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MINISTER, HON. J. J. GREENE, MINISTRE • DEPUTY MINISTER, S. B. WILLIAMS, SOUS-MINISTRE

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CANADA AGRICULTURE

COVER PHOTO—The Sir John Carling Building at the Central Experimental Farm, Ottawa. This is the new national headquarters of the Canada Department of Agriculture

PHOTO SUR LA COUVERTURE—Édifice Sir John Carling, à la Ferme expérimentale centrale, Ottawa, Bureau central du ministère de l'Agriculture du Canada

"Canada Agriculture" is published quarterly by the Canada Department of Agriculture. Its purpose is to help keep extension workers and agri-businessmen informed of developments in research and other federal agricultural responsibilities as carried on by the various units of the Department.

Contributors, namely, professional personnel in the Department's Research, Economics, Health of Animals, and Production-Marketing Branches, Special Act Administrations (PFRA, etc.), and the Farm Credit Corporation are invited to submit their articles in either English or French.

Contributions should be addressed to the Secretary, Editorial Board, Information Division, Canada Department of Agriculture, Ottawa.

The use of trade names in articles published in this journal implies no endorsement of the products named nor any criticism of similar products not mentioned.

«Canada Agriculture», publié par le ministère de l'Agriculture du Canada, paraît tous les trois mois. Ce journal a pour objectif de renseigner sur l'activité des Directions du ministère, les agronomes et les hommes d'affaires intéressés à l'agriculture.

Nos collaborateurs, du personnel professionnel des directions de la recherche, de l'économie de l'hygiène vétérinaire et de la production et des marchés, de l'administration des lois spéciales (ARAP, etc.) du Ministère ainsi que de la Société du crédit agricole peuvent, à leur gré, soumettre des articles en anglais ou en français.

Adresser toute communication au secrétaire du Comité de la rédaction, Division de l'information, ministère de l'Agriculture du Canada, Ottawa.

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CANADIAN DAIRY COMMISSION

COMMISSION CANADIENNE DU LAIT

The establishment of the Canadian Dairy Commission by Act of Parliament in October 1966, marks the first entry of the federal government into a national marketing agency for dairy products.

The Commission is responsible for stabilizing the price of manufacturing milk and cream. By administering federal support funds, it regulates payments to milk and cream producers to give them a fair return for their labor and investment while at the same time ensuring consumers of a continuous and adequate supply of high-quality dairy products. It works closely with provincial agencies to coordinate national dairy policy and has authority over interprovincial and export trade. Under the Canadian Dairy Commission Act, it also has the power to buy and sell dairy products, make payments to producers, investigate the production, processing and marketing of dairy products, promote their use, and encourage improvements in their quality and variety.

La Commission canadienne du lait a été établie en vertu d'une loi du Parlement, passée en octobre, 1966. C'est la première fois que le gouvernement fédéral décide d'instituer un organisme national de commercialisation des produits laitiers.

La Commission doit stabiliser le prix du lait et de la crème de fabrication, administrer le fonds de soutien du gouvernement fédéral, établir les paiements versés aux producteurs de lait et de crème de façon à leur fournir un revenu équitable et à assurer aux consommateurs un approvisionnement soutenu et suffisant de produits laitiers de haute qualité. Elle travaille avec les régies provinciales à la coordination d'une politique nationale du lait, et est autorisée à réglementer le commerce interprovincial et international. La Commission a le pouvoir d'acheter et de vendre des produits laitiers, de verser des paiements aux producteurs, d'enquêter sur la production, la transformation et la vente des produits laitiers, de

The Commission is appointed by the Governor-in-Council and consists of a chairman, a vice-chairman and one other member. The Commissioners are directly responsible to the Minister of Agriculture and their offices are in Ottawa. To assist the Commission with advice on production and marketing matters, there is a consultative committee of nine members, appointed by the Minister, who represent a variety of interests in the dairy industry.

Appointments to the Canadian Dairy Commission and to the Consultative Committee to the Commission were announced December 2, 1966.

The three members of the Commission are S. C. Barry, Chairman, Ottawa; Jules Thibaudeau, Vice Chairman, Thurso, P.Q.; and L. A. Atkinson, Member, Vancouver.

The nine Consultative Committee members are P. Pariseault, Granby, P.Q.; J. L. Dewar, Charlottetown, P.E.I.; Leopold Harvey, Saint Coeur-de-Marie, Co. Lac St. Jean, P.Q.; Ulysse Bernier, Bedford, P.Q.; G. R. McLaughlin, Beaverton, Ont.; Ellard Powers, Beachburg, Ont.; W. T. Murchie, Toronto; J. S. Turnbull, Regina; and J. L. Bailey, Clover Bar, Alta.

The three members of the Commission have administrative experience and knowledge of dairy industry production and processing.

Mr. Barry, who has been federal Deputy Minister of Agriculture since 1960, has resigned that post to accept the Commission chairmanship. He has been in the employ of the federal Department of Agriculture in successively senior positions since 1925.

Mr. Thibaudeau is a dairy farmer, and has played a leading part in farm organization and cooperative affairs. He is a director and member of the executive of the Federation de l'Union Catholique des Cultivateurs (U.C.C.) Laurentides, and a director of the Regional Dairy Cooperative of Thurso.

Mr. Atkinson has been General Manager of the Fraser Valley Milk Producers' Association since 1959 after having served previously as Production Manager, Assistant General Manager, and Manager of the fluid milk division in a 40-year career with the organization. The Association is a farmers' cooperative organization with 1,500 milk shippers engaged in the processing and merchandising of fluid milk and a wide range of dairy products.

The nine member Consultative Committee has representation from across Canada. Because Ontario and Quebec, together, produce 70 per cent of Canada's manufacturing milk, three members of the Committee were appointed from each of those two provinces, one from the Maritimes and two from Western Canada.

Mr. Pariseault is General Manager of the Cooperative Agricole de Granby, the largest cooperative milk

stimuler leur utilisation et d'encourager l'amélioration de leur qualité et de leur variété.

La Commission nommée par le gouverneur en conseil, comprend un président, un vice-président et un autre membre. Les commissaires relèvent directement du ministre de l'Agriculture, et leurs bureaux sont situés à Ottawa. Un comité consultatif, composé de neuf membres nommés par le Ministre représente divers secteurs de l'industrie laitière et aide la Commission en matière de production et de vente.

La nomination des membres de la Commission et du Comité consultatif a été annoncée le 2 décembre 1966.

Les trois membres de la Commission sont MM. S. C. Barry, président, d'Ottawa; Jules Thibaudeau, vice-président, de Thurso (Qué.) et L. A. Atkinson, de Vancouver.

Les neuf membres du Comité consultatif sont MM. P. Pariseault, de Granby (Qué.); J. L. Dewar, de Charlottetown (Î. du P.-É.); Léopold Harvey, de Saint-Cœur de Marie, comté du Lac St-Jean (Qué.); Ulysse Bernier, de Bedford (Qué.); G. R. McLaughlin, de Beaverton (Ont.); Ellard Powers, de Beachburg (Ont.); W. T. Murchie, de Toronto; J. S. Turnbull, de Regina, et J. L. Baily, de Clover Bar (Alb.).

Le président, M. Barry était sous-ministre de l'Agriculture depuis 1960. Il avait occupé successivement de hautes fonctions au ministère de l'Agriculture du Canada, depuis 1925.

M. Thibaudeau est un producteur laitier qui a joué un rôle prépondérant au sein des organisations syndicales et coopératives. Il est directeur et membre du Conseil exécutif de l'Union catholique des cultivateurs (UCC), section des Laurentides et directeur de la Coopérative laitière régionale de Thurso.

M. Atkinson, gérant général de la Fraser Valley Milk Producers' Association depuis 1959, avait auparavant agi comme gérant de la production, gérant général adjoint et gérant de la division du lait nature, soit 40 années au service de l'Association. L'Association est une société coopérative de cultivateurs groupant 1,500 fournisseurs de lait adonnés à la transformation du lait ainsi qu'à la commercialisation du lait nature et de toute une série de produits laitiers.

Les neuf membres du Comité consultatif représentent diverses régions du Canada. Vu que l'Ontario et le Québec produisent 70 pour cent du lait de fabrication au Canada, trois membres du Comité viennent de chacune de ces deux provinces, un des provinces Maritimes et deux de l'Ouest Canadien.

M. Pariseault est directeur général de la Coopérative agricole de Granby, la plus grande usine coopérative de transformation du lait au Canada. Il était président du Comité consultatif canadien de l'indus-

processing plant in Canada. He was Chairman of the Canadian Dairy Advisory Committee, formed by the Canadian Dairy Conference in 1963, which recommended the establishment of a Canadian Dairy Commission.

Mr. Dewar, a dairy farmer, is Secretary of the Prince Edward Island Federation of Agriculture.

Mr. Harvey, also a dairy farmer, is President of the 'Federation des producteurs de lait industriel du Quebec', the organization which will administer the joint plan for the marketing of manufacturing milk in Quebec.

Mr. Bernier was chosen Laureate du Merite Agricole, as Quebec's outstanding farmer for 1966. Primarily a dairy farmer, he is active in local government, in the U.C.C., the Montreal Milk Shippers' Association and the Canadian and Quebec Ayrshire Associations.

Mr. McLaughlin, a dairy farmer at Beaverton, Ontario, is Chairman of the Ontario Milk Marketing Board and President of the Dairy Farmers of Canada.

Mr. Powers, a farmer at Beachburg, Ontario, is the first vice-president of the Ontario Farmers' Union.

Mr. Murchie is President of Pet Milk (Canada) Limited. He is a Director of the National Dairy Council and has served as Chairman of the Council's cheese and export committees.

Mr. Turnbull is General Manager of the Saskatchewan Cooperative Creameries, with approximately 41,000 cream and 300 fluid milk shippers. He is a Director and past President of the National Dairy Council.

Mr. Bailey, a dairy farmer, is Second Vice-President of Dairy Farmers of Canada, and past President of the Alberta Dairymen's Association.

Six of the nine members of the Consultative Committee are dairy farmers, two are General Managers of large dairy cooperatives, and one is from the private industrial sector. The appointment to the Committee of the Chairman of the Ontario Milk Marketing Board and the President of the organization which will administer the joint milk marketing plan in Quebec underscores the importance of collaboration between the Canadian Dairy Commission and provincial control agencies.

As we go to press, details of the Canadian Dairy Commission's price stabilization and subsidy program have been announced. Readers wishing to obtain these details may write to the Information Division, Canada Department of Agriculture, Ottawa, Ont., requesting a copy of FARM LETTER No. 28 for April–May, 1967.

trie laitière, comité qui a recommandé la mise sur pied d'une Commission canadienne du lait.

M. Dewar, producteur laitier, est secrétaire de la Fédération de l'agriculture de l'Île du Prince-Édouard.

M. Harvey, producteur laitier lui aussi, est président de la Fédération des producteurs de lait industriel du Québec, organisme qui administrera le plan conjoint chargé de la vente du lait de fabrication au Québec.

M. Bernier a été choisi lauréat du Mérite agricole du Québec en 1966. Cultivateur laitier avant tout, il joue un rôle actif dans le gouvernement de sa localité, au sein de l'UCC et de l'Association des expéditeurs de lait à Montréal ainsi que dans les Associations d'éleveurs de bétail Ayrshire du Canada et du Québec.

M. McLaughlin, producteur laitier de Beaverton (Ont.), est président de l'Ontario Milk Marketing Board et président de l'Association des producteurs laitiers du Canada.

M. Powers, cultivateur de Beachburg (Ont.), occupe les fonctions de premier vice-président de l'Ontario Farmers' Union.

M. Murchie est président de Pet Milk (Canada) Limited. Il est aussi directeur du Conseil national de l'industrie laitière et a agi comme président du Conseil des comités du fromage et de l'exportation.

M. Turnbull est gérant général des Saskatchewan Co-operative Creameries, groupant environ 41,000 fournisseurs de crème et 300 expéditeurs de lait nature. Il est aussi directeur et ex-président du Conseil national de l'industrie laitière.

M. Baily, producteur laitier, est deuxième vice-président de l'Association des producteurs laitiers du Canada et ex-président de l'Alberta Dairymen's Association.

Six membres du Comité consultatif sont des producteurs laitiers, deux sont directeurs généraux de coopératives laitières, et un appartient au secteur industriel privé. La nomination au Comité du président de l'Ontario Milk Marketing Board et du président de l'Office chargé d'administrer le plan conjoint de la vente du lait au Québec souligne l'importance qu'on attache à la collaboration entre la Commission canadienne du lait et les régies provinciales.

Au moment d'aller sous presse, nous recevons un communiqué de la Commission canadienne du lait précisant son programme de stabilisation des prix et de subventions. Pour plus amples renseignements, demander la LETTRE AU CULTIVATEUR nº 28 avril–mai à: la Division de l'information, ministère de l'Agriculture du Canada, Ottawa.

MECHANICAL HARVESTING OF BRUSSELS SPROUTS

J. A. CUTCLIFFE

A major horticultural crop processing industry has been quietly developing in Prince Edward Island. In keeping with this progress, the CDA Research Station at Charlottetown has been and is conducting various horticultural crop trials with a view to improving varieties and cultural practices. This industry now returns in excess of $2 million annually to P.E.I. farmers.

One of the main crops to which we have directed our attention has been Brussels sprouts. Historically, the sprouts have been stripped from the plants by hand as they developed to marketable size. This method was adopted when the crop was introduced to Island farmers in 1958. Three to five pickings per season were required and this resulted in high labor requirements and costs. It was apparent that cultural methods requiring less labor would have to be devised if the production of Brussels sprouts was to expand with the industry.

Early investigations at Charlottetown were directed at attempts to enhance concentrated maturity, in contrast with the normal progressive development of the sprouts from the base to the apex of the plant. It was soon discovered that the removal of the terminal growing bud in late summer did increase the proportion of the sprouts that were of marketable size. Later investigations revealed that best results could be obtained if the terminal growing bud was removed when 7 to 9 whorls of sprouts had formed, and when the largest sprouts were 1 to 1.5 inches in diameter. We also found that Brussels sprouts could be harvested at one picking without substantially reducing yields.

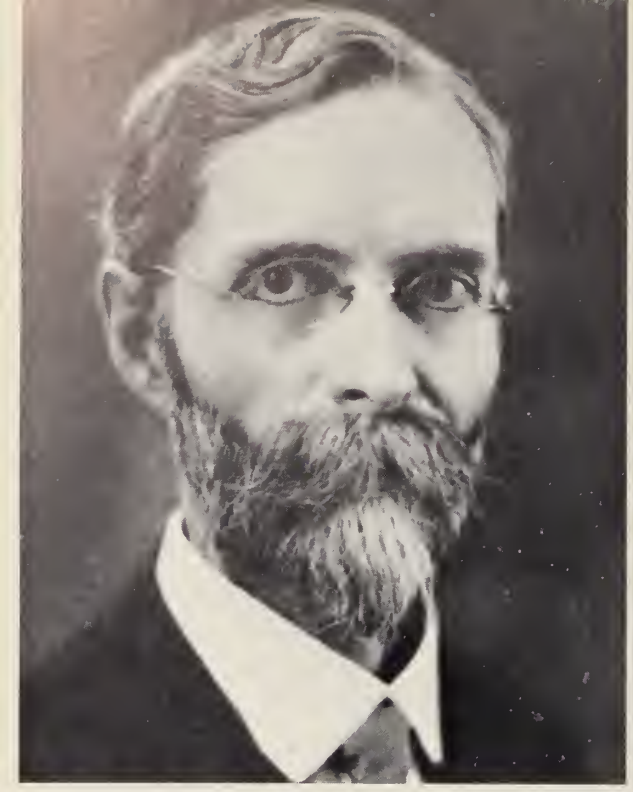
Growers soon adopted the method of single harvesting. They cut the plants off at ground level and delivered stalks, with sprouts attached, to the processing plant. There the sprouts are cut from the stalks. This greatly reduced the labor required on the farm to harvest the crop. It also led to the development of machines that cut the plants off and elevated them into vehicles to be transported to the processor.

Thus, an entirely stoop labor harvesting procedure has been completely mechanized. Brussels sprouts have come to occupy a prominent place in the production of vegetable crops for freezing in Prince Edward Island.

1—Harvesting brussels sprouts mechanically

2—Close-up view of mechanical harvesting of brussels sprouts

The author is a horticulturist with the CDA Research Station, Charlottetown, P.E.I.



CENTENNIAL TRIBUTE • DOUBLE CENTENAIRE

Sir Charles Saunders

Sir Charles Edward Saunders, who developed Marquis wheat and helped make the Canadian prairies one of the world's great wheat growing areas, was born 100 years ago—on February 2, 1867

Sir Charles Edward Saunders, créateur du blé Marquis qui fit des Prairies le grenier du monde, est né il y a cent ans, soit le 2 février 1867

It is an appropriate coincidence that the 100th anniversary of the birth of the man who gave Marquis wheat to Canada should be celebrated in his country's centennial year.

The man was Sir Charles Edward Saunders, born February 2, 1867, at London, Ont., the third of five sons of William Saunders. The wheat variety he was to produce aided development of the prairies and made Canada famous. In terms of value, his contribution must be measured in the hundreds of millions of dollars. Marquis also was to set a new standard of baking and milling quality for hard red spring wheat.

William Saunders, the father, was a largely self-educated chemist who became professor of pharmacy at the University of Western Ontario. But it was in agriculture that his main interest lay and this was reflected in the experimental work he carried out at his London farm. It contained orchards, vineyards, cereal test plots, and a small laboratory.

His work, particularly in plant breeding, had earned him an outstanding reputation by 1886 when he was asked by the federal government to set up and head an experimental farms service across Canada.

While Charles continued his studies in chemistry at the University of Toronto, the Saunders family moved to Ottawa where the father took over his new duties as director of the Experimental Farms Service.

Le hasard a voulu que le centième anniversaire de naissance de Sir Charles Edward Saunders, créateur du blé Marquis, coïncide avec le centenaire de la Confédération.

Charles Edward, le troisième des cinq fils de William Saunders, naquit le 2 février 1867 à London (Ont.). La mise au point du blé Marquis qu'il effectua, devait stimuler le développement de l'agriculture des Prairies, accroître la réputation et les revenus du Canada et permettre d'établir pour le blé vitreux (dur) roux de printemps, une nouvelle norme des qualités meunière et boulangère.

William Saunders était un chimiste en grande partie autodidacte qui devint professeur de pharmacie à l'université Western, Ontario. Cependant, c'est à l'agriculture expérimentale qu'il s'intéressait avant tout; dans son exploitation à London on trouvait des vergers, des vignobles, des parcelles d'essai de céréales et un petit laboratoire.

Ses travaux, particulièrement dans le domaine de l'amélioration des plantes, lui avaient déjà acquis une réputation remarquable lorsqu'en 1886, le gouvernement fédéral lui demanda d'établir et de diriger un service de fermes expérimentales dans tout le Canada.

La famille Saunders vint s'installer à Ottawa et Charles continua ses études de chimie à l'université de Toronto. Un autre membre de la famille Saunders,

Another son, Percy, under direction of his father, busied himself in the task of cross-breeding wheat varieties to find one more suitable for prairie conditions than the Red Fife that was widely used at that time.

Red Fife was late in maturing and too often fell victim to frost on the prairies to make it a reliable and suitable variety for this region.

The need and demand for a new wheat grew with the prairie population which rose to 62,260 in 1881, to 152,206 in 1891, and to 419,512 in 1901. Not only did eastern Canadian farmers flock to this rich agricultural area but there was a steady stream of immigrants attracted by reports like the following that appeared in an English newspaper:

"Millions of acres of virgin prairie are to be had close to the railway for from $5 to $10 an acre. Plough in the autumn, sow wheat in the spring, and bear the harrow against the ice, and without fertilizer or manure, you ought to harvest from 30 to 34 bushels an acre."

In 1895, Charles—who in the meantime had received his Ph.D. from Johns Hopkins University at Baltimore and had taught chemistry at a Kentucky university for a while before returning to Toronto—moved to Ottawa to join his father's staff of researchers. Shortly before his arrival, Percy moved to the United States to accept a professorship.

The work of breeding new varieties was well under way by the time Charles joined his father's staff and testing of experimental crosses was being carried out at three of the new experimental farms—at Agassiz, B.C., Brandon, Man., and at Indian Head in the Northwest Territories area that became the Province of Saskatchewan in 1905. Some of the work involved crossing varieties imported from northern Russia and from India with Red Fife and White Fife.

In the next eight years, Saunders, his father, and William Macoun, an old friend from London who had joined the staff, tested thousands of strains from hundreds of crosses of wheat without success. Most did well in Ottawa but failed on the prairies. Those which ripened early enough or yielded well enough in prairie tests proved to be too brittle for good milling or they made poor bread.

In 1903, Charles was appointed Dominion Cerealist and took charge of the breeding work. By then, however, he had begun to retest some of the crosses made earlier by his brother.

The variety he sought had to ripen 5 to 10 days earlier and have a yield at least equal to Red Fife. It also had to be superior in quality to all existing varieties to command the highest prices in Europe—an important factor in offsetting the cost of shipping wheat from western Canada.

Percy, entreprit de faire des croisements en vue d'obtenir une variété de blé qui conviendrait mieux aux conditions des provinces des Prairies que le Red Fife, très cultivé à cette époque.

Le Red Fife, de maturation tardive était trop souvent atteint par le gel. Le besoin et la demande d'une nouvelle variété s'intensifiaient avec l'accroissement de la population, qui, de 62,260 habitants en 1881, passait à 152,206 en 1891 et à 419,512 en 1901. Les agriculteurs de l'Est émigraient en grand nombre dans ce riche territoire. De plus une foule d'immigrants étaient attirés par des annonces alléchantes telles la suivante:

«Des millions d'acres de prairie vierge situées à proximité du chemin de fer sont disponibles à raison de $5 à $10 l'acre. Labourez à l'automne, semez du blé au printemps et, sans engrais commerciaux ni fumier, vous devriez récolter 30 à 34 boisseaux l'acre.»

Charles obtint un doctorat à l'université Johns Hopkins de Baltimore; il enseigna la chimie quelque temps dans une université du Kentucky et retourna à Toronto. En 1895, il venait à Ottawa travailler avec les chercheurs de la Division des céréales. Peu de temps avant son arrivée à Ottawa, son frère Percy s'en allait enseigner aux États-Unis.

Les travaux de création de nouvelles variétés étaient commencés depuis quelque temps déjà lorsque Charles entra à la Division des céréales. A Agassiz (C.-B.), à Indian Head (Sask.) et à Brandon (Man.) se poursuivait l'essai des croisements de variétés importées du nord de la Russie et de l'Inde avec les variétés canadiennes Red Fife et White Fife.

Au cours des huit années qui suivirent, Saunders et ses collaborateurs, essayèrent mais sans succès, des milliers de souches issues de centaines de croisements. La plupart réussissaient bien à Ottawa mais non dans les provinces des Prairies. Les blés qui mûrissaient assez de bonne heure et rendaient suffisamment dans les Prairies étaient trop cassants pour se bien moudre ou donnaient un pain médiocre.

En 1903, Charles fut nommé directeur de la Division fédérale des céréales. A cette époque, cependant, il avait commencé à essayer quelques-uns des croisements faits les années précédentes par son frère.

Il recherchait une variété qui mûrirait cinq à dix jours plus tôt que le Red Fife tout en donnant un rendement au moins égal. La future variété devait être supérieure aux variétés existantes afin de commander les prix les plus élevés en Europe, élément qui pourrait compenser les frais élevés du transport.

L'attention de Charles fut attirée par la descendance d'un croisement effectué par Percy vers 1892 entre le Red Fife et une variété de blé rouge vitreux hâtif venant de Calcutta: on appela Markham la des-

In the re-testing, one cross of Red Fife and early maturing Hard Red Calcutta made by Percy about 1892 caught his attention. It was called Markham. Careful selection by Charles and the use of his famous 'chewing' test led to the isolation of a superior strain with outstanding baking and milling qualities. It was named Marquis in 1906.

In 1907, 23 pounds of Marquis seed were sent to the Experimental Farm at Indian Head for testing and results confirmed Saunders' hopes. The next year more tests were made, this time at Brandon, and Red Fife was grown alongside Marquis for comparison. It was a bad year. The crops of thousands of farmers who had sown Red Fife were wiped out by a sudden frost. The plots of Red Fife at Brandon were destroyed too, but Marquis was unharmed because it had matured 10 days earlier and had been harvested before the frost struck.

After being multiplied in 1909, Marquis seed was made available the next year to all farmers who asked for it. The price: three bushels for $5, f.o.b. Ottawa.

Marquis began winning awards, first in New York City in 1910, in Lethbridge in 1912 and in 1913 at Tulsa, Oklahoma. The demand for the new variety spread like a prairie grass fire. By 1920, Marquis accounted for 90 per cent of western Canada's 17.1 million acres of spring wheat and it was being grown on 12 million acres in the United States.

Marquis helped to make the west 'golden' too. It is conservatively estimated that this higher yielding wheat brought $20 million more per annum into Canada than any other variety then available could have done.

Superb in quality and excellent in yield, Marquis did have one flaw—it was susceptible to rust disease. Despite this, Marquis was the key to a record 400 million bushel yield in 1923 and one of 500 million bushels in 1928.

In an address in Toronto in 1929, Saunders (who had retired as Dominion Cerealist seven years earlier because of poor health) said:

"Marquis is still king, and it looks as if, when the day comes for Marquis to step out, it is likely to be one of his descendants who will be crowned."

His prophecy came true in 1935 with the introduction of rust-resistant Thatcher wheat. It had Marquis as one of its ancestors.

Thatcher itself fell victim to new races of rust and was followed by newer and more resistant varieties. Most of them—including the variety Manitou developed by the CDA Research Station at Winnipeg and released in 1965—can trace part of their ancestry to Marquis.

Marquis is still grown on about 100,000 acres in rust-free areas of western Saskatchewan and Alberta

cendance de ce croisement. Charles s'appliqua à la sélectionner et, se servant particulièrement de son célèbre essai de la mastication, il isola une souche qui possédait des qualités meunière et boulangère remarquables: c'était en 1906 et on baptisa cette souche du nom de Marquis.

En 1907, 23 livres de semence de blé Marquis furent envoyées à la ferme expérimentale d'Indian Head pour être essayées: les résultats répondirent aux espérances de Saunders. L'année suivante, on fit des essais à Brandon, en cultivant le Red Fife à côté du Marquis de façon à pouvoir comparer le comportement des deux. Malheureusement, l'année fut mauvaise. Les récoltes de milliers de producteurs de Red Fife furent détruites par un gel. Le Red Fife, cultivé à la Ferme expérimentale fut aussi détruit mais le Marquis ne fut pas touché, parce que, ayant mûri dix jours plus tôt que l'autre, il avait été récolté avant le gel.

En 1909, on multiplia la semence disponible et on en offrit l'année suivante, au prix de cinq dollars les trois boisseaux, livraison à Ottawa.

Le blé Marquis commença à remporter des prix, à New York d'abord en 1910, à Lethbridge en 1912 et à Tulsa, Oklahoma en 1913. La demande de la nouvelle variété se répandit comme un feu d'herbe dans les Prairies, à tel point qu'en 1920 le Marquis représentait 90 p. cent des emblavures de blé de printemps de

Le blé Marquis (au centre est le fruit d'un croisement de la variété hâtive du blé dur Red Calcutta (à gauche) et du Red Fife (à droite). Bien que le Red Fife parvenait à maturité plus tôt que toute autre variété, il était encore trop tardif pour être profitable dans les Prairies. La venue du Marquis au début du siècle fut la solution à ce problème

Marquis wheat (center) was developed from a cross of early maturing Hard Red Calcutta (left) and Red Fife (right). Although maturing earlier than any other variety available at the time, Red Fife was still too late to be a sure crop for the prairies. The introduction of Marquis in the early 1900's solved this problem

and the variety is still considered the standard of milling and baking quality for hard red spring wheat in Canada.

For his contribution to agriculture, Saunders was knighted in 1933.

His death in 1937 prompted such Canadian tributes as that of the Prime Minister who said: "He made two bushels to grow where one grew before."

The tributes were virtually world-wide. In England, the Manchester Guardian said: "Canada has lost a scientist who probably contributed more than any other person to make the Dominion what it is today. Indeed his work as Dominion Cerealist. . . was a notable contribution to wheat culture throughout the world."

And the London Daily Express: "He added more wealth to his country than any other man. Marconi gave power. Saunders gave abundance. Great lives, these!"

Aerial view of the William Saunders Building on CDA's Central Experimental Farm. The building was named after his father, Dr. W. Saunders (1836-1914), who founded the Dominion Experimental Farms Service, and lived for many years on the site in the director's residence

Vue à vol d'oiseau de l'Édifice William Saunders à la Ferme expérimentale centrale. L'édifice porte le nom de son père le Dr William Saunders (1836-1914) qui établit le Service des Fermes expérimentales du Canada et pendant de nombreuses années occupa la résidence du directeur, sise à la Ferme expérimentale centrale

l'ouest du Canada; le total des emblavures était alors de 17.1 millions d'acres au Canada et de 12 millions, aux États-Unis.

On peut sans exagération dire que le supplément de rendement que donnait le Marquis a rapporté au Canada environ vingt millions de dollars de plus par année, que n'importe quelle autre variété disponible à cette époque.

Si la qualité était superbe et le rendement excellent, le Marquis avait cependant une faiblesse: il était sensible à la rouille. Cette maladie fit des dégâts considérables en 1916. Néanmoins, grâce au Marquis, le Canada obtint en 1923, une production de blé encore jamais atteinte de 400 millions de boisseaux et en 1928, nouveau record, 500 millions de boisseaux.

Dans une causerie qu'il prononçait à Toronto en 1929, Saunders, qui avait alors quitté le poste de Chef de la Division des céréales affirmait:

«Le Marquis est encore roi et il semble que lorsque le jour viendra pour lui de céder sa place, elle sera prise par l'un de ses descendants.»

Cette prophétie se réalisa en 1935 avec l'introduction d'un descendant du Marquis, «le Thatcher» résistant à la rouille.

Mais le Thatcher se montra lui-même sensible à de nouvelles races de rouille et fut remplacé par des variétés nouvelles, plus résistantes, dont la plupart—notamment le Manitou, créé à Winnipeg par la Station de recherches du ministère de l'Agriculture du Canada et homologué en 1965—descendaient elles aussi du Marquis.

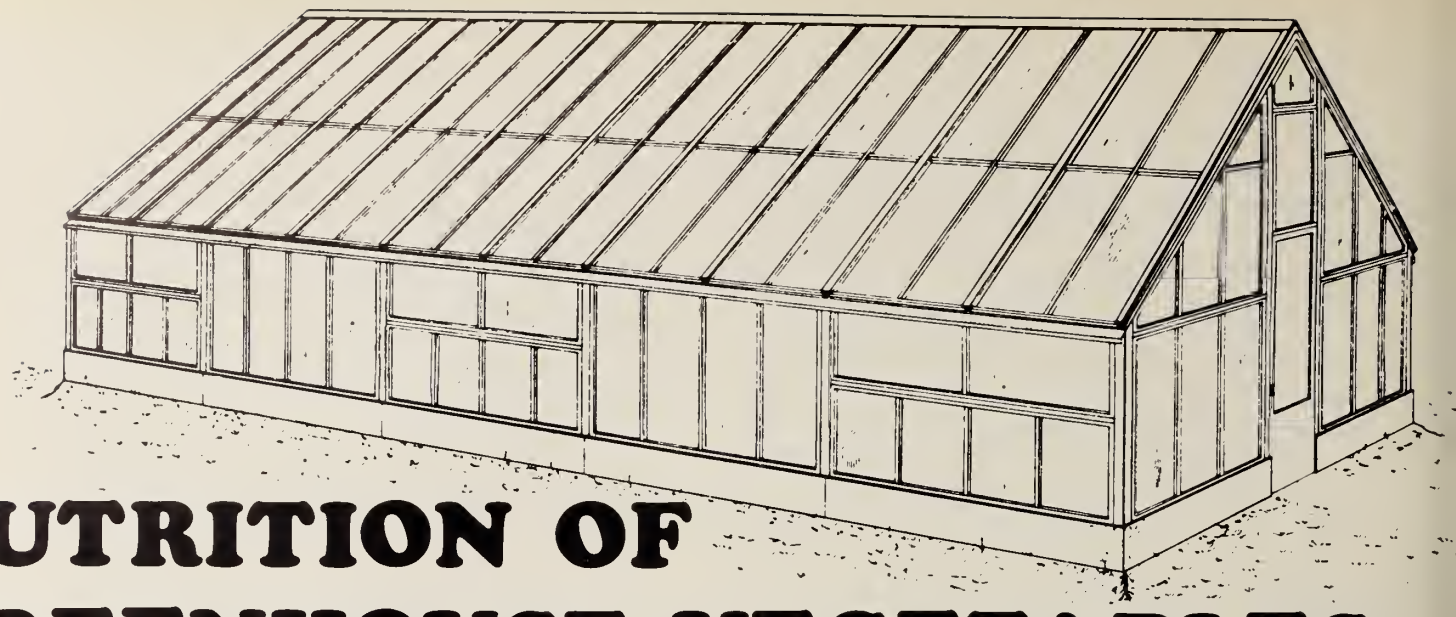
Le Marquis se cultive encore sur environ 100,000 acres situées dans le secteur exempt de rouille de l'ouest de la Saskatchewan et de l'Alberta et il est toujours considéré comme la norme même des qualités meunière et boulangère du blé de printemps vitreux roux, au Canada.

Pour sa contribution à l'agriculture canadienne, Saunders fut créé chevalier en 1933.

Le créateur du blé Marquis mourut en 1937. Le premier ministre de l'époque affirmait alors: «Saunders réussit à obtenir deux boisseaux là où l'on n'en obtenait qu'un auparavant.»

En Angleterre, le *Manchester Guardian* écrivait: «Le Canada vient de perdre un chercheur qui a probablement contribué plus que toute autre personne à faire du Canada ce qu'il est aujourd'hui. En fait, l'œuvre qu'il a exécutée à la Direction de la Division fédérale des céréales constitue un apport marquant à la culture du blé dans le monde entier».

Le London Daily Express disait: «Il a fait plus que n'importe qui pour accroître la prospérité de son pays. Marconi a donné la puissance, Saunders a donné l'abondance. Quels grands hommes que ceux-là!»



NUTRITION OF GREENHOUSE VEGETABLES

G. M. WARD

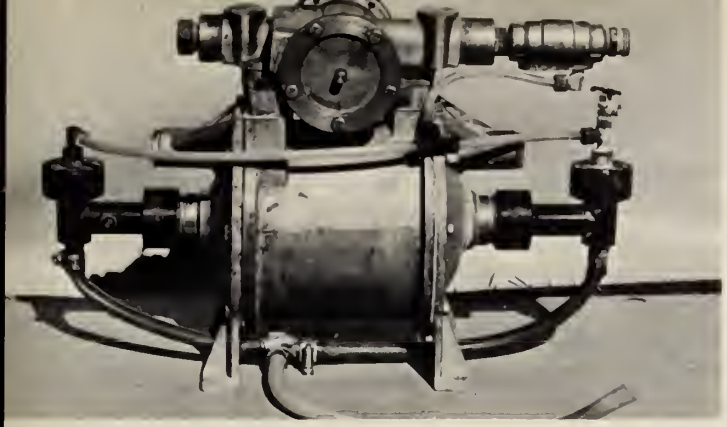
Automation has moved into the modern greenhouse and the feeding of vegetable crops has become a precise and rigidly controlled operation. Greenhouse tomatoes and cucumbers have been grown successfully for many years in many parts of the world and for at least sixty years in Ontario but there has always been a wide variation in fertilizer practice, particularly in the amounts of nutrients applied in producing a crop. One of the common mistakes has been overfeeding which has resulted in numerous nutritional difficulties. In earlier times most of the fertilizer, including large quantities of animal manure, was applied and worked into the soil before planting in much the same way that field crops are fertilized. Some solid fertilizer in granular form was spread along the plant rows during growth and watered in. The modern procedure for feeding is to inject a high-analysis liquid fertilizer concentrate into the irrigation water by means of a proportioning pump. The water is then applied to the crop by an automatic or mechanical watering system. Intensive feeding of the crop continued throughout almost the entire six-month growing period is a unique feature in agricultural practice.

For six years, we have directed our investigations at the Harrow Research Station towards making greenhouse vegetable nutrition into a more accurate and reliable procedure with the use of these modern techniques, recognizing at the same time that no single exact and universal feeding formula can be recommended and that the element of personal judgement will never be eliminated in the production of a good crop.

The author is a chemist with the CDA Research Station Harrow, Ont.

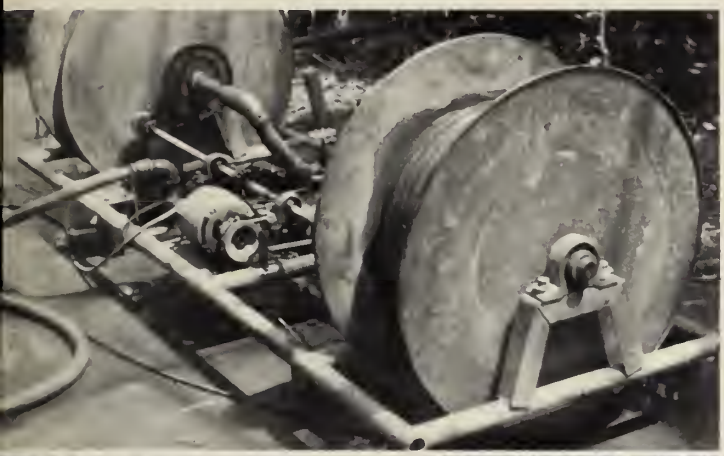
A grower determines the current nutrient status and requirements of his crop by visual observation of its appearance—color, the amount of curling in new foliage, blossom development, fruit set etc. He relies to some extent on periodic soil tests. Plant tissue tests are also beginning to be used as an aid in some places. Our laboratory has developed a sampling technique for the greenhouse tomato and a set of standard nutrient levels to be used in assessing tissue analysis data. Using the fifth leaf from the growing tip as the appropriate indicator tissue, a normal healthy plant should have 5.25% nitrogen, 4.00% potassium, nitrogen/potassium ratio 1.31, 0.80% phosphorus, 1.50% calcium, and 0.45% magnesium (per cent of dry weight).

The amount of fertilizer that is applied to a crop ought to bear some relationship to the amount that the plant absorbs during the course of normal development. This has been determined for the greenhouse tomato and cucumber in an extensive study of nutrient ontogeny. A tomato plant requires about four square feet of space for normal development and during its full life span it produces 15 pounds of fruit on a plant that weighs 4 pounds. A cucumber plant requires five square feet of space, produces 41 pounds of fruit on a plant that weighs 5 pounds. During the life of a tomato crop, an acre of plants will absorb 309 pounds of nitrogen, 80 pounds of phosphorus, 511 pounds of potassium, 220 pounds of calcium and 37 pounds of magnesium. An acre of cucumber plants will absorb 510 pounds of nitrogen, 161 pounds of phosphorus, 755 pounds of potassium, 597 pounds of calcium and 135 pounds of magnesium.



Fertilizer proportioning pump

Hoseboy, used for automatic mechanical watering of greenhouse plants



Hoseboy in operation

Gro-hose, perforated plastic hose for automatic watering of greenhouse plants. Also shown: greenhouse thermometer and soil moisture meter

A number of other mineral elements are required for normal plant growth—sulphur, boron, manganese, iron, copper, zinc, molybdenum—trace elements required by plants in minute amounts. There is usually a sufficient quantity of all of these in a fertile soil to supply all the needs of a crop. In special cases when a deficiency occurs, it is confirmed by chemical analysis of soil or tissue and an adequate amount is applied as a fertilizer to correct the disorder. Deficiencies of this type rarely occur on the light sandy soils of the Leamington district of Southwestern Ontario where most of the Canadian greenhouse vegetable industry is concentrated. Occasionally an abnormal soil condition will release some trace elements in the soil in quantities large enough to be toxic to plants. This imbalance is much more difficult to correct. A condition of manganese toxicity has sometimes been observed and it is believed to be related to the practice of steaming soils annually for the control of disease.

Numerous experiments such as the ones described here have contributed information about the growth and nutrient absorption patterns of these two crops. This knowledge has been used for the development of a fertilizer schedule for greenhouse tomatoes which is recommended to growers in Southwestern Ontario. A similar schedule for cucumbers is being prepared.

A recent development in greenhouse culture is the popular and widespread use of supplementary carbon dioxide in the atmosphere. This is considered to be a nutritional feature. The atmosphere normally contains about 300 parts per million of this gas which is a major supply material for photosynthesis—the process through which all living material is sustained. In a closed greenhouse in the wintertime, a crop of large actively growing plants will soon deplete the supply. Experiments at Harrow and elsewhere have shown that under these conditions an extra supply of CO_2 provided as pure gas from cylinders, as solid CO_2 (dry ice) or as the complete combustion product of fuel oil or propane gas will stimulate plant growth. Under appropriate conditions this stimulation may result in an increase in the yield of tomato fruit of as much as 20 per cent. Similar effects occur in other crops. The chain of events in this process is exceedingly complex, favorable results are not always duplicated, and much still remains to be learned about the application of this nutritional aid to crop production.

Essex County has about 300 acres of glass and plastic greenhouses. The annual value of the vegetable crop is over six million dollars. The industry is still growing and markets are expanding. A sensible program of well balanced nutrition will do much to ensure that this industry remains in a healthy and vigorous condition.

competition for WATER

Is the supply of water in the Saskatchewan-Nelson Basin sufficient to satisfy the ever-increasing demands of an expanding prairie economy? The author assumes that water supplies would have to be augmented—and discusses the need to plan for such an eventuality.

M. J. FITZGERALD

From a reading of the proceedings of the Prairie Provinces Water Board since its inception in 1948, one can sense the preoccupation of its members with two separate but intimately related problems. First, that the supply of water in the Saskatchewan-Nelson basin will be insufficient to satisfy the ever-increasing demands of an expanding prairie economy. Second, assuming supplies would have to be augmented, how should planning for such an eventuality proceed? It was because of these problems that the Board recommended to the Federal Government and the three Provincial Governments represented on the Board, that a detailed study should be made of the total water supply available in the basin, and what could be made available by diversion from other basins to ensure sufficient water to satisfy the ever-increasing needs of urban centers, of agriculture, of industry and the requirements of other sectors of a developing prairie economy. The Ministers of the various Governments to whom Board members report agreed in principle to the study and now are in the process of making the necessary arrangements to have it carried out.

The author is Director, Prairie Farm Rehabilitation Administration, CDA, Regina, Sask., and also Chairman, Prairie Provinces Water Board.

The accompanying map outlines the Saskatchewan-Nelson basin, an area of approximately 414,000 square miles drained by the Nelson River and its tributaries. It can be seen that it includes nearly all of the settled regions of Alberta, Saskatchewan and Manitoba, a sizeable portion of Ontario and spills across the international boundary into North Dakota, Minnesota and Montana.

Within the main basin there are three large sub-basins—the areas drained by the Winnipeg River, the Red River, the Saskatchewan River and their tributaries.

The greater part of the Winnipeg sub-basin lies in the Pre-Cambrian shield with its abundance of lakes and forest cover and relatively high annual precipitation. Consequently, the Winnipeg River has a comparatively high and steady annual runoff, making it an attractive river for hydro development.

The Red River, with its main tributaries, the Assiniboine and Souris, drains the southern and central prairies. Unlike the Winnipeg sub-basin, the runoff from this area is relatively low. In the region drained by the Assiniboine, the major contribution to runoff comes not from rainfall, which is comparatively low, but from melting snow in the spring.

The Saskatchewan River sub-basin, which drains the major part of the main basin, has characteristics which make it quite different from either the Red or the Winnipeg sub-basins. First of all, the drainage area is dominated by two major rivers. These are the North and South Saskatchewan rivers which originate very close to each other in the icefields east of the

Continental Divide. Another distinguishing feature is, of course, the Rocky Mountain area with its immense icefields and its heavy precipitation both in terms of snow and rain. It also contains a foothill area with a comparatively high annual rainfall and, finally, an immense area of prairie with a relatively low and somewhat variable annual precipitation. Of the two main rivers, namely the North and South Saskatchewan, the latter is far more important at the moment, serving as it does the settled part of both Alberta and Saskatchewan. To date, this river and its tributaries have experienced some development, particularly in terms of irrigation in Alberta and, of course, the proposed development that will result from the construction of the South Saskatchewan River Dam.

ARE ANTICIPATED NEEDS BEING MET?

The annual flow of the South Saskatchewan River is in excess of seven million acre-feet per annum. This flow is comparable to, but slightly more than, that of the North Saskatchewan, and the combined flow of these two rivers at the Manitoba border is in the order of seventeen and a half million acre-feet. At first glance, it would appear that there is plenty of water in the South Saskatchewan to satisfy anticipated needs for the area that this river might serve. The fact of the matter is, however, that the seven million acre-feet or more that flows annually in this river is available in relatively small quantities over most periods of the year. For example, the Prairie Provinces Water Board has already allocated about two and a quarter million acre-feet to irrigation areas in Alberta and proposed irrigation areas in Saskatchewan. This water for irrigation must be available during the growing seasons of June and July of every year. In making this allocation, the Board was aware that, in the past, the flow of the river during the growing season has at times been dangerously close to the amount of water already allocated for irrigation and other purposes. While it is true that storage has been developed, including the large storage behind the South Saskatchewan River Dam and upstream storages on the St. Mary River in Alberta, which reduces the need to rely completely on annual river discharges, we still must face up to one big fact. What it it, you ask? Just this. . . that existing storages would be heavily taxed if we were faced with a period of low precipitation when the demand for irrigation water would increase while the flow in the river would be lower than normal due to lack of runoff. Without quoting hydrological data to support this point, there is no question of the future need to supplement the flow of the South Saskatchewan River.

THREE MEASURES FOR SUPPLEMENTING FLOW

To supplement the South Saskatchewan River flow, three measures could be undertaken. The first of these is the creation of additional storage sites in the main tributaries of the South Saskatchewan, either on the St. Mary and its tributaries, the Oldman, the Red Deer or the Bow River. The St. Mary River and its main tributaries are now in a sense fully developed as a result of the construction by PFRA of the St. Mary Dam and the diversion into its reservoir of water impounded by dams constructed on the Belly and Waterton Rivers. As yet, there has been little or no storage development on the Oldman River although a number of potential sites have been investigated and have proven to be engineeringly feasible. On the Bow, considerable development has taken place both in the field of hydro power development upstream from Calgary, and by works located on the river at Carseland and Bassano to serve the needs of irrigation on the Bow River and Eastern Irrigation District projects. The Red Deer River has yet to undergo any significant development.

The second measure that could be undertaken to supplement the South Saskatchewan River flow is the diversion of certain streams into the Red Deer or into the North Saskatchewan and a diversion from there into the South Saskatchewan for impoundment and regulation upstream from the South Saskatchewan River Dam.

These first two measures, however, merely make more readily available waters that now make up the total supply within the basin itself. In other words, they do not increase the amount of water that flows through the basin.

The third measure involves importing water from outside the basin into the rivers flowing within. Regarding this latter measure, there are a considerable

PFRA

THE SASKATCHEWAN-NELSON BASIN

number of schemes that are technically feasible. They involve diversion from the Peace, the Athabasca and the Pembina Rivers and other smaller streams that lie northeast of the Great Divide. Still other schemes involve pumping water over the Divide from such rivers as the Fraser, the Columbia and the Kootenay. While all these various schemes are feasible from an engineering point of view, the scheme or combination of schemes selected depends on a great many factors that will determine economic feasibility in relation to development needs.

OTHER FACTS TO BE CONSIDERED

Planning the water supply of the basin, however, involves more than just studying the engineering and economic feasibility of moving water into the basin from other basins. When, for example, we speak of diverting a river like the Peace, deliberations must take into consideration the fact that the Province of British Columbia is now undertaking a major development in the upper reaches of this river. To the extent that it may be credible, we must also take into consideration such international schemes as the North American Water and Power Alliance proposal. This scheme includes the Peace River, not only as a source of water but also as a route through which the waters of the Yukon and Alaska Rivers would be channelled into the proposed reservoir in the Rocky Mountain Trench. The latter is the key storage facility as visualized in the NAWAPA plan, to enable diversion of the water into the west-central and western areas of the United States and into Mexico. These schemes are mentioned merely to emphasize that comprehensive planning for water development may be influenced by plans of jurisdictions sometimes far removed from the particular basin in which one happens to be located. There are also questions of constitutional and legal rights of these jurisdictions which, in many instances, may prove much more difficult to overcome than the engineering problems associated with inter-basin development.

To return to the Saskatchewan-Nelson basin and, more particularly, that area of Saskatchewan that lies within the basin, one cannot help but be optimistically excited over what may transpire in this area over the next few decades. If we accept, as most resource development people do, that the four major physical sinews of social and economic development are land, water, minerals and energy, this particular section of the basin holds an enviable position in comparison to other areas of our country.

With respect to our land resources, we have achieved a level of efficiency in dry-land farming practices considered to be as advanced as any other country in the world. Great strides have been made to combat the vagaries of climate as it affects our soils and crops and limited water supplies. We also recognize that we could, through the application of known techniques such as the use of fertilizers, new pesticides and herbicides, and through the more extensive use of improved crop varieties, further increase our over-all production significantly, not to mention the considerable increases in yield and diversity of production that could be achieved by giving greater emphasis to irrigation. Keeping these factors in mind, there would appear little doubt that

our land is capable of producing a great deal more should it be called upon to do so.

Concerning our water resources, the over-all potential remains relatively undeveloped. We are still using only a very small percentage of the water which could be made available and yet still flows unused into the Hudson Bay. In terms of surface waters that originate within the province, the picture is a little different since here we have, through such programs as are administered by PFRA and the Prairie Provinces, made great strides in catching and conserving runoff water for domestic, agricultural and municipal purposes. As to groundwater, which we know exists in vast quantities, we have had no significant use of this vast supply except to satisfy a very small percentage of domestic requirements.

As to minerals, we are only now beginning to realize the vast potential of these resources. The postwar development of oil and gas reserves has been phenomenal. In more recent days, we have witnessed the start of an unprecedented activity associated with potash mining. We now appear to be on the threshold of an enormous development in this field and this will mean the raising of the general tenor of economic and social activity within the province. It is claimed, in fact, that in not too many more years this exploding section of the economy will have a total annual dollar value comparable to that now coming from the agricultural sector.

Insofar as energy is concerned, here again there are vast deposits of fossil fuels and reserves of gas and oil at our disposal. Such projects as the South Saskatchewan River Dam and the regulation of flow it will provide will greatly increase the hydro capacity to satisfy the energy needs that further development will require.

WATER MOST CRITICAL ELEMENT

Of these four elements, namely land, water, minerals and energy, water is by far the most critical inasmuch as it is essential to the productivity of the other three. The four, however, are closely and inextricably interrelated. Whatever use we make of one resource will almost certainly have a strong effect upon all of the others. For example, the allocation of water to irrigation limits the amount of water that can be made available to the production of energy. In turn, this loss of power, unless it is supplemented from fossil fuels, could inhibit industrial development. Moreover, industrial development in a very definite way, having regard to its effect on concentrating population in certain areas, will have the effect of changing traditional patterns of land use. The point to emphasize is that in planning for the development of any of the resources—and this seems to apply more particularly to water resources—it will be essential to keep these interrelationships between resources clearly in mind at all times, giving due recognition to the contributing productive potential of each.

WATER RESOURCES PLANNING VITAL TO PEOPLE'S WELFARE

To plan and direct a program for the development of the water resources of a country or of a basin calls for a deep sense of public responsibility. Whether a country or an area is richly or poorly endowed, such life-giving water as it may have is the common possession of the whole people and anything done with it or to it is done as a public trust. Those who for various reasons have accepted some responsibility in planning the development of our resources must also accept responsibility for the stewardship of this vital resource. In the handling of this resource, our objective should be to conserve it, while making it yield for us as high a production return as possible.

In the prairie area we are at that point in time when we enter a stage where development will accelerate at an ever-increasing rate. We have the choice of either indiscriminate exploitation of our resources or rational and responsible planning of them. Our only real choice is the latter.

Finally, in the planning of our water resources, as in all other planning, account must be taken of the most important element of all which gives meaning and reality to all of the others—people and their welfare. Economic development of physical resources, whether it be water or any other resource, has no meaning and no purpose except in terms of the people who stand to gain or lose by it. If more rational utilization of resources is not done for the benefit of the people and does not result in richer opportunities for them to develop their own capacities, it will completely fail in its purpose.

ECHO

NOTES AND COMMENTS FROM THE FIELD

NEW APPLE PACK—Canned apples may now be prepared for dessert use with a new method which combines techniques available to even the smallest processor, but which requires no new and expensive equipment. It was developed at the CDA Experimental Farm, Smithfield, Ont.

To use the method, core, dice or cut apples into chunks and cook in 35 per cent hot syrup under vacuum for several minutes. Remove apple pieces from the syrup, fill cans, and top off with apple juice of the same variety. Then vacuum-seal the cans and process as usual.

Several varieties have been tested for this pack, including McIntosh and Northern Spy. Results with McIntosh are of particular interest, because this variety is usually plentiful. It is firm, has good color and excellent texture and flavor in the final product.

When juice was substituted for syrup, a very favorable pack resulted, characteristic of the variety being processed.

This produce would be at least equal to standard apple sauce for dessert use.—H. B. HEENEY, SMITHFIELD, ONT.

PLANT HARDINESS MAP—Saving ornamental trees and shrubs from being winterkilled is a major problem in Canada. The best approach is to choose plants which can survive the climate of the area where they are to be planted.

To help growers do this, C. E. Ouelet and L. C. Sherk of the Plant Research Institute, Central Experimental Farm, Ottawa, have prepared a map showing regions where woody ornamentals will survive. Lists of representative plants which normally survive in each zone are included.

The colored map, to be published soon, was based on survival data for 174 different plants, gathered in a survey of 108 stations across Canada.

First job for the research team was to evaluate the relative winter-hardiness of the plants surveyed. The indices established ranged from 3 for non-hardy plants to 99 for very hardy plants. Some examples: common lilac, 97; Almey crabapple, 93; Vanhoutte spirea, 79; Korean forsythia, 64; fragrant viburnum, 59; Chenault coralberry, 47; Chinese witchhazel, 37; Japanese maple, 28; winter jasmine, 15.

Next, the indices of suitability for the winter survival of woody ornamentals were established for 650 stations. These were based on plant-hardiness indices, survival data from the survey, and climatic factors such as mean minimum temperatures of the coldest month, frost-free period, rainfall, and winter snow cover.

The hardiness map was then prepared from this data. Ten zones were drawn, ranging from 9a, the mildest, to 0, the coldest. Zones 8 to 0 were divided into a and b halves, the colder and milder sections respectively.

Zone 9a occurs only around Victoria and some of the adjacent islands. Zone 8 includes Vancouver, the Fraser Valley and coastal British Columbia.

Mildest areas in eastern Canada are in Zone 7. This takes in Windsor and sections of the Niagara Peninsula. In zone 6 are coastal areas of the Maritimes, Toronto and parts of the interior of British Columbia.

Ottawa, Montreal, large areas of the Maritimes and parts of British Columbia are in Zone 5.

Mildest area on the Prairies is Zone 3b, southern Manitoba. Most of the Prairies, northern Ontario and Quebec, and the interior of British Columbia are in Zones 3a and 2. The northern Prairie Provinces are in Zones 1 and 0.

CARTE DE RUSTICITÉ DES ARBUSTES—La préservation des arbres et arbustes d'ornement contre les gels d'hiver constitue un problème de taille au Canada. La meilleure façon d'aborder ce problème est de choisir des plants aptes à survivre sous les climats des régions qu'on leur destine.

Pour faciliter le choix des arbrisseaux dans cette perspective, MM. C. E. Ouellet et L. C. Sherk, de l'institut de recherches sur les végétaux, à la Ferme expérimentale centrale d'Ottawa, ont établi une carte indiquant l'aptitude des plantes ligneuses d'ornement à surmonter les rigueurs de l'hiver dans les diverses régions. Ce travail comprend aussi des listes de plants représentatifs qui survivront normalement dans chacune des zones. Cette carte en couleurs doit être publiée prochainement.

Elle a été préparée d'après les données sur la survivance de 174 espèces, données recueillies de relevés effectués à 108 endroits du Canada.

Notre équipe de chercheurs a dû en premier lieu évaluer la rusticité relative des plants faisant l'objet de l'étude. Les indices ainsi établis varient à partir de la cote 3 pour les plants sans rusticité, jusqu'à la cote 99 pour ceux dont la rusticité est très grande. Voici quelques exemples de cotes: lilas commun, 97; pommetier Almey, 93; spirée de Van Houtte, 79; forsythie de Corée, 64; viorne odorante, 58; symphoricarpe de Chenault, 47; hamamélis chinois, 37; érable japonais, 28; jasmin, 15.

Les indices d'aptitude à la survivance d'hiver des plantes ligneuses d'ornement ont été établis par la suite en 650 endroits, s'appuyant sur des facteurs comme ceux-ci: indices de rusticité des plantes, chiffres de survivance recueillis lors de cette étude, éléments climatiques comme la température minimale moyenne pour le mois le plus froid de l'année, la période exempte de gel, la pluviosité, la couverture de neige et autres.

Tous ces indices d'aptitudes ont servi à la préparation de la carte de rusticité. Dix zones y sont délimitées; elles s'échelonnent depuis la zone 9a pour le climat le plus doux à 0 pour le climat le plus rigoureux. Les zones de 8 à 0 ont été subdivisées en a et b, soit les zones les plus froides et les plus douces respectivement. La zone 9a est confinée aux environs de Victoria et à certaines îles avoisinantes. La zone 8 comprend la région de Vancouver, la vallée du Fraser et le littoral de la Colombie-Britannique. Les régions les plus douces de l'est du Canada occupent la zone 7, qui comprend la région de Windsor et certaines parties de la péninsule de Niagara. La zone 6 comprend les régions côtières de l'Atlantique, Toronto et certaines parties de l'intérieur de la Colombie-Britannique.

Ottawa, Montréal, de vastes régions des provinces de l'Atlantique et certains endroits de la Colombie-Britannique font partie de la zone 5. La zone la plus douce des Prairies, classée 3b, comprend le sud du Manitoba. La majeure partie des Prairies, le nord de l'Ontario et du Québec et l'intérieur de la Colombie-Britannique font partie de la zone 3a et de la zone 2. Le nord des provinces des Prairies occupe les zones 1 et 0.

AGRICULTURAL RESEARCH GRANTS—Last year, for the first time. a new form of federal assistance was available for agricultural research work carried on outside the Canada Department of Agriculture.

Grants similar to those made for many years by the National Research Council will be awarded annually by CDA in support of agricultural research. Additional funds are being made available to the department for this purpose.

Last year the department distributed a total of $304,660 among eight universities and colleges. This was the full sum available for the purpose that year. There were 155 applications for the grants, which went to 71 professors heading projects at the eight universities and colleges.

Allocation of funds was made by CDA's

Sugar hybrid watermelons and cantaloupes of the Samson Hybrid variety are displayed by two young women at the CDA Experimental Farm, Fort Simpson, Northwest Territories. Although the average number of frost-free growing days here are only 92, good results were obtained from growing this produce in tests at the farm last summer.

Plastic-covered shelters were used that resemble conventional greenhouses, but are cheap to build and can easily be carried by four persons. Watermelon yield for the season averaged 123 lb. per shelter (144 sq. ft.) and cantaloupe 104 lb. The largest watermelon weighed more than 14 lb. and the largest cantaloupe six lb.

Deux charmantes jeunes femmes présentant des melons d'eau hybrides sucrés et des cantaloups hybrides Samson, à la Ferme expérimentale du ministère de l'Agriculture du Canada, à Fort Simpson, T. N.-O. A voir ces beaux fruits, croirait-on que le nombre de jours sans gel n'a été que de 92, l'été dernier?

Ces melons ont poussé sous tentes de plastic, lesquelles ressemblent à des serres mais coûtent moins cher et se transportent facilement. Le rendement des melons d'eau a été de 123 livres par tente (144 pi. carrés) et celui des cantaloups, 104 livres. Le plus gros melon d'eau pesait plus de 14 livres et le cantaloup 6 livres.

Operating Grants Committee made up of senior officials of the Research Branch and deans of faculties of agriculture.

Recipients were: University of Alberta, $50,940; University of British Columbia, $27,000; University of Guelph, $55,670; Laval University, $23,300; MacDonald College, $41,700; University of Manitoba, $44,500; Veterinary College of the Province of Quebec $8,000; University of Saskatchewan $53,550.

NEW OAT VARIETIES LICENCED—Two new oat varieties, Sioux and Kelsey, were licenced last December by the Canada Department of Agriculture. The latest in a long series of crop varieties developed by CDA scientists for the benefit of Canadian agriculture, they have good disease resistance, and are higher-yielding than standard varieties.

Sioux, developed at the CDA Research Station in Winnipeg, is a cross between the varieties Garry and Rex. It is adapted to the drier areas of Alberta and Western Saskatchewan where it has outyielded Harmon, Garry and Rodney. It equals Garry in resistance to smut and stem rust but, like all commercial varieties, is susceptible to race 6AF of oat stem rust.

Kelsey was developed jointly by scientists at the Federal Experimental Farm at Indian Head, Sask. and the Winnipeg Research Station. It has outyielded Harmon, Garry and Rodney in Manitoba and eastern Saskatchewan, and shown some promise in limited tests in Ontario. It is more tolerant than other oat varieties to crown rust and is resistant to race 7A of stem rust. However, it, too, is susceptible to race 6AF. While Kelsey's kernels are relatively small-sized, they have a higher energy content for livestock feed than any of the oat varieties now being grown.

Seed of the Sioux variety will be available this year to selected seed growers in Alberta and western Saskatchewan. Kelsey seed will be distributed next year among selected growers in eastern Saskatchewan, Manitoba and Ontario. Growers, selected by the Provincial Seed Stock Committees, will be contacted by the Seed Section, CDA Research Station, Box 38, Regina, Sask., to determine their interest in obtaining seed.

Registered seed of the two varieties should be available to the public by spring, 1968.

LAB'S ROLE IN BRUCELLOSIS ERADICATION—Scientists at eight laboratories operated by the Canada Department of Agriculture's Health of Animals Branch play a vital role in CDA's program to eradicate brucellosis in Canada, the first phase of which was completed last September. Cattle testing is being continued, after this first phase, to mop up remaining pockets of the infection, so Canada may eventually qualify for the ultimate classification of "brucellosis free".

When their work on Canada's nearly 13,000,000 cattle has been completed, the scientists will have tested 16,088,539 samples of cattle blood. They will also have produced the entire amount of antigen used in these tests. The antigen, a suspension of dead brucellosis organisms, is mixed with the blood constituents in determining if an animal is infected.

The amount of antigen diluted and used in laboratories up to now is 40,000 gallons—enough to fill five railway tank cars.

The disease-causing organism, Brucella abortus, is incredibly small. With a length of 1/25,000 of an inch, and a width of 1/50,000 of an inch, it would take 1.5 million of them to cover the head of a pin.

Despite their small size, 162 lb. of the bacteria have been produced and used in the laboratories since the program began in 1957. If the bacteria were placed end to end, they would form a line stretching 226 million miles, or long enough to go around the earth 9,080 times at the equator.

FIGHT AGAINST RABIES

More than 72,000 dogs and cats were vaccinated against rabies in 1966 at free clinics conducted by the CDA Health of Animals Branch.

The number is a sharp increase from the 30,500 pets brought to clinics for immunization treatment in 1965. Most of the clinics last year were held at centers in 23 counties of Ontario and one in Quebec where the incidence of rabies was greatest.

Reported cases of rabies in wildlife and domestic animals numbered 1,241—down 500 from 1965. The total included 966 in Ontario, 105 in Quebec, 59 in Manitoba, 46 in Saskatchewan, one in Alberta, and two each in British Columbia and the Northwest Territories. New Brunswick, where there had been only one known case until last year, had 60.

Wildlife, mainly foxes and skunks, accounted for 656 of the cases, while cats and dogs were involved in 153 (240 in 1965), and farm animals in 432 (630 in 1965).

RABIES

Rabies is an infectious disease caused by a virus that affects the nervous system of all warm-blooded animals, including livestock and man.

HOW IS RABIES SPREAD?

It is usually spread by the bite of a rabid animal. Infection can result if the saliva, blood, milk or any other body fluid of an infected animal enters a cut or scratch. Animals that bite, such as the skunk, fox, wolf, coyote, cat and dog, are the most active spreaders of the disease. Wild animals are excessively bold, have no fear of man and other animals and often attack domestic animals in pastures or barns.

HOW LONG DOES IT TAKE RABIES TO DEVELOP?

In a farm animal, symptoms of rabies may appear as early as 10 days after it has been bitten, but three to six weeks is more usual. Symptoms in dogs may not show for up to six months. The length of time between infection and the onset of symptoms depends on the severity of the bite or wounds and their distance from the brain.

HOW DOES A RABID ANIMAL ACT?

Cattle: Infected cattle may have a wild, staring expression due to excitement. This is followed by violent actions, which are sometimes brought on by approaching objects. Cattle may suddenly let out a loud, hoarse, unnatural bellow, as though terrified; pull strenuously backward and forward if tied up; rush about wildly and leap into the air if loose; stamp their feet and switch their tails; shake their heads violently; bite viciously at any object or animal within reach, sometimes biting the manger and injuring their mouths. Between these violent outbursts there may be periods of calm in which they stand quietly with head slightly raised. Twitching of the muscles of the ears, skin and tail, accompanied by frequent blinking of the eyelids, may be noticed. At times cattle may be restless and kick at their abdomen. Sexual desire may be increased and they will ride other cattle. A strong and often persistent desire to lick objects is present. There is an abundant flow of saliva. The animals do not eat and as a result become very weak and thin. Following this stage, paralysis sets in, affecting the hindquarters first. Soon the cattle are unable to rise. They may become unconscious and die rapidly, or struggle for a few days before dying.

In some cases of rabies, the excitement stage is absent or very short and goes unnoticed and only the paralytic stage is seen. Cattle usually stay away from the rest of the herd, are dull, yawn a good deal, shift

This article was prepared by Veterinarians in the CDA Health of Animals Branch.

and livestock

their feet and knuckle at the fetlocks; and their face and neck muscles twitch. They may strain considerably and arch their backs, urinate frequently, smack their lips and grind their teeth. Milk production drops suddenly, salivation is excessive and rumination ceases, causing bloating. As the animals are unable to swallow or close their mouths, they sometimes appear to be choking. They rapidly become thin, get weak in the hindquarters, stagger and go down. Death usually occurs 4 to 6 days after symptoms appear.

Horses: Symptoms of rabies in horses are similar to those described for cattle. In the initial stage of excitement horses stand with their ears erect, quite alert, and their eyes have a glassy stare. Their muscles often twitch and their eyes move quickly back and forth. Horses with rabies may get up and lie down frequently, roll and shake their heads. The site of the bite may be intensely irritated and they will lick and frequently chew it viciously. Violent spasms, which may be brought on by a noise, are common. Horses kick, rush and bite savagely at the manger, burying their teeth in the wood and sometimes breaking them. Later they may smash their stall to pieces and escape from the barn. Saliva flows copiously and the horses are extremely thirsty, grind their teeth frequently, suddenly snort loudly, and have difficulty in swallowing, with the result that food returns through their nostrils. They begin to move stiffly and jerkily; become quite vicious, rushing at other animals and biting; become quite thin; and have frequent convulsions, during one of which they may die.

In other cases, horses are dull and depressed. Muscles twitch, including those of the eye, which have a reddened, unnatural appearance. Breathing is labored and jerky, accompanied by snuffling sounds. The animals may press their heads against the manger or wall and grind their teeth. As the disease progresses, they knuckle over on their fetlocks, stagger and eventually go down. Horses become quite thin and the flow of saliva increases. They may bury their teeth in the ground or other objects and hang on. Convulsions set in, and gradually become more severe. Finally, paralysis and death occur 4 to 6 days after the onset of symptoms.

Sheep: The symptoms seen in sheep are similar to those in cattle. They hold their heads erect; their eyes are bright and rolling; they grind their teeth; give frequent loud hoarse bleats; have a desire to lick; are quarrelsome, running and butting others viciously, and occasionally biting; have increased sexual desire; have increased salivation; stop eating, becoming thin and weak; eventually stagger and fall; go into convulsions and die 2 to 5 days after symptoms appear. In some cases, the period of excitement is absent and sheep are found lying down, unable to get up, breathing heavily, with muscles and eyes twitching, and salivating profusely. They become quite thin, go into convulsions and soon die.

Swine: Swine affected with rabies frequently hide in bedding or other places and may, without any apparent reason, rush out in terror, grunting and squealing loudly, their eyes quite brilliant. They stop eating but will chew on wood and other objects. They may have increased salivation; "champ" their jaws; be extremely restless; and attack and bite savagely. Swine rapidly become paralyzed, with throat and hindquarters

affected first. They go into convulsions and die quickly, 1 to 6 days after symptoms appear.

HOW RABIES IS DIAGNOSED

Although the symptoms of rabies are fairly characteristic and a veterinarian may make a clinical or tentative diagnosis, a final diagnosis can be made only by laboratory examination of an animal's brain. It is therefore important that, when an animal has to be killed, it is NOT shot in the head.

TREATMENT

There is no treatment for rabies. The disease in farm animals is fatal.

HOW TO PREVENT RABIES

In areas where rabies exists, do not let your dogs and cats run loose. Dispose of all stray animals humanely. Have your dogs and cats vaccinated against rabies every year. This will protect most of them, although a small percentage may not receive full protection from vaccination. Consult your veterinarian about the vaccination of other pets and livestock.

As the reservoir of infection is wildlife, especially foxes and skunks, the populations of these animals should be controlled.

WHEN RABIES IS SUSPECTED

- Notify the Health of Animals Branch of the Canada Department of Agriculture as quickly as possible; or notify your local veterinarian, police, or agricultural representative. Under federal law, rabies is a reportable disease.
- When a person is bitten, call a doctor immediately. If a doctor is not available, thoroughly scrub all wounds to their full depth, for 15 to 20 minutes, using a strong soap and changing the wash water frequently. Then apply an antiseptic.
- When an animal is bitten, confine it away from people and other animals.
- Make every effort to capture or confine any suspect rabid animal in order to determine definitely whether or not it is rabid. Do not kill it unless it presents a further danger to human health or unless killing is necessary to prevent its escape.
- If an animal must be killed, as would be the case with wild animals, do NOT shoot it in the head, as the brain must be preserved, undamaged, for laboratory examination. Take precautions to prevent people and other animals from coming in contact with the carcass, saliva, blood and other body fluids. To preserve the head, keep it as cool as possible and in winter let it freeze.
- Wear heavy gloves if you must handle a suspect animal, or an animal that may have just been bitten by a suspect animal or objects which may have saliva from a suspect animal on them.
- Do not put your hands or fingers in any animal's mouth if it appears to be choking, as you could expose yourself to rabies if you have cuts or scratches on your hands.
- Do not touch, with your bare hands, wild animals that appear to be excessively tame or sick. Squirrels, chipmunks, gophers and bats often bite children when they try to feed them or pick them up.

RABIES AND YOUR PET

Rabid dogs and cats may exhibit many of the following symptoms, but not necessarily all of them.

IN THE DOG, the first symptom noticed is usually a change in its disposition. A normally friendly dog may become shy, hide in dark places, resent attention and snap when bothered. A normally shy or snarly dog may become unusually friendly. During this stage, a dog's voice becomes hoarse and its appetite diminished or perverted; it will eat sticks, stones or rubber.

Soon after this, the dog becomes very nervous and excitable. The expression of its eyes and face is a combination of alertness, fear and ferocity. This has been described as a 'fox-like' expression. During this stage, the dog may travel several miles, trotting along with its head and tail down, drooling saliva, and biting at anything and everything it meets. A dog that is tied or shut up will often chew at its chain or the bars of its cage, injuring teeth and mouth so that blood appears in its saliva. This period may last several days, and the dog will become thin because it is not eating.

In the third or paralytic stage the dog staggers; is soon unable to get up; and eventually becomes completely paralysed. Death follows unconsciousness or a violent convulsion, about 4 to 7 days after symptoms first appear.

IN THE CAT, the symptoms are much the same as in the dog. It becomes restless and moves about persistently in an erratic manner. It will not wander as far as a dog. Muscle spasms occur and are often brought on by sudden noise or excitement. During these spasms, the cat will jump about furiously and attack other animals and man.

In some cases, the period of excitability and viciousness is either absent or very short and often goes unnoticed. Paralysis usually starts in the throat, so that the animal is unable to bite or swallow, and saliva drools from its partly open mouth; it may appear as if it had a piece of bone stuck in its throat. It rapidly loses weight; paralysis develops quickly; and the animal dies shortly afterwards.

In areas where rabies exists, have your dogs and cats vaccinated against rabies every year. This will protect most of them, although a small percentage may not receive full protection from vaccination.

For other pets, such as rabbits, raccoons and hamsters, consult your veterinarian. Some rabies vaccines can be used safely only on certain animals.

DISTRICT VETERINARIAN BRANCH OFFICES

BUREAU DES VÉTÉRINAIRES RÉGIONAUX

British Columbia Colombie-Britannique	Room 801 1001 West Pender Street Vancouver 1, B.C.
Alberta	403 Public Building Calgary, Alta.
Saskatchewan	828 Motherwell Building Rose and Victoria Streets Regina, Sask.
Manitoba	613 Federal Building 260 Main Street Winnipeg, Man.
Ontario	Dominion Public Building 1979 Weston Road Weston, Ont.
Quebec	Room 715 400 Youville Square Montreal 1, Que.
Québec	400 Place D'Youville Pièce 715 Montréal (1re) (Québec)
Atlantic Provinces Provinces de l'Atlantique	424 Federal Building 1081 Main Street (Mail) P.O. Box 338 Moncton, N.B.

LA RAGE et les bestiaux

La rage est une maladie infectieuse causée par un virus qui atteint le système nerveux de tous les animaux à sang chaud, y compris les bestiaux et l'homme.

COMMENT LA RAGE SE PROPAGE-T-ELLE?

La rage se transmet généralement par la morsure d'un animal enragé. L'infection peut aussi se produire si la salive, le sang, le lait ou toute autre sécrétion d'un animal infecté pénètre par une coupure ou une égratignure. Les animaux mordeurs comme le putois, le renard, le loup, le coyote, le chat et le chien sont les plus actifs propagateurs de la maladie. Les animaux sauvages sont hardis, ne craignent ni l'homme ni les autres animaux et attaquent souvent les animaux domestiques dans les pâturages ou les étables.

COMBIEN DE TEMPS DURE L'INCUBATION DE LA RAGE?

Chez les animaux de ferme, les symptômes de rage peuvent se manifester dès le dizième jour qui suit la morsure, mais le plus souvent dans les trois à six semaines qui suivent. Chez le chien, cette période peut durer jusqu'à six mois. L'intervalle qui s'écoule entre l'infection et l'apparition des symptômes dépend de la

Cet article a été préparé par les vétérinaires de la Direction de l'hygiène vétérinaire du ministère de l'Agriculture du Canada.

LUTTE CONTRE LA RAGE

Dans les cliniques de la Direction de l'hygiène vétérinaire, du ministère de l'Agriculture du Canada, on a en 1966 vacciné 72000 chiens et chats.

C'est là une augmentation de 30500, sur le nombre d'animaux favoris immunisés en 1965.

La plupart des cliniques ont eu lieu dans 23 comtés en Ontario et dans le comté le plus infecté au Québec.

On a déclaré 1241 cas chez la faune et les animaux domestiques, soit 500 cas de moins que 1965. Ce nombre comprenait 966 cas en Ontario, 105 au Québec, 59 au Manitoba, 46 en Saskatchewan, un en Alberta, deux en Colombie-Britannique et deux dans les Territoires du Nord-Ouest. Au Nouveau-Brunswick, il y eut 60 cas, alors que jusqu'à l'an dernier on n'en avait déclaré qu'un seul.

On a trouvé 656 cas chez la faune surtout les renards et les mouffettes; 153 cas chez les chats et les chiens (240 en 1965); 432 cas chez les animaux de la ferme (630 en 1965).

sévérité de la morsure, des blessures et de leur distance au cerveau.

DE QUELLE FAÇON UN ANIMAL ENRAGÉ AGIT-IL?

Bovins: Les bovins infectés peuvent avoir une expression farouche, des yeux effarés par suite d'une excitation quelconque. À cet état succèdent des gestes violents, provoqués quelquefois par des objets se déplaçant devant les animaux atteints. Il n'est pas rare que les bovins émettent soudainement un beuglement anormal, terrifié; tirent vigoureusement sur leur attache; courent et sautent s'ils sont en liberté; frappent du pied et agitent vivement la queue; secouent violemment la tête; mordent tout objet ou tout animal à leur portée; mordent parfois leur mangeoire et s'endommagent la gueule. Il peut y avoir des périodes de calme alors qu'ils se tiennent debout tranquilles, la tête légèrement levée. On observe parfois des tressaillements aux muscles des oreilles, de la peau, de la queue, accompagnée de fréquents clignotements des paupières. Les animaux deviennent parfois agités, se frappent l'abdomen avec leurs pattes et cherchent à couvrir les autres bovins. Ils éprouvent un désir irrésistible et souvent persistant de lécher les objets. Il y a écoulement abondant de salive. Les animaux cessent de manger, maigrissent, deviennent très faibles et paralysent de l'arrière-train d'abord. Ils deviennent inconscients et meurent rapidement ou en quelques jours.

Dans certains cas, l'état d'excitation est absent ou très bref et passe inaperçu; seul le stade paralytique se manifeste. Les animaux se tiennent généralement à l'écart; ils sont déprimés, bâillent beaucoup, agitent leurs pieds; il y a tressaillement des muscles de la face et du cou. Ils se raidissent, s'arrondissent le dos, urinent fréquemment, font claquer leurs lèvres et grincent des dents. La production laitière diminue soudainement, l'émission de salive est excessive et la rumination cesse provoquant la météorisation (ballonnement). Les animaux ne peuvent ni avaler ni fermer la gueule; ils ont parfois l'air d'étouffer. Ils maigrissent à vue d'œil, s'affaiblissent du train de derrière, chancèlent, tombent et meurent généralement 4 à 6 jours après l'apparition des symptômes.

Chevaux: Les chevaux atteints présentent à peu près les mêmes symptômes que les bovins. Au stade initial, les chevaux se tiennent debout, plutôt éveillés, le regard vitreux, les oreilles dressées; ils tressaillent souvent et leur regard se déplace vivement; ils se lèvent et se couchent fréquemment, se roulent et secouent la tête. Le lieu de la morsure s'irrite parfois de façon intense, de sorte que l'animal lèche et mord la plaie. Des spasmes violents, causés par un bruit quelconque, ne sont pas rares. Les chevaux ruent, se démènent et mordent rageusement leur mangeoire, s'enfoncent les dents dans le bois et les cassent parfois. Ils mettent parfois leur stalle en pièces et s'évadent. Ils bavent, ont une soif inextinguible, grincent fréquemment des dents, renâclent soudainement avec force, et éprouvent de la difficulté à avaler, de sorte que les aliments reviennent par les narines. Bientôt ils se déplacent avec raideur et par à-coups; ils se ruent sur les autres animaux et les mordent; ils s'émacient et ont des convulsions fréquentes, au cours desquelles ils peuvent mourir.

Dans d'autres cas, les chevaux sont déprimés et abattus. Leurs muscles tressaillent; les yeux rougissent et prennent une apparence anormale. Les animaux respirent difficilement; ils pressent leur tête contre la mangeoire ou le mur, grincent des dents, trébuchent, chancèlent et tombent. Les chevaux s'émacient et l'écoulement de salive s'accroît. Parfois ils s'enfoncent les dents dans le sol ou dans d'autres objets et s'y cramponnent. Les convulsions commencent, la paralysie apparaît et la mort survient 4 à 6 jours après le début des symptômes.

Moutons: Ils se tiennent la tête haute; leurs yeux brillent et roulent dans leur orbite. Les animaux grincent des dents, font entendre fréquemment des bêlements rauques et forts, sont portés à lécher, deviennent querelleurs, courent et attaquent les autres avec méchanceté, les mordant occasionnellement; il

y a hypersalivation et l'instinct génésique devient plus marqué; les moutons cessent de manger, maigrissent et s'affaiblissent; puis ils chancèlent, tombent, subissent des convulsions et meurent 2 à 5 jours après l'apparition des symptômes. Dans certains cas, la période d'excitation est absente; on trouve les moutons couchés, incapables de se lever, respirant avec difficulté; il y a tressaillement des muscles et des yeux et salivation abondante. Ils maigrissent, subissent des convulsions et meurent bientôt.

Porcs: Les porcs atteints de rage se cachent souvent dans la litière ou ailleurs et parfois, sans raison apparente, en sortent tout effrayés, les yeux très brillants, puis grognent et crient éperdument. Ils cessent de manger, mais rongent le bois et les autres objets. Leur salivation peut être excessive; ils claquent leurs lèvres; peuvent devenir extrêmement agités, attaquer et mordre sauvagement. Les porcs deviennent vite paralysés, la gorge et l'arrière-train étant les premiers atteints. Ils subissent des convulsions et meurent rapidement, de 1 à 6 jours après l'apparition des symptômes.

COMMENT DIAGNOSTIQUER LA RAGE

Un vétérinaire peut poser un diagnostic clinique ou provisoire mais le diagnostic définitif ne peut être établi que par l'examen en laboratoire de la cervelle de l'animal. Il importe donc, lorsqu'un animal doit être tué, de ne pas le tirer dans la tête.

TRAITEMENT

Il n'existe aucun traitement contre la rage. Chez les animaux de la ferme, la maladie est mortelle.

COMMENT PRÉVENIR LA PROPAGATION DE LA RAGE

Dans les régions où la rage existe, ne pas laisser les chiens et les chats en liberté. Détruire sans cruauté tous les animaux errants. Une fois par année, faire vacciner les chiens et les chats contre la rage. De cette façon, la plupart d'entre eux sont protégés, bien que quelques-uns ne soient peut-être pas complètement immunisés par le vaccin. Consulter le vétérinaire au sujet de la vaccination des autres animaux et des animaux favoris.

Puisque la source d'infection de la rage se trouve dans la faune sauvage, surtout les renards et les moufettes, il est nécessaire d'en régir la population.

SI L'ON SOUPÇONNE LA PRÉSENCE DE LA RAGE

- Avertir le plus tôt possible la Direction de l'hygiène vétérinaire ou, le vétérinaire de l'endroit, la police, ou l'agronome. En vertu de la Loi fédérale, la rage est une maladie qu'il faut signaler.
- Si quelqu'un est mordu par un animal, appeler le médecin immédiatement; laver les plaies jusqu'au fond pendant 15 ou 20 minutes; utiliser à cette fin un savon fort et changer l'eau fréquemment. Appliquer ensuite un antiseptique.
- Si un animal est mordu, l'isoler.
- Prendre tous les moyens possibles pour capturer ou renfermer tout animal soupçonné de rage. Il ne faut le tuer que si cela est nécessaire pour l'empêcher de fuir ou s'il présente un danger pour la santé publique.
- Quand il est nécessaire de tuer un animal, ne pas le tirer dans la tête, car la cervelle doit être conservée intacte en vue de l'examen en laboratoire. Il faut empêcher les gens et les autres animaux de venir en contact avec la carcasse, la salive, le sang ou autres humeurs. Conserver la tête au frais; la faire geler en hiver.
- Porter des gants épais lorsqu'on doit manipuler un animal soupçonné d'être atteint de la rage, un animal qui vient d'être mordu par un animal douteux, ou des objets portant de la bave d'un tel animal.
- Ne jamais mettre les doigts ni la main dans la gueule d'un animal qui semble s'étouffer, car on s'exposerait à l'infection rabique si l'on a des coupures ou des égratignures à la main.
- Ne pas toucher avec des mains nues à des animaux sauvages qui ont l'air malades ou tout à fait apprivoisés. Les écureuils, les tamias (suisses), les marmottes et les chauves-souris mordent souvent les enfants qui leur donnent à manger ou les prennent dans leurs mains.

Mature cow is stiff, shows oedema and starving almost to death despite adequate supply of feed

COPPER AND SELENIUM SUPPLEMENTS FOR CATTLE

J. L. MASON AND J. E. MILTIMORE

At the CDA Research Station, Summerland, B.C., we have been studying the problem of ill-thrift in cattle pastured on poorly drained soils in the British Columbia Interior, and have clearly established that animals will respond to copper supplementation. We found that injections of copper increased animal growth rates by 0.3 lb. per day, while injections of selenium plus Vitamin E gave comparable increased growth rates on one ranch but did not influence rates on others.

We undertook this study because many cattlemen in the Interior were concerned about the unthriftiness of all or some individuals in their herds. We learned that they had comparable breeding lines to those of their neighbors whose cattle made better gains. But, occasionally, the situation becomes so acute that rather obvious symptoms of unthriftiness occur. Usually only beef cattle are affected, although young dairy stock have also shown the symptoms.

SYMPTOMS

Extreme laxation is a frequent symptom, with the tails and rear quarters of animals being splattered with manure; extreme thinness, in spite of adequate feeding, is typical; and bleaching of the hair coat is perhaps the most dramatic sign. We have observed red-colored animals, such as Herefords, whose coats have faded to a light shade of orange, with shoulder hair later turning a creamy white color and, in extreme cases, spreading throughout the entire red part of the coat. We have noticed that all of these symptoms sometimes occur in one animal although usually just one or two symptoms are seen in an individual. Moreover, no matter how seriously affected some animals have been, there have always been some in the herd that showed no symptoms and were in good flesh. However, it is likely that even the animals without symptoms were making poorer gains than normal animals.

CONFINED TO LOW LANDS

Our study showed that the problem seems to occur whenever cattle are confined to forage grown on poorly drained soils. These soils may be either of organic or mineral composition. We discovered, too, that it is quite customary for animals to recover spontaneously when their diet is changed to forage from upland soils. Accordingly, we noticed that, on some ranches,

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Yearling showing laxation, emaciation and slight depigmentation while grazing on abundant pasture.

Appearance of yearling one year after being given copper supplement. Hair color is normal and animal is both alert and fat

the symptoms appeared in both summer and winter, but, on others, in either summer or winter.

FORAGE SPECIES

Our research also revealed that a change in the stand from predominantly grass to legume pasture can bring on a severe outbreak. We found that the copper deficiency was often induced by high molybdenum contents and legumes were higher in molybdenum than grasses. We also noticed that symptoms tended to disappear when the pasture became more mature, and sometimes, if pasture was not grazed but cut for hay, the cattle showed no symptoms.

In our trials with beef cattle pastured on poorly drained soils (tests cover a 3-year period over an extended geographic area), we found a consistent response to copper injections. This response amounted to around 0.3 lb. gain in animal weight per day, but when we gave selenium plus Vitamin E injections in addition to copper, no further benefit resulted. However, our experiments showed that selenium plus Vitamin E alone increased gains in one herd but in other herds the response was nil.

CAUSES VARY WIDELY

Our research revealed that causes of ill-thrift vary widely. In some herds the problem seems to stem from a simple copper deficiency. We discovered copper levels in the forage as low as 1 part per million. In other herds, the condition occurs even though there is adequate copper in the forage. In these herds, the problem is caused by a high content of molybdenum in the forage which interferes with copper utilization. In still other herds, the forage has adequate copper and does not have a toxic amount of molybdenum. But this forage contains sufficient sulphur to activate molybdenum so that it interferes with copper utilization. A fourth complication occurs where the copper content is high enough to be safe, molybdenum and sulphur are not present at toxic levels, but manganese is present at high levels. For example, in one forage sample, we found a manganese content of 229 parts per million. This amount of manganese is much higher than the required amount for normal animal health and, in view of the interactions with copper, molybdenum, sulphur, it is likely that manganese is quite toxic on some ranches.

In this study we have clearly established that animals showing this condition will respond to copper supplementation. Analyses of hay and pasture indicate that different amounts of copper will be required in different geographic areas. We are currently studying the relationships of soil to the hay and pasture in order to define the different problem areas. It will then be necessary to substantiate the probable response to copper supplementation with tests using cattle.

lilacs for prairie

W. A. CUMMING

"Come down to Morden in lilac time", to paraphrase the words of a well known song, for Morden can easily rival Kew at lilac blossom time. Three hundred and twenty-two species and cultivars, plus a goodly number of crossbred seedlings selected at Morden, are presently being evaluated in the arboretum of this Experimental Farm located in southern Manitoba.

Lilacs are probably the most widely grown and most satisfactory hardy flowering shrubs for the prairie provinces of Canada. They thrive well on our high lime soils and bloom profusely. Their dark green, handsome foliage and dense growth make them admirable subjects for screens, natural and trimmed hedges and specimen plants. Almost without exception, their leaves stay green late into the fall and make a good contrast with brightly colored autumn foliage of many of our trees and shrubs.

By far the largest group of named cultivars belong to the Common lilac, *Syringa vulgaris*. They are often referred to as the French hybrids because the Lemoines, father and son, working in France at the turn of the century, bred, selected and introduced over 200 varieties many of which are, today, top-ranking lilacs. In fact, of the top 100 varieties recommended by the American Association of Botanical Gardens and Arboretums in 1953, seventy-five were Lemoine introductions. All of these are growing in the Morden arboretum. Lemoine also introduced the Early hybrids which were from crosses of the northern Chinese species *Syringa oblata* and its botanical variety *giraldii*. Most of these Early hybrids of Lemoine's lack hardiness under our conditions, but later introductions of this series from the United States such as 'Charm' and 'Esther Staley' rate highly at Morden.

Canadian plant breeders, by their ingenuity in breeding new hybrid species, are playing an important and increasing role in the development of new lilac cultivars.

Dr. Frank L. Skinner of Dropmore, Manitoba, used the Korean *Syringa oblata dilatata* in crosses with Common lilac varieties, and as a result has produced a new race of hardy, early flowering lilac cultivars of excellent quality. These American hybrids, as Dr. Skinner has designated them, are gaining a world-wide reputation and much more will be heard of them in the future. Nineteen of these cultivars are in the Morden collection. 'Evangeline', a double-flowered magenta, is always the first herald of the lilac season at Morden followed closely by 'Assessippi', single lilac in color, 'Pocahontas', single purple and 'Sister Justina' a single pure white, probably the best single white lilac in existence. 'Gertrude Leslie', named for the wife of a former Superintendent of Morden Experimental Farm, is a double-flowered white of high quality and 'Swarthmore', a double-flowered lilac in color, which never fails to bloom, are two other outstanding cultivars of this early flowering group. Among the new accessions, 'Mount Baker', 'Chas. Nordine' and 'Daphne Pink' were outstanding in 1966. The foliage of most of these hybrids turns purple in the autumn in contrast to other groups mentioned here which remain green.

The late Miss Isabella Preston, who was responsible for the breeding and introduction of many varieties of ornamental plants from the Central Experimental Farm at Ottawa, has her name perpetuated in a race of late flowering hybrid lilacs. *Syringa Prestoniae*, which she bred and introduced, was described by Mrs. S. D. McKelvey of the Arnold Arboretum at Harvard University. The Preston hybrids follow the Common

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canada

The late blooming Amur lilac

The American hybrid lilac 'Sister Justina' among the finest white lilacs

lilacs in season of bloom and are mostly hybrids of *S. villosa* × *S. reflexa*. Only a few of the nearly one hundred varieties which Miss Preston named are available to-day, outside of arboretums. From open-pollinated seedlings of Miss Preston's first-named varieties of *Syringa Prestoniae*, the Morden Experimental Farm introduced the variety 'Coral' in 1936. At approximately the same time, 'Royalty' and 'Redwine' from an open-pollinated seedling of another late-flowering hybrid of Miss Preston's, *S. Josikaea* × *S. reflexa*, were introduced from Morden. This complex was later described by her as the hybrid species *S. josiflexa*.

These three, 'Coral', 'Redwine' and 'Royalty', along with Dr. Skinner's *S. Prestoniae* 'Donald Wyman' are the most popular varieties in the Late flowering group. Actually, Dr. Skinner made the same cross at about the same time as Miss Preston. At Morden, we have further complicated the pedigree of this series by crossing the cultivars 'Redwine' with 'Donald Wyman' with very good results. A selection from this cross, a bright pink, will be named soon. There are, as well, in this cross, some very good selections which bloom a week to ten days later than any of the named varieties of Late flowering lilacs. The late Dr. Yeager of the University of New Hampshire, named a number of new cultivars from open-pollinated seedlings of Morden's 'Royalty' among which 'James MacFarlane' seems to be gaining in popularity in the United States.

Among other species which usually perform well at Morden are—*S. chinensis* and its varieties, *S. Josikaea*, *S. laciniata*, *S. Meyeri* (a dwarf small leafed, very useful species variously listed as *S. palibiniana* and *S. microphylla* 'Minor'), *S. pekinensis*, *S. persica*, *S. pubescens*, *S. Skinneri*, *S. velutina* and *S. villosa*.

The Amur lilac, *Syringa amurensis*, and its botanical variety the Japanese tree lilac, *S. amurensis japonica*, are the latest hardy lilacs to bloom. Amur lilac grows to about 15 feet in height, roundish in outline, with good dense foliage and its large spikes of creamy white small blooms are borne profusely. Japanese tree lilac is very similar, more upright in habit and taller, growing 20–25 feet. It can be trimmed to a single or multiple-stemmed small tree or left to grow naturally into a large shrub. Crosses with these two lilacs and others with colored flowers have been attempted at Morden and in several other locations, so far without success. Unfortunately these two fine lilacs are subject to chlorosis when the soil begins to approach a pH of 8 or better.

Except for the odd second crop of blossom on such species as *S. Meyeri* and *S. microphylla*, the five to six week lilac season starts with 'Evangeline', in mid-May. It ends with the blooming of Japanese tree lilac.

P. PANKIW AND C. R. ELLIOTT

LEGUME POLLINATION

What factors determine the seed yield of a field of clover? The primary factor is the total amount of bloom which is a product of the duration and intensity of bloom at one time. This intensity of bloom or numbers of flowers available for pollination determines the pollinator requirements (Table 1). In our investigations at the CDA Research Station, Beaverlodge, Alta., we found that sweet clover had the highest requirements for bees, followed by red and alsike clover.

Clover, trefoil or alfalfa will not produce good seeds crops unless they have been cross pollinated by bees (Table 2). Our results at Beaverlodge indicate that honey bees, if provided in sufficient numbers, will adequately pollinate sweet clover, alsike clover, white clover, birdsfoot trefoil and diploid red clover. Alfalfa, however, depends on wild bees for pollination as honey bees will only trip alfalfa under forced conditions. Also, results with the imported leaf-cutter bee, *Megachile rotundata* in southern regions are very encouraging, while domiciling of bumble bees for tetraploid red clover pollination may also become practical.

WEATHER PLAYS ROLE

Weather determines the activity of pollinators, production of nectar for attraction of bees and the period from pollination to seed maturity. In our studies we have found that bees, in good weather, fly from 7:00 a.m. to 10:00 p.m., although 8 hours a day is more common, that honey bees do not fly during rainy weather and very little at temperatures below 65°F, that bee flight is also restricted by winds over 10 m.p.h. where bee yards are not protected by windbreaks, and that warm, dry days with good soil moisture are excellent for the production of nectar with a high sugar concentration. We have also discovered that there is some compensation in loss of bee activity during inclement weather in that a floret, once opened, can remain so for 4-5 days in cool weather and still set seed on cross-pollination. However, the accumulation of unpollinated florets require a greater number of bees for pollination than if the weather had been favorable. The time of ripening of the seed crop is influenced by the period of effective pollination. In our investigations, we found that it normally takes alsike clover and red clover 4 weeks and sweet clover 5 weeks to mature after pollination, but in excessively cool, cloudy weather this period

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TABLE 1—NUMBERS OF FLORETS (APPROXIMATE) OF ALSIKE CLOVER, RED CLOVER AND SWEET CLOVER AVAILABLE FOR POLLINATION AT DIFFERENT DATES. BEAVERLODGE, ALTA.

	Number of florets (in millions) per acre				
	July 15	July 23	July 31	Aug. 7	Aug. 14
Aurora alsike clover	5	28	22	10	
Erector sweet clover		30	100	120	70
Altaswede red clover		10	50	20	5

POLLINATION SERVICE: WHEN IS IT PROFITABLE FOR BEEKEEPER AND SEED GROWER?

What about honey production at the recommended rates of pollinators as reported in the accompanying article? This is an important consideration as the beekeeper is also interested in an economic return from his colonies. According to studies made at the CDA Research Station, Beaverlodge, Alta., a legume floret secretes nectar more or less uniformly for 4 to 5 days after opening. As soon as a floret is pollinated, whether it is 1 or 5 days old, nectar production stops and any nectar that is not collected by bees or other insects is absorbed by the plant. Maximum efficiency in honey production is obtained when bees visit only the older florets which have the most nectar. This condition exists where a colony of bees has 4 or more acres of clovers to forage. However, seed production at this population of bees is low and unprofitable. As the bee population is gradually increased to the recommended rates, the bees are forced to visit younger florets with less nectar and more florets are visited by each bee to make up a nectar load. Also, with increased bee density per acre, florets are often visited by 2 or more bees. This ensures better seed setting but greatly reduces honey production. At rates of 1 colony per acre on such crops as alsike clover, trefoil and red clover, honey production may become uneconomical.

Where high priced seed is being grown, the seed grower would find it profitable to pay for the pollination service provided by the beekeeper and he should consider these costs as part of his overhead. Contract arrangements between seed growers and beekeepers may be based on either a fixed rate per colony, a portion of the seed produced or compensation for lower honey yields while performing this pollination service.

TABLE 2—LEGUME SEED YIELDS AND POLLINATOR POPULATIONS FOR LEGUMES GROWN IN 3-FOOT ROWS. (AVERAGE OF 4 YEARS.) BEAVERLODGE, ALTA.

	Seed yields (lb. per acre)			Average bees per acre	
				Open field	
Crop and Variety	No. bees in cages	Honey bees in cages	Open field ½ to 1 col/ of honey bees/acre plus wild bees	Honey bees	Bumble bees
ALSIKE CLOVER					
Commercial	30	380	300	1450	50
Tetra (tetraploid)	7	340	315	1450	50
RED CLOVER					
Ulva (tetraploid)	6	240	145	970	970
Altaswede	25	390	330	530	440
LaSalle	14	170	140	190	150
TREFOIL					
Viking (poor stands)	5	185	125	1450	25
SWEET CLOVER					
Arctic	110	705	840	4100	200
Cumino	80	640	615	3970	100
Ereter	11	545	520	2760	100
ALFALFA					
Vernal	10	454	80	2850	10

Honey bees are essential for economic seed production; the grower cannot depend on wild pollinators alone.

may be increased by as much as 1-2 weeks. However, as our killing fall frosts at Beaverlodge (28°F. or lower) may come in the first week of September, pollination after the first week in August does not produce mature, viable seed.

VISITATION RATE IMPORTANT

The rate of visitation is another important factor. Our research has revealed that this varies somewhat with the amount of nectar available and the concentration of bees. For example, in our studies, one comparative day's observation indicated that honey bees visit sweet clover at the rate of 30 florets per minute, alsike clover at 20 and red clover at 12 florets per minute. Thus the larger amount of sweet clover bloom is partly compensated for by the higher visitation rate.

MANAGEMENT PROBLEM

A problem in managing honey bees for pollination is their diverse preference for the different crops. Based

on an index of: $\frac{\text{number of florets,}}{\text{visitation rate}}$ we found that honey bees prefer alsike clover, sweet clover, trefoil and alfalfa equally well whereas red clover is less liked mostly because the nectar is more difficult to obtain. In a comparison of 3 crops in full bloom in mid-July, we discovered that the average number of bees on Arctic sweet clover was 3200 per acre, on Tetra alsike clover 1600 and Altaswede red clover 1000 bees per acre. Taking into account the visitation rates and an 8-hour-flight day, we calculated that these bees visited 46 million sweet clover flowers, 15 million alsike clover flowers and 6 million red clover flowers. If each flower visited produced mature seed, this could have produced 230 pounds of sweet clover, 50 of alsike clover and 22 pounds of red clover. Thus, to increase seed setting of the less preferred red clover, the number of colonies would have to be increased or the crop grown in isolation. Bumble bees (Table 2) prefer red clover, and alfalfa is least liked when competing crops are available. This points out the need of growing alfalfa in isolated areas, particularly where alfalfa is dependent on bumble bees for pollination.

RESEARCH RESULTS

Our research at Beaverlodge (Table 2) shows that one-half to three-quarters of a colony of honey bees per acre on large acreages are sufficient for alsike clover, trefoil and white clover pollination. The yield of caged areas with bees indicates the potential of the crop as the bees were forced to pollinate the crop. For sweet clover, one colony per acre is required to pollinate the larger number of flowers available. For red clover, which has the lowest honey bee preference and a lower rate of visitation, at least one colony per acre is required, and it is preferable to have other competing crops at a minimum. ✡

Fig. 1—Field plots showing cages and pollination counting areas

Fig. 2—A field of Altaswede red clover which produced 450 lb. of seed per acre

ERRATUM NOTE

On the map on page 12 of CANADA AGRICULTURE (Winter, '67), a figure of '10%' appears twice as applying to the four Atlantic Provinces. It should have been shown only once. We regret this oversight.

OPALESCENT APPLE JUICE CONCENTRATE

A. W. MOYLS

Opalescent or natural apple juice accounts for approximately one-third of the British Columbia apple juice pack. From the standpoint of economics and consumer convenience, a concentrated product appears to be a logical development. The present investigation was initiated by the Fruit and Vegetable Laboratory, CDA Research Station, Summerland, B.C., to obtain information regarding processing, quality and storage life of opalescent apple juice concentrates. Three types were produced: regular, depectinized "full bodied" and depectinized "cloudy". We limited our tests to McIntosh and Delicious but the process developed should be suitable for other varieties as well.

Essentially, the process consists of first preparing a single strength opalescent apple juice. To ensure a light colored juice, ascorbic acid is mixed with the pomace (crushed apple) prior to pressing. Depending upon the type of concentrate desired, a pectin-hydrolyzing enzyme may or may not be added. The remainder of the process consists of stripping the flavor components from the juice and concentrating these components and stripped juice separately. To prevent darkening, a low temperature vacuum concentration process is employed. Concentrate and essence are recombined, canned and frozen.

The first of the three types developed, regular opalescent apple juice concentrate, is a 4½-fold product. It contains the natural pectin present in the fruit. Since this pectin is not removed or destroyed, concentration must cease at a sugar solids concentration of about 50% or an apple jelly will result. On reconstitution, this product is very similar to good quality, single strength, opalescent apple juice. It is light yellow-white in color and full flavored.

In the second and third types, pectin is destroyed by enzyme action prior to concentration. They are classed as "depectinized" and may be either "full bodied" or "cloudy". These products can be concentrated to 70% soluble solids (6-fold) or higher without fear of gel formation.

When the "full bodied" product is diluted back to single strength, sedimentation will occur. This is not serious if the juice is to be consumed immediately or if it is dispensed from a fruit drink cooler where it is being constantly agitated.

In preparing the "cloudy" product, the juice is siphoned off the settled residue after enzyme treatment and then concentrated. As a result, there is little or no settling out in the reconstituted product. This product has less body than conventional opalescent juice and is very suitable for blending with other fruit juices where a light attractive color is desired.

With any opalescent concentrate, one must pay strict attention to processing and storage temperatures. This is essential in order to obtain a high quality product. High temperatures, especially during concentration, result in a dark unattractive product. For this reason we have found that processing must be under vacuum at a temperature below 120°F. In addition, in order to obtain a satisfactory shelf life, the concentrate must be frozen stored. These products are not as stable as single strength opalescent apple juice. However, at 0°F or lower, changes in color and quality are negligible for periods up to 12 months' storage.

The author is a specialist in fruit and vegetable processing at the CDA Research Station, Summerland, B.C.

Essence recovery unit for concentrating apple juice volatiles

POTENTIAL THREAT TO ALFALFA PRODUCTION IN CANADA ...

DR. C.C. CHI

In a study at the CDA Research Station, Ottawa, we are investigating a highly destructive root-rot disease of alfalfa caused by *Phytophthora megasperma* which was found on this crop in the Ottawa Valley in 1964, 1965 and 1966. The disease manifests itself as a soft, spongy rot of the root and crown of alfalfa, especially in the early stage of growth.

Phytophthora megasperma looms as a potential threat to our alfalfa farms in eastern Canada. Its importance may have been overlooked in western Canada because of the difficulty of isolation in the presence of and with the mixed effect of *Pythium* and *Fusarium*. In our study, we found that the tops of infected plants became bleached and withered. This fungus incited a pre- and post-emergence damping off. Some infected embryos were reduced to a brown gelatinous mass while within the seed coat, or the radicle and cotyledons became brown and softened outside the seed coat.

In studying the potential of this disease, we compared the pathogenicity of Canadian and American isolates which were all obtained from alfalfa. The pathogenicity tests revealed that Canadian isolates of *Phytophthora* were highly pathogenic to Du Puits, Ranger, Rhizoma, and Vernal varieties of alfalfa. The percentage of seed emergence was greatly reduced and a high percentage of post-emergent damping-off was recorded. We found that all inoculated seedlings showed a high degree of infection. In this study, we noted that the inoculated seedlings collapsed, beginning on the third day and, at the end of four weeks, all infected seedlings were dead. Our control plants remained healthy, with only a slight discoloration on the roots in some cases. The wilted plants had a reddish-brown to dark brown necrotic area, stringy in appearance, which extended below the crown and encircled the root. Host tissues were soft and water-soaked and the roots were easily separated from the top.

We also noted that the affected areas on older plants were similar to the seedling infection. The lesions were red to brown in color with a yellow, diffuse discoloration extending above and below them on the tap roots.

In our four-year survey, 1962-65, it was revealed that many fungi have been associated with diseased crown and roots of alfalfa and have been responsible for deterioration and poor persistence in stands. *Phytophthora* was the most virulent pathogen in the group. This study is continuing.

Dr. Chi is plant pathologist with the Forage Crops Section, CDA Research Station, Ottawa, Ont.

Fig. 1—Alfalfa plant (left) showing the symptoms of bacterial wilt. Healthy plant (right)

Fig. 2—The spring black stem disease (left) of alfalfa, and (right) summer black stem

PUBLICATIONS

Copies of these, and a list of other publications may be obtained free of charge (unless otherwise stated) from: Information Division, Canada Department of Agriculture, Ottawa.

On peut obtenir gratuitement (à moins d'avis contraire) des exemplaires de ces publications ainsi qu'une liste d'autres publications à: la Division de l'information, ministère de l'Agriculture du Canada, Ottawa.

1298 CONTROL OF ANTS 12 pp. Ants damage lawns, wooden beams, food and clothing. Recommended control measures for all situations.

1298 RÉPRESSION DES FOURMIS. 12 pp. Suggestions permettant de réprimer ces ennemis des pelouses, charpentes de bois, aliments et vêtements.

1250 SUPPLEMENTARY FORAGE CROPS FOR THE MARITIME PROVINCES 16 pp. When hay and pasture are in short supply, annual crops are productive and inexpensive.

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1182 PLANNING YOUR GARDEN 44 pp. Tree hedge and flower arrangement can improve the appearance of your home grounds. Available only from Queen's Printer. $1.00.

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CANADA AGRICULTURE