Canadian meal market.

World's largest canola exporter

Today, canola is a $1 billion industry, and next to wheat is Canada's most important crop. Canada is the world's top supplier of canola, with exports accounting for half of the 3 million t produced each year. In fact, Canada annually exports five times more canola seed — 1.5 million t versus 300 000 t — than all the European Economic Community countries combined.

That export figure may rise in the wake of the U.S. Food and Drug Administration's 1985 decision to approve canola oil for general use in food in that country. In July 1986, Procter & Gamble, the American food giant, reformulated its Puritan brand of vegetable oil to contain 100 per cent canola oil. Previously, Puritan was an 80:20 mixture of soybean and sunflower oil. "Puritan has always been marketed as a vegetable oil for people who are interested in reducing their serum cholesterol," said Procter & Gamble spokesman Don Tassone. "Canola provides an optimum blend of the different health attributes in an oil."

To satisfy world demand, Canadian canola production has increased 300 per cent in the past 10 years. As well, companies such as Allelix Inc. of Toronto, Ontario, are active in the effort to develop and commercialize hybrid canola varieties through biotechnological means. Canadian scientists, meanwhile, are continuing to research and develop canola breeds in an effort to improve quality, increase yields, and further contribute towards an industry they helped create.

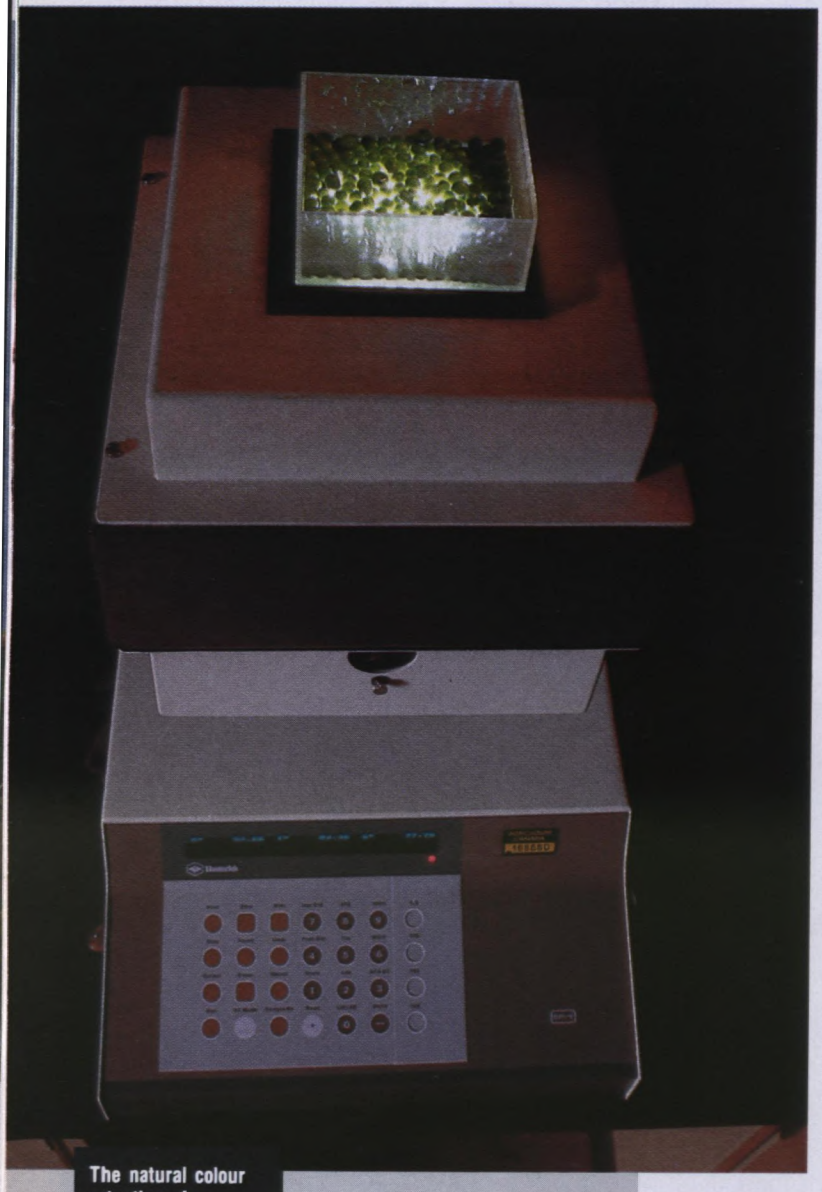
Energy-Efficient Blancher Saves Time and Money

For 50 years, fruit and vegetable companies have used a process called blanching to inactivate enzymes that would otherwise cause degradation of food products in frozen storage. Although the process is necessary for products being frozen, its high energy consumption proved costly.

Since 1980, ABCO Industries Limited of Lunenberg, Nova Scotia, has been offering manufacturers a solution: a line of steam blanchers that drastically reduce energy consumption and, at the same time, costs. Today, ABCO blanchers are the most energy-efficient and technologically advanced in the world, saving 90 per cent in energy costs, and retaining higher levels of nutrients than other blanching systems.

The ABCO blancher is the result of seven years of industry and government co-operation. Agriculture Canada initiated the project in 1973 and

The ABCO blancher is the most energy-efficient and technologically advanced in the world. Peas, for example, are heated for only 35 seconds, compared to 120 seconds in conventional blanchers.



The natural colour retention of a product blanched in ABCO K-Series blanchers has been measured by instrumentation. The enhanced appearance of the ABCO product is noticeable even when visually compared with a product processed by conventional blanchers. The ABCO product also retains a higher nutrient value.

designed the prototype. After preliminary testing, ABCO, a major fish-processing equipment manufacturer, became involved. By 1978, ABCO had developed and successfully tested an industrial prototype in a food processing plant. The system was introduced in 1980, and has since won awards in Canada and abroad for its innovative design.

Conventional blanchers use hot water or pressurized steam to heat food until its centre reaches a certain temperature. Energy costs rise with the length of time required to achieve that temperature. ABCO blanchers reduce that time by using a unique, two-part process.

"Most other systems use overkill," ABCO marketing manager Alec Gingell explains. "They keep the temperature up until the core of a vegetable is sufficiently heated, but as a result the surface ends up overcooked."

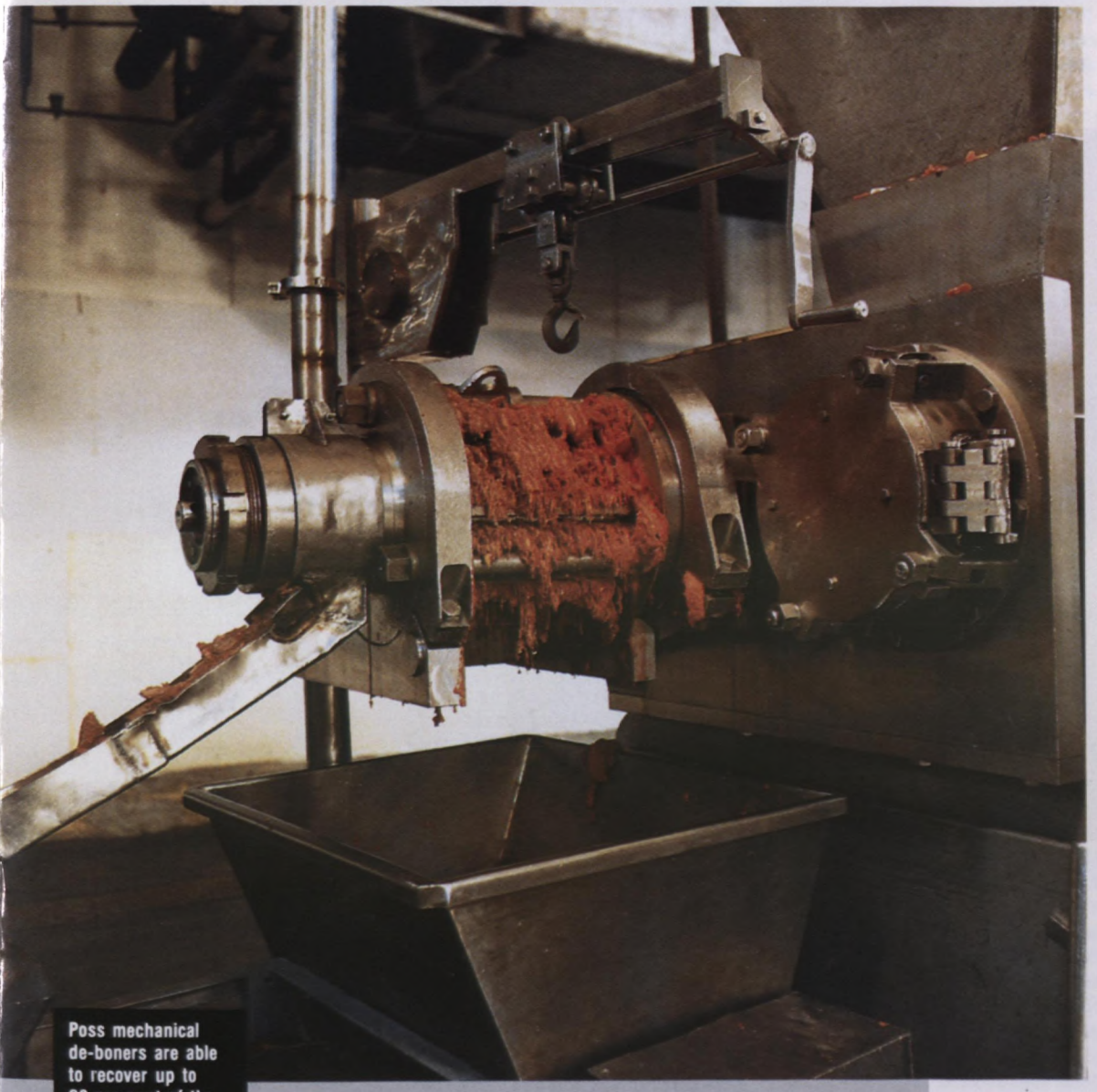
The ABCO system avoids such "overkill" by first applying a short burst of steam to a single layer of food in the blancher's heating section. Specially designed valves and seals minimize heat loss, and direct all steam energy to this section. Peas, for example, are subjected to heat for only 35 seconds, compared to up to 120 seconds in conventional blanchers.

After heating, the food moves to the blancher's fully insulated holding section, where it is heaped in buckets with heat-reflective sides. The food is kept in the bucket until the heat is conducted from the food's exterior to its centre. Peas, again, require just 55 seconds in the holding section to reach the desired internal temperature.

In addition to saving energy, the system offers improved quality by increasing the amount of nutrients and vitamins retained in foods. Broccoli, for example, retains 52 per cent more vitamin C than if it were blanched by a conventional system. Other laboratory tests have shown better colour retention, with french fries coming out golden instead of with a grey tinge. And the results of taste tests have verified that the flavour of a wide variety of fruits and vegetables is enhanced.

Revolutionary De-boning System Turns Meat Scraps into Profits

In the past, the meat scraps left on chicken or cattle carcasses after the most popular cuts of meat were removed were usually discarded, or ground together with the bone and sold cheaply for pet food. But these scraps often accounted for a high percentage of the total weight of the carcass, meaning that much potentially edible meat was being diverted to other purposes. The problem was how to extract that meat economically, so that it could be used for human consumption.



Poss mechanical de-boners are able to recover up to 98 per cent of the meat from any type of bone.

The answer was mechanical deboning. Poss Limited of Etobicoke, Ontario, is one of only a dozen firms in the world to manufacture mechanical systems that cleanly separate meat from bone in a single pass. This revolutionary equipment allows poultry, beef, and other meat processing plants to convert meat that would otherwise be used less profitably into perfectly suitable food.

Adapting an old concept

The concept of mechanical deboning originated in the Japanese fishing industry in the 1930s. At that time, primitive machines were used on fish carcasses to force leftover meat through a screen. In the early 1970s, a leading Canadian poultry processor, Protein Foods Group Inc., modified the Japanese equipment and began using it exclusively on its own poultry products. A Protein Foods engineer named Werner Poss eventually redesigned the system to increase its capabilities and capacity, and in 1985 Poss Limited began manufacturing the equipment for widespread commercial use.

Poss de-boners recover up to 98 per cent of the meat from any type of bone: poultry ribcages, legbones, necks and backs; beef necks, backs, hips, and vertebrae; and lamb and pork bones. As the carcasses are fed through the equipment, they rub against razor-sharp openings, which shear the soft tissue right off the hard bone. The meat slivers produced are then squeezed through filter plates and collected. This recovered meat is used in a variety

of food products, including bologna, hot dogs, sausages, pepperoni, soup mixes, and chicken loaf and nuggets.

Meat has higher quality

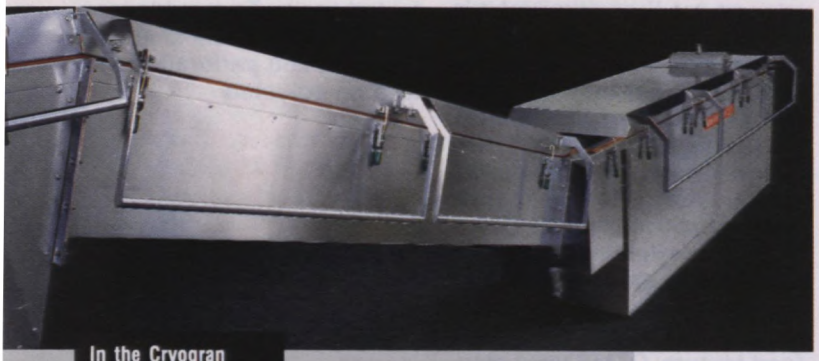
One of the advantages of Poss de-boners is the superior texture of the end product. "In a lot of other equipment, the meat comes out very fine, almost like toothpaste," explains David Emery, Poss sales and marketing director. "Our end products consist of meat tissue strands. This is important to consumers, because if the meat is being used for chicken burgers, you want it to look like chicken."

A further benefit of Poss equipment is that it employs a lower temperature during processing than other mechanical de-boners. As a result, the possibility of bacterial growth is kept to an absolute minimum, and meat stays fresher.

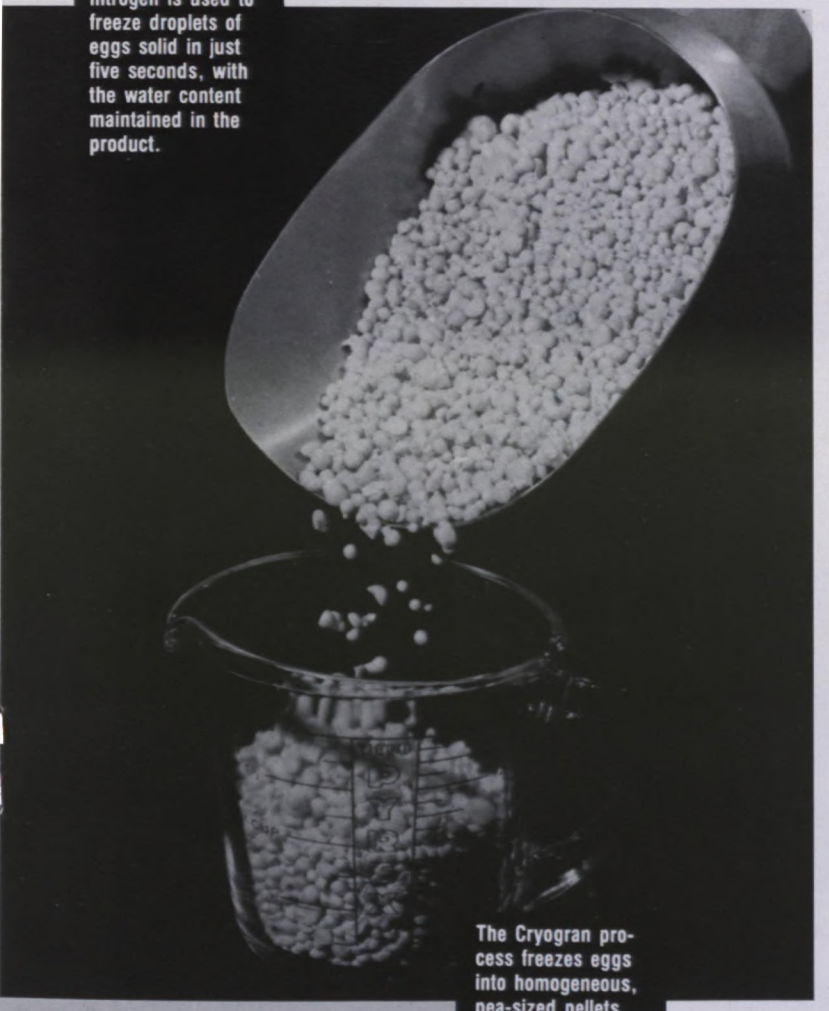
Today, Poss equipment annually supplies 25 per cent, or almost 70 million kg, of all the de-boned meat products in the world. With international demand for chicken and beef increasing, Poss is showing meat-processing companies that they can make the most profits by making the most of their meat.

Chicken necks and backs de-boned by Poss equipment provide a superior meat texture as compared to the end products of other de-boners.

Cryogran Provides Eggs-act Portions



In the Cryogran process, liquid nitrogen is used to freeze droplets of eggs solid in just five seconds, with the water content maintained in the product.



The Cryogran process freezes eggs into homogeneous, pea-sized pellets. One cup of pellets equals one cup of eggs.

Although "scrambled Cryogran" doesn't quite have the same ring as "scrambled eggs," a unique Canadian process may soon be changing the way eggs, and many other foods, are produced and prepared.

Cryogran is a patented process for freezing liquid and semi-liquid foods into homogeneous pellets. IQF Inc. of Mississauga, Ontario, is the only company in the world that manufactures Cryogran equipment and that also produces one of the end products of the unique process — pelletized eggs.

Conventionally frozen eggs posed problems

Restaurants, hotels, and others in the food service industry traditionally had a difficult time using conventional frozen eggs. The eggs were frozen in pails and had to be thawed for use. But freezing took 36 to 48 hours, allowing time for bacteria to grow. The time it took to thaw the eggs posed the same problem. And even if a cook needed a small portion of eggs, the entire pail had to be thawed, mixed, and used quickly before the eggs went bad.

The Cryogran process solves those problems by freezing eggs into pellets. In the process, developed by Agriculture Canada, liquid nitrogen is pumped from a tank onto a series of trays. Droplets of eggs, with the yolk and albumen already mixed, flow from nozzles onto the nitrogen "river," and are frozen solid in just five seconds. The pea-sized pellets are then carried until they reach a wire-mesh belt. The liquid nitrogen falls through the belt, and the pelletized eggs are collected.

Unlike freeze-drying, which extracts water from food, Cryogran freezes water content into the product. "The eggs require no water to be reconstituted," explains IQF vice-president Bosko Milankov. "If you need half a pound of egg for a recipe, just scoop out half a pound of pellets and put them in the mix." The eggs suffer no loss of quality by undergoing the Cryogran process, and remain as fresh as when they were frozen until the moment they are used.

Process has diverse applications

Cryogran eggs are proving particularly useful to large bakeries and restaurants. The Harvey's fast-food chain, for example, uses Cryogran eggs in its western omelettes. In addition to supplying egg pellets, IQF leases its equipment for use on other foods, such as dairy products, as well as on some non-food products. One American firm even uses the equipment to produce frozen microbial cultures.

With so many diverse applications, the future of this revolutionary process looks promising. Anyone for "Cryogran over easy"?

Canadian Food Texture System "Measures Up"

Studies have shown that consumers look at the texture of food as indicative of its quality. At produce bins in grocery stores, shoppers squeeze the melons and oranges, and carefully study the surface of tomatoes or green peppers, in their search for the ideal specimen. Fruits and vegetables that don't measure up are returned to the bin. Likewise, food that seems too hard or soft to the taste when eaten at home may not be purchased again.

As part of their product development and quality control, food manufacturers have for years used two traditional systems to measure food texture. The first, sensory analysis, used taste test panels but was cumbersome, time-consuming, and expensive. More recently, instruments were used to objectively measure factors such as tension and compression. But these instruments were not flexible enough to measure a wide range of products, using a variety of tests. There were some general-purpose objective measurement instruments, but few of these were suited for use in both research laboratories and industrial quality control.

New test cell designs

A versatile texture-measuring apparatus now exists, and it is capable of performing a variety of measurements in both quality control and research activities. The Ottawa Texture Measuring System (OTMS), manufactured and distributed by Canners Machinery Limited of Simcoe, Ontario, was developed by engineers in the federal Department of Agriculture to provide an accurate, unbiased method of measuring food texture. OTMS uses electronic recording devices, a computerized system of texture analysis, and interchangeable test cells to measure the texture of a wide range of raw or processed foods.

The test cell designs are the key to OTMS. These cells, or containers, have a wire grid or perforated plate as a bottom. Foods are placed into a cell, which is installed in a press. A plunger forces the food through the grid or plate, and the amount of force required is measured electronically. By analyzing the recorded measurements, operators can determine the firmness and toughness of the food.

Each cell is equipped with adjustable frames, so that foods of various sizes can be tested easily. To provide maximum flexibility, the shapes of the grids and perforations can also be adjusted.

The Ottawa Texture Measuring System uses electronic recording devices, computerized analysis, and interchangeable test cells to determine the precise firmness and toughness of a variety of foods.

Variety of applications

The applications of OTMS are almost limitless. It can be used to measure the tenderness of vegetables, the toughness of meat, the firmness of fruits, the hardness of beans, the tensile strength of spaghetti, even the force needed to puncture the skin of an apple. It can be used both to test individual products and to compare different brands of the same product.

Food manufacturers throughout the world, including General Foods Ltd. and Del Monte Corporation, have successfully used OTMS for quality control. Other organizations, such as universities and government food research institutes, are finding the system helpful in evaluating texture when breeding new varieties of food and agricultural products, and when developing new food-processing systems.

However it is used, OTMS will ultimately allow food manufacturers to provide products that are better suited to all our tastes.

The next time you bite into your favourite food, remember that a machine may already have "tasted" it for you.

Flexible Header Is a Cut Above

The problem with conventional harvesting equipment that cut in a straight path is that land is not always level. Until now, farmers often missed part of their crop when cutting because the headers on the front of their combines could not adjust to uneven land. They either had to make a second pass, or leave the crop uncut.

This problem is becoming a thing of the past. Rock-O-Matic Industries of Vonda, Saskatchewan, has become the first, and only, company in the world to manufacture flexible combine headers. The 9-m-wide header easily adapts to most makes of combine and has a revolutionary design that allows it to precisely follow the contours of the land.

The "flex-head" design incorporates three sections: a 2.4-m-wide centre piece, and two 3.3-m-wide wings. By adjusting the height of the wings as the combine travels, farmers are able to cut their crops to consistent heights. The header can flex as it follows the rolls of a hill, or the bed of a gully, thereby providing the same uniform cut on any contour of land.

The "flex-head" offers many advantages over conventional headers. Farmers can complete their harvest sooner by making just one uniform pass, and at the same time save fuel. Also, since the header can be kept adjusted at a given height above the ground, there is less chance of rocks and dirt entering the combine cylinder and damaging it. And getting to and from the field is made easy, as the header's wings fold upright when being transported. These qualities combine to provide farmers with a more productive method of harvesting.

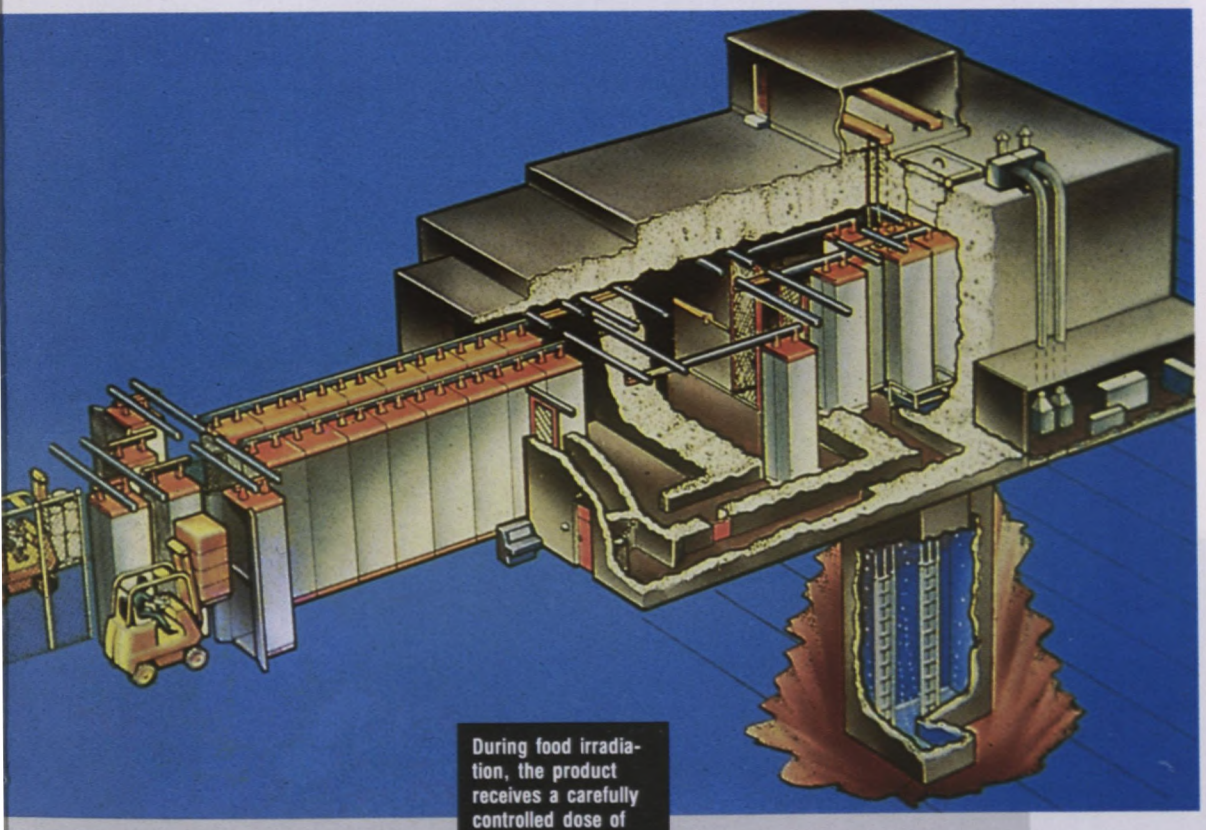
Rock-O-Matic's flexible combine header adjusts to the contours of the land, enabling it to make consistent, uniform cuts. The unit is the only one of its kind in the world.

Keeping Foods Fresh through Irradiation

For years, food-processing companies have been faced with, and often baffled by, the problem of how to keep food fresh and safe to eat. Pasteurization, heat sterilization, and freezing are just some of the processes used in the attempt to preserve food longer and better. Now, Canada is playing a major role in the development of another preservation process that may soon be in widespread use: food irradiation.

Process kills bacteria

Irradiation involves exposing food to a carefully controlled dose of ionizing radiation, either from radioactive isotopes that emit gamma rays, or from electronic and mechanical sources. The major source of ionizing radiation for this application is cobalt-60, which is essentially a Canadian product. Atomic Energy of Canada Limited (AECL), a federal government agency, provides 90 per cent of the world's cobalt-60.



During food irradiation, the product receives a carefully controlled dose of ionizing radiation, which kills bacteria and extends shelf life. Atomic Energy of Canada Limited provides 90 per cent of the world's cobalt-60, the major source of ionizing radiation. (Photo courtesy of Atomic Energy of Canada Limited — Radiochemical Company)

The irradiation process is currently used in 30 countries, and can be applied to a variety of agricultural products, food ingredients, and fresh or frozen foods. Irradiation destroys certain micro-organisms of public health significance and extends shelf life by slowing down cell division, thus delaying the ripening of fruits and preventing sprouting in root crops like potatoes and onions. Unlike chemical fumigants, which are now widely used to kill such pests as weevils and fruit flies, irradiation doesn't leave any residue. After the food is treated, it can be immediately handled and consumed.

As yet, there are no irradiated foods on the retail market in Canada. But in the 1960s, Canada was one of the first countries to approve ionizing radiation treatment for certain foods. Potatoes and onions were cleared for treatment in the early sixties, and wheat and flour in 1969. More recently, in 1984, spices and seasonings were approved for irradiation. It is expected that irradiation will soon be reclassified from an additive to a process, meaning it would be regarded like any other food process. However, stringent preclearance and compliance requirements have been proposed, and additional approved uses will be considered on a case-by-case basis.

Two centres to study technology

If irradiation is approved as a process, the next step towards its widespread use will be to demonstrate its benefits to the food industry. The federal Department of Agriculture will be studying those benefits at

its new food research centre in St. Hyacinthe, Quebec. The centre was established to carry out research and development projects. In addition, an industrial food irradiation facility, to be called the Canadian Irradiation Centre, is being built at Laval, Quebec. This centre is a joint project between AECL and the University of Quebec, and is intended to demonstrate Canada's radiation processing technology.

Among the problems to be studied at the Agriculture Canada centre is the control of salmonella bacteria in poultry. In Canada, about 10 to 12 000 cases of salmonellosis food poisoning are reported annually, with 25 per cent directly associated with poultry. In the poultry industry, eliminating salmonella would require spending tremendous amounts of money, according to Agriculture Canada's Food Research Centre. The irradiation of poultry is expected to solve that problem, and researchers will be studying the dose needed to eliminate salmonella without affecting poultry flavour and nutritional value.

Agriculture Canada researchers will also be looking at hybrid preservation methods (which combine, for example, irradiation with canning), and at ways to extend the shelf life of various foods. Strawberries could stay in good condition for three to four weeks if irradiated, compared to about one week if left untreated. And potatoes, which normally sprout after just a few days on the shelf, will last for up to four months after treatment.

No danger to consumer

Despite irradiation's many benefits, the food industry is concerned about how consumers will perceive the safety of irradiated food products. However, Agriculture Canada's researchers emphasize that the food does not become radioactive and that at the low dosage levels being proposed for the commercial irradiation of foods, there is no danger to the consumer.

Numerous scientific studies have proven that irradiated food is safe. In 1980, for example, a joint committee of the Food and Agricultural Organization, the International Atomic Energy Agency, and the World Health Organization concluded that irradiation of food up to an overall average dose of 10 kGy presents no toxicological hazards. Moreover, the committee found that irradiation induces no nutritional or microbiological problems. The Consumers' Association of Canada generally accepts food irradiation as a safe process, although it does want irradiated products to be clearly and prominently identified.

When irradiated products begin to appear on Canadian grocery shelves, possibly by 1990, consumer reaction will ultimately decide the fate of food irradiation. Two major Canadian surveys have already shown that, although most consumers don't know enough about irradiation to make an informed judgement, they would prefer it to chemical treatment as a food preservation technique. And if that attitude holds, irradiation may soon be as common a food industry practice as canning.

Note: Once irradiation is accepted, there will be a regulation that all foods treated by ionizing radiation or some such process be properly labelled before distribution in Canada. Foods exported to other countries have to be in accord with the regulations of the importing country.

Higher doses of irradiation extend the shelf life of foods. At 200 krads, shelf life is extended seven to ten days.

Maple Syrup Not Just for Pancakes Any More

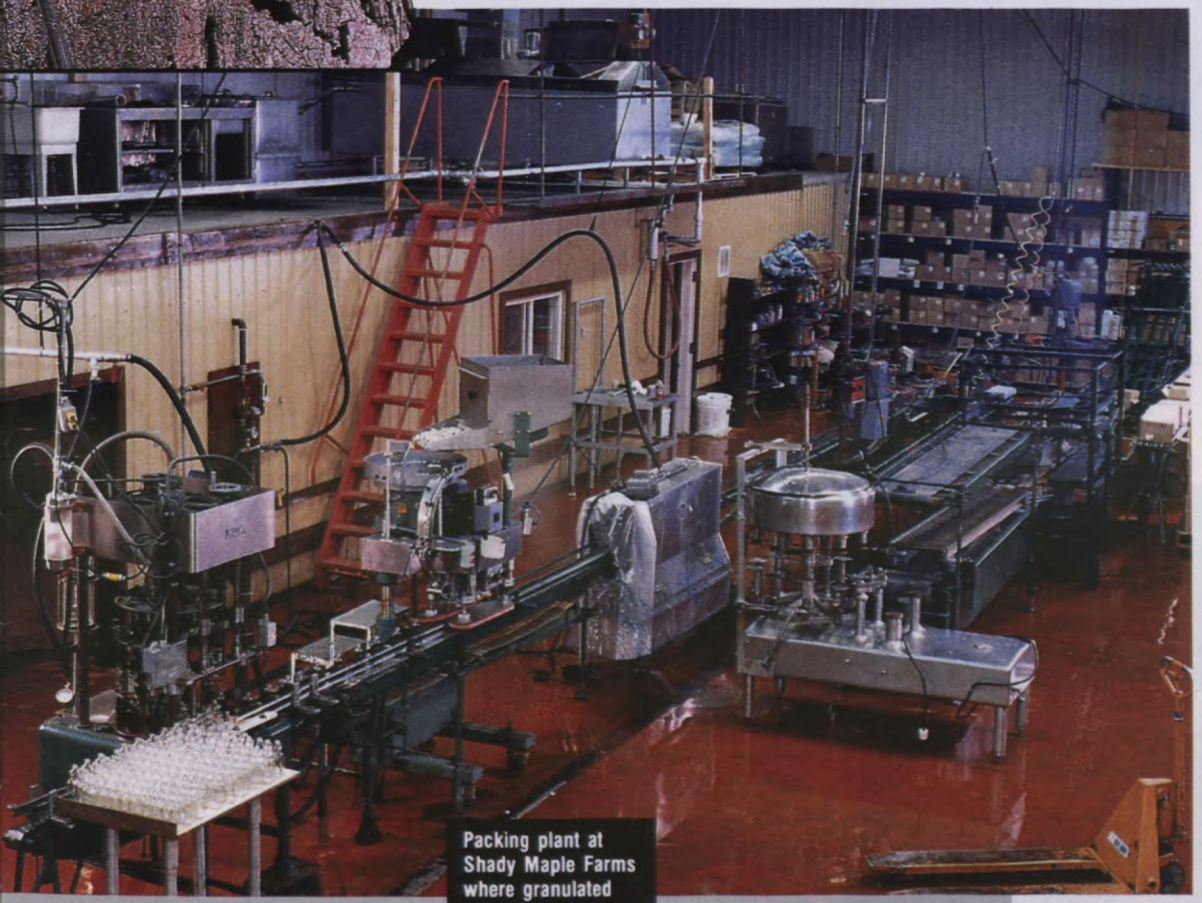
If someone said "maple syrup" in a word association test, the most likely response would be "pancakes." The two foods have long been linked in the minds of consumers throughout the world. But many of those consumers are now discovering novel uses for maple syrup and related maple products.

Maple syrup has been called "the ultimate Canadian sweet." It is derived from the sugar maple tree, which is found only in northeastern parts of North America. Canada provides 75 per cent of the world's supply of maple syrup (about 10 million L annually), with Quebec accounting for 90 per cent of that total.

The syrup has long been an important part of Canada's food industry and of Canadian diets. In the old days, farmers' wives used to do a lot of cooking with maple syrup, partly because it provided a much needed source of energy. Although many of those traditional recipes are too rich for modern cuisine, there are still a number of uses that suit today's palates.

A recently developed maple product, dehydrated syrup, can be used to replace sugar in virtually any recipe. Turkey Hill Sugarbush Ltd. of Brome, Quebec, and Shady Maple Farms Ltd. of St. Evariste, Quebec, are the only two companies in Canada to distribute this product. Like sugar, dehydrated maple syrup is sold in granulated form, requires no refrigeration, and has an indefinite shelf life. In addition, the weight of granulated maple syrup is about two-thirds that of the liquid form, making it more economical to ship. This new product is gaining increasing acceptance from health and specialty food stores, as well as from restaurants and hotels.

Although maple syrup is more expensive than sugar, it possesses a distinctive taste and benefits health. It contains more calcium than milk, has one-tenth the sodium of honey, is rich in vitamins and minerals, and is accepted by Weight Watchers Intl. as an alternative to sugar.



Packing plant at Shady Maple Farms where granulated maple syrup and other maple products are produced. Inset: Tapping a maple tree for sap, the raw material for maple syrup products. (Photos courtesy of Shady Maple Farms and Communications Branch, Agriculture Canada)

Canadian Cattle:

A Breed Apart

A single superior cell can be physically cut to produce two offspring, thus improving the rate of genetic progress. This technique, along with artificial insemination, holds great promise for the future of livestock production. (Photo courtesy of Animal Research Centre, Agriculture Canada)

Laboratory testing for brucellosis in Canadian cattle. Canada officially became free of bovine brucellosis in 1985. (Photo courtesy of Communications Branch, Agriculture Canada)

Canadian cattle have long been recognized for their superior genetic traits. These traits have not only benefited the Canadian dairy and beef industries, but have been instrumental in developing those industries throughout the world.

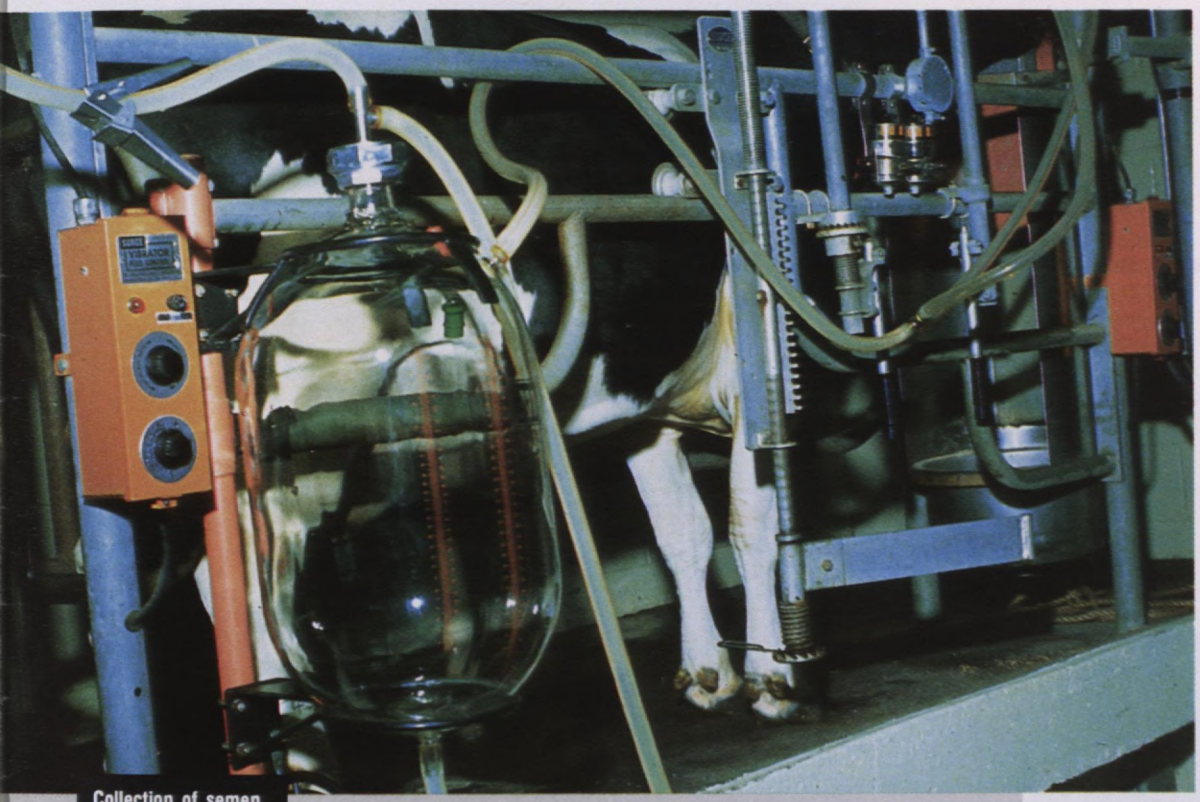
Each year, Canada exports approximately 36 000 dairy cattle, 10 000 beef cattle for breeding, and 1.5 million doses of frozen bull semen, to more than 65 countries. Through breeding programs and genetic selection, Canada has developed cattle bloodlines that are highly sought as a means of increasing dairy production and beef quality.

Canadian dairy cattle, 95 per cent of which are Holsteins, are the world's most efficient milk producers according to the Holstein Association of Canada. These Holsteins have the strength and constitution to produce large quantities of milk year after year. Domestic beef cattle, meanwhile, are valued for their high yield of beef. This beef is also noted for its low fat and flavour retention.

To maintain this impressive reputation, Canadian dairy and beef cattle undergo the most sophisticated methods of sire selection and performance testing. Almost half of Canada's 1.7 million dairy cows are enrolled in programs that record milk production. All dairy cattle are required to meet the rigid standards of the Canadian Milk Recording Board, a group composed of representatives from government, milk producers, breed associations, and the artificial insemination industry.

Purebred beef cattle undergo equally stringent testing. Under the Canadian Livestock Pedigree Act, all cattle are registered in their breed association's official herd book. These records provide a complete and accurate identification and pedigree of each animal. The federal Department of Agriculture annually tests and analyzes 160 000 animals for economically important genetic traits, such as calving ease, growth, and reproductive ability.

Bulls that are being considered for artificial insemination service are selected from the offspring of superior cows. The national sire evaluation program identifies those bulls that have the highest capacity for transmitting desirable traits. More than 10 000 bulls are tested in over 100 test stations



Collection of semen for artificial insemination. (Photo courtesy of Communications Branch, Agriculture Canada)

across Canada. The top bulls are then made available for use in commercial herds and artificial insemination centres. Through artificial insemination, superior genetic traits are transmitted to thousands of offspring, both in Canada and abroad.

In addition to possessing traits that encourage greater production and quality, Canadian cattle are healthy and hardy. Tuberculosis is next to eliminated and Canadian cattle are free of foot-and-mouth disease, rinderpest, and blue tongue. In 1985, Canada officially became free of bovine brucellosis. All animals offered for export are subjected to extensive tests to ensure that they are healthy.

Canada's variable climate has also created cattle capable of withstanding climatic extremes. These cattle have acclimatized well in a wide range of conditions, from the plains of the United States to the high Andes of South America.

Appendix

List of Companies and Organizations

The following is a list of companies and organizations mentioned in the preceding articles.

ABCO Industries Limited
P.O. Box 1120
81 Tannery Road
Lunenberg, Nova Scotia
Canada B0J 2C0

Tel: 902-634-8821
Telex: 019-21654

Agriculture Canada Food Research Centre/
Centre de la recherche alimentaire
Agriculture Canada
3600 Casavant Boulevard W.
St. Hyacinthe, Quebec
Canada J2S 8E3

Tel: 514-773-1105

Allelix Inc.
Diagnostic Division
6850 Goreway Drive
Mississauga, Ontario
Canada L4V 1P1

Tel: 416-677-0831
Telex: 06-968036

Atomic Energy Of Canada Limited
P.O. Box 13500
Kanata, Ontario
Canada K2K 1X8

Tel: 613-592-2790

Canners Machinery Limited
P.O. Box 190
Simcoe, Ontario
Canada N3Y 4L1

Tel: 519-426-0310

Canola Council of Canada
301-433 Main Street
Winnipeg, Manitoba
Canada R3B 1B3

Tel: 204-944-9494
Telex: 07-57672

Engineering and Statistical Research Centre
Research Branch, Agriculture Canada
Ottawa, Ontario
Canada K1A 0C6

Tel: 613-995-9671

Food Research Centre
Research Branch, Agriculture Canada
Ottawa, Ontario
Canada K1A 0C6

Tel: 613-995-3722

Holstein Association of Canada
P.O. Box 610
Brantford, Ontario
Canada N3T 5R4

Tel: 519-756-8300
Telex: 061-81139

IQF Inc.
3545 Hawkestone Road
Unit 7
Mississauga, Ontario
Canada L5C 2V1

Tel: 416-848-4927

Poss Limited
500-701 Evans Avenue
Etobicoke, Ontario
Canada M9C 1A3

Tel: 416-620-0268
Telex: 06-984576

Protein Foods Group Inc.
P.O. Box 463, Station B
Hamilton, Ontario
Canada L8L 7W9

Tel: 416-522-9214
Telex: 061-8343

Rock-O-Matic
P.O. Box 70
Vonda, Saskatchewan
Canada S0K 4N0

Tel: 306-931-1133

Shady Maple Farms
R.R. No. 1
St. Evariste, Quebec
Canada G0M 1S0

Tel: 418-459-6649

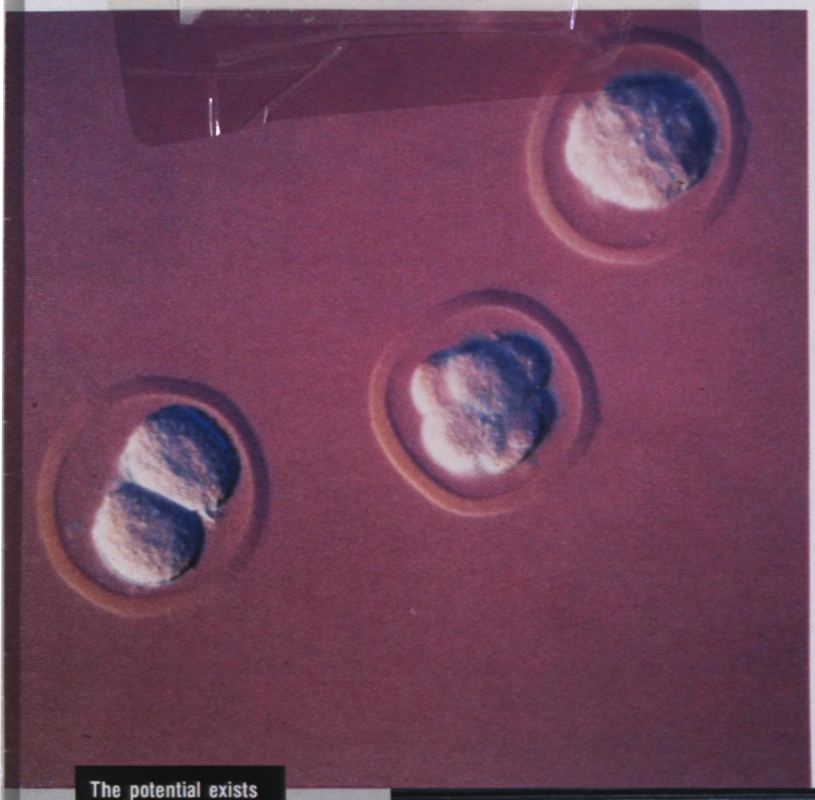
Turkey Hill Sugarbush Ltd./
Turkey Hill Érablière Ltée
R.R. No. 2
Brome, Quebec
Canada J0E 1K0

Tel: 514-243-6594
Telex: 055-604-97

For general information on Canadian agriculture, or agricultural products, contact:

Agricultural Inquiries
Communications Branch
Agriculture Canada
Sir John Carling Building
930 Carling Avenue
Ottawa, Ontario
Canada K1A 0C7

Tel: 613-995-8963
Telex: 053-3283



The potential exists to freeze and implant fertilized embryos from genetically superior livestock, the same way that is currently being done with semen in artificial insemination. (Photo courtesy of Animal Research Centre, Agriculture Canada)

Grand champion Holstein bull. (Photo courtesy of Communications Branch, Agriculture Canada)

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