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Strict import controls protect this chick from contacting Newcastle disease. See story on page 20.

De strictes mesures d'importation protègent ce poulet de la maladie de Newcastle. Voir texte en page 20.

CANADA AGRICULTURE

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Contributors may submit articles in either English or French to the Secretary, Editorial Board, Information Division, Canada Department of Agriculture, Ottawa.

La revue trimestrielle *CANADA AGRICULTURE* renseigne les vulgarisateurs et représentants du négoce agricole sur les développements de la recherche et des autres services agricoles du gouvernement fédéral.

Les articles en anglais ou en français doivent être adressés au secrétaire du Comité de rédaction, Division de l'information, ministère de l'Agriculture du Canada, Ottawa.

Agriculture Canada

NATIONAL MARKETING BOARDS
WHY AND WHY NOT?

GEOFFREY HISCOCKS

D'après l'auteur, l'office de commercialisation est un organisme global et coercitif de mise en marché des produits naturels primaires et transformés. Il fonctionne en vertu de pouvoirs délégués par le gouvernement. Les offices de commercialisation permettent aux agriculteurs d'accroître leur pouvoir de négociation et, de ce fait, les aident à régler leurs problèmes de mise en marché. Toutefois, l'auteur note qu'il peut être dangereux pour l'économie de doter un secteur de pouvoirs monopolistes.

A marketing board can be defined as a compulsory, horizontal marketing organization for primary and processed natural products operating under authority delegated by the Government. The compulsory feature means that a significant proportion of farms producing a given product (there are always exclusions) in a specified region are compelled by law to adhere to the regulations of a marketing plan. Marketing boards generally function in a horizontal fashion because they cover the output of farms participating in the particular marketing scheme, and they aggregate the supply at the first point of sale—they seldom operate vertically through the whole food system to the consumer.

Government authority through legislation is essential to achieve the required compulsion. The power of the boards utilizing this authority is generally wide enough to affect the form, time and place of marketing and, directly or indirectly, the price. It is clear that this is a powerful and far-reaching type of market organization and that society takes a very significant step when it gives these powers to one group in the economy. However, the range of activities is far wider than any existing marketing board has undertaken and it is unlikely that any board will adopt all of them.[1]

Organizations of the producers with powers to regulate the marketing of a product nationally are set up under the Farm Products Marketing Agencies Act. A national board has been set up for eggs (Canadian Egg Marketing Agency), and another for turkeys (Canadian Turkey Marketing Agency). A national board for broilers is presently under discussion. While these national boards have supply management powers, it is not necessary for a national board to have such extensive authority in order to fulfill a useful national role. For example, a national board could have solely an export role or operate a national teletype marketing system—in both cases, with no quota powers whatsoever. There are two other organizations that may be regarded as national boards—the Canadian Wheat Board and the Canadian Dairy Commission. However, these are not really marketing boards because they are not directly organizations of producers.

Background

Marketing Boards can be defined as follows, in terms of their objectives:

- To maintain or increase the income of the producers of a particular product.
- To stabilize income from the sales of the product.

Dr. Hiscocks is Director of the Policy Advisory Group, Economics Branch, CDA, Ottawa.

[1]Bennett, T. A., 1973. Toward an Expanding Aggressive Agriculture—The Challenge for Marketing Boards. Canadian Farm Economics. Vol. 8, No. 1: 14-18.

• To standardize, for all producers, the terms of sale of the product. In a wider context, this tends to equalize market opportunities to market returns between different producers.
National Boards have the additional advantage of reducing the interprovincial problems.

Why do producers need this powerful type of organization to achieve their objectives? To answer this question we must review certain features of the Canadian agriculture and food industry. Stated factually, these features are:

- Large variability of farm production annually and seasonally.
- Price inelasticity of foods at any given time.
- Steady increases in agricultural production over time.
- Slow rate of increase in total food consumption in Canada.
- Large number of producers who lack market influence.
- Small number of buyers and suppliers of inputs—both with considerable market influence.
- High farming ability and low marketing involvement.
- Decreasing share of consumers' dollars going to farmers.
- Pressure of processors and retailers on farm prices.
- Impact of non-Canadian supplies on prices.
- Regional production variations.
- Impact of agricultural policies of other countries.

Farm production cannot be controlled like factory production—the supply varies and in a freely operating situation it does not necessarily balance with demand in the short term. Nor can demand, in general, be stimulated like many other consumer items through price and advertising. Furthermore, much of the production of farms is seasonal with special storage and seasonal price requirements. Because of the biological nature of farm production, cyclical production situations occur. As production areas are not close to consumption areas, good transport arrangements are vital. The presence or absence of barriers to import and export trade have effects. Superimposed on all this is the continual technological advance in production, processing and handling, and growth of incomes in Canada. Farmers want their share of this income growth based on their own expert ability to improve productivity.

Thus, the marketing of farm produce is full of production and price problems which put severe pressure on the farmer. Individually, however, he lacks the strength to influence the market. On the other hand, most of his suppliers and buyers of his products are powerful regional, national or international organizations with considerable market influence. Marketing boards provide a means to return some of the control of farming to farmers and to redress the balance of unequal farmer bargaining power.

Disadvantages

In addition to the positive aspects of marketing boards, there are also negative features. These are modified, however, by the offset of imports and the substitutability and interchangeability of most foods by consumers.

- They are monopolies, and aside from any emotional aspects, there are good economic arguments based on efficiency criteria and optimum resource allocation to suggest that free competition is preferable to monopoly.
- They give this monopoly power to one special sector interest. In other words, the constitution of a national board can be such that farmers have complete control and no other interest group in the food business, i.e. processor, wholesaler, retailer, or consumer can have either the equal power or a say in the use of the monopoly powers of the board. But this dominant farmer position does not have to exist and the influence of other interest groups can be very significant. In any case, the National Farm Products Marketing Agencies Act confines supply control to poultry and eggs.
- Because foods are price inelastic, boards can keep raising prices well above production costs in an uncontrolled, profiteering fashion—a specific feature of monopoly but important enough to list separately. In practice, this ability is severely limited by imports and consumers switch to alternative foods.
- Once given such wide authority, boards tend to want to, and be thought of, as solving all problems for that commodity.
- These powers are seldom given to industry—but other sectors of the economy, such as labor and the professions, do have them.

The International Problem

Canada has traditionally been a trading nation and agriculture has been a very significant exporting industry. Moreover, since the end of World War II, successive international trade negotiations have led to easier access to the Canadian market for imports. In the agricultural and food sector the trade barriers are now the lowest in the world. The result is Canadian consumers have a wide choice of some of the lowest priced food supplies available. However, the same policy subjects producers to the cold draughts of low-priced imports, often as a result of surplus production and frequently assisted with export subsidies. Continuity of production within Canada can be in jeopardy under these conditions.

By keeping the national borders under review at all times, governments have a safeguard on marketing board activities. This ensures that the board does not push prices too high, and that producers remain competitive and efficient. However, while international prices are one of the best and most practical measures of efficiency we have available. it does not follow that every international price, every day and

every year, is the direct result of efficient production. Frequently, the price is the result of a local or international market situation—a temporary glut, a closing off of another market, an extra large crop, or a misjudgment of demand. Farmers should not have to compete individually and directly under these conditions.

The Federal Legal Problem

The legal development of marketing board legislation has been long and interesting. The earliest form of marketing boards was developed on a provincial basis. Then in 1934, the Natural Products Marketing Act established a Dominion Marketing Board. In 2½ years, 22 marketing schemes were approved. In 1937, however, the Privy Council declared the Act unconstitutional on the grounds that it infringed on provincial jurisdiction over matters of property and civil rights. Provincial marketing boards continued, but the courts restricted them to intraprovincial trade. In 1949, the Agricultural Products Marketing Act was passed to permit the granting of powers by the federal Government to local marketing boards to regulate interprovincial and export trade. With this extension, a provincial board, nevertheless, is restricted to the regulation of that province's product while it remains within the province.

In recent years, enough provincial boards have been established in the same commodity to lead to the desire for national marketing structures. The problem was how to achieve a workable organization within the division of authority established in the B.N.A. Act. The Canadian Egg Marketing Agency (C.E.M.A.) was the first agency set up under the Farm Products Marketing Agencies Act (1972). This Agency has been through a difficult learning period and has been exposed to much investigation and criticism. Perhaps, as a result of this process, there will be a better understanding of the difficulties involved in organizing and operating a national board. The experience will accentuate the need for a precise operating plan and guidelines for management.

Study of Marketing Boards

The "Report on Consumer Interest in Marketing Boards" (the Forbes Report), published in October 1974, does not reject marketing boards out-of-hand. They are recognized as having a role in agricultural policy, providing a number of conditions are met. The conditions are better supervision, greater access by the public to decisions of the boards and publication of adequate information of boards. In addition, it is noted that the combined effects of boards and buyers may operate against consumers and that the capitalized value of quota rights should not be used as a justification for increasing the prices set by the Board.

Dr. Forbes prepared an 85-page summary report, and there are six individual commodity board studies prepared by a research team covering milk, poultry, fruits and vegetables, hogs, grains and tobacco. The summary report implies that consumer interest is in low farm prices. The size and variability of marketing margins between producers and consumers has not been taken into account. These margins significantly affect the extent to which farm-gate prices are reflected in consumer prices. Nor is adequate consideration given to other elements: the consumer interest in such features as continuity of supply, quality of product and price stability.

The report launches into an abstract criticism of agricultural policy, only barely related to marketing boards and not substantiated by background studies. One valid point is that the farm, income-level problem partly lies with non-commercial producers and this part of the problem cannot be solved through prices. However, the general policy argument is weak and omits much. For example, marketing boards are equated with farm policy and because some board situations are found to be weak, the policy must be weak. In fact, boards are only one instrument of policy, suited and used in some circumstances, unsuited and unused in others. Dr. Forbes equated all marketing boards with supply and price control. In fact, there are wide differences in the extent of controls given to and exercised by local boards, and only a small proportion actually control production or marketing or support price. The six commodity studies avoided this error of generalization. The report concludes that the consumer and taxpayer costs of agricultural programs are probably well over $1 billion annually. However, the figure is not substantiated anywhere in the report or studies, and the argument assumes that there are no consumer benefits from agricultural programs. In fact, these programs have substantial benefits to consumers, especially in high quality levels of all farm products, wholesomeness and health safeguards on meat, and research ensuring continued rising efficiency of Canadian agriculture.

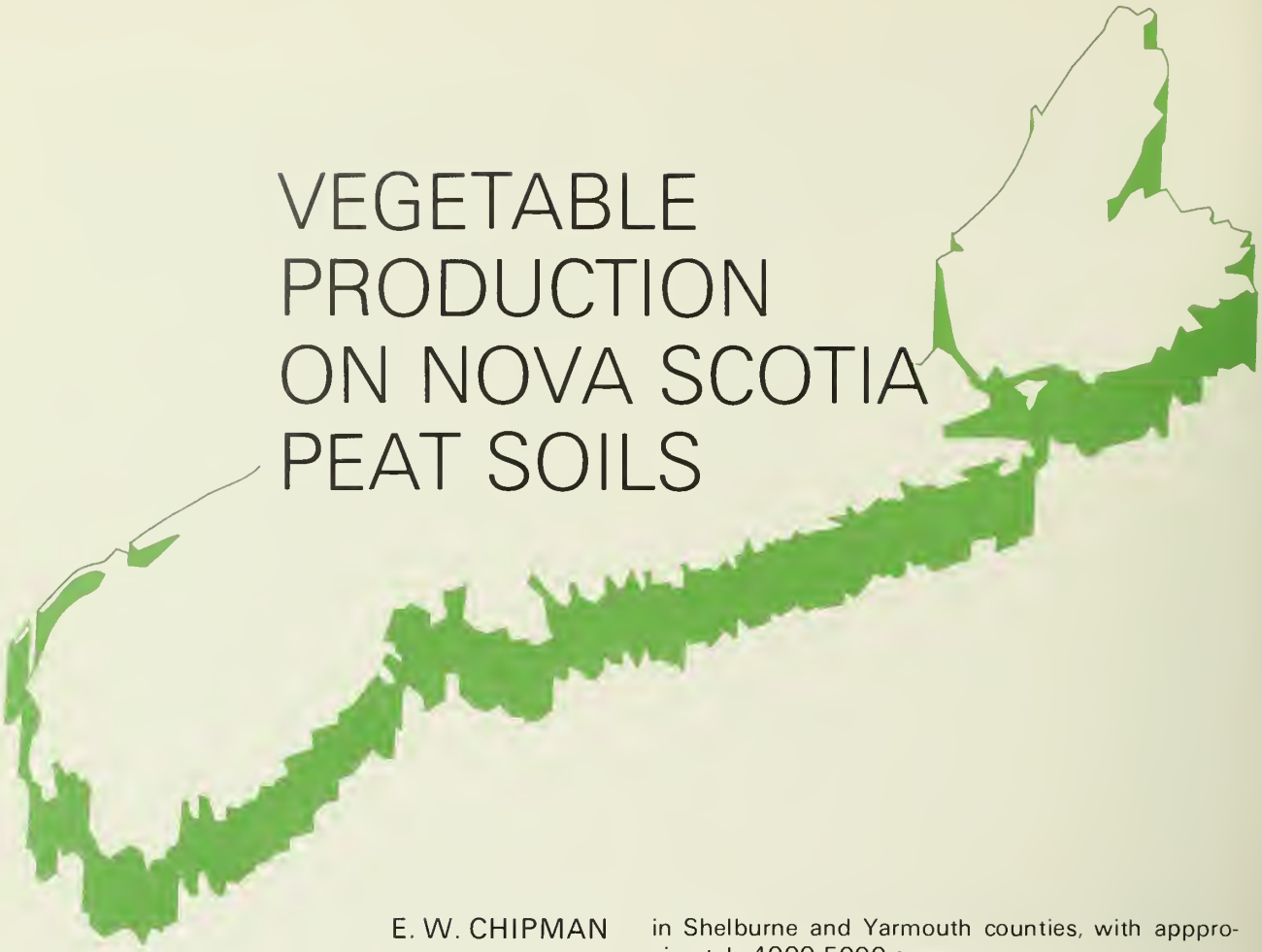
Summary

The pros can be summed up as follows:
More bargaining power is given to farmers to help them help themselves. They are many, small, individually lacking influence and trapped in production and particularly troubled with marketing problems peculiar to agriculture and food.

The cons can be summed up as follows:
It is harmful to the rest of the economy to give exclusive and dangerous monopoly powers to the interests of one sector, especially with a basic item like food which we must all have.

So far Canada has only two operating national marketing boards. They involve only about 5 percent in value of all commodities sold by farmers. Five percent is not much—it's a little. Yet most of Canada seems to fear this monstrosity of national marketing boards which is about to engulf the consumer! ■

VEGETABLE PRODUCTION ON NOVA SCOTIA PEAT SOILS



E. W. CHIPMAN

Seulement 100 des 300,000 acres de terres noires de la Nouvelle-Écosse servent actuellement à la culture des légumes comme la carotte, le céleri, la laitue et l'oignon. Même si les gelées, le drainage et les mauvaises herbes créent certaines difficultés, il existe de grandes possibilités pour la production maraîchère commerciale.

Peat bogs may well become the future commercial production areas for Nova Scotia grown vegetables. With over 100 ac presently growing such crops as carrots, celery, lettuce and cabbage, the future looks bright.

There are over 300,000 acres of sphagnum peat soils in Nova Scotia, but many of these areas are small, poorly drained, or inaccessible. There are, however, a number of dome or high bogs in western Nova Scotia which can be easily drained and are generally less susceptible to frost damage. Two of these, Caribou and Millville in Kings County, are presently being developed. Other promising bogs are Black Point in Digby County, and several others in Shelburne and Yarmouth counties, with appproximately 4000-5000 acres.

Mr. Chipman is a végetable crops specialist at the CDA Research Station, Kentville, N.S.

These soils have a very high moisture holding capacity. However, because of their porous nature, they provide adequate aeration for an ideal physical medium for the growth of plants. Crops with high moisture requirements like lettuce and celery are well adapted, and root and bulb crops, like carrots and onions, can grow and expand in peat without the need for the careful plant spacing that is required for mineral soils. Also, because these soils are soft and free of mineral particles, carrot roots are not subject to abrasion and subsequent phenolic browning and are more attractive in appearance.

Research Program

To assess the value of these bogs for vegetable growing, the Kentville Research Station has been actively involved since 1952. Experiments have proceeded along several lines and have included field, greenhouse and laboratory studies. The field work has been done on the Caribou Bog in the Annapolis Valley.

Peat soils in Nova Scotia are extremely acid (pH 3.5) and require large quantities of lime to successfully grow most vegetable crops. With virgin peat, application rates of 6 tons/ac of dolomitic lime, followed by deep plowing with an additional 4 tons are recommended. A thorough mixing of the soil and lime to a depth of 8-10 in. is necessary.

Although these soils are initially highly infertile, excellent crops can be grown when optimum amounts of fertilizers are applied. Experiments have shown that 150-250 lb/ac of nitrogen (N) may be necessary for the first year or more. Phosphorus (P) too has been shown to be beneficial with suggested rates of 40-60 lb/ac. Response of some crops to potassium (K) has been slight, but celery and lettuce appear to have a relatively high requirement with 125-200 lb/ac suggested.

Because these organic soils have developed from organic rather than mineral matter, they are frequently deficient in some of the trace elements necessary for plant growth. To date, it has been necessary to add boron, molybdenum and copper. It has also been noted that when the pH is 4.5-5.0 there is a very high level of available manganese, which may cause marginal burn to carrot leaves.

Cultivar and cultural trials have also been investigated.

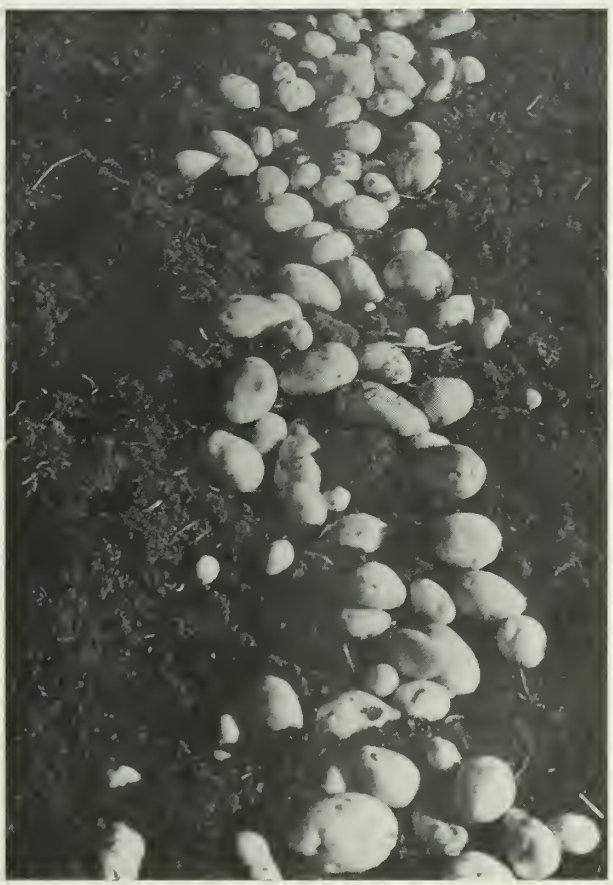
Results can best be assessed from the yields and quality of the vegetables grown: carrots (cultivar Hi-pak) yield 600-800 lb/ac; celery (Utah 52-70) and lettuce (Ithaca) have large, high quality stalks and heads; onions (Autumn Spice) yield 900 bu/ac; and potatoes (Kennebec) with yields of 600-700 bu/ac. Other vegetables such as beets, broccoli, cauliflower, parsnips, radishes, rhubarb, spinach and turnips have all been grown with success.

Some of the problems associated with cropping these bogs have been frosts, drainage, and weeds. There also have been mechanical problems with tillage, planting and harvesting, but solutions to these have largely been solved by the ingenuity and efforts of the growers.

The low pH values associated with these soils make them different from most other organic soils. Because of this, there may be problems arise for which the solution is not readily available. However, it is hoped with the present research program underway that these may be solved.

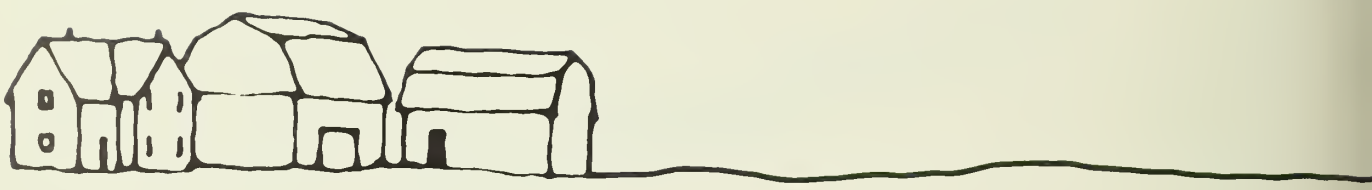
With the large acreage of these peat soils awaiting development in Nova Scotia, a great potential for commercial vegetable production exists. ■

Onions can grow and expand in peat without the need for careful plant spacing.



Potato yields of 600 to 700 bu/ac are not uncommon.

PROGRAMME DE DÉVELOPPEMENT DES PETITES FERMES



THE SMALL FARM DEVELOPMENT PROGRAM

R.C. BAILEY

Helping people. That's what the Small Farm Development Program is all about. The program provides personal counselling to assist those who wish to leave farming and farm management counselling for small farmers who plan to expand their operation.

Mrs. Hale (a fictitious name) is 62 years old, a widow whose husband farmed all his life. After he passed away, Mrs. Hale continued to operate the

Mr. Bailey is Chief of Rural Development Services, Farm and Rural Development Division, Economics Branch, CDA, Ottawa.

R. C. BAILEY

Le Programme de développement des petites fermes ne vise qu'à venir en aide aux gens. Il comporte un service d'orientation personnelle destiné à aider ceux qui désirent abandonner l'agriculture ainsi qu'une équipe de conseillers en gestion agricole dont le rôle est de venir en aide aux petits exploitants qui ont l'intention d'étendre leur exploitation.

Mme Têtu (nom fictif) est âgée de 62 ans. Son mari, décédé, avait pratiqué l'agriculture pendant toute sa vie. Après le décès de ce dernier, Mme Têtu a continué elle-même à exploiter un quart de section en comptant sur l'aide a mi-temps de ses enfants. Lorsque sa santé commença à faiblir, elle fut forcée de s'inscrire au bien-être social et devint extrêmement déprimée et solitaire.

Sa situation fut portée à l'attention d'un conseiller en développement des petites fermes qui discuta avec elle des diverses possibilités qui s'offraient à ses yeux. Mme Têtu décida alors de vendre sa ferme, fit une demande de subvention d'aide aux vendeurs, accordée dans le cadre du Programme de développement des petites fermes, et déménagea dans une

M Bailey est le chef des Services de développement rural de la Division de la gestion de l'exploitation agricole et du développement rural de la Direction de l'économie (ministère de l'Agriculture du Canada), Ottawa.

Farm management counsellors assist farmers to expand their operations and improve their income.

Des conseilers en gestion agricole aident les cultivateurs à agrandir leurs exploitations et à améliorer leurs revenus.

quarter section with the part-time assistance of her children. When her health began to fail, she was forced to go on welfare and became extremely depressed and lonely.

Her plight was brought to the attention of a small farm counsellor who discussed with her the various alternatives that she could take. Mrs. Hale decided to sell her farm, apply for a vendor grant under the Small Farm Development Program and move to a home in the nearby town. With the help of the counsellor, she was able to arrange her financial affairs to provide a small income until she was eligible for pension.

On subsequent visits, the counsellor reported a marked improvement in her spirit now that she was close to friends and health facilities.

In another part of Canada, Mr. Yost (fictitious name), 31, married, with two young children and a diploma in agriculture wanted to make farming his full-time occupation. During the past 6 years, he had been working at a local feed mill in order to earn money to pay for a small farm. Now he owns an 80 ac farm with a house, barn and a small hog operation. However, this was still not large enough to generate an adequate income for his family. With the help of a small farm counsellor, Mr. Yost prepared a farm plan with investment and budget information, cropping and livestock expansion plans and a record-keeping system. He then took this information to the Farm Credit Corporation, applied and received special credit requiring only a low down-pay-

maison située dans la ville avoisinante. Grâce à l'aide du conseiller, elle a pu régler ses affaires financières de façon à retirer un petit revenu jusqu'au moment où elle serait admissible à la pension de vieillesse.

Lors de visites ultérieures, le conseiller a signalé que son état s'était sensiblement amélioré parce qu'elle était maintenant établie près de ses amis et des services sanitaires.

Dans une autre partie du Canada, M. Charbonneau (nom fictif), âgé de 31 ans, marié, père de 2 enfants de bas âge et titulaire d'un diplôme en agriculture obtenu dans le collège local, voulait faire de l'agriculture une activité à plein temps. Au cours des 6 dernières années, il avait travaillé dans une meunerie locale en vue d'accumuler l'argent nécessaire pour acheter une petite exploitation. Il est maintenant le propriétaire d'une ferme de 80 acres, d'une maison, d'une petite étable et d'un petit élevage porcin. Toutefois, cette entreprise était trop petite pour être rentable et permettre à sa famille de retirer un revenu suffisant. Avec l'aide d'un conseiller en développement de petites fermes, M. Charbonneau a préparé un plan d'exploitation comportant des renseignements en matière d'investissement et de budget, des plans d'expansion de ses productions végétales et animales et un système de tenue de registres de ferme. Il a fait parvenir ces renseignements à la Société du crédit agricole à laquelle il a adressé une demande de prêt; la Société lui a consenti un crédit spécial avec paiement initial peu élevé pour l'achat d'une exploitation supplémentaire. Par la suite, l'organisme provincial de crédit agricole lui a accordé un prêt à taux réduit en vue de la construction d'une étable pouvant loger son troupeau croissant et en vue de l'achat d'autres sujets. Ces prêts lui permetteront de réaliser un revenu net estimatif de $9000, toutes dépenses et frais de dette déduits.

Voilà deux clients, parmi plusieurs centaines d'au-

ment to purchase an additional farm. Next, he received a discounted loan from the provincial agricultural credit agency to erect a barn for his expanding livestock operation and to purchase more livestock. This will provide him with a projected net income of $9,000 after all expenses and debts are serviced.

These are but two of the many hundreds of clients now being assisted by the federal-provincial Small Farm Development Program operating in all provinces except Newfoundland.

This federally-financed program is aimed at assisting small, low-income farmers in Canada. Grants of up to $3500 are available to those who decide to leave farming to retire or to move to another more remunerative occupation. Special credit is available to small farmers wishing to expand their farm to improve their income situation. The financial portion of the program is administered by the Farm Credit Corporation (F.C.C.). In order, however, to be of maximum benefit, this financial assistance should be accompanied by personal counselling services. Such services are provided by rural development counsellors who generally work with small farmers experiencing personal problems, retiring farmers, or those who leave the farm for other occupations. The farm management counsellors work with farmers who wish to remain in farming and expand their operation to improve their incomes. These counselling services are provided by mutual agreement between the federal and provincial governments. In B.C., Alberta, Manitoba, New Brunswick and P.E.I., federal staff have been seconded to the provinces for this purpose.

Precise eligibility criteria have been drawn up to define ''small farmers'' for the purpose of this program. It does not apply to all farmers. Program details are available from provincial departments of agriculture, or F.C.C.

Statistics indicate that nearly one-third of Canadian farmers can be eligible for the program, either as buyer or seller. Some of these people live entirely from the meager earnings of an uneconomic farm. They are the rural poor in Canada—poor for a variety of reasons that are just now coming to light. They may be on marginal farms, may be old, may not know about assistance programs, be handicapped, or have personal problems that must be solved before they can earn an adequate income either on or off the farm. Many are older people, often widows or widowers, who require information on disposing of their farms, on retirement, or on pensions. Many of the poor know little about present government assistance programs or lack the interest or ability to take advantage of them.

This is the segment of Canadian farmers that the Small Farm Development Program is designed to assist. Last year, 2,000 people like Mrs. Hale and Mr. Yost were helped; this year as many as 3,000 people may be reached on a one-to-one basis. ■

tres, qui bénéficient actuellement d'une aide dans le cadre du Programme fédéral-provincial de développement des petites fermes offert dans toutes les provinces à l'exception de Terre-Neuve.

Ce Programme, financé par le gouvernement fédéral, vise à venir en aide aux exploitants canadiens de petites fermes qui retirent un faible revenu. Les personnes abandonnant l'agriculture pour prendre leur retraite ou exercer une activité plus rémunératrice sont admissibles à des subventions d'au plus $3500. Les petits agriculteurs désirant étendre leur exploitation en vue d'accroître leur revenu ont droit à un crédit spécial. La Société du crédit agricole administre les aspects financiers du programme. Toutefois, afin de retirer le plus d'avantages possible, cette aide financière doit être accompagnée par des services d'orientation personnelle. Ces derniers sont assurés par des conseillers en développement rural qui œuvrent généralement auprès des petits exploitants éprouvant des problèmes personnels, des agriculteurs en retraite ou de ceux qui abandonnent l'agriculture pour exercer un autre métier. Pour leur part, les conseillers en gestion agricole sont à la disposition des petits exploitants qui désirent demeurer en agriculture et étendre leur exploitation en vue d'accroître leur revenu. La mise sur pied de ces services de consultation est sanctionnée par une entente mutuelle entre les gouvernements fédéral et provinciaux. En Colombie-Britannique, en Alberta, au Manitoba, au Nouveau-Brunswick et à l'Ile-du-Prince-Édouard, des membres du personnel du ministère de l'Agriculture du Canada ont été mis à la disposition des provinces à cette fin.

Selon les statistiques, près du tiers des agriculteurs canadiens peuvent être considérés comme de petits exploitants; bon nombre d'entre eux ne doivent compter que sur les faibles revenus qu'ils retirent d'une exploitation non rentable. Ce sont les défavorisés de la classe rurale et leur état est attribuable à une gamme de motifs que l'on vient à peine de mettre en lumière: ils peuvent cultiver une terre à faible rendement, être des immigrants qui ne comprennent pas les langues du pays ou ne connaissent rien des programmes d'aide, être handicapés ou éprouvent des problèmes personnels qu'ils doivent résoudre avant d'être en mesure de gagner un revenu suffisant d'origine agricole ou non agricole. Bon nombre d'entre eux sont âgés, souvent veufs ou veuves, et ont besoin de renseignements en matière de vente d'exploitations agricoles, de retraite, de pension ou d'impôt sur le revenu. La plupart d'entre eux ignorent presque tout des programmes actuels d'aide gouvernementale, ou manifestent peu d'intérêt ou d'aptitude à en tirer profit.

Ce sont ces agriculteurs que le Programme de développement des petites fermes a pour but d'aider. L'an dernier, 2000 personnes comme Mme Têtu et M. Charbonneau ont bénéficié de cette aide personnelle; il est possible que cette année ce chiffre soit porté à 3000. ■

Members of the Canadian Agricultural Research Council are as follows: seated, left to right, J.C. Simoneau, Quebec Department of Agriculture; W.R. Mason, General Foods Ltd; B.B. Migicovsky, Agriculture Canada; N.R. Richards, University of Guelph; D.G. Peterson, Agriculture Canada; D.G. Howell, University of Guelph; standing, left to right, G. Anderson, representing B.H. Kristjanson, Manitoba Department of Agriculture; E.M. King, British Columbia Department of Agriculture; J.A. Newman, Agricultural Institute of Canada; H.F. MacRae, Nova Scotia Agricultural College; J.C. Rennie, Ontario Ministry of Agriculture and Food; H.B. Jeffery, Alberta Department of Agriculture; B.M. Craig, University of Saskatchewan; R.E. Drennan, Massey-Ferguson Industries Ltd.; J.R. Cochran, Saskatchewan Department of Agriculture; G. Flaten, producer; J.A. Forsyth, Canadian Veterinary Medical Association; J.F. Frank, Agriculture Canada; J.A. Coleman, associate secretary, Agriculture Canada.

THE CANADIAN AGRICULTURAL RESEARCH COUNCIL

Le Conseil canadien de la recherche agricole, qui groupe des représentants des gouvernements, des universités, des industries et des producteurs, déterminera l'orientation que prendra la recherche agricole au Canada. Comme point de départ, le Conseil se servira du bilan le plus récent de toutes les activités de recherches agricoles effectuées au Canada. Après avoir fait l'étude du bilan, les membres du Conseil établiront une base solide d'information sur laquelle ils s'appuyeront pour formuler des recommandations quant à l'orientation des nouvelles recherches.

The direction of agricultural research in Canada is under the guidance of a new committee. The Canadian Agricultural Research Council, which was recently established by the Canadian Agricultural Services Coordinating Committee, will make recommendations on priorities and allocation of resources for all agricultural research in Canada.

The 21-member council, which has brought together representatives of governments, universities, agribusinesses, and producers, will have several functions to perform. According to Dr. N. R. Richards, council chairman, they will advise on the need for research in all areas related to agriculture, make recommendations on financing, advise on federal, provincial, university and industrial roles, and recommend priorities for research. The council's recommendations will be passed on to the Canadian Agricultural Services Coordinating Committee and other agencies involved in agricultural research.

The council will develop a work program and study specific questions referred to it by other agencies. One of their first programs will be to complete an inventory of all agricultural research being conducted in Canada. This will provide an information platform for making recommendations. They also plan to study the mechanisms for funding research.

The council has established an executive committee to meet periodically in addition to the three council meetings a year. Chairman of the new council is Dr. N.R. Richards, professor of soil science and former dean of agriculture at the University of Guelph. Dr. B.B. Migicovsky, director-general of Agriculture Canada's Research Branch is vice-chairman, and D.G. Peterson, coordinator (Executive Program) of the Research Branch, is the secretary. The three other members elected from the council to the executive committee include: J.C. Simoneau, assistant deputy minister, Quebec Department of Agriculture; L.H. Shebeski, dean of agriculture, University of Manitoba; and W.R. Mason, technical director, General Foods Limited.

Included as council members are representatives of each of the provincial and regional agricultural services coordinating committees, the Agricultural Institute of Canada, Agriculture Canada, the deans of Agriculture and Veterinary Medicine of Canadian universities, the associations of Faculties of Veterinary Medicine and of Agriculture in Canada, the Canadian Veterinary Medical Association, the federal Ministry of State for Science and Technology, the National Research Council of Canada, producers, and agribusiness. ■

A SYSTEM FOR BEEF PRODUCTION IN A COLD CLIMATE

L. JAMES

A la Ferme expérimentale de Kapuskasing, les chercheurs et les ingénieurs cherchent à mettre au point un système économique d'élevage des bovins de boucherie en climat froid, lequel tiendrait la competition sur le marché. Ils ont constaté qu'une étable à stabulation libre modifiée, comprenant un étang à lisier, accroît les économies d'aliments, de litière et de main-d'œuvre, et assure une meilleure gestion du troupeau.

It's a fact. More agricultural land will be needed in the future for beef production if some of Canada's present farm land moves from beef to grain and other cash crops. Relatively untapped agricultural land resources like the Great Clay Belt of northern Ontario and northwestern Quebec could become increasingly important as land becomes scarce and Canada's population increases.

J. M. Wauthy, superintendent of the Experimental Farm, Kapuskasing, Ont., says that the 600,000 ac of cultivated farm land in the Great Clay Belt could become an important beef producing area if the demand for beef in Canada increases. In addition to the land already cleared, there are also several million acres of arable forested land that has potential for beef production.

But first, a total system for beef production and manure handling must be established. At the Kapuskasing Experimental Farm, Agriculture Canada is demonstrating the potential of the area for beef production. Under the direction of the Ottawa Research Station and in cooperation with the Animal Research Institute and the Engineering Research Service, scientists are attempting to solve the problems in this wet, cold, northern region.

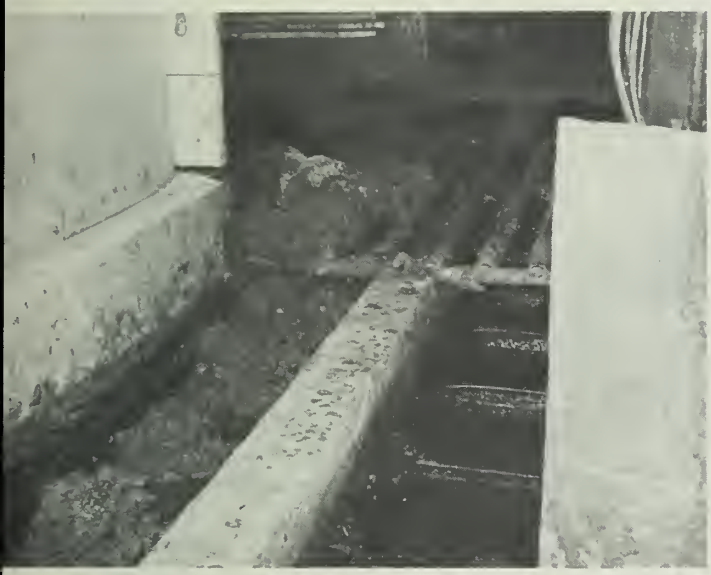
Lois James is an editor-writer, Periodical Services Unit, Information Division, CDA, Ottawa.

Production Problems

In 1966, the Research Branch moved Agriculture Canada's Shorthorn herd to Kapuskasing to study the feasibility of developing an economical system for raising beef cattle in a cold climate that would be competitive with other areas. Provision of shelter and feed, and disposal of manure are more difficult in this area than in many other areas of Canada. This results is increased costs of producing beef in the north.

Dr. E. E. Lister and W. A. Jordan, Animal Research Institute (ARI), Ottawa, found that Shorthorn cows could winter outdoors, and produce a healthy calf, but that they required approximately 30 percent more feed to maintain their weight than cows kept in a log barn or an insulated barn. They also found that the energy requirements of cows were about the same when housed in either barn. Manure handling and control, however, were problems in both barns, and particularly for the outside lots.

With an average mean daily temperature of —1°F in January, an average of only 86 frost-free days a year, and about 3.2 in. of rainfall a month during July, August and September, many problems are inherent in the area. Comparatively little grain is



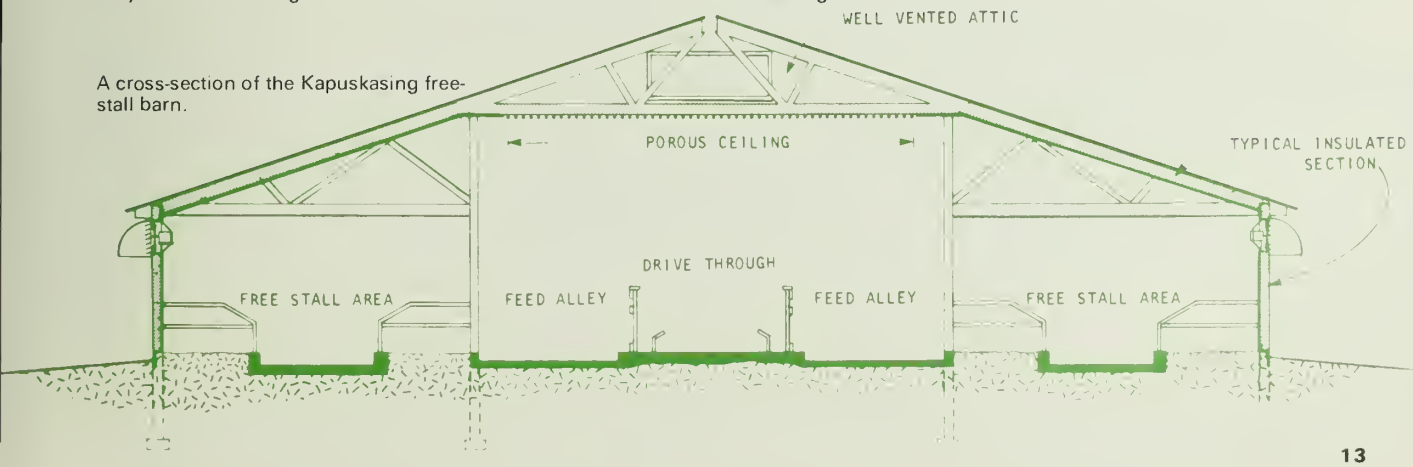
(Top left) Very little bedding is required in the clay-floored free stalls, thus reducing labor and the cost of bedding.

(Bottom left) A gutter cleaner runs across one end of the barn for easy manure handling.

(Top right) A tractor is used daily to scrape manure from the free stall and feeding area into a gutter cleaner.

(Bottom right) The manure pit is filled from the bottom to avoid freezing.

A cross-section of the Kapuskasing free-stall barn.



grown in the north making straw scarce and expensive. Thus, shavings were purchased for bedding materials. About 1 ton of shavings per animal unit was required for the winter. Besides being expensive, shavings were wet, making them difficult to store and handle. Soil bacterial action was slow, due to the cold weather, causing a buildup of shavings on the land and reduced crop yields. Manure could not be spread until early July because of the late thaw. This left only short periods to spread the manure between various cropping procedures. The Experimental Farm also faced the problem of possible pollution from manure run-off to the river bordering the farm.

Confinement Housing

With virtually no research available on beef housing and manure handling systems in the north, the ARI scientists began consultation with engineers at CDA's Engineering Research Service and Architectural and Engineering Section to develop a system. The short growing season, and long period that cattle are on stored feed prompted the scientists to study an intensive year-round confinement system. In searching for the optimum design, J. E. Turnbull and J. A. Munroe, Engineering Research Service, and P. J. McGann, Architectural and Engineering Section, proposed several systems in consultation with the animal scientists.

In 1970, the original log barn was replaced with a cold, modified-environment barn where the cattle were divided into several large pens. This barn was an uninsulated shell which relied on natural air flow. Although the barn was satisfactory for housing the cow herd indoors, extreme condensation, fogging, and frozen manure created problems when the temperature dipped from —20°F to —40°F for prolonged periods. In 1972, the barn was changed to a warm-controlled environment with a forced-air ventilation system, insulation and a hot-air furnace to overcome the cold conditions. Although the warm environment overcame the problem of frozen manure, ventilation was still unsatisfactory, heating oil was expensive and the high labor required for manure handling remained. With the increase in labor and fuel costs this concept was not economical.

The Free Stall System

A second and larger barn was partially constructed in 1971. The scientists and engineers decided the dairy free stall system could be redesigned to suit the cow-calf operation. In the fall of 1973, the second barn was modified to the free stall principle. Almost no bedding is required in the clay-floored, free stalls, thus reducing labor and the cost of bedding.

The engineers also designed a manure handling system that greatly reduced labor requirements and eliminated manure run-off in the spring. The tractor is used daily to scrape manure in the free stall alley and feeding area into a gutter cleaner that runs across one end of the barn. A gate arrangement allows for separation of cattle when the alleys are being scraped. A large piston pump moves the manure underground through a smooth 12 in. pipe to an earth-walled manure storage 100 ft. away.

The concrete floor of the manure storage pit measures 140 ft. by 100 ft. and the earth banks average 11½ ft. in depth. It can hold waste from 300 animal units for 11 months. The storage is filled from the bottom to avoid freezing, and has a concrete entrance ramp so that the semi-solid manure can be loaded by tractor scoop and spread on the land. Mr. Wauthy contends that the storage system reduces nutrient loss and fertilizer purchases.

Renovations to the barn included installing ventilation fans with stepped thermostat controls, and adding sidewall and ceiling insulation. A porous ceiling of wire mesh, supporting 5 in. of glass fiber insulation, covers the center 32 ft. of the ceiling span. This allows the fans to draw fresh air from the attic space and through the porous ceiling. This concept is based on conserving animal heat instead of using fuel. The system reduces the problem of condensation and fogging by allowing moisture to diffuse into the attic space. So far, barn humidity has been acceptably controlled down to —20°F outside temperature. Research is continuing at Kapuskasing, Normandin and Guelph to optimize the porous ceiling principle for better ventilation in extremely cold weather.

Practical Application

Following the successful operation of the free-stall system in the second barn, renovations began in the fall of 1974 to alter the first barn to the same design. This provides extra space to over-winter the 150 cow herd and their calves. The staff at Kapuskasing can now handle the manure more efficiently and provide better herd management. They also find it easier to artificially breed Shorthorn cows to Limousin bulls.

Mr. Wauthy feels that the free stall concept has practical application for farmers in the north and perhaps across Canada. Although several farmers have shown interest in the barn, it will take time before it can be proven as an economical method of producing beef. According to Mr. Turnbull, space requirements per animal are too high, but with the savings in feed, shavings and labor, it should prove at least as economical as a pole barn and paved feedlot.

With a total system for housing and manure handling, the ARI scientists are directing their attention to forage preservation as silage with input from Dr. Lessard, also of ARI. The major effort is now directed to comparing year-round confinement with winter confinement and summer pasture systems.

When Canada needs more land for beef production, will the Great Clay Belt be the new frontier? Agriculture Canada will have the research results which should assist in answering this question. ■

ENERGY LOSS IN STORED GRAIN BY PEST INFESTATION

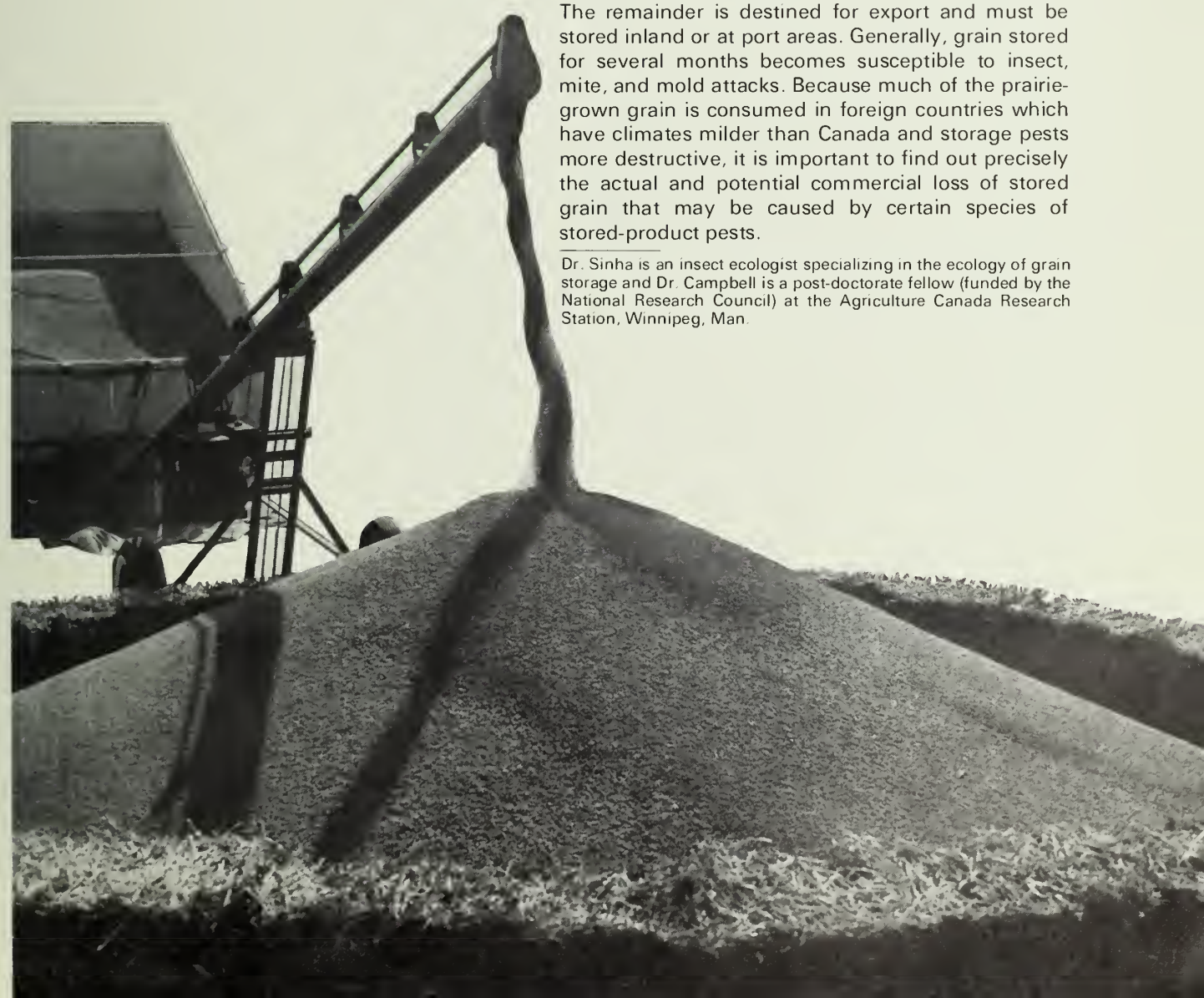
R. N. SINHA and A. CAMPBELL

A la Station fédérale de recherches agricoles, à Winnipeg, des chercheurs ont mis au point une méthode pour mesurer les pertes possibles en énergie alimentaire dans le blé infesté par des insectes. Ils ont trouvé que la quantité d'énergie consommée par le cucujide roux, au cours de son développement, est beaucoup plus faible que celle consommée par la calandre des grains. Toutefois, en raison du taux de reproduction élevé du cucujide roux, il est un important parasite des céréales entreposées.

At present the world population is soaring, but food production is lagging behind. While plant scientists in our Agriculture Canada Research Branch and elsewhere are making valiant efforts to increase the yield of cereal crops per acre, little is known about the loss of the grain that has been already produced and is awaiting consumption.

The domestic consumption of wheat in Canada amounts to about one-third of our total production. The remainder is destined for export and must be stored inland or at port areas. Generally, grain stored for several months becomes susceptible to insect, mite, and mold attacks. Because much of the prairie-grown grain is consumed in foreign countries which have climates milder than Canada and storage pests more destructive, it is important to find out precisely the actual and potential commercial loss of stored grain that may be caused by certain species of stored-product pests.

Dr. Sinha is an insect ecologist specializing in the ecology of grain storage and Dr. Campbell is a post-doctorate fellow (funded by the National Research Council) at the Agriculture Canada Research Station, Winnipeg, Man.

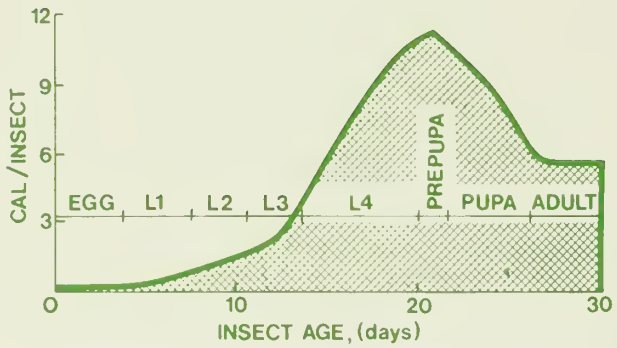


Few accurate figures on losses of grain and its products during storage are available. Estimates of losses incurred by various countries or local areas range anywhere from 1 percent to 50 percent of total production. In some developing countries where Canada exports grain, the magnitude of losses caused by insects often offsets much of the gains that have been made by the introduction of new varieties and improved production techniques; the amount of their imported grain often equals the amount lost to pests during storage.

To estimate the economic loss of stored cereals, storage specialists have used various criteria, such as weight loss, uric acid pollution, milling and baking quality loss, reputation loss, and loss due to application of preventive fumigation. Establishment of a loss measurement criteria that will be universally acceptable is a prerequisite for budgeting of food resources, and developing rational storage and distribution systems for food grain.

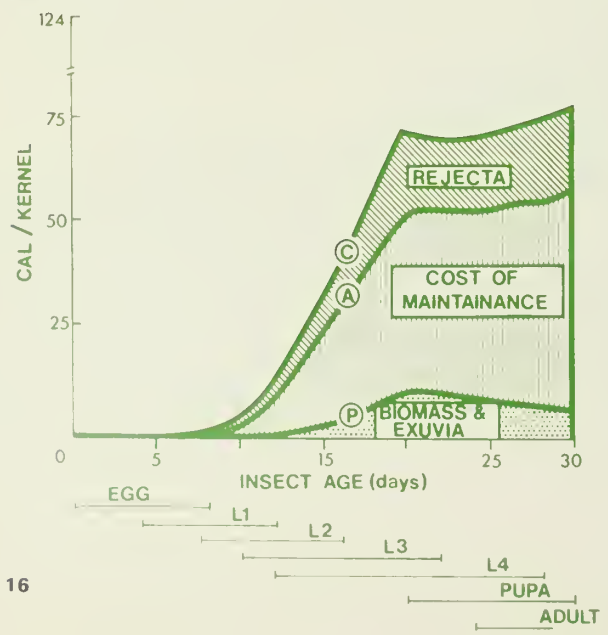
Despite such need and continued search for a criterion of loss caused by insect activity that would be both generally acceptable and scientifically defensible, no such criterion has emerged. At the Agriculture Canada Research Station, Winnipeg, we are investigating the problem of spoilage of stored grain. We are developing accurately calculated energy budgets of several major stored-product insect pests commonly found in the grain producing and storing areas of Canada and the countries to which our grain is sold. By measuring the exact amount of food consumed from a wheat kernel by each species during its different life history stages we can tell the exact and potential caloric loss of food energy used by that species.

We are also conducting studies of wheat bulks infested by these insects. Such studies will allow us to assess changes in the physical, chemical and biological (microorganisms and insects) variables in stored grain bulks infested by pests. The results of this study may provide us with a workable criterion on the energy loss (in calories) caused by populations of each destructive insect species on a certain type of cereal. We hope this information will form a realistic basis for the commercial assessment of actual and potential loss of stored grain by individual species of insects. We report here some aspects of the energy budget of two stored-grain insect species—the granary weevil, a major pest of stored grain in Eastern Canada and the rusty grain beetle, the main pest of stored cereals in Western Canada.



(Above) Growth curve of an average granary weevil in terms of its energy content reared at 30° C and 70 percent RH.

(Below) A cumulative energy budget of a population of granary weevils during development. Average of 20 to 40 larvae each developing in individual wheat kernels having an average energy content of 124 cal. C=Consumption, A=Assimilation, P=Production.



An energy budget is usually expressed by several simple equations that use the caloric unit per unit time for each insect:

Consumption = Production + Metabolism + Rejecta.

Assimilation = Consumption — Rejecta.

Production means body growth including "skins" shed by insects (exuviae). Metabolism (or cost of maintenance) includes respiration and physiological activity to maintain the body. Rejecta means that part of the consumed food which is eliminated as excrement, such as urine and other excreted products. Assimilation is the sum of production and metabolism.

We have calculated separately the caloric value of single wheat kernels, and also their germ and endosperm components. These insect energy budgets are based on cumulative measurements of caloric values of each developmental age interval from egg to adult. Each insect was allowed to complete its life history while feeding on a single kernel. For each age group, 50 kernels were used.

The Granary Weevil

The average caloric value per individual for all stages of the granary weevil is shown in Figure 1. The caloric value increased dramatically during larval growth, reaching a peak during the late fourth instar and prepupal period before decreasing during the pupal stage and then levelling off after emergence to the adult stage.

Figure 2 shows the amount of wheat energy consumed by a granary weevil in the course of its development. The horizontal lines at the bottom of the figure show the distribution of the life history stages from the time of egg deposition to the emergence of adults. By the time the larva was ready to pupate, at 20 days, 58.2 percent of the caloric content of the kernel was consumed; one wheat kernel has an average 124 calories of energy. Of the total energy consumed for development only 16.2 percent (11.7 cal) comprised the insect body; 79.0 percent of the assimilated energy was used up in metabolism.

The Rusty Grain Beetle

The growth curve of an average rusty grain beetle closely resembles that of the granary weevil (Figure 1). The amount of wheat energy consumed by the rusty grain beetle during its development was considerably lower than that of the granary weevil. By the time the larva was ready to pupate, at 20 days, only 4.5 percent of the total caloric content of the kernel was consumed. Of the total energy consumed for development, 16.2 percent is represented by the insect itself; 76.6 percent of the assimilated energy was expended in metabolism to produce the insect.

Both species of insects have similar energy values in terms of calories per milligram of body weight and efficiency in converting energy from wheat to insect body tissue. The two species, however, differ in their total body caloric content and in the amount of food consumed. The lower body weight of the rusty grain beetle is also reflected in its lower consumption of wheat; the difference is about 14 times on both criteria. Nevertheless, the high losses from the rusty grain beetle can be attributed to its high reproductive rate—60 times per lunar month as compared to 15 times for the granary weevil under optimum conditions. In addition, the rusty grain beetle is more adaptable to the extreme temperatures of the continental temperate climate of the Canadian Prairies.

This study shows that measurement of energy loss of wheat kernels by insect infestation can be quantified in caloric values. Our future plans include measurement of the energy values of insects reared on different foods at known climatic and storage environments and conversion of this data into monetary values. We hope that when the work has been completed this information will provide an accurate indication of the actual and potential commercial loss of stored grain caused by stored-product insects. ■

(Top) Combustion of insect material in a microbomb calorimeter is being recorded by an electronic recorder.

(Bottom) Typical damage of wheat kernels by the rusty grain beetle.

ECHOES
FROM THE FIELD AND LAB

Dr. George Mraz, airport veterinarian for Agriculture Canada's Health of Animals Branch, checks one of the 1,105 Canadian polled Herefords purchased by Czechoslovakia.

ALL ABOARD! Czechoslovakia has recently received 1,105 polled Herefords purchased from Canadian cattle producers for a pilot project aimed at using the hillside rangeland in southwestern and eastern Czechoslovakia. If the project is successful, the Czechs could be in the market for up to 10,000 Canadian Herefords. The cattle—1,054 bred heifers and 51 bulls—were flown to Prague and Bratislava in 13 flights in November and December.

Dr. W. H. J. Davis, import-export supervisor for Agriculture Canada's Health of Animals Branch in Ontario, says one of the main problems was persuading the Czechs that Canadian Herefords can take care of themselves on the open range. A team of buyers from Czechoslovakia visited Canada in early autumn and arranged to buy the cattle from 63 Prairie farms at an average price of $550 each. The whole project, including air transportation, was worth more than $1 million to Canada.

For this project, the Czechs accepted cattle vaccinated for I.B.R., a virus disease which can cause death. Some European countries require a negative blood test for I.B.R. Vaccinated animals can show positive results for some months after they have been vaccinated, notes Dr. Davis. It is hoped that, if the project is successful, the acceptance by Czechoslovakia will encourage other countries to change their requirements to accept vaccinated cattle.

Dr. Davis accompanied one load and visited the ranches to check on the animals. The general health of the Canadian Herefords was good and there was no evidence of I.B.R.

RETIREMENTS Two friends of *Canada Agriculture* have recently retired after long-term services with Agriculture Canada. Sydney B. Williams, 62, Deputy Minister, Agriculture Canada, retired from the public service on March 31, 1975. Dr. J.C. Woodward, Assistant Deputy Minister (Research) retired on December 27, 1974, after 40 years with Agriculture Canada.

The career, that took Mr. Williams to the department's top job, began in 1931 as a summer student assistant at the Central Experimental Farm in Ottawa. After university graduation in 1935, he joined the department's research staff in Ottawa and from there served in several areas of the department including head of the Nappan Experimental Farm, director of administration for the department, director-general of the Production and Marketing Branch, chairman of the Agricultural Stabilization Board, and assistant deputy minister. At one time, Mr. Williams was also a member of the editorial board of *Canada Agriculture*.

Dr. Woodward, who held the post of assistant deputy minister for the last 6 years, began his career in agricultural research in 1934 as an animal and poultry nutritionist with the Chemistry Division of the department. Dr. Woodward was involved in many areas of research over the years including chemist-in-charge of the research program in cereal, forage and field crops, chief of the Chemistry Division, associate director of the Experimental Farms Service and associate director-general of the Research Branch. Dr. Woodward was also a member of the *Canada Agriculture* Editorial Board for several years.

Since the 1930's the role of Agriculture Canada has changed along with farming. In the early years, the department was primarily concerned with production programs. Although the department is still carrying on with ROP programs and production research, it is also involved in farm adjustment, computerized farm record keeping, marketing programs and price and income stabilization, noted Mr. Williams.

GREENER PASTURES Lush, green pastures with grass 1½ to 2 ft tall is an outstanding feature of agriculture in the U.S.S.R., says Walter Childers, chief of the forage section of the CDA Research Station, Ottawa, Ont. Dr. Childers was in the U.S.S.R. last year to attend the International Grassland Congress in Moscow. According to Dr. Childers, some of the Soviet Union's best land is used for pasture. North American farmers tend to use lower grade land, as well as less fertilizer.

High fertilization, irrigation, and good pasture management are the reasons why the U.S.S.R. has progressed in stabilizing or even increasing total milk production, notes Dr. Childers. High nitrogen fertilizer, about 80 lb of nitrogen to the acre, is applied to the pasture the day after the cows have been moved off. Also, irrigation is used extensively for maximum pasture yields.

The cattle are allowed to graze for 4 days, and on the fifth day they are moved to another pasture. Any grass left is cut 2 in. from the ground and is raked up and put in silos. The pasture is then fertilized and left to rest for 20 days. By that time, the grass is 18 to 24 in. high. There are no stems, just leafy grass, when the cattle are brought back, explains Dr. Childers. High yields are obtained with grasses that are developed specially for each area of the country to suit that area's soil and climate.

THAT THISTLE! Remember the day you got caught in a prickly patch of thistles? Would you like to know exactly which thistle bearer it was? Agriculture Canada has printed a new pocket book all about the thistles of Canada.

R. J. Moore and C. Frankton of the Biosystematics Research Institute, Ottawa, have compiled a booklet that includes all the species and hybrids known in Canada (including two that were identified at the beginning of the century and may or may not have survived). For each species, the common names are listed and distribution patterns described, often with a map. The illustrations by I. Steins are clear and definitive.

The 100-page, indexed book also contains an extensive list of references and a selected glossary of botanical terms.

For this invaluable compendium, request "The Thistles of Canada", Research Branch Monograph No. 10 from the Information Division, Agriculture Canada, Ottawa, K1A 0C7.

ECHOS
DES LABOS ET D'AILLEURS

ENTREPOSAGE EN VRAC DE LA POMME DE TERRE La pomme de terre est un organisme vivant, très sensible à son environnement immédiat. Aussi est-il important de la conserver sous un entreposage qui lui conservera ses qualités.

Il s'agit, d'abord, de savoir qu'un entreposage de pommes de terres n'est efficace, que lorsque ceci contribue, sans excès, au ralentissement du processus vital du tubercule. En fin de compte, on peut dire que le revenu de la culture des pommes de terre dépend, en dernière instance, du processus d'entreposage. Cette opération commence deux semaines avant l'arrachage des tubercules pour se terminer à la fin de la saison de commercialisation. Il faut alors préparer les pommes de terre à l'entreposage et leur fournir un entrepôt convenable.

À cette fin, Agriculture Canada, dans sa publication No 1508, groupe les travaux de plusieurs spécialistes en ce domaine. Du préentreposage à l'entreposage lui-même en passant par le type physique du bâtiment jusqu'aux systèmes de ventilation, tout y est expliqué. Les conditions de rentabilité du tubercule font aussi l'objet d'un chapitre.

Cette publication sera d'une précieuse assistance aux agriculteurs. Complet et clair, le texte est rédigé de façon à permettre une lecture facile et une référence rapide.

ALIMENTATION DES BOUVILLONS CROISÉS Un important programme d'expérimentation effectué à la Station de recherches agricoles de Lennoxville démontre qu'il y aurait avantage à améliorer l'alimentation des bouvillons issus de croisements bovins laitiers et bovins de boucherie pour augmenter la production de viande de bœuf, plus spécialement au Québec.

M. Gaspard Lalande, zootechnicien spécialisé en régie animale à la Station, a mis à l'épreuve 178 bovins castrés issus de six croisements (Charolais, Limousin et Hereford croisés avec Holstein et Ayrshire) en les soumettant à deux régimes alimentaires, soit un composé principalement de moulée destiné au sujets "CR" (croissance rapide) et l'autre constitué plutôt de fourrages pour les "CL" (croissance lente).

Les résultats de l'expérience ont démontré que les bouvillons "CR" donnent une viande de qualité supérieure et que leur croissance quotidienne est plus rapide, les animaux atteignant le poids à l'abattage 296 jours plus tôt que les "CL".

Au point de vue économique, le chercheur a aussi constaté qu'il serait préférable d'appliquer le régime à base de grains. Tout d'abord, on nourrit l'animal 296 jours de moins et, même si ce régime est plus coûteux, la viande produite se vend à un prix plus élevé de sorte que ce genre d'alimentation devient un investissement rentable.

Parmi tous ces croisements, "Hereford x Holstein" s'est avéré le plus rentable parce qu'il met à profit les aptitudes des deux races, soit la précocité dans la production de viande pour le Hereford et le taux de croissance rapide pour la Holstein.

SULPHUR DEFICIENCY In the past 12 to 15 years, the amount of sulphur added to Prince Edward Island soils through fertilizers has decreased as less single superphosphate has been used. According to Dr. Umesh Gupta, a micronutrient specialist at the CDA Research Station, Charlottetown, P.E.I., if the sources of sulphur are not equal to crop removal, soil sulphur reserves will eventually be depleted to a level where sulphur applications may be necessary for maximum yields.

In researching sulphur deficiency, Dr. Gupta grew a series of crops in sequence in pots under greenhouse conditions on two P.E.I. soils to determine whether, by continuous cropping, sulphur deficiency could be induced by not using sulphur fertilizer. Successive crops were grown in three series of pots with rates of added sulphur at 50, 100 and 150 ppm.

Dr. Gupta found that the first crop in each series plus the second and third sequence crops of series 2 (peas and red clover) did not respond to applied sulphur. The remaining crops responded to sulphur and showed tissue disorders in the absence of added sulphur.

The general yellowing of the entire plants and burning and scorching of leaf edges were the two most distinguishing features of sulphur deficiency observed by Dr. Gupta. Should sulphur deficiency occur under field conditions, these symptoms should prove useful in determining the cause of the disorder.

LIVESTOCK TRANSPORTATION Transportation and movement of animals is necessary in varying degrees in order to feed people in Canada and other parts of the world. However, Dr. K. Wells, veterinary director-general of Agriculture Canada's Health of Animals Branch, stresses that livestock transportation must be humane.

Dr. Wells notes that research has found that the specified transit time is not the critical factor in transporting animals. Mandatory off-loading may be more stressful to the animal than a few hours longer in transit. Preconditioning is also essential and contributes to the better condition of the animals on arrival. This research was carried out in cooperation with the Canadian Federation of Humane Societies, the Canadian Cattleman's Association, and the railways.

Based on this research, a new set of guidelines for transporting cattle has been established by the Health of Animals Branch in cooperation with the Department of Justice and the Canadian Federation of Humane Societies. Although the Bill to authorize these regulations has not yet been passed as law, Dr. Wells points out that the regulations governing the transport of animals will be all inclusive, covering the time the animal leaves the farm until it arrives at its final destination. Most problems concerning the health, welfare and humane treatment of animals could be covered by the regulations.

Janie Matheson, an Agriculture Canada seed biologist, determines the percentage germination of a seed sample. For a minimal fee, farmers can have their seed germination-tested at any of Agriculture Canada's six Plant Products' laboratories.

A Health of Animals Branch veterinarian conducts a post-mortem examination for Newcastle disease.

NEWCASTLE DISEASE IN CANADA

J. E. LANCASTER

Le ministère de l'Agriculture du Canada recommande un programme de vaccination contre la maladie de Newcastle chez la volaille. Toutefois, si un foyer se déclare, la réglementation rigoureuse des importations et la politique d'abattage de la Direction de l'hygiène vétérinaire pourraient l'éliminer rapidement du Canada, comme en fait foi l'éradication des cinq foyers qui se sont, jusqu'à maintenant, déclarés au pays.

In Canada, Newcastle disease, which affects poultry flocks, is a named disease under the Animal Contagious Diseases Act. All confirmed and suspected cases of the disease must be reported to the Health of Animals Branch, Agriculture Canada.

Viscerotropic velogenic[1] Newcastle disease first appeared in Canada in July 1971, and from that date until the last outbreak in July 1973 five distinct outbreaks occurred in poultry flocks. The origins of these outbreaks are unknown. However, likely means of spread between premises involved in an outbreak were determined in some instances. No further incidence of the disease has been reported as of December 1974.

Control Measures

The general world incidence of velogenic Newcastle disease requires that very strict import con-

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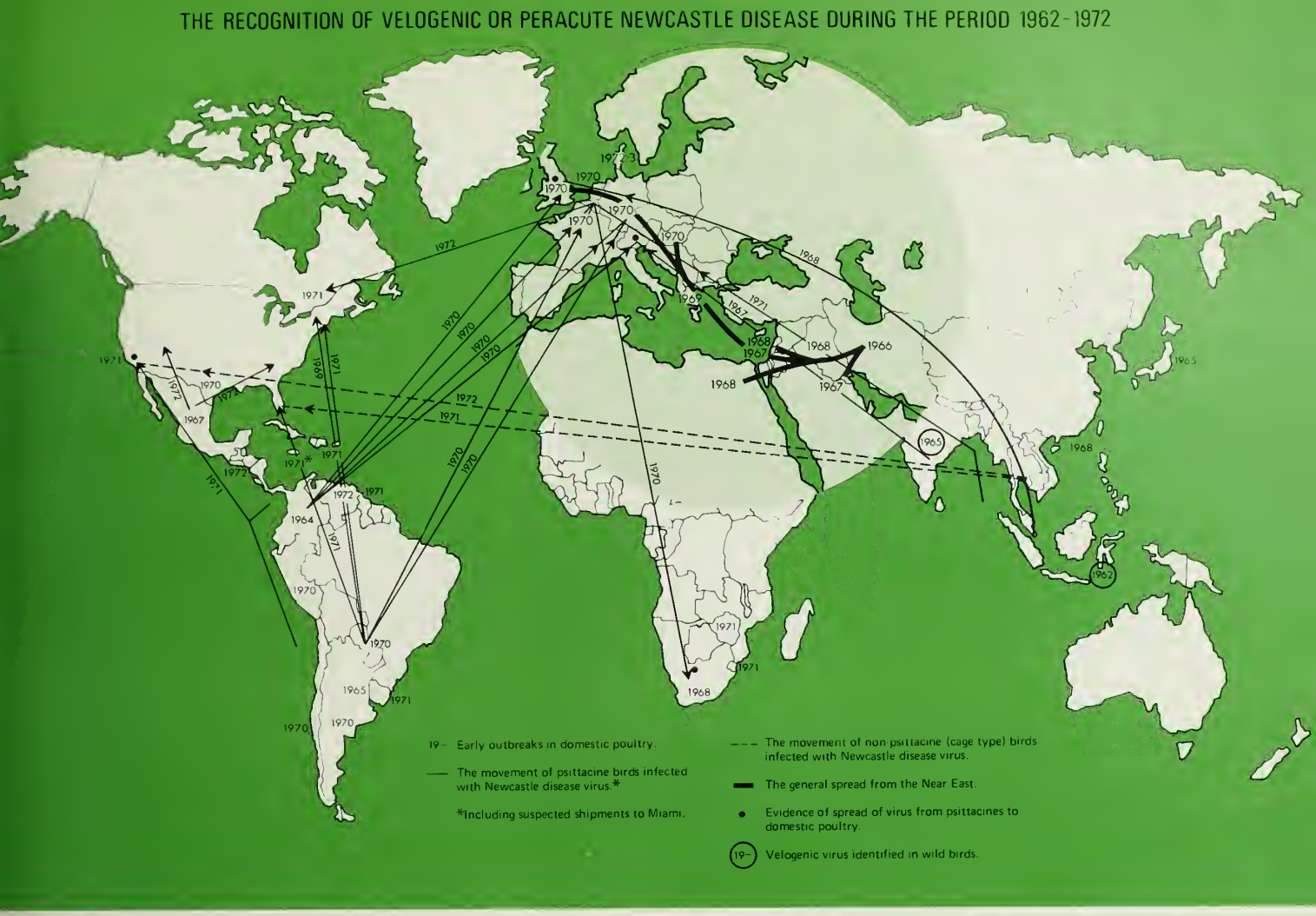
[1] "Viscerotropic velogenic" may be defined as a form of the virus which in susceptible chickens causes a high mortality and lesions in the intestines and viscera.



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trols be maintained by Canada. Importation of all avian species and hatching eggs from countries other than the United States is controlled by import permit. Before the Health of Animals Branch grants an import permit, consideration is given to the species of birds involved, the country of origin and the suitability of the quarantine premises in Canada. The map indicates the movement of certain species of cage birds and the occurrence of virulent Newcastle disease in some countries of the world.

Velogenic strains of Newcastle disease virus have been isolated from some shipments of cage and pet birds under quarantine in Canada (see map). However, there is no evidence of spread of the virus to domestic poultry flocks.

Action Taken

A federal slaughter policy under the Animal Contagious Diseases Act is enforced immediately after the disease is reported. Premises are placed under quarantine and a diagnosis is made as quickly as possible. All domestic poultry within a five mile radius are placed under surveillance by the Health of Animals Branch. Slaughter of the infected flocks and disposal of all carcasses are conducted with minimum delay.

Each outbreak of Newcastle disease has been eradicated. In total, five outbreaks have occurred, involving 42 flocks. Both chicken and turkey flocks have been infected and approximately 250,000 poultry have been slaughtered. Hatching eggs have also been destroyed.

For the individual farmer, an outbreak of the disease causes financial losses. Although the owner is compensated at market value for poultry ordered slaughtered and eggs destroyed, there is an overall loss from the cost of cleaning and disinfection and the general disruption of business.

The eradication of Newcastle disease has been aided by the response of the poultry industry to the need for prompt reporting of suspected outbreaks. This has permitted prompt diagnosis and slaughter of infected flocks.

Due to the Health of Animals Branch's strict import controls and slaughter policy, Canada has been able to quickly eradicate outbreaks of the disease. In addition, Agriculture Canada also recommends vaccination against Newcastle disease. ■

LABORATORY TESTING OF INSECTICIDES

S. McDONALD

Les méthodes d'analyse en laboratoire permettent aux chercheurs de la Station de recherche de Lethbridge d'évaluer de nombreux insecticides en un temps relativement court. On analyse leur action à un stade de développement particulier du parasite. Les plus efficaces sont ensuite sélectionnés au moyen d'analyses comparatives de toxicité et subissent en dernier lieu une épreuve sous des conditions ressemblant à celles de la pratique en vue de déterminer les taux d'application et la durée d'efficacité.

Chemicals must be used to control insect pests of crops if we are to increase or maintain the level of agricultural production.

The introduction of DDT and other synthetic organic insecticides brought important advances in man's fight against insect pests, but it also brought unforeseen problems such as environmental contamination and strains of resistant insects. As a result, since the advent of DDT, hundreds of candidate insecticides have been introduced by industry to overcome the problem of resistance and to reduce the hazard of persistent residues.

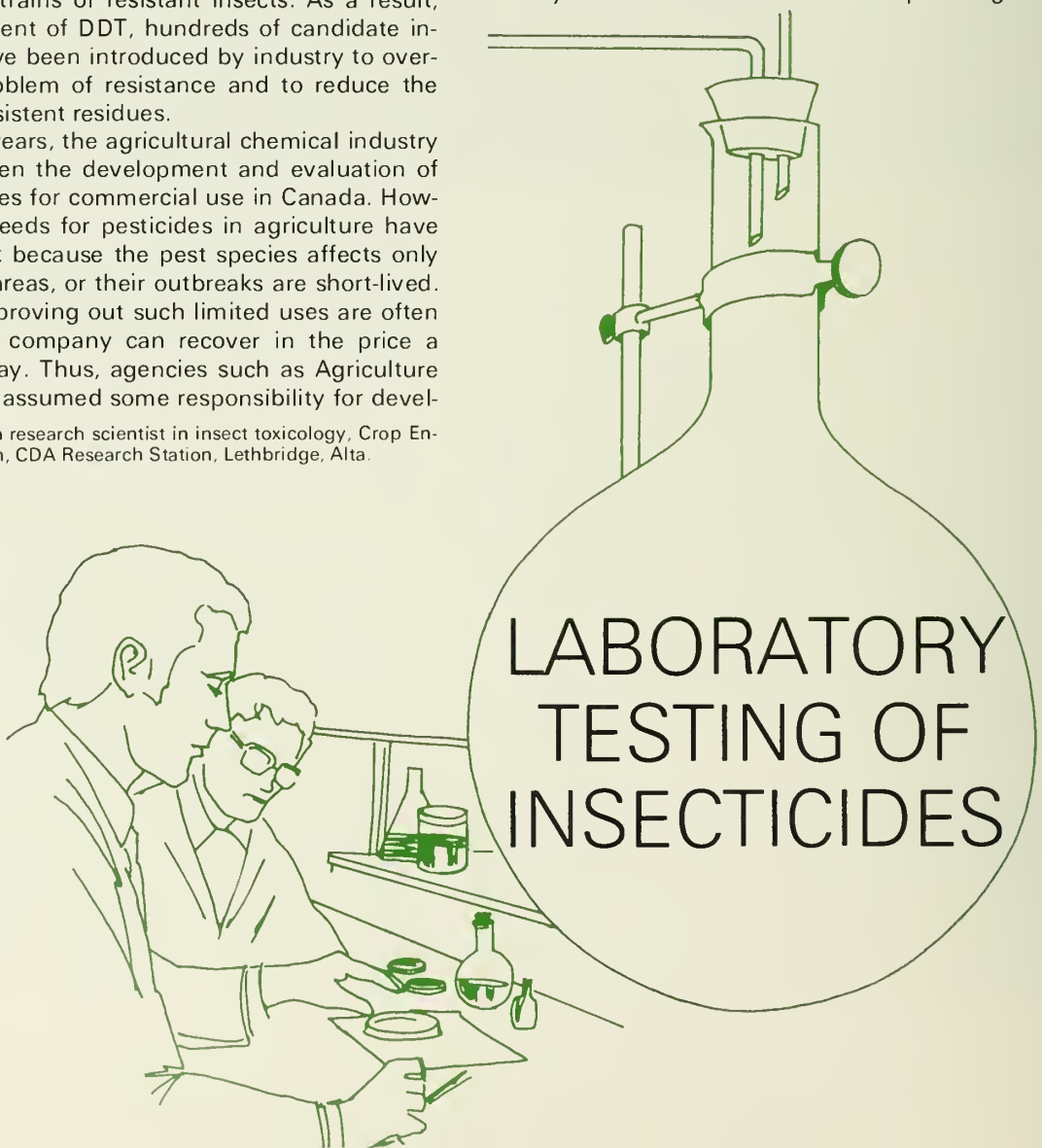
For many years, the agricultural chemical industry has undertaken the development and evaluation of most pesticides for commercial use in Canada. However, some needs for pesticides in agriculture have not been met because the pest species affects only limited crop areas, or their outbreaks are short-lived. The costs of proving out such limited uses are often more than a company can recover in the price a farmer can pay. Thus, agencies such as Agriculture Canada have assumed some responsibility for developing data to support registration of insecticides to control many Canadian insect pests. All pesticides must be registered under the Pest Control Products Act before sale and use in Canada is permitted.

S. McDonald is a research scientist in insect toxicology, Crop Entomology Section, CDA Research Station, Lethbridge, Alta.

Well designed field tests provide the best measure of the effectiveness of an insecticide. However, heavy infestations on specific crops at convenient locations are required and this combination does not occur every year. Field testing is expensive and the number of insecticides that can be tested at any given time is limited. At the Lethbridge Research Station, we have developed laboratory test procedures that enable us to evaluate many candidate insecticides in a relatively short period. Only the most promising compounds are then tested against crop pests in large-scale field tests.

Insecticide Screening

Initially, we screen candidate insecticides for their efficacy against a specific stage of the selected pest species. Only technical grade insecticides, as supplied by industry, dissolved in a suitable solvent are used in these tests. The stage of the pest chosen is usually the one that does the most crop damage.



Small amounts of insecticides are applied to discs of lettuce for oral toxicity tests, left, or directly to larvae for contact toxicity tests, right.

Usually three dose levels are tested. The mortalities are recorded at specific time intervals and compared with those produced by similar concentrations of known, standard insecticides.

The tests provide an accurate and rapid means of selecting the most effective insecticides. For example, of 100 candidate insecticides screened against a specific species, only 10 may rank sufficiently high to be selected for further laboratory tests.

Comparative Toxicity Tests

The next step is to establish data that can be analyzed by computer to give accurate comparative toxicity ratings. The tests are similar to the initial screening procedures. Eight to 12 doses of each insecticide selected by the first step are applied. The number of insects killed at each dose level is determined for a given time interval. This information is then calculated by computer to give the dose level that will kill 50 percent (LD_{50}) or 95 percent (LD_{95}) and the comparative toxicity ratings for each insecticide. This information allows an accurate comparison not only of the toxicity of various insecticides to a particular species but also of the toxicity of a particular insecticide to various species.

Other information from these tests indicates the mode of action of the candidate compound and also whether the species may have resistance to the insecticide or possess the ability to recover from the toxic dose. All of these factors affect the choice of insecticides and are unlikely to be shown in normal field tests. The information can also be useful as a reference to indicate when and if a species develops resistance to an insecticide or to a group of similar insecticides.

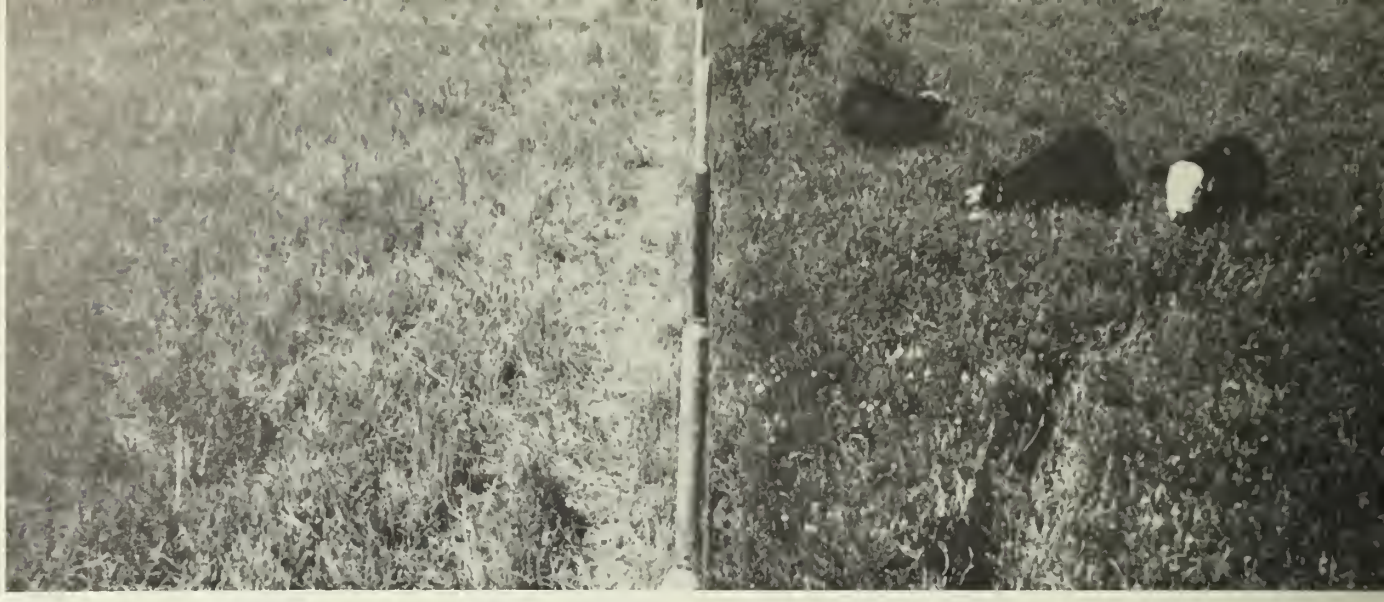
Simulated Field Testing

The first two phases of laboratory evaluation will eliminate many candidate insecticides and give comparative toxicity ratings. Further tests with formulated insecticides are necessary to establish approximate field rates and to evaluate other considerations such as period of effectiveness. Also, they allow us to evaluate the effects of various soil types and conditions of temperature and moisture on the efficacy of the insecticide.

At the Lethbridge Research Station, we have developed techniques to simulate field testing. The experiments are conducted under controlled environments in the greenhouse or in special chambers or under outdoor weather conditions under cages. Various formulations of candidate insecticides are applied either to the insects directly, to soil inhabited by insects, or to plants onto which insects will be placed after application. In emergency situations, it is possible to establish within 24 to 48 hours the field rates for satisfactory control.

During the tests, the plant damage caused by insect feeding is recorded and phytotoxicity caused by the insecticide treatment or formulation is evaluated. An assessment of these factors will also assist in determining whether a candidate insecticide is worthy of further field trial evaluation.

The laboratory test procedures outlined can be done when pest species are at a low ebb. Thus, when infestations occur, a limited number of insecticides can be selected for field testing and at rates that are likely to give satisfactory control. These procedures have been in use for several years and have proven to be essential in the fight against insect pests. ■



SAINFOIN FOR PASTURE

M. R. HANNA, D. B. WILSON, and S. SMOLIAK

Des chercheurs de la Station fédérale de recherches agricoles à Lethbridge ont trouvé que le sainfoin offrait d'excellentes possibilités comme plante à pâturages, parce qu'il est riche en protéines et qu'il ne provoque pas la météorisation. En 1973-1974, des bouvillons d'un an gardés sur des pâturages de sainfoin irrigués ont fait des gains de 2.5 lb par tête et par jour, durant une période de 3½ mois, passés au pâturage. Utilisé comme foin ou comme pâturage, le sainfoin est d'un goût très agréable pour toutes les classes bestiaux.

Shortages and high costs of grain and fertilizer are forcing livestock producers to reduce levels of grain feeding. Forage crops, especially legumes, can play a vital role both as hay and pasture in replacing grain in the diets of cattle and sheep. Unfortunately, alfalfa and many other forage legumes may induce bloat when grazed. Thus, livestock producers are often reluctant to risk putting their animals onto legume pastures or legume-grass mixtures.

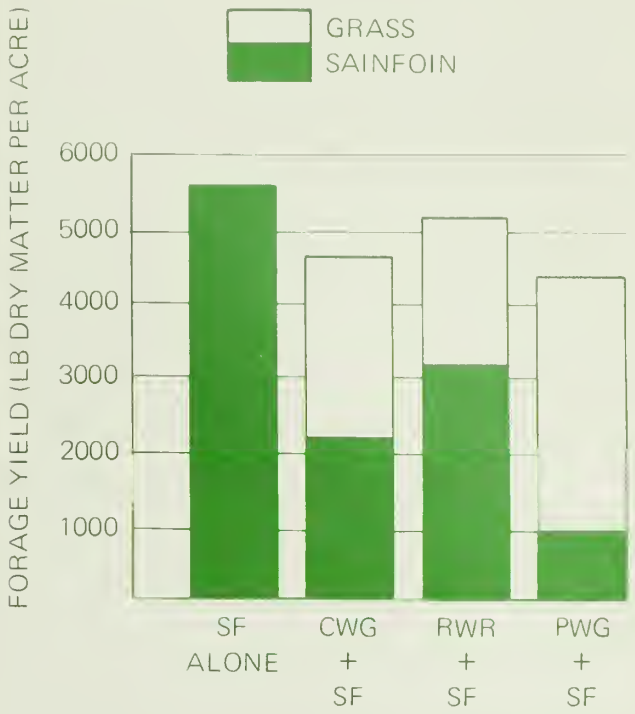
One legume that does not cause pasture bloat in ruminant animals is sainfoin. At the Lethbridge Research Station, we have been conducting trials with this crop for several years, with very favorable results. Sainfoin has been included in simulated and actual grazing trials with sheep and cattle on both dry and irrigated land. It is a perennial, like alfalfa, but tends to be shorter-lived; stands usually do not persist and remain productive for more than 4 or 5 years. It does not recover as quickly as alfalfa after cutting or grazing, but regrowth is satisfactory if the crop is cut or grazed by the late bud stage, and if sufficient time is allowed for recovery. So far, sainfoin has been relatively free of disease and insect problems. It has a protein content slightly lower than that of alfalfa.

Sainfoin is adapted to many of the areas in western Canada where alfalfa can be grown. It grows best on the Black, Dark Brown, and the moister Brown soils. A Canadian sainfoin variety, Melrose, was licensed in 1969 and is now being grown in western Canada for both hay and pasture. Since the release of Melrose, sainfoin's attractive pink flowers have become a particularly noticeable addition to the early summer landscape in southwestern Alberta.

Yields

In our trials on dryland, we have found that sainfoin and sainfoin-grass mixtures generally yield 10 to 30 percent less than straight alfalfa or comparable alfalfa-grass mixtures over a 4- or 5-year span. However, we feel that the lack of any bloat hazard more than compensates for the yield difference. Sainfoin

Dr. Hanna is a forage legume breeder, Dr. Wilson is pasture specialist and Head of the Plant Science Section, and Mr. Smoliak is a range specialist, at the CDA Research Station, Lethbridge, Alta.



(Above) Ewes and lambs grazing sainfoin-crested wheatgrass pasture.

(Left) Yearling steers grazing irrigated sainfoin pasture. The animals have just been turned into the pasture at right. The pasture at left has not been clipped after grazing, to encourage faster regrowth.

(Right) Average forage yields of sainfoin (SF) grown alone or in mixtures with crested wheatgrass (CWG), Russian wild ryegrass (RWR), and pubescent wheatgrass (PWG), on dryland at Lethbridge (1967-71).

grown alone usually outyields sainfoin-grass mixtures by a small margin. If sainfoin is grown with a grass, it does best with bunchgrasses such as crested wheatgrass and Russian wild ryegrass. In mixtures of sainfoin with creeping-rooted grasses such as bromegrass and pubescent wheatgrass, total yields may be about as high as those obtained in mixtures with the bunchgrasses. However, sainfoin usually makes up a much lower proportion of the mixtures with creeping-rooted grasses (Fig. 1), producing a lower quality forage.

Grazing Value

Under more moist conditions, the yield of sainfoin is usually similar to that of alfalfa. In a sheep-grazing test on a sub-irrigated site, we found no difference in the yield of sainfoin and alfalfa, either alone or with crested wheatgrass, during 5 years of grazing. Ewes and lambs completed three rounds of grazing each season in a four-field, rotation system, in which they had free choice of the legume or legume-grass mixtures. The sheep showed some preference for the sainfoin and consumed a higher proportion of it than of the alfalfa. This agrees with the experience of producers, who have found that sainfoin used for either hay or pasture is highly palatable to all classes of livestock. Some growers have adopted the practice of taking one hay cut in mid-June and grazing the regrowth during late summer and early fall.

Data from irrigated pasture trials with sainfoin at Lethbridge have also given some encouraging results. In 1973-74, yearling steers grazing on irrigated sainfoin pastures made excellent weight gains of 2.5 lb/head/day during the 3½-month grazing season. Before 1973, it was necessary to move the animals off the sainfoin pasture several times during the grazing season because regrowth after grazing was so slow. We had been managing the sainfoin much like the grasses, which included mowing the coarse stems that were left after grazing. In 1973 and 1974, we did not mow, and regrowth was much faster. This enabled us to increase the number of grazing days.

The problem of weeds was aggravated when we stopped mowing, because mowing had been a partial control measure. The main weeds in our irrigated pastures were foxtail barley, dandelion, and flixweed. No single herbicide will control all of these weeds without injuring sainfoin. Economical weed control measures are urgently needed. Partly because of weeds, the useful life of an irrigated sainfoin pasture is about 3 years.

Sainfoin has excellent potential for grazing because it provides high protein feed and is non-bloat inducing. Like other legumes, it can also play an important part in lessening the need for nitrogen fertilizers, making soil nitrogen available for associated grasses or subsequent crops.

Grazing studies with sainfoin are continuing. Although there are still some unanswered questions on the management of sainfoin, we feel that it has a place in pastures in western Canada. ■

THE WORLD FOOD CONFERENCE

La conférence mondiale sur l'alimentation tenue à Rome s'est surtout portée sur le besoin de nourrir les peuples en proie à la famine et sur les méthodes à utiliser pour leur venir en aide. Le Canada a joué un rôle prépondérant dans plusieurs secteurs de la Conférence en y prenant divers engagements et par sa participation à la rédaction des résolutions.

The recent World Food Conference in Rome focused on the need to feed the hungry nations and the methods of providing food aid to these countries. Increased production by all farmers in the world was stressed several times to the 1200 delegates attending the conference from 125 countries.

Canada provided a leadership role at the Conference through specific food aid pledges and initiative in drafting resolutions for consideration by the delegates. Specifically, Canada provided leadership in several areas:

- Canada pledged 1,000,000 tons of food grains annually for each of the next 3 years. This more than proportionate share of the world target for aid in food grains is significant because it was pledged in quantities of food rather than amounts of money.
- Canada agreed to increase substantially the allocation of commodities other than food grains for food aid purposes.
- Canada agreed to allocate $50 million of Canada's development assistance to be used to alleviate the world food shortage.
- Canada was the only country to pledge 20 percent of its food aid through multilateral channels including a supplementary contribution to the World Food Program.
- The Canadian food aid pledge helped to move Australia and the EEC into making specific food aid pledges, and the United States to accept the 10 million ton annual food aid target.
- Canada drafted the clause ensuring that the Agricultural Development Fund would come into effect when there were substantial new funds and the prospect of continuity. Canada was also one of the first countries to accept the Agricultural Development Fund.
- Canada pushed for a universal exchange of information on crop prospects and inputs.
- Canada offered to "earmark" national grain reserves for world food security.
- Canada led in stressing the importance of fisheries and environmental concerns.
- Canada has pressed for effective follow-up to the World Food Conference using existing international agencies that have a proven record of producing results.

Resolutions

Several resolutions were passed by the plenary session of the conference. Most important of the resolutions is the one to establish a fund to be called the "International Fund for Agricultural Development". The fund would finance agricultural and fisheries development projects in developing countries. Contributions to it would be on a voluntary basis. The fact that the resolution's co-sponsors included oil producing nations may be regarded as a commitment by these countries to use some of their financial resources to support a multilateral program for agriculture and fisheries development.

The conference has asked that the FAO and other concerned international organizations such as the International Wheat Council make the arrangements necessary for the establishment of a Global Information and Early Warning System on Food and Agriculture.

The objectives, policies and guidelines of the proposed FAO International Undertaking on World Food Security were also endorsed by the conference. Governments of major exporting and importing nations have been invited to enter discussions on the feasibility of establishing grain reserves in appropriate locations. The Director General of the FAO convened a meeting in late November of representatives of interested countries to look at the short-term problems of the developing countries most seriously affected by current food shortages. The arrangements for follow-up at the conference were covered in a resolution that set up a World Food Council at the Ministerial level that would report to the United Nations General Assembly through the Economic and Social Council. The World Food Council will serve to coordinate follow-up policies concerning food production, nutrition, food security, food trade and food aid.

The conference also recommended that an FAO Committee on World Food Security, the Intergovernmental Committee of the World Food Program, and the Board of Directors of the International Fund for Agricultural Development should all submit periodic reports to the World Food Council.

A declaration entitled "Declaration on the Eradication of Hunger" was also adopted although it is not as strong as desired due to the need for concensus.

The leadership role that international groups and organizations take in following up the results of the conference will greatly affect the future elimination of hunger. The Conference specifically requested that international groups be involved in following up these results. ■

AGRICULTURE CANADA'S ROLE IN MERC

BEN BERCK

Le Manitoba Environmental Research Committee (MERC) (Comité de recherches sur l'environnement du Manitoba) vise à accroître les ressources humaines du Canada destinées à combattre la pollution et à améliorer l'environnement de l'homme. Par divers programmes de recherches, Agriculture Canada et le MERC collaborent à la solution de questions relatives à l'environnement

The Manitoba Environmental Research Committee (MERC) is a non-profit group of professional scientists and engineers. The 14-member Board and over 180 project leaders are interested in developing Canada's human resources to combat pollution and improve the human environment. MERC has had 4 years of operational experience and is the successor of the Manitoba Scientists to Combat Pollution (MSCP), which was created as a Manitoba Centennial Project in 1970.

MERC organizes and extends team effort to help solve a wide range of environmental and socioeconomic problems. MERC also assists career development and increases individuals' employability by providing experience in advanced fact-finding and problem-solving methods. To the best of our knowledge, MERC is the only group of its kind in Canada, the United States or Europe.

With financial support from federal programs, MERC has developed unique cost-sharing employment plans, which have employed 650 graduates and under-graduates from high school to the Doctorate level in MERC's multidisciplinary environmental research. Many research projects have been undertaken only because of MERC participation. MERC is presently being funded by the Environmental Management Division, Manitoba Department of Mines, Resources and Environmental Management.

Public or private funding for job creation would be inadequate without the voluntary cooperation of

Mr. Berck is a research scientist at the CDA Research Station, Winnipeg, Man. He is also chairman of the Manitoba Environmental Research Committee.

MERC project leaders who donate their time and expertise to train and supervise MERC research assistants, and the cooperation of federal, provincial and municipal governments, universities and industries that provide buildings, equipment, laboratories and libraries. This large technological backup is a major cost-sharing and cost-reducing factor.

Project Framework

Within the scientific community, MERC aims to develop greater involvement in environmental problems that are both regional and national in character. MERC projects cover a wide spectrum of practical problems. Project leaders generally suggest projects related to their ongoing research. After review and endorsement by the MERC Board, through grants MERC hires research assistants selected by the project leaders. Over 200 projects have been supported.

To maintain MERC support for a project, it is mandatory that MERC project leaders submit progress reports for publication in MERC Proceedings. The Proceedings are donated to major public libraries in Canada.

Agriculture Canada—MERC Cooperation

Since MERC project leaders are also active leaders in existing research agencies, multidisciplinary research relationships of mutual benefit are a normal occurrence. Agriculture Canada has an important role in the growth and development of the MERC formula for supplementary environmental research. Specifically, Agriculture Canada has provided the use of equipment, instrumentation, laboratory, office and library facilities, and assistance in field and laboratory experiments. Moreover, the loan of the author's time to serve as MERC's chairman and coordinate the multiple aspects of MERC operations has resulted in new programs and research undertaken by participating scientists.

Various projects have been undertaken by Agriculture Canada research scientists in cooperation with MERC at the CDA Research Stations at Morden, Brandon and Winnipeg. Many of the projects have involved crop storage, pest infestation in grains, herbicide residues, animal and industrial wastes, degradation of pesticide chemicals, the use of activated charcoal for cleaning-up food processing effluents, toxic levels of trace elements in plants and soils, the effect of monoculture on life forms in agricultural ecosystems and the fate of minerals from disposable animal wastes. Some 35 other agricultural projects were conducted by research scientists at the University of Manitoba and the University of Brandon, some in collaboration with Agriculture Canada researchers, and with the aid of MERC research assistants.

A variety of innovative concepts, previously tested in MERC projects, will be further developed by Agriculture Canada research scientists, including an early warning system to detect incipient spoilage of grain, storage of grain at low temperatures using different bin materials, cooling stored grain and animal feeds in large food storages, and testing scrap paper in livestock feed rations.

These projects indicate a useful role for groups such as MERC to act as an interface between employment funding and the research resources, both physical and human, of federal, provincial, university and industrial agencies. An increase in the collective quality and amount of research output has resulted. The encouragement and stimulus to develop fresh approaches to solve the many environmental problems that confront Canadian communities is one of the positive values achieved by this unique investment of human energy, scientific leadership, modest funding and technological backup. Agriculture Canada has a key role in the development of MERC and its catalytic effectiveness. ■

A snow dump at Brandon is sampled for analysis of heavy metal content and salinity of core samples.

A MERC research assistant takes gas samples in experimental grain bins.

ACTION AGAINST WILD OATS

H. W. LEGGETT

La folle avoine dispute farouchement les ressources disponibles aux cultures céréalières; elle réduit sensiblement le rendement lorsque son peuplement varie de 10 à 40 plants par verge carrée. Les exploitants de silos terminus estiment que la folle avoine constitue environ 41% de la totalité de leurs déchets. Dans des conditions météorologiques favorables et grâce à une bonne gestion, les producteurs peuvent éliminer cette plante adventici en appliquant des désherbants et de bonnes façons culturales.

Considerable interest has recently been aroused regarding the extent of losses from wild oat competition in western Canadian grain fields. Although the wild oat problem has remained virtually unsolved for many years, its solution by modern methods will represent a major increase in grain production in Canada. Therefore, a brief review of the wild oat infestation and a calculation of total losses in view of recent grain prices is necessary to place wild oats in proper perspective as a major constraint on Canadian food production.

Degree of Infestation

Although few, if any, areas of western Canadian cropland are free of wild oats, there is a general pattern to the degree of infestation. It has been found that wild oats do not appear to be well adapted to the dry area in southwestern Saskatchewan and southeastern Alberta, but prefer the cooler, more moist cropland in Manitoba, northern and eastern Saskatchewan, and northern and western Alberta.

Researchers have found that the areas infested did not change drastically from the years since the first survey in 1930. It has been pointed out that the light, medium and heavy areas of infestation coincide closely with the brown, dark brown and black soil zones of western Canada.

It is evident, however, that the general level of severity of wild oat infestation has increased over time. A study in 1959 showed that an average of 300,000 tons of dockage per year was shipped from Prairie farms to terminal elevators between 1924 and 1957 and that this dockage was approximately 30 percent wild oats. In 1973, the Canadian Grain Commission reported that 487,000 tons of dockage was shipped to terminal elevators in the 1969-70 crop year. Terminal operators estimate that wild oats now make up about 41 percent of the total dockage at terminal elevators.

Another way of looking at the wild oat dockage is a report from the Canadian Grain Commission show-

Mr. Leggett is Director of the Grains and Special Crops Division, Production and Marketing Branch, CDA, Ottawa.

ing that the total amount of wild oats arriving at terminal elevators increased from 5.3 million bu in 1959 to 11.7 million bu in 1969 and 18 million bu in 1972.

Wild oats are strong competitors with grain crops and significantly reduce yields when wild oat populations reach 10 to 40 or more plants/sq. yd.

Using a formula developed by the Lacombe Research Station and projecting the degree of infestation to acreage sown to various crops in the brown, dark brown and black soil zones of western Canada, the loss from wild oats ranges from approximately 4 to 10 bu/ac. When this loss is projected to the acreage sown to the six major grains (wheat, oats, barley, rye, flax and rapeseed), the total loss is about 350 million bu or a loss to western farmers of approximately $900 million.

The present demand for maximum grain production makes the loss of yield attributable to wild oats very important. It is clearly evident that Canada must look very closely at the need for further research into better control measures and the increased use of the cultural and chemical control methods already in use if we are to reduce these losses to an acceptable level.

Control Practices

Wild oat control is certainly one of the most complex problems on the farm. There are many factors involved, some of which are readily controlled, others are not. It takes expert management and a few breaks in the weather to clean-up wild oats. Many farmers have done it through cultural and chemical control practices, others have not been so successful. In most areas in western Canada, some farmers have been successful in reducing the wild oat infestation in their crops, while others have not been successful.

It has become very evident to all of those on the *Wild Oat Action Committee*[1] that extreme care must be taken when using herbicides to control wild oats. With optimum weather conditions and extreme care in applying a herbicide, good results can be obtained. Farmers must be sure that sprayer equipment is operating properly. Sprayers are being improved and it is in the farmers' best interest to see that the chemical is applied at the right time, that the required amount of water is used, that each nozzle is delivering the same amount, and that the pump is in good working order. Herbicides are costly but will give good results if care is taken to see they are applied properly.

Canada's reputation as a supplier of clean grain could be greatly enhanced by reducing the quantity of wild oats. Controlling wild oats will also increase production and reduce the number of bushels of wild oats shipped to terminal elevators each year. Farmers must remember that besides the increased yields they will obtain, they are also increasing the efficiency of their grain handling and transportation system and substantially reducing the costs which they pay at the terminal elevators. ■

Wild oats can severely reduce yields in flax.

[1] The *Wild Oat Action Committee* was formed as a result of a seminar on wild oats in 1973. The seminar was sponsored jointly by the United Grain Growers Ltd. and Agriculture Canada. Committee members were drawn from all segments of the grain industry including farmers from each of the Prairie provinces, representatives from the provincial governments, grain companies, universities, and CDA staff engaged in weed research and production.

A dairy division inspector grades creamery butter at the plant.

DAIRY DIVISION QUALITY PROGRAM

P. J. BRACKENRIDGE

Le contrôle de qualité de la Division du lait de la Direction de la production et des marchés, permet de garantir la haute qualité des produits laitiers à la consommation grâce à la collaboration des gouvernements provinciaux et les établissements. Grâce à ses quatre sous-programmes, l'enregistrement et l'inspection des laiteries, l'inspection des produits, les normes et les laboratoires, la Division du lait apporte sa collaboration en coordonnant les travaux de l'industrie en vue de conserver l'uniformité des produits à travers le Canada.

The Dairy Division of the Production and Marketing Branch, Agriculture Canada, functions in three main programs areas: Quality, Markets and Merchandising, and Production Liaison. Major emphasis is focussed on the Quality Program to help ensure adequate revenue to milk producers through the continued development of a responsible Canadian dairy industry. It also ensures a supply of high quality dairy products to the consumer.

The Quality Program is composed of four subprograms:

- Dairy Plant Inspection and Registration
- Dairy Product Inspection
- Grade Standards
- Laboratory

In the operation of the Quality Program, the Division functions as a coordinator rather than solely as a "policeman". To do this, the Division works very

Mr. Brackenridge is an agricultural officer in the Dairy Division, Production and Marketing Branch, CDA, Ottawa

An inspector matches the cheese color to the official standards for grading purposes.

closely with the industry and the provinces to establish quality objectives and goals, delineate respective roles, and assure the acceptance of responsibility for quality by all parties.

Dairy Plant Inspection and Registration

To ensure the production of high quality dairy products in Canada, a uniform inspection of dairy plants is necessary. In-depth inspections and consultations between government and industry make this a joint, cooperative effort.

The national inspection program, based on hundreds of inspection point items, is achieved through a computerized inspection, reporting and information system. The Dairy Division provides regional registration coordinators in Edmonton, Toronto and Montreal to ensure, in cooperation with the provinces, uniform inspection, and continued maintenance and improvement in processing facilities and methods of operation across the country.

Dairy Product Inspection

All manufactured dairy products such as skim milk powder, butter, cheese, ice cream and imported dairy products are inspected for quality related to composition, weight, packaging, labelling and grade (where applicable). Most product inspection is based on a statistically valid method of sampling the product and on the F.O.I.L. concept (frequency of inspection level) that provides for alternative levels of inspection frequency depending on the quality of the product being inspected.

During the development of quality criteria and inspection guidelines for each product, every effort is made to ensure maximum consultation with all concerned.

Grade Standards

Grade standards established for butter, cheddar cheese and skim milk powder have enabled the industry to market its products in an orderly fashion and have given consumers assurance of quality. The Dairy Division's staff grade products and issue grade certificates. They also inspect products for accuracy of industry assigned grade. Grading panels, composed of Dairy Division graders, representatives of industry and other governmental agencies, have been established to improve the uniformity of grade designation. They grade products in a controlled environment, discuss the designated grades and work towards greater uniformity.

Laboratory

The Dairy Division has five district laboratories, located at Moncton, Montreal, Toronto, Winnipeg and Edmonton. Each laboratory is properly equipped for accurate dairy product analysis and follows identical analytical procedures.

At present, regular analyses are conducted on butter, cheese and ice cream for compositional quality. Results are recorded by computer. Compositional (chemical) and micro-biological analyses on skim milk powder are conducted by the Analytical Services laboratory of the Plant Products Division. Grade certificates for international and domestic trade are issued on these results.

The laboratories of some companies have been approved by the Dairy Division to conduct their own analyses on skim milk powder. The Dairy Division regularly monitors these results for accuracy. The success of this approach will undoubtedly be the basis for similar joint programs for other dairy products.

Integrated Approach

To establish an even more unified Quality Program, in the future there will be a complete integration of the sub-programs through the use of computer systems. The purpose is three-fold:

- To ensure that plant sanitation and operation, compositional and bacteriological product analyses and grade designation are all considered as a total quality requirement.
- The principle of a top quality plant producing a top quality product can be realized through amalgamation of all quality criteria, and inspection frequencies allocated accordingly.
- Greater emphasis can be placed on problem solution to prevent recurrence of quality difficulties by allocating inspection resources to the areas of greatest need.

With total integration of the sub-programs, the Dairy Division's Quality Program will be able to ensure fulfillment of its responsibilities to the dairy producer, the dairy processor and the Canadian consumer. ■

JERUSALEM ARTICHOKE

FORMULATING THE POTENTIAL OF A NEW CROP

M. D. STAUFFER, B. B. CHUBEY and D. G. DORRELL

Suivant les recherches à la Station de Morden, la culture du topinambour offre d'excellentes possibilités quant à la production de sucre et d'alcool. La végétation aérienne et les résidus de pulpe des tubercules de topinambour à haut rendement pourraient servir d'aliments pour le bétail.

In our search for new crops, Jerusalem artichoke (*Helianthus tuberosus* L.) has shown excellent potential as an alternative sugar crop. Preliminary information indicated high yields of inulin from tubers. Initial research was aimed at determining its value as a sweetening agent and as a base for alcohol production. However, the high yields per ha of pulp and top growth demanded that the investigation be broadened to assess utilization of the total plant.

Jerusalem artichoke is native to North America and well adapted to northern climates. The plant grows tall and upright and varies from non-branching to branching forms of growth. Florets occur at the terminal points of the main stem and branches and are small and yellow, bearing hard, small seeds. Tuber shape, size and display vary from round, knobby clusters to long, smooth single tubers.

Growth begins from tubers early in the season and plants mature in about 130 days. However, because of moderate tolerance to spring and fall frost, the growing season extends beyond that of conventional crops. This attribute aids in achieving high tuber yields. No disease problems were encountered during our several years of investigation. However, diseases such as downy mildew, rust, septoria leaf spot, and Sclerotinia wilt are common in the sunflower (*Helianthus annuus* L.) and are potential problems in Jerusalem artichoke. White mold and soft rot tuber diseases occur in storage and may pose a problem. Investigations to delineate proper storage practices are planned because the epidermal layer is thin predisposing tubers to possible secondary disease organisms following physical damage during harvest. Tubers left in the field over-wintered well, with only occasional rotting observed.

Insect damage was also minimal. Sunflower

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Jerusalem artichoke plant before flowering.

beetles tended to reject Jerusalem artichoke even when beetle populations were high. The only insect damage observed was of a secondary nature where larvae of an unknown species were found in the pith of stems broken by high winds. In all respects, Jerusalem artichoke has displayed remarkable resilience to any damage which, in conjunction with its adaptability, accounts for the high yields attained.

The potential of this crop in terms of its component is shown in the table. Its possible uses are discussed on the basis of plant yields and chemical analyses.

Sugar and Alcohol

A comparison of data on two Jerusalem artichoke lines, branching and non-branching, and on sugar beets shows major differences in the components of yields. Tuber and sugar yields were greater in the branching type, whereas the non-branching line produced more forage. The branching Jerusalem artichoke significantly out-yielded sugar beets in yield of sugar per ha. In translating sugar yields into alcohol production, theoretical yields from Jerusalem artichoke would exceed 850 l/ha. This compares favorably with 500 l/ha of alcohol from sugar beets.

Jerusalem artichoke tubers from strains grown at Morden, 1972; upper—native, lower left—commercial, lower right—branching.

YIELD IN T/HA OF TUBERS AND TOP GROWTH, AND THE SUGAR AND PROTEIN CONTENT OF EACH FRACTION FROM TWO JERUSALEM ARTICHOKE (HELIANTHUS TUBEROSUS L.) TYPES AND FROM SUGAR BEETS (BETA VULGARIS L.)

	Tubers						Top growth	
		Sugar content				Pro-		Pro-
Type	Yield[1]	Total	Fru	Glu	Pulp	tein	Yield[1]	tein
Branching	20.9	3.38	3.00	0.38	0.83	0.22	12.3	1.2
Non-branching	14.1	2.56	2.30	0.25	0.73	0.15	17.9	0.7
Sugar beet	13.6	1.81	—	—	0.09	—	—	—

[1]Fresh weight

Hydrolysis of inulin produces fructose. In addition, fructose is 1.5 to 1.7 times sweeter than sucrose. Because of the sweetness rating, the calorie: sweetness ratio is lower, a benefit which should be important to Canadians according to the recently published national nutritional survey.

Increases in sucrose prices promoted the use of alternative sugars in several major sugar-using industries. The soft drink industry was among the first to utilize fructose in the form of invert sugar from high fructose corn syrup. Also, the Food and Drug Administration (U.S.A.) approved its use in jams, jellies and preserves. Reports indicate that the invert sugar: fructose formulations are 3:1. Although fructose, as a food sweetener, has been widely accepted, Canadian industries appear slow to substitute fructose for sucrose or invert sugars.

Vegetable Use

Jerusalem artichoke has been marketed as a vegetable in various countries, mainly as a specialty item. Suggestions have been made that it be used as a "non-food" vegetable. Since humans cannot digest inulin, utilizable caloric intake is reduced but volume intake and hunger are satisfied. The value of low-calorie food items in the diets of Canadians warrants further study.

Extracted Pulp

Protein yields and quality in the tuber pulp residue after extraction indicated potential as a protein adjunct in livestock feeds. Preliminary yield (see table) and quality data indicate that the product is similar to or better than sugar beet pulp. Caution must be taken, however, in assessing Jerusalem artichoke pulp yield relative to beet pulp yields since drying methods differ. Allowing for losses in Jerusalem artichoke in a commercial drying operation, pulp from Jerusalem artichoke still appears attractive.

Top Growth

Yields of 12-plus tons per ha of top growth have been observed (see table), suggesting a possible disposal or utilization problem. Indications are that the top growth makes a low to moderate grade of silage with the disadvantage of woody stems compensated for, in part, by the protein content. Studies are underway to determine the value of the silage.

Alternative uses for the tops may be in processing stalks and leaves for fibre board, or for charcoal and methyl alcohol production. These potential uses would be predicated on high yields of cellulose being available at low cost. Exploration of these possibilities would broaden the scope and extent to which Jerusalem artichoke may be used.

Major uses of this "new crop" lie in sugar and alcohol production. The high yields obtained to date and the possibility of total plant utilization make Jerusalem artichoke an attractive crop. ■

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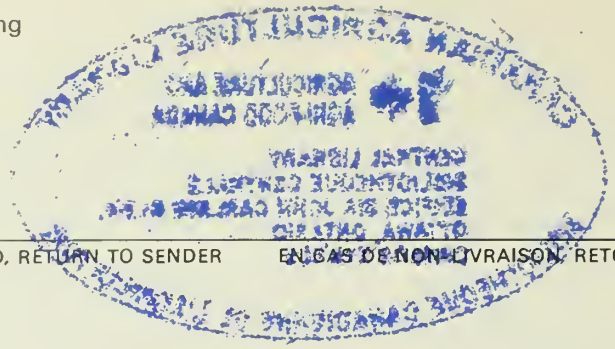

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