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COVER PHOTO: After the long winter . . . spring "takes over"

PHOTO DE LA COUVERTURE: Après le long hiver . . . la douceur du printemps

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

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

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D. S. MACLACHLAN

Seed potato certification in Canada is a federal responsibility. The CDA's Plant Protection Division therefore holds a unique position in that it establishes and enforces regulations governing seed production throughout the country and does so without charge to the grower.

At the moment, we are awaiting final legislative approval of a certification scheme tested and refined over several years and designed to open new markets for potato exports from this country.

Our system has a number of advantages, the main one being that uniform standards for seed potatoes are in effect in all provinces. Associated with this is uniformity in the enforcement of standards by the inspection staff. A prospective customer for seed potatoes is thus able to negotiate for Canadian seed, rather than for New Brunswick, Prince Edward Island or British Columbia seed.

There is a disadvantage to this system in that it is difficult to legislate for differences in disease, insect and cultural problems in the various areas of Canada. Changes in standards and regulations are usually initiated by federal officials, and it is difficult to obtain a consensus on these changes from the potato industry.

In the past few years, seed potato planting in Canada has averaged around 65,000 acres, with a yield of approximately 9 million hundredweight (138.4 cwts per acre). Domestic consumption of seed is approximately 3 million hundredweight, leaving a surplus of some 6 million hundredweight to be disposed of either as seed on the export market, or as domestic table stock. Of these alternatives, there is no doubt that export is the most desirable.

Dr. MacLachlan is Director, Plant Protection Division, CDA Production and Marketing Branch, Ottawa.

SEED POTATO PROGRAM

D. S. MACLACHLAN

La certification des plants de pommes de terre est du ressort du gouvernement fédéral. La Division de la protection des végétaux occupe donc une position unique du fait qu'elle établit et met en vigueur les règlements concernant la production des plants, partout au pays, sans qu'il en coûte un cent aux producteurs.

La Division attend l'approbation définitive, par des législateurs, d'un plan de certification essayé et mis au point durant plusieurs années; il ouvrira de nouveaux marchés aux producteurs de pommes de terre de notre pays.

Notre système possède un certain nombre d'avantages dont le principal est l'uniformité des normes de qualité pour les plants de pommes de terre dans toutes les provinces. Cette uniformité s'accompagne d'un programme visant à faire respecter les normes par un personnel d'inspection. Tout acheteur éventuel peut ainsi négocier l'achat de plants canadiens plutôt que de plants du Nouveau-Brunswick, de l'île du Prince-Édouard ou de la Colombie-Britannique.

Ce système comporte le désavantage: il est difficile de légiférer sur des différences de maladies, d'insectes et de problèmes de culture qui se rencontrent dans les différentes régions du Canada. Les changements de normes et de règlements sont habituellement décidés par les fonctionnaires fédéraux, et il n'est pas toujours facile d'obtenir l'unanimité de l'industrie de la pomme de terre à ce sujet.

Au cours des quelques dernières années, la plantation des pommes de terre, pour la production de plants, au Canada, s'est élevée à 65,000 acres avec

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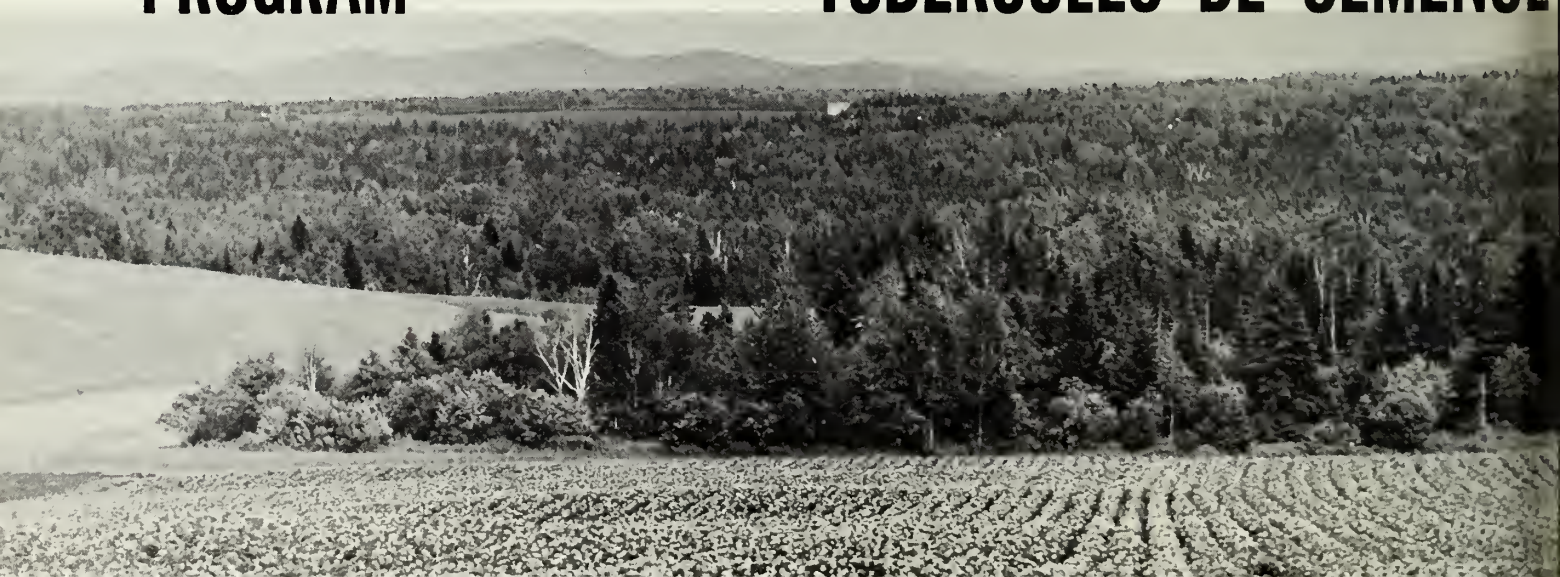
PROGRAMME RELATIF AUX TUBERCULES DE SEMENCE



Canada has been in a fortunate position with regard to export sales of seed potatoes for many years. We have been able to hold traditional markets and to expand our sales to other countries. However, competition is becoming stronger and, along with this, there is a trend for importing countries to demand a better product, both in the area of freedom from diseases and pests, and in shape and size of tubers.

We realized several years ago that to meet these demands, and improve domestic potato production, we would have to modify our regulations and we began work which culminated in the present system.

Reviewing requirements of importing countries, and our own situation, it became apparent to us that priorities could be put on our production problems.

For instance, although bacterial ring rot had been identified in Canada for some 40 years, and a zero tolerance had been placed on it in the regulations, we decided that this disease presented the major problem in seed potato production in most areas of Canada. Many potential purchasers of Canadian seed required a declaration to the effect that "this seed was free of bacterial ring rot," or that "bacterial ring rot had not been found within a distance of 20 miles in the past five years," etc. Canada has strictly enforced the zero tolerance in its seed potato inspections, but all who are familiar with this disease agree that it is virtually impossible to detect trace amounts in field inspection with the detection procedures available today. For this reason Canadian authorities could not supply the declaration some countries required in regard to bacterial ring rot.

Similar situations arose with respect to certain virus diseases. It was therefore apparent that the major disease problem in seed potatoes in Canada was bacterial ring rot, and that an attempt should be made to lower the tolerance for viruses.

It had been demonstrated in several countries in Europe that bacterial ring rot could be eliminated through a rigid sanitation program and the planting of small whole seed. Traditionally, Canadian seed potato growers have planted cut seed, and their whole production operation was geared to this. It was not possible, therefore, to legislate that only whole seed be planted. The alternative was a program which would provide for a nucleus of tubers free from ring rot for distribution to the better seed growers.

The most reliable method of testing tubers for the presence of bacterial ring rot is the Gram Stain Smear method but because it is slow and exacting it does not lend itself to a large testing program. Some provision had to be made for initial testing of a limited number of tubers and for building up a sizeable stock from these tubers under controlled sanitary conditions.

Such a program was devised and has been in operation for at least three years; it appears to be quite successful.

Formerly only two classes of seed potatoes were produced in Canada—Foundation and Certified.

(*continued on page 4*)

rendement approximatif de 9 millions de quintaux (138.4 quintaux à l'acre). Le besoin au pays est d'environ 3 millions de quintaux, ce qui laisse un surplus de quelque 6 millions de quintaux à écouler soit comme plants à l'exportation, soit comme tubercules de table sur nos marchés. Des deux systèmes, il n'y a pas de doute que le plus désirable est celui qui se rapporte à l'exportation.

Durant plusieurs années, le Canada a été en position avantageuse à l'égard des exportations de plants de pommes de terre. Nous avons été capables de retenir les marchés traditionnels et d'accroître nos ventes à d'autres pays. Toutefois, la concurrence devient plus serrée alors que les pays importateurs ont tendance à exiger un produit de la qualité la meilleure, tant pour l'absence de maladies et de parasites que pour la forme et la grosseur des tubercules.

Nous avons constaté depuis plusieurs années déjà, que pour répondre à ces exigences et améliorer la production des pommes de terre au pays il nous faudrait modifier nos règlements; aussi avons-nous commencé à travailler dès lors à préparer ce qui a abouti au système actuel.

En passant en revue les exigences des pays importateurs et notre situation, il est devenu apparent qu'il fallait accorder la priorité à nos problèmes de production.

Ainsi, malgré que la flétrissure bactérienne ait été identifiée au Canada depuis une quarantaine d'années et que les règlements n'en tolèrent pas la présence nous avons admis que cette maladie constitue le principal problème en production des plants de pommes de terre dans la plupart des régions du Canada. Beaucoup d'acheteurs possibles de plants canadiens exigent une déclaration à l'effet que «ces plants sont exempts de flétrissure bactérienne» ou que «l'on n'a pas trouvé de flétrissure bactérienne dans un rayon de 20 milles au cours des cinq dernières années», etc. Le Canada exige strictement que ses plants de pommes de terre soient exempts de flétrissure bactérienne à l'inspection, mais tous ceux qui sont familiers avec cette maladie s'entendent pour reconnaître qu'il est pratiquement impossible de dépister de faibles traces d'infection au cours de l'inspection des champs en n'utilisant que les méthodes de détection en usage présentement. C'est la raison pour laquelle les producteurs canadiens ne pouvaient pas fournir la déclaration exigée par certains pays à l'égard de la flétrissure bactérienne.

Il a été démontré dans plusieurs pays de l'Europe que la flétrissure bactérienne peut être éliminée par un programme rigide d'assainissement et la plantation de petits tubercules entiers. Les producteurs canadiens de plants de pommes de terre ont traditionnellement planté des tubercules coupés et toute leur production gravitait autour de cette pratique. Il ne s'agissait donc pas d'imposer par une législation la plantation de tubercules entiers. L'autre moyen consistait donc à mettre sur pied un programme qui fournirait, comme point de départ, une petite quantité de tubercules

(*A suivre page 4*)

Under the new system, there are five, although only two of these will be available for sale in Canada or for export in large quantity.

Here are the basic features of the program in its apparent final approved form.

ELITE 1

A small number of selected tubers from the best foundation growers are brought into our laboratories across Canada. These tubers are generally selected in the 10 to 12-ounce size. An eye is removed from the tuber and planted in the greenhouse. The resulting plant is examined for virus infection and discarded if infected. A smear is prepared from the stem-end of each tuber, stained, and examined microscopically for bacterial ring rot. If Gram positive bacteria in the size range of the ring rot organism are present, the tuber is discarded.

An alternative method for ring rot diagnosis consists of harvesting each hill separately and taking smears from the base of each stem in the hill. If ring rot bacteria are found in any stems in the hill, all tubers in that hill are discarded. Following indexing, the healthy tubers are returned to the selected grower, or to a provincial seed farm for planting. The tubers must be planted in tuber units (cuttings from one tuber are planted consecutively for observation and record purposes), with spacing between units. Plants are inspected at least three times during the growing season, and there is no tolerance for visible virus. Unlimited rogueing is allowed. Progeny from these indexed tubers is called Elite I seed. It can only be sold to growers with the permission of the Plant Protection Division which has a list of approved growers.

Each year, tubers are selected from Elite I seed and re-indexed for bacterial ring rot and viruses, and these tubers are planted for the production of the new Elite I crop.

The remaining tubers of Elite I (i.e. those which have not been indexed) are planted and the progeny is known as Elite II seed. This seed must also be planted in tuber units and is subject to very careful inspection. Only relatively small quantities of both Elite I and II seed are, and will be, produced.

Progeny of Elite II seed will be called Elite III. We require 10 per cent of the tubers planted for the production of Elite III also to be planted in tuber units.

The progeny of Elite III seed will be named Foundation seed. In this class there is no requirement for tuber unit planting. This is the first class of seed which will be widely distributed and will be the main class offered for sale on the export and domestic markets.

The final class of seed is known as "Certified" and will be produced from Foundation seed. This is the commercial grade of seed and will be utilized primarily for the production of table stock.

exempts de flétrissure bactérienne pour les distribuer aux meilleurs producteurs de tubercules de semences.

La méthode la plus sûre, pour faire l'essai des tubercules en vue de découvrir la présence de la flétrissure bactérienne, est la méthode de coloration élective Gram mais, parce qu'elle est lente et astreignante, elle ne convient pas à un programme intensif d'essais. Il a fallu prévoir au début l'essai d'un nombre limité de tubercules en vue de les multiplier pour s'assurer des stocks convenables de tubercules produits dans des conditions saines.

Un tel programme a été établi puis mis à exécution depuis au moins trois ans et il semble avoir passablement réussi.

Auparavant, on ne produisait que deux classes de plants de pommes de terre au Canada: les plants souches et les plants certifiés. Avec le nouveau système on en comptera cinq même s'il ne s'en trouve que deux disponibles en grandes quantités pour la vente au Canada et à l'exportation.

Voici les caractéristiques fondamentales du programme dans sa forme apparente définitivement approuvée.

ÉLITE 1

Nos laboratoires à travers le Canada se procurent un petit nombre de tubercules choisis provenant des meilleurs producteurs de plants-souches. Le choix de ces tubercules varie généralement de 10 à 12 onces en poids. On enlève un œil de chaque tubercule pour le planter en serre. La plante qu'il donne est examinée pour s'assurer qu'elle n'est pas infectée par le virus; quand elle l'est, le tubercule est éliminé. On prépare ensuite un frottis avec l'extrémité des tubercules qui était attachée à la tige puis on l'examine au microscope pour y dépister la flétrissure bactérienne. Lorsqu'on y trouve des bactéries Gram positives dont la grosseur est la même que celle de l'organisme qui cause la flétrissure, on élimine le tubercule.

Une autre méthode pour diagnostiquer la flétrissure consiste à récolter séparément les pommes de terre de chaque butte puis de préparer des frottis avec la base de chaque tige d'une même butte. Lorsqu'on trouve l'organisme de la flétrissure sur l'une des tiges, on élimine tous les tubercules de la butte. Après avoir été répertoriés, les tubercules sains sont retournés à des producteurs choisis ou à une ferme provinciale de semences pour y être plantés. La plantation doit se faire en groupant tous les plantons d'un même tubercule à la suite les uns des autres (afin de faciliter l'observation et la prise de notes), puis on laisse un espace entre chaque groupe. On examine les plants au moins trois fois durant la saison de croissance et on ne tolère pas ceux qui font voir la présence du virus. On élimine rigoureusement tous les plants non désirables. La «progéniture» répertoriée des tubercules qui subsistent après ces éliminations forme ce qu'on appelle les plants Élite I. Ils ne peuvent être

(*suite à la colonne adjacente*)

The five classes of seed are: Elite I, Elite II, Elite III, Foundation and Certified. With only one exception, the seed will be reduced in classification each year. The exception is that if a grower plants Elite III seed for the production of Foundation class, and if he plants a seed plot in tuber units and has had no history of bacterial ring rot for a period of three years, and if the seed plot meets the standards for Elite III seed, he may replant this seed for the reproduction of Foundation seed—but only on his own farm.

At present, Elite seed is being produced on an experimental basis. Elite seed farms have been established in the provinces of Prince Edward Island, New Brunswick and Quebec. Elite seed is also being produced by certain selected growers, and in one province the production of Elite seed is being subsidized by the province. The general grower reaction to this plan has been favorable, but it is still too early to assess the actual performance of seed produced. There is no question that more seed selection is taking place under this proposed plan, and the plan itself is flexible enough to allow individual provinces and areas to incorporate additional testing procedures as dictated by local conditions.

It is our hope that, by feeding clean seed into the system, by minimizing the chances of outside contamination, and by reducing the seed classification each year, Canada may be in a position to guarantee a better quality of seed potatoes and a potato which can meet the most exacting requirements for freedom from bacterial ring rot. ●

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vendus aux producteurs qu'avec la permission de la Division de la protection des végétaux, qui dresse une liste de producteurs autorisés.

Chaque année, des tubercules sont choisis parmi les plants Élite I, puis on les répertorie à nouveau pour dépister ceux qui pourraient être infectés du virus de la flétrissure bactérienne, après quoi on les plante pour produire une nouvelle récolte de semence Élite I.

On plante le reste des tubercules d'Élite I (ceux qui n'ont pas été répertoriés) et leur progéniture est connue sous le nom de Élite II. Ces plants doivent aussi être plantés en groupes espacés les uns des autres que l'on soumet à une inspection très soignée. Il ne se produit et ne se produira que des quantités relativement faibles de plants Élite I et Élite III.

La progéniture d'Élite II sera connue sous le nom d'Élite III. On exige que 10 p. 100 des tubercules servant à la production d'Élite III soient aussi plantés en groupes espacés.

La progéniture d'Élite III sera connue sous le nom de plants-souches et, dans cette classe, on n'exige pas la plantation en groupes espacés. C'est là la première classe de plants qui seront largement distribués; ce sera aussi la principale classe offerte en vente pour l'exportation et les marchés du pays.

La dernière classe de plants est connue sous le nom de Certifiée et on la produira avec des plants-souches. C'est la catégorie commerciale de plants qui sera utilisée surtout pour la production de pommes de terre destinées à la consommation.

Les cinq classes de plants sont donc les suivantes: Élite I, Élite II, Élite III, Plants-souche et Plants Certifiés. A l'exception d'un cas, tous les plants descendent graduellement de classe à chaque année. L'exception prévue est la suivante: lorsqu'un producteur plante des plants Élite III pour la production de plants-souches, ou s'il plante une parcelle de plants en groupes isolés, ou s'il n'a pas eu de cas de flétrissure bactérienne durant une période de trois années, et si sa parcelle de plants répond aux normes des plants Élite III, il peut utiliser ces plants pour produire des plants-souches, mais seulement sur sa propre ferme.

Présentement, on produit des plants Élite seulement de façon expérimentale. On a établi des termes pour la production de plants Élite dans les provinces de l'Île du Prince-Édouard, du Nouveau-Brunswick et du Québec. Les plants Élite sont aussi produits par certains producteurs choisis et, dans une province, la production de plants Élite y est même soutenue par des subventions. La réaction générale des producteurs a été favorable à ce programme, mais il est encore trop tôt pour estimer les résultats que donneront les plants ainsi produits. Il est certain que la sélection sera plus intense avec le système proposé, et le plan lui-même est suffisamment flexible pour permettre à chaque province ou région d'ajouter d'autres méthodes d'essais que pourraient exiger les conditions locales.

Nous espérons qu'en alimentant le système avec des plants sains, en réduisant les possibilités de contamination externe, et en descendant le classement des plants chaque année, le Canada se trouvera en position pour garantir une meilleure qualité des tubercules de semence puisqu'il offrira des tubercules qui répondront aux exigences les plus strictes en ce qui a trait à la non-contamination par la flétrissure bactérienne. ●

THE USE OF CORN SILAGE IN DAIRY CATTLE RATIONS

L. J. FISHER AND V. S. LOGAN

The use of corn silage for increasing milk production has been extended by the introduction of hardy corn varieties adapted to the rigorous climate of Eastern Ontario. It is, therefore, important that the factors which affect the quality, palatability and nutritive value of corn silage be appreciated and controlled with the objective of obtaining maximum dry matter and milk production output per acre.

In a recent series of experiments conducted at the Animal Research Institute, Ottawa, we tested several varieties of corn harvested at different stages of maturity. Corn silage was fed with three levels of hay. Lactating cows were used to evaluate the nutritive quality of the silages and the complete rations.

In the first year of the study, Pride 5 corn (requiring 2600 heat units or 90 to 95 days to reach maturity) and Pioneer 383 corn (requiring 3000 heat units or 95 to 100 days to reach maturity) were harvested and ensiled 107 days after seeding. At harvest time, the maturity of each variety was estimated by measuring its moisture content and proportion of ears on random field samples. During the winter months, each silage was fed free choice either as the only source of roughage or with 6 lbs. of hay daily to cows averaging 30 to 40 lbs. of milk production per day. Concentrate was fed to all cows at the rate of 6 lbs. daily.

At the time of ensiling, Pride 5 silage had a higher dry matter content (22.0 percent) and a slightly higher proportion of ears (28.6 percent) than the corresponding values for Pioneer 383 silage of 17.6 percent dry matter and 25.4 percent ears. The differences between silages were an indication that Pride 5 corn was relatively more mature at harvest time than Pioneer 383. There was a 7 percent loss of material during the storage period for Pride 5 silage compared to a 12.5 percent loss for Pioneer 383 silage. We consider this loss to be a function of the moisture content of the ensiled material.

The cows consumed larger amounts of silage from the more mature corn; 25 lbs. of dry matter daily as compared with 21.5 lbs. of dry matter daily for the less mature variety. The addition of hay reduced the dry matter intake from 25.1 lbs. per cow per day to 21.4 lbs., although the total ration dry matter intake remained nearly the same. The level of milk production was higher for Pride 5 silage at 37.4 lbs. per day when compared with the 34.7 lbs. per day when Pioneer 383 silage was fed. This increase reflects the difference in dry matter intake which occurred between the two silages. There was a slight increase in milk production when hay was fed even though dry matter intake of the two feeding regimes remained approximately the same. The increase in dry matter intake and milk production as a result of feeding Pride 5 corn silage may have been due to its more advanced maturity or a reflection of a varietal difference.

In an effort to estimate the effect of maturity upon both silage dry matter intake and milk production, Pride 5 and a new variety Warwick 605 (requiring 3200 heat units or more than 105 days to mature) were harvested and ensiled at 106 days (early cutting) and 120 days (late cutting) after seeding. The four silages were each fed free choice as a complete ration to cows in late lactation averaging 20 lbs. of milk per

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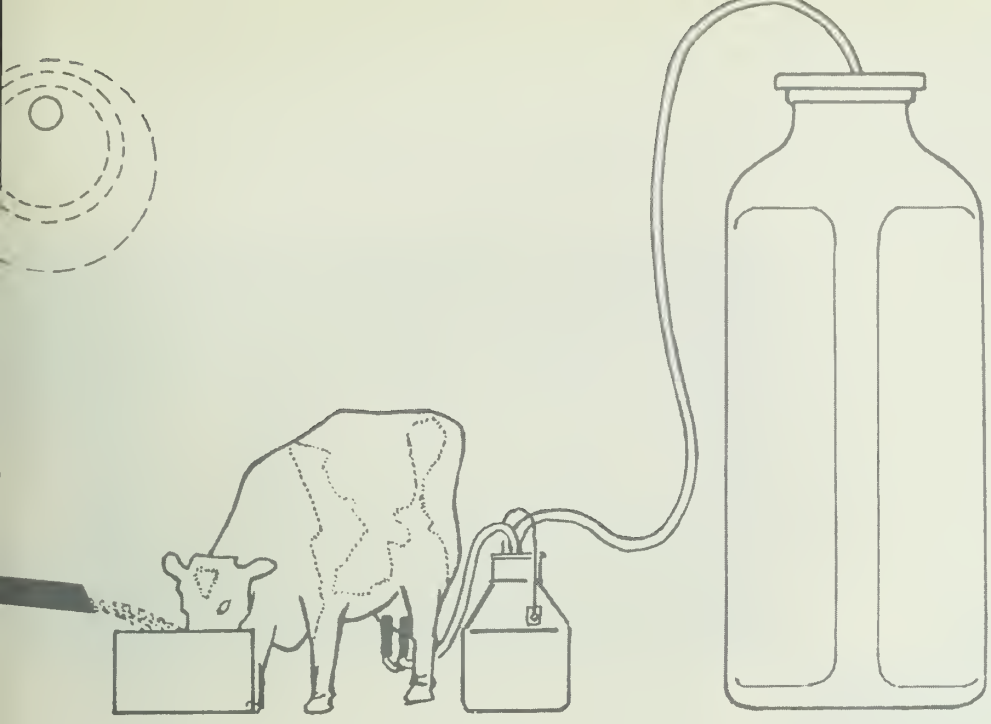

day. The cows were given a mineral supplement but received no concentrate or hay.

The dry matter content of the silages from Pride 5 corn showed a difference of approximately 5 percent with the extra two weeks to reach maturity while the silages from the Warwick 605 corn had nearly identical dry matter content. However, silages from both varieties showed a higher pH value for the late silage as compared to the early silage indicating some difference in the fermentation pattern which took place during ensiling. The feeding trial results indicated a preference for Pride 5 silage in terms of dry matter intake resulting in a slight increase in milk production when compared with Warwick 605 silage. The difference in harvesting date resulted in a difference in dry matter intake only in the case of the Pride 5 silage whereas both late and early cut Warwick 605 silages, with approximately the same moisture content at ensiling time, showed no apparent difference in either dry matter intake or milk production.

The results of this study emphasize the importance of the dry matter content of the corn at harvesting time as the criteria of acceptability of the silage to lactating cows. This may have been due to one or both reasons: First, its inverse relationship with maturity or second, the effect that moisture content has on the fermentation process.

In the first experiment, feeding of hay resulted in an increase in milk production when compared with feeding of corn silage as the only source of roughage. We wanted to substantiate this observation and, if possible, determine an optimum level of hay supplementation for corn silage feeding. Pride 5 and Warwick 605 were harvested and ensiled 118 days after seeding. At time of harvesting, field yields were measured for each variety and representative field samples were physically analyzed for the proportion of ears and chemically analyzed for proximate principles. Each silage was fed free choice in conjunction with two levels of hay either 5 or 10 lbs. per cow per day. The concentrate was fed at the rate of 5 lbs. per cow per day. Silage intake and milk production were measured for each treatment.

Warwick 605 outyielded Pride 5 in terms of dry matter per acre. However, the silage from Pride 5 corn had a higher dry matter content, 27 percent, as opposed to 22 percent for Warwick 605. As a result, the intake of silage dry matter was higher for Pride 5 silage at 15 lbs. per day as compared to 13.7 lbs. per day for Warwick 605. Silage dry matter intake was reduced on an average of 1.5 lbs. per cow with the higher level of hay supplementation. However, there was no appreciable increase in milk production corresponding to the higher intake of hay. We concluded from this latter experiment that, although feeding of approximately 5 lbs. of hay per day with corn silage fed free choice increased milk production, there was no further increase with the feeding of 10 lbs. of hay per day.

To obtain optimum silage quality, it is apparent that corn should be harvested at the most mature stage possible. However, losses due to severe weather conditions can occur and this factor must always be kept in mind in selecting a harvesting date. It is also important in marginal corn growing areas to use the earliest maturing varieties even if they may not be best in terms of yield. Although corn silage is satisfactory when fed as the only source of roughage, under the conditions of our studies feeding a small amount of hay daily to each cow proved beneficial from the standpoint of milk production. ●

Growing Rutabagas in the Atlantic Provinces

D. C. READ

Rutabaga (Swede turnips) growers in the Atlantic Provinces are quite familiar with the damage caused by the cabbage maggot, and many know of the extremely severe injury encountered when the maggots became resistant to aldrin and heptachlor. Furthermore, the use of these materials has had to be reduced or stopped entirely because of the increase of poisonous residues in our soils.

Fortunately, there are other insecticides which give excellent control of this insect pest and several materials are now registered for commercial use. In order of their effectiveness according to our plot tests, the materials include: Dasanit, Birlane, Zinophos and Thimet (the names most familiar to farmers). We also found that repeated applications of Diazinon will give good results but the other four materials require only a single preplanting treatment and are effective for the whole growing period of the crop.

With the new insecticides, it is once again possible to grow rutabagas, as shown in Fig. 1, center row. However, it is not simply a matter of placing seed and insecticide in the soil and then harvesting the crop. Our experiments at Charlottetown have emphasized that care must be taken in preparing the land, fertilizing, applying precise amounts of insecticide at the proper depth in the soil, spacing the plants 4-5 inches apart in the row, and in harvesting and storing the crop at cool temperatures. We have found that certain of the organophosphorus insecticides now required for root maggot control tend to promote or in some way increase infections of rhizoctonia (Fig. 2) and other rot organisms in rutabagas. Our tests have shown that it is advisable to grow the crop in stubble land rather than in fields where potatoes were grown the previous year. In addition, these new materials are extremely poisonous and must be handled with great care. For comparison, one may estimate that a gram of the insecticides listed above is about 300 to 400 times as poisonous as a gram of DDT.

A final point is storage. It has been long established that rutabagas should be stored at a temperature as close to 32°F as possible. Many growers with inadequate or without storage facilities are forced to sell their total crop in the fall. The resulting surplus on the market in the fall and early winter depresses prices to the grower. However the grower who has proper storage is able to hold a high quality product until the low quality surplus is disposed of and can take advantage of better prices later in the year. In the spring of 1967, growers received about $4.00 for a bag of rutabagas. With yields up to 1,200 bushels per acre, this price brought a good return. One cannot, of course, expect such a return on all of his crop. but this situation surely points up the advantages of good storage. ●

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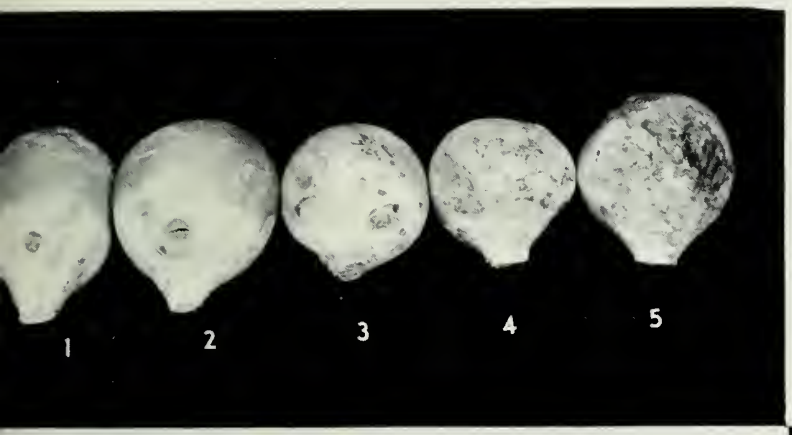

Fig. 1—Various degrees of infection of rhizoctonia on rutabagas; Nos. 4 & 5 also have secondary rot organisms.

Fig. 2—Treated (center row) and untreated rutabagas.

Fig. 3—Two-row subsurface insecticide applicator with fertilizer applicator attachment at front and space planting seeder at rear.

MECHANICAL APPLICATOR DEVELOPED

As a sideline of our research on root maggot at the CDA Research Station in Charlottetown, a machine was developed for applying insecticides and sowing seed at precise depths in the soil and a prototype of this machine (Fig. 3) is now manufactured commercially in Charlottetown. This device applies fertilizer, bands the insecticide at the prescribed depth in the soil, and spaces the seed in the ridged row slightly above the center of the band of insecticide.

For small plantings, the operations of fertilizing, making the rows, applying the insecticide, and sowing the seed are done separately; details on methods for the three Maritime Provinces are set forth in CDA Publication 1075, available free on request. Cultural practices in Newfoundland are sometimes different than in the other Atlantic Provinces and Newfoundland farmers are therefore advised to contact their provincial or federal officials.

RECENT IMPORTATIONS DRAMATIZED VIGILANCE OF CDA VETERINARIANS

N. G. WILLIS

Several articles have appeared concerning the recent importation of cattle from France to improve Canadian herds—but little mention has been made of the extensive tests to which the cattle were subjected by the CDA Health of Animals Branch before they were admitted to this country. For example, all animals were tested to show freedom from such diseases as bluetongue, Johne's disease, brucellosis, leptospirosis, tuberculosis and leukosis, but the most important tests were for foot-and-mouth disease. Here's an account of the careful work entailed.

After the Canadian buyers selected the cattle at the farms of origin, the animal health records of France were checked to make sure that this area had not had an outbreak of foot-and-mouth disease and that these animals had not been vaccinated against this infection. In addition, it was required that the animals be under nine months of age to minimize chances of being chronic carriers. They were also carefully examined by a Canadian veterinarian. Next, the animals were tested for the presence of virus in their throats and antibodies in their blood.

It is now known that an animal may appear perfectly healthy and yet carry the foot-and-mouth virus in its throat area for as long as 200 days after clinical foot-and-mouth symptoms have disappeared. To detect this type of carrier animal, a 'probang test' was devised, in which a small, sterile, steel cup on the end of a curved rod is introduced through the animal's mouth to take scrapings of tissue and saliva from the throat area. If virus is present in these scrapings, it can be revealed by the inoculation of baby mice or tissue culture.

An alternative method of determining whether cattle have had foot-and-mouth disease is to test for the presence of antibodies in their blood. After an animal has recovered from the disease and again appears healthy, its blood may be found to contain antibodies against the foot-and-mouth virus. The serum from an animal with antibodies, when mixed

(*continued on page 12*)

Dr. Willis is with the Virology Section, Animal Pathology Division, Health of Animals Branch, CDA Animal Diseases Research Institute, Hull, Que.

CATTLE IMPORTATIONS CALL FOR CARE

Fig. 1—Quarantine barn at maximum security Quarantine Station, Grosse Isle, Que. On their arrival from France, cattle were held in quarantine here for a mininum of 90 days while being tested for foot-and-mouth and other diseases.

Fig. 2—Barn at Quebec City, Que. from which cattle were released to buyers after quarantine period at Grosse Isle had ended. But as an extra precaution, cattle were quarantined a further 90 days on owners' farms.

Fig. 3—Charolais cattle being unloaded on arrival from France at maximum security Quarantine Station, Grosse Isle, Que., to begin 90 day quarantine period.

Fig. 4—Aerial view of maximum security Quarantine Station at Grosse Isle, Que., (Note quarantine barn in centre of photo).

with foot-and-mouth disease virus, will neutralize the virus in inoculated mice and tissue cultures. In other words, just as the antibody will prevent recurrence of the disease in the animal, so will antibody in a blood sample combine with the virus in a test tube rendering it non-infective. If an animal is shown to have antibodies in its blood, this indicates either that it has previously been given foot-and-mouth disease vaccine or that it has had the disease. In either case, it would not be suitable for importation to Canada. Hence, a probang sample and a blood sample were taken at the farms of origin and sent to the World Centre for Foot-and-Mouth Disease Research at Pirbright, England. Here, the blood specimens were checked for antibodies and the probang samples for virus.

Providing the animals were negative to these two types of tests for foot-and-mouth, as well as all other disease tests, the animals were taken from the farms of origin to the official French quarantine station at Brest, France, where they were held for a 30-day observation period, using the feed and bedding obtained from Canadian sources. During this entire period, the cattle were constantly under the supervision of a veterinarian of the CDA Health of Animals Branch. Second probang and blood samples were taken during this quarantine period and sent to Pirbright, England. If the second report was negative, the animals were shipped by boat to Canada at the end of the 30-day observation period. The water route was chosen because it prolonged the observation period. All bedding and feed used during the voyage was obtained from Canadian sources to avoid the introduction of any infection in this way.

The first Canadian soil touched by the cattle was at the maximum security Quarantine Station at Grosse Ile, a small island in the St. Lawrence river, some 40 miles downstream from Quebec City. At Grosse Ile, the cattle were held in quarantine under constant veterinary supervision, for a minimum of 90 days, during which time the testing and retesting is continued. On arrival, a third blood sample for foot-and-mouth disease testing is taken from each animal and sent at once to England. This is repeated a fourth time one month later. After the imported animals became settled in the Quarantine Station, healthy Canadian steers were mixed with the imports to see if the latter transmitted any disease. The Canadian cattle stayed with the imported animals for the remainder of the quarantine period on Grosse Ile.

Our veterinarians took probang samples from the imports and from the Canadian control animals 14 days after the latter had been placed in contact with the imported cattle. The samples were then shipped immediately to England for examination there within 48 hours after collecting. As a further precaution, members of the CDA Animal Pathology Division tested the probang samples from all the cattle for virus. This was done in a special laboratory set up for the purpose on Grosse Ile. Baby mice and pigs were inoculated and observed for signs of infection for a 10-day period. All of these repeated tests for foot-and-mouth disease proved negative. However, had any test shown the presence of virus in even one animal, all would have been slaughtered immediately.

When the quarantine ended at Grosse Ile, the cattle were released to the buyers. But, as a final security measure, the animals were again quarantined for 90 days on the farms of destination.

The importation of French cattle into Canada involved a large number of specialists in the CDA Health of Animals Branch. Meticulous checking and cross checking, testing and retesting was carried out with the utmost thoroughness to ensure that the dreaded foot-and-mouth disease had not been introduced into Canada with the importation.

Rigid stipulations, the discovery of new techniques, and increased knowledge about the virus which causes 'foot-and-mouth' have made it practical to permit certain imports on a carefully controlled basis—thus providing a valuable source of genetic material with which Canadian cattle breeders can improve their herds. ●

slender wheatgrass

NEW VIEWS ON AN OLD GRASS

Fig. 1—Left: Primar slender wheatgrass; Right: Agropyron fibrosa. The latter is an introduction native to the U.S.S.R. and similar in many respects to slender wheatgrass.

1

Fig. 2—Holstein calves grazing slender wheatgrass lines in a pasture study at Saskatoon.

2

W. L. CROWLE

Slender wheatgrass *Agropyron trachycaulum* (Link) Malte or Western ryegrass, as it was known by some of our earlier farmers, is one of the very few native grasses to become a cultivated crop. It is commonly found as part of the natural herbage of the Prairies, particularly where moderate soil salinity prevails. It is a short-lived (3–5 years) perennial bunchgrass with good salt tolerance.

There are many forms or biotypes in nature which differ markedly in appearance. Unlike many perennial grasses, slender wheatgrass is self-pollinating. This makes the improvement of this crop by plant selection a relatively straightforward procedure. Three varieties, Mecca, Fyra and Grazier were developed by Canadian workers prior to 1940 but seed of these varieties can no longer be procured. The only variety presently available is "Primar". This is an American variety which originated from a native seed collection made in Montana in 1933. (See Fig. 1). *(continued on page* 14)

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RESEARCH IN PROGRESS

At Saskatoon we started a program with slender wheatgrass in 1959 to develop improved varieties with particular emphasis on longevity and salinity tolerance. Seed lots of forty selections were obtained in 1959 and 1960 from the Plant Introduction Station, Pullman, Washington and formed the basis of the first space-plant nursery. The seed lots had been selected to provide a cross-section of native collections made in the United States. During July and August of 1961, trips were made to various parts of Saskatchewan and Eastern Alberta to collect seed lots from single native plant selections. A total of 570 collections were made from as far north as Dorintosh to as far south as Val Marie, both in Saskatchewan. In addition to other native collections, seed was obtained from Russia, Germany, Jugoslavia, Finland, Hungary, Czechoslovakia, Belgium and Sweden. A total of 739 selections have been evaluated to date.

In our investigations, all the seed lots of slender wheatgrass were screened in space-plant nurseries at the CDA Experimental Farm, Scott and the CDA Research Station, Saskatoon. Each nursery consisted of fifteen plants spaced three-feet apart, with a three-foot spacing between rows. We took actual yields for each line, to estimate yield potential and provide seed increase, and rated the plants for important agronomic differences. Individual nurseries were not ploughed until they had been fully rated for longevity. The more promising lines were further evaluated in replicated tests with Primar as the check variety. In addition, we included Summit or Fairway crested wheatgrass in each test.

Tolerance to salinity is difficult to measure but the techniques employed indicated significant differences between lines. In our studies, we seeded the various slender wheatgrass lines in rows down the slope of a hill into a saline-alkali flat. The slope provided a range of salinity from low to very high concentration. We seeded tall wheatgrass, which is noted for salt tolerance, in every third row and it acted as a standard for rating the lines. In addition, lines were germinated in concentrations of salt solutions (replicated) and compared to germination in distilled water. Sodium sulphate was the main chemical used in solution to increase osmotic pressure (simulate saline soils). This salt is most prevalent in local soils analysed for salt content. The performance of lines germinated in salt solutions was next compared to germination and survival in saline soil. (Fig. 2). Greenhouse soil and extremely saline soil were blended to provide a range of salinity levels.

In a grazing study at Saskatoon in 1965, we seeded twenty-four lines of slender wheatgrass, twelve lines of crested wheatgrass and tall wheatgrass. That year sheep were used followed by Holstein calves in 1966 to rate lines for production, consumption and animal preference. (Fig. 3). Finally, in 1966, we determined the proportions of leaf, head and stem and made analyses for protein and dry matter digestibility of component parts from a quality study. (Fig. 4). Only part of this data is presently available.

TABLE I

Variety or Strain	Source	Hay Tons D.M./ac. Av. 3 locations* (1965-1967)	Establishment Vigor (1-best, 5-poor) Av. 4 locations	Quality Factors**—Hay Stage (anthesis) Weight Leaf + sheath / Ratio Stem + head	Dry Matter Digestibility (%) (*In vitro*)
1055	Native Scott Sask.	1.97	1.9	.80	54.4
1246	" Luseland Sask.	1.91	1.2	.66	53.9
1318	" Swift Current Sask.	1.94	2.0	.75	54.6
1338	" Orkney Sask.	1.89	1.8	.86	55.2
1373	" Eastend Sask.	1.95	1.8	.74	56.4
1523	" Chauvin Alta.	1.95	2.0	.75	54.0
1558	" Revenue Sask.	2.02	1.6	.84	54.7
Primar	Pullman Wash. U.S.A.	1.96	1.8	.47	50.7
Crested wtgss. (Summit)		1.62	2.4	.36	52.1
Average (25 strains)		1.92	1.9	.70	54.3

*Hay yields not taken at Saskatoon in 1967.

**Data from Saskatoon trial, 1966 harvest.

All slender wheatgrass strains had significantly higher leaf/stem ratios and percentages of digestible dry matter than Primar.

Fig. 3—Greenhouse rating of grasses for emergence and survival with five levels of soil salinity. Note limited growth in highest salt concentration.

Fig. 4—Relative proportions of heads, leaves and stems of slender wheatgrass. (Cards show weights in grams for various portions of whole plants.) Note substantially higher leaf fraction for the 1558 line compared to the Primar variety.

RESEARCH RESULTS

Our research revealed wide morphologic differences in such factors as leafiness, color, growth habit, height of growth, spike and seed size. The most promising seed collections to date have come from plants growing wild in various parts of Saskatchewan. We found that none of the selections obtained from the United States performed any better than Primar under our growing conditions. Our animal grazing studies indicated that at the pasture stage (approximately 8 in. growth), strains of crested wheatgrass, slender wheatgrass and tall wheatgrass were readily consumed with no apparent animal preference. At the hay stage, animals preferred crested wheatgrass to slender wheatgrass and the latter to tall wheatgrass, but would consume all grasses. Also, animals were selective for certain lines of each grass.

We seeded a uniform test of twenty-five strains (Summit crested wheatgrass included) at four Research Stations in Saskatchewan and Alberta in 1965, which produced an overall average yield of 1.90 tons of dry matter per acre in the establishment year. Many lines yielded more than twice as much forage as Summit crested wheatgrass. Seed was harvested in the year of seeding at Saskatoon and the average yield for all strains was 649 lb. per acre. Very high seed yields for this grass are not uncommon. The average yield at Lacombe for 1966 and 1967 was 1007 lb. of seed per acre with one line averaging 1491 lb. per acre. Other interesting agronomic data resulting from this co-operative trial are given in Table 1 along with 25-strain averages. All slender wheatgrass lines listed were considered equal or superior to Primar for salinity tolerance.

PRESENT AND FUTURE USE

Slender wheatgrass is considered a good hay crop for use in short-term rotations and is commonly recommended in mixture with sweet clover. It will stand up to five weeks of flooding in the spring and is tolerant of severe salinity. Slender wheatgrass produces very high seed yields even in the establishment year. This factor, coupled with its current special-purpose usage, limits any seed production enterprise to a very small acreage.

It is my contention that slender wheatgrass should not be considered only as a special-purpose grass for saline soils and short-term rotations. Slender wheatgrass will establish easier than other adapted perennial grasses, and should always be considered for problem soils with poor structure, whether grown alone or as one component of a mixture. With favorable growing conditions, this grass will produce almost as much forage in the year of seeding as in subsequent years, and not enough attention has been given to its dual value as annual forage as well as perennial. Slender wheatgrass can outyield crested wheatgrass for three consecutive years of production. Management studies presently in progress indicate real yield advantages from using slender wheatgrass seeded in mixture or in alternate rows with other grasses or legumes. Slender wheatgrass performs best in the first year or two of production while most grasses reach their peak about third year of production.

The old standard variety, Primar, is somewhat coarse and stemmy. A more vigorous, leafier and more digestible variety would be highly desirable and should be forthcoming. For the present, the 1558 line is worthy of consideration as a variety. Although not much higher yielding, it establishes more readily than Primar, has more salinity tolerance and is of decidedly better forage quality. This program should soon come to fruitation with a new and superior variety. ●

ECHO

NOTES AND COMMENTS FROM THE FIELD AND LAB

CHEMICAL CHANGES IN STORED POTATOES—Chemical changes that occur in potatoes stored at low temperatures present a problem for commercial producers of chips and french fries.

Potatoes subjected to temperatures of 45 degrees or less become "sweet"—the starch in them turning to sugar. They are then useless for chips or french fries because the sugar produces an undesirable color and flavor when they are processed.

Normally, the sugar can be converted back to starch by keeping the potatoes in a temperature of over 65°F for several weeks—a process known as conditioning and which is followed by processors. But conditioning can be a costly job for processors because of the loss in tuber weight from shrinkage that occurs at high temperatures, and the expense for buildings and other facilities needed to keep the tubers in a warm environment.

However, the potato strain F889—developed in the CDA breeding program at Fredericton—often has only limited amounts of sugar in tubers stored at low temperatures.

The strain is still undergoing regional trials, but its value for processing has been shown in tests at this station. Compared with the standard variety Kennebec, F889 tubers had a low sugar and high starch content and gave excellent chips when processed on their removal from 40-degree storage.

A storage temperature of 55° gives good results with F889 tubers. Tuber weight loss from shrinkage was low and chip color was much like that obtained with tubers held at 70°.

SEED FROM CONTAMINATED LAND—If farm land becomes heavily contaminated by Strontium-90, say from atomic explosion fall-out, it is not necessarily wasteland. Though it should not be planted for feed crops, it can be used for seed production.

This conclusion was reached by the CDA Soil Research Institute, Ottawa, Ont., after an experiment with seeds of oats, barley, wheat and soybean from plants grown in heavily contaminated ground. The contaminated seed was grown to maturity on uncontaminated soil and the Strontium-90 contained in the straw and grain of the new crops was measured by very sensitive methods.

The results of the experiment showed that only a small part of the radioactivity originally present in the contaminated seed was contained in the straw of the new crop, and no radioactivity was found in the new grain.

A higher proportion of radioactivity was found in the soybean straw than in the straw of the three cereal crops. In order to investigate the soybean further, a pressed plant was exposed to suitable film, and after a period of time a picture showing the position of the radioactivity in the plant was formed on the developed film. This picture, or radio-autograph as it is called, showed that a large part of the radioactivity remained in the two leaves which comprised most of the original seed. A slight amount of radioactivity could be detected in the stem below these two leaves, but none could be detected in the stem above them. Failure of Strontium-90 to move upward would explain the absence of radioactivity in the seed of the new crops.—E. J. EVANS, OTTAWA, ONT.

A soybean seedling, grown from seed contaminated with Strontium 90, produced seed free of all such radioactivity when grown on clean soil. At left is a photograph of the pressed plant and at right a radio-autograph. The latter shows only those parts of the plant containing traces of radioactivity (see story below).

Plant de fève soja provenant d'une semence contaminée de strontium 90, mais dont les grains ne portaient pas le moindre indice de radioactivité dans un sol qui en était lui-même exempt. A gauche, photo de la plante sous presse et, à droite, radio-autographie de la plante, cette dernière n'indiquant que les parties de la plante atteintes de traces radio-actives (voir article ci-dessus).

SEMENCES PROVENANT DE SOL CONTAMINÉ—S'il arrivait qu'un terrain agricole soit fortement contaminé de strontium-90, par suite des retombées d'une explosion nucléaire, cela ne veut pas nécessairement dire qu'il soit condamné. Même si l'on ne peut l'utiliser pour la production fourragère, il peut l'être pour celle des grains de semences.

C'est la conclusion à laquelle est arrivé l'Institut de recherches sur les sols du ministère de l'Agriculture du Canada, à la suite d'essais effectués sur de l'avoine, de l'orge, du blé et du soja provenant de plantes cultivées en sol fortement contaminé.

On a semé et laissé mûrir ces graines contaminées dans un sol non contaminé. On a ensuite, par des méthodes très sensibles, mesuré la teneur en strontium-90 dans la paille et les graines des nouvelles plantes.

A la suite de l'expérience on n'a retrouvé dans la paille des nouvelles plantes qu'une faible portion seulement de la radioactivité originale présente dans les semences. Les graines produites par les nouvelles plantes n'ont révélé aucune radioactivité.

On a noté une plus forte teneur de matière radioactive dans la paille de soja que dans celle de trois autres céréales. Pour en savoir plus long sur le soja, on en a pressé une plante qu'on a exposée ensuite sur un film approprié. Après quelque temps, on a obtenu sur le film développé une image permettant de localiser les matières radioactives dans la plante. L'image, ou radio-autographie comme on l'appelle, a révélé qu'une forte proportion de la radioactivité demeure dans les deux feuilles (ou cotylédons) qui formaient la plus grosse partie de la graine d'origine. On a pu déceler une faible radioactivité dans la partie de tige située au-dessus. L'absence de radioactivité dans les semences de la nouvelle plante semble s'expliquer par l'incapacité du strontium-90 à se déplacer vers le haut.—E. J. EVANS, OTTAWA, ONT.

DAIRY POLICY '68

Based on the text of a speech given by Hon. J. J. Greene, Minister, Canada Department of Agriculture on the Dairy Policy effective April 1, 1968.

In announcing the dairy policy for the year which started April 1, 1968 I would like, first, to express my appreciation of the very close and useful consultations which we have had with farm and dairy organizations over recent months.

These have been extremely helpful to us in developing a continuing program for the rationalization and improvement of the industry and we have drawn extensively on the proposals from them.

A significant feature of these consultations has been the almost unanimous agreement with the necessity of keeping production within the bounds of what can be disposed of in normal markets. The result of the failure to do this in most major dairy countries has been apparent during the past year. There are now heavy world surpluses and seriously depressed international prices of butter, powder and cheese.

Of thirty-five countries whose milk production is reported by the United States Department of Agriculture, only eight did not show an increase in 1967 over 1966. Canada is one of the eight. One of the few, if not the only one, whose dairy policy is designed to keep production in line with market requirements.

We do, of course, have an imbalance in skim milk powder, and the present glutted world market and depressed prices have resulted in the Dairy Commission holding a very substantial surplus.

The increasing production of skim milk products over recent years has been due to a gradual conversion from cream shipments to milk shipments, which is happening in most countries and not to an increase in total milk supplies.

Generally, the past year has been a reasonably satisfactory one for manufacturing milk and cream shippers. Returns may not have been quite what they considered necessary, but there has been a very substantial improvement over recent years.

I know it will be understood that fiscal circumstances and the uncertainties of the market, place some restrictions on further adjustments which can be made at the present time.

Under the present form of dairy policy, the returns which a shipper receives for manufacturing milk and cream depend on four factors.

The first is the market price, which is related to the Dairy Commission's support prices for the major dairy products. These will remain at the same levels for 1968-69 as in 1967-68.

POLITIQUE LAITIÈRE DE 1968

D'après la déclaration faite par l'hon. J. J. Greene, Ministre, de l'Agriculture du Canada, sur la politique laitière commençant le 1er avril 1968.

En annonçant la politique laitière de la campagne commençant le 1er avril 1968, je tiens d'abord à dire combien j'apprécie les entretiens que nous avons eus avec des groupements agricoles et laitiers pendant ces derniers mois.

Ces entretiens nous ont permis de mettre au point un programme visant à rationaliser et à améliorer l'industrie laitière.

On maintiendra la production proportionnellement au volume qui peut être écoulé sur des marchés normaux; la plupart des principaux pays laitiers ont méconnu ce principe l'an dernier, de sorte que des excédents considérables se sont accumulés et que les prix internationaux du beurre, de la poudre et du fromage ont accusé une baisse sensible.

Sur les trente-cinq pays, dont le ministère de l'Agriculture des États-Unis signale la production dans ses rapports, huit seulement, dont le Canada, n'ont pas enregistré d'accroissement de production en 1967 comparativement à 1966; nous sommes un des rares pays, sinon le seul, dont la politique laitière vise à harmoniser la production avec les besoins du marché.

Il y a chez nous déséquilibre dans la production de poudre de lait écrémé et la Commission canadienne du lait détient des stocks excédentaires considérables.

L'augmentation croissante des produits de lait écrémé est sans doute attribuable à une transition graduelle des expéditions de crème à des expéditions de lait aux fabriques, et non à une augmentation des approvisionnements de lait.

La dernière année a été raisonnablement satisfaisante pour les expéditeurs de lait industriel et de crème. Les recettes n'ont pas été telles qu'escomptées, mais il y a eu une amélioration très sensible.

La situation fiscale et les incertitudes du marché imposent des restrictions aux réformes possibles.

Les recettes d'un expéditeur de lait et de crème de transformation dépendent de quatre facteurs: le prix du marché, lié aux prix de soutien de la Commission du lait pour les principaux produits laitiers, lesquels resteront aux mêmes niveaux en 1968-69 qu'en 1967-68; le niveau de la subvention: elle sera cette année de $1.31 les cent livres de lait (37.42c. la livre de matière grasse). Le soutien du marché plus la subvention assurent un soutien global de $4.85, comparativement à $4.75 en 1967-68; la retenue sur la subvention pour financer le coût de la péréquation à

The second is the level of subsidy. For the present year this will be $1.31 per hundredweight of milk (37.42 cents per pound butterfat). The market support and subsidy, together, provides total support of $4.85, compared to $4.75 in 1967-68.

The third is the holdback from subsidy to finance the cost of export equalization. For 1968-69 there is a differential holdback for milk and cream—15 cents on milk and 3.5 cents on cream.

The fourth is the extent to which a shipper's subsidy quota matches his total deliveries. With the free quota available to it, the Commission can now move to increase quotas for shippers whose 1967-68 deliveries have exceeded their quota for that year.

It was not desirable to change market support prices now. The support on butter will remain at 63 cents for 40-score butter. The basic support price for skim milk powder will remain at 20 cents per pound, but in the interest of improving quality, the Commission is considering a quality price differential.

The Commission's support of the cheese market during the past year has been primarily through export equalization. In addition, the Ontario Milk Marketing Board has provided direct support of the Ontario cheese price.

There is general agreement that cheese should be supported on a national basis and that this should be provided entirely by the Commission. The Commission will, therefore, establish a support price for cheese in line with those on butter and powder.

The policy of deducting from subsidy payments an amount to cover the cost of equalizing export and domestic prices on products which are surplus to Canadian requirements continues in 1968-69.

We recognize that cream shippers do not contribute to the surplus of skim milk products which, under present conditions, are the major charge on the export equalization fund, and that it probably is not equitable to assess them for the cost of their disposal.

For the 1968-69 year, therefore, the Commission sets different levels of holdback from subsidy for cream shippers and milk shippers.

The holdback against cream shippers is related to the approximate cost of export equalization on whole milk products. The rate of holdback is 3½ cents per hundredweight of milk (1 cent per pound of butterfat).

Since the cost of export equalization on skim milk products will be charged against milk deliveries the holdback from subsidy to milk shippers is now 15 cents per hundredweight (4.3 cents per pound butterfat). The holdback in 1967-68 was 11 cents per hundredweight of milk (3.15 cents per pound butterfat), on both milk and cream.

The combination of the $1.31 subsidy and the rate of holdback improves the net position of cream shippers, as compared to 1967-68, by 17½ cents per hundredweight, and, of milk shippers, by 6 cents.

This differential offsets, in part, the lower value of skim milk fed on the farm as compared to its market

l'exportation. Pour 1968-69, il y a une retenue de 15c. sur le lait et 3.5c. sur la crème; enfin la mesure dans laquelle le contingent ou quota de subvention d'un expéditeur correspond à ses livraisons globales. La Commission accroît les contingents des expéditeurs dont les livraisons de 1967-68 ont dépassé leur contingent ou quota de l'année.

Le prix de soutien restera à 63c. pour le beurre de pointage 40; pour la poudre de lait écrémé il restera à 20c. la livre, mais pour en améliorer la qualité, la Commission songe à un prix différentiel basé sur la qualité.

L'année dernière, la Commission a soutenu le marché du fromage principalement au moyen de la péréquation à l'exportation; l'Office de vente du lait de l'Ontario a fourni un soutien direct du prix du fromage fabriqué en Ontario.

Le fromage devrait être soutenu sur une base nationale entièrement aux frais de la Commission qui établira un prix de soutien du fromage en conformité avec ceux du beurre et de la poudre.

La déduction sur les subventions d'un montant égal au coût de la péréquation des prix domestiques et d'exportation de nos produits excédentaires subsistera en 1968-69.

Les expéditeurs de crème ne contribuent pas à l'accumulation des surplus de produits de lait écrémé qui pèsent principalement sur le fonds de péréquation des prix d'exportation, et il n'est peut-être pas juste qu'ils contribuent aux frais d'écoulement.

En 1968-69, la Commission établit donc à des niveaux différents la retenue à même les subventions aux expéditeurs de crème et aux expéditeurs de lait.

Pour les expéditeurs de crème, la retenue qui correspond au coût approximatif de la péréquation des prix d'exportation des produits de lait entier, s'élève à 3½c. les cent livres de lait (1c. la livre de gras butyrique); le coût de la péréquation des prix d'exportation des produits de lait écrémé sera imputé aux livraisons de lait et la retenue de subvention pour les expéditeurs de lait est de 15c. les cent livres (4.3c. la livre de gras butyrique). En 1967-68, la retenue était de 11c. le cent livres de lait (3.15c. la livre de gras butyrique), pour le lait et la crème.

La combinaison de la subvention de $1.31 et du taux de la retenue augmente le revenu net des expéditeurs de crème de 17½c. les cent livres, et celui des expéditeurs de lait de 6c., comparativement au regard de 1967-68.

Cette différence compense en partie la baisse de valeur du lait écrémé utilisé à la ferme, comparativement au prix de vente; elle devrait ralentir la tendance à expédier de la crème plutôt que du lait aux fabriques, réduisant ainsi l'accumulation de lait écrémé.

Le principe d'établir un rapport entre le total des subventions et les besoins normaux du marché, institué par la Commission canadienne du lait en 1967-68, sera maintenu en 1968-69.

HIGHLIGHTS

(1) Subsidy quotas for 1968-69 adjusted by the Canadian Dairy Commission for those who enlarged their operations in 1967-68 over 1966-67.

(2) New shippers in 1967-68 who did not have subsidy quotas in that year to receive quotas for 1968-69.

(3) Subsidy rate for 1968-69 is $1.31 per hundredweight of milk, or 37.42¢ per pound butterfat. ($1.21 per hundredweight, 34.57¢ per pound butterfat, in 1967-68).

(4) Holdback from subsidy to cream shippers is related to cost of export equalization of whole milk products. Now 3.5¢ per hundredweight of milk, (1¢ per pound butterfat). (11¢ per hundredweight, 3.15¢ per pound butterfat, in 1967-68).

(5) Holdback from subsidy to milk shippers is related to cost of export equalization of both whole milk and skim milk products. Now 15¢ per hundredweight of milk, (4.29¢ per pound butterfat). (11¢ per hundredweight, 3.15¢ per pound butterfat, in 1967-68).

(6) Combination of subsidy rate and holdback for 1968-69 improves net position of cream shippers by 17.5¢ per hundredweight, (5¢ per pound butterfat) over 1967-68.

(7) Combination of subsidy rate and holdback improves net position of milk shippers by 6¢ per hundredweight (1.71¢ per pound butterfat) over 1967-68.

(8) Market support price of butter remains at the 1967-68 level of 63¢ per pound.

(9) Market support price of skim milk powder remains at the 1967-68 level of 20¢ per pound, with a differential for quality to be fixed by the Commission.

(10) The Commission takes full responsibility for support of cheese market and sets support price for cheese in relation to butter and skim milk powder.

(11) Phasing-out payments made to those excluded from subsidy in 68-69 based volume.

(12) Subsidy payments related to milk and cream quality starts April 1, 1969.

(13) New manufacturing milk and cream shippers in future cannot expect subsidy quotas except by reallocation of existing quotas.

POINTS SAILLANTS

(1) Les quotas de subventions en 1968-69 sujets à rectification par la Commission canadienne du lait, à l'égard des producteurs qui ont agrandi leur exploitation en 67-68.

(2) Quotas de subventions en 1968-69 aux nouveaux expéditeurs de 1967-68 qui n'en avaient pas déjà.

(3) Taux de la subvention pour 1968-69: $1.31 les cent livres de lait ou 37.42 c. par livre de gras butyrique (équivalent $1.21 et 34.57 c. respectivement, en 1967-68).

(4) Réduction prélevée à même la subvention aux expéditeurs de crème en rapport avec la péréquation des frais d'exportation pour les produits de lait entier: 3.5c. les cent livres de lait ou 1c. la livre de gras de beurre (soit 11c. les cent livres de lait et 3.15c. la livre de gras butyrique en 1967-68).

(5) Prélèvement à même la subvention aux expéditeurs de lait en rapport avec les frais de péréquation des exportations à la fois des produits du lait entier et du lait écrémé: 15c. les cent livres de lait ou 4.29c. la livre de gras de beurre (soit 11c. les cent livres de lait et 3.15c. la livre de gras butyrique en 1967-68).

(6) La combinaison du taux de la subvention et de la retenue pour l'année 1968-69 augmente de 17.5c. les cent livres de lait ou 5c. la livre de gras butyrique, le revenu net des expéditeurs de crème par rapport à celui de 1967-68.

(7) La combinaison du taux de la subvention et de la retenue augmente le revenu net des expéditeurs de lait de 6c. les cent livres de lait ou 1.71c. la livre de gras par rapport à celle de 1967-68.

(8) Le prix de soutien du marché du beurre reste à son niveau de 1967-68, soit 63c.

(9) Le prix de soutien de la poudre de lait écrémé demeure à son niveau de 1967-68 de 20c. la livre; la Commission se charge de fixer un prix différentiel selon la qualité.

(10) La Commission déterminera le prix de soutien du marché du fromage, en rapport avec celui du beurre et de la poudre de lait écrémé.

(11) Indemnités ou paiements de compensation, fondés sur le dernier volume de leurs livraisons, aux producteurs exclus des subventions de 1968-69.

(12) Les subventions seront fondés sur la qualité du lait et de la crème à compter du 1er avril 1969.

(13) Les nouveaux expéditeurs de lait industriel et de crème recevront à l'avenir des quotas de subventions, sauf dans les cas de réallocation des quotas en vigueur.

price and should have some influence in slowing down the conversion from cream to milk shipments and the build-up in surpluses of skim milk products.

The fourth factor, the policy of relating the total of subsidy payments to the normal market requirements, instituted by the Canadian Dairy Commission in the 1967-68 year continues in 1968-69.

Disregarding skim milk powder, which is a by-product of butter and other high fat products, production and normal market use of dairy products were about in balance in 1967-68. Both were down slightly due to a minor decline in butter production and sales.

The global figure for the payment of subsidies in 1968-69 has been set at the equivalent of 98,500,000 hundredweight of milk. The figure in 1967-68 was 99,500,000.

We recognize the desirability, in the interests of rationalization of the industry, to provide additional subsidy quota to those who, during the past year, in order to develop more viable production units, have increased their operations.

Using normal under-deliveries by those who do not meet their quotas, and withdrawals, it will be possible to meet these needs and still keep total payments within the authorized global amount.

The Commission will, therefore, move to increase quotas where 1967-68 deliveries have exceeded the quota for that year. The extent to which it will be able to do this will not be known finally until its 1967-68 records are completed, which may be late June or early July. Any adjustments made in quotas at that time, however, will be applicable back to April 1, 1968.

The Commission's preliminary appraisal is that it will be able to provide quotas for those below 100,000 pounds for the full amount of their 1967-68 deliveries, with possibly descending percentages in higher levels of production and a maximum production figure above which there is no additional quota provision.

Equivalent consideration will be given to new manufacturing milk and cream shippers in 1967-68 who had no subsidy quota for that year.

The Commission, however, has given notice that people entering dairying from now on cannot expect to receive a subsidy quota except by reallocation of existing quotas. Also those who shipped less than 12,000 pounds of milk, or 420 pounds of butterfat, in 1967-68, are not eligible for subsidy quota in 1968-69.

Those shipping between 12,000 and 50,000 pounds are required to reapply for subsidy. Their eligibility will be determined in relation to whether they are full-time farmers and the percentage of their farm income from the sale of milk and cream.

We agree there should be a phasing out payment to those who are excluded from subsidy under this arrangement and a fund has been set aside.

The payment will be at the 1968-69 subsidy rate for the amount of their 1967-68 deliveries.

An item on which there has been unanimous agreement is that the subsidy payments should be related to milk and cream quality. The Commission has given notice that this will take effect April 1, 1969. ●

Abstraction faite de la poudre de lait écrémé, la production et l'utilisation normale des produits laitiers se sont équilibrées durant 1967-68. La production et les ventes de beurre ont accusé une faible baisse.

Le volume global des subventions en 1968-69 a été établi à 98,500,000 quintaux (100 livres) de lait, pour 99,500,000 en 1967-68.

Il est souhaitable, pour la rationalisation de l'industrie, d'accorder un contingent additionnel de subvention pour ceux qui ont agrandi leur exploitation.

Les livraisons sous la normale de ceux qui ne satisfont pas à leurs contingents et les retraits permettront de satisfaire aux besoins et de limiter les paiements au montant global autorisé.

La Commission accroîtra les quotas lorsque les livraisons de 1967-68 dépasseront le contingent de cette année-là. La possibilité de réaliser ce programme sera problablement connue fin juin, début juillet. Les redressements éventuels des contingents seront rétroactifs au 1er avril 1968.

La Commission estime qu'elle pourra accorder des quotas à ceux dont les livraisons sont inférieures à 100,000 livres pour le plein montant de leurs livraisons de 1967-68, avec des pourcentages possibles décroissants pour ceux dont la production est plus élevée, et un chiffre de production maximum au-dessus duquel aucun quota additionnel n'est accordé.

Une attention équivalente sera accordée aux nouveaux expéditeurs de lait et de crème de transformation en 1967-68 qui ne touchaient pas de contingent de subvention cette année-là.

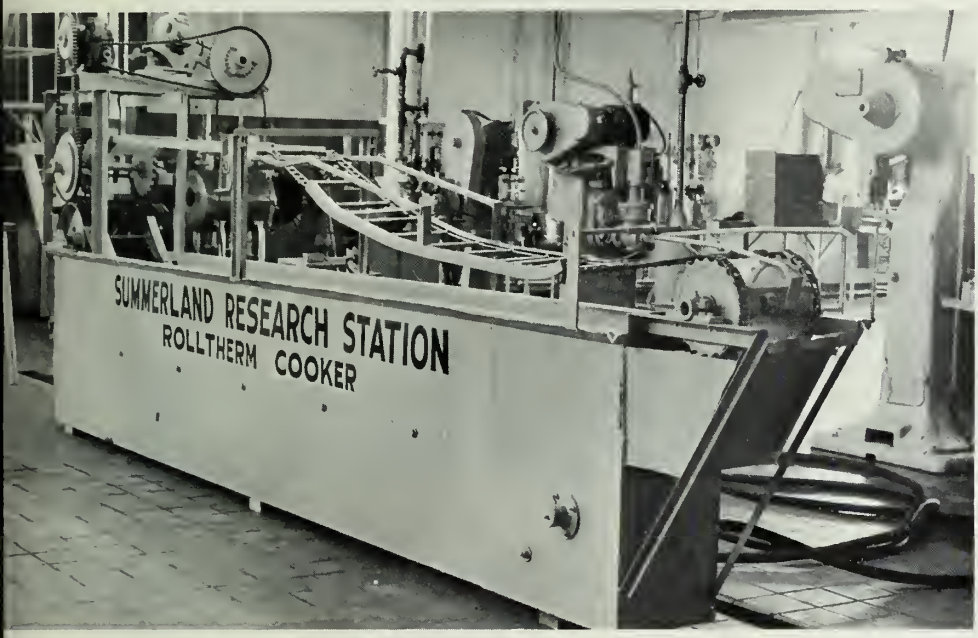
La Commission a envoyé un avis à l'effet que les gens qui se lanceront dans l'industrie laitière à partir d'aujourd'hui ne peuvent pas s'attendre à recevoir un contingent de subvention sauf par la réallocation des contingents existants.

Ceux qui ont expédié moins de 12,000 livres de lait ou 420 livres de matière grasse en 1967-68 ne sont pas admissibles au contingent de subvention en 1968-69.

Ceux qui expédient de 12,000 à 50,000 livres doivent soumettre à la Commission une nouvelle demande de subvention. Les producteurs n'auront accès à la subvention que s'ils sont agriculteurs à plein temps et en fonction de la proportion du revenu agricole qu'ils tirent de la vente du lait et de la crème.

Nous sommes d'accord sur le principe d'un paiement de compensation temporaire à ceux exclus du nouvel arrangement. Un fonds spécial a été réservé.

Le paiement, basé sur le taux subsidiaire de 1968-69, portera sur un volume de lait égal aux livraisons de 1967-68. Le montant des subventions correspondra à la qualité du lait et de la crème. L'accord entrera en vigueur le 1er avril 1969. ●



Larger cans of fruit can be processed for institutional use without loss of quality with the aid of the Rolltherm shown here (see article below).

A l'aide du Rolltherm, illustré ici, on peut se servir de boîtes plus grandes, à l'intention des institutions, comme contenants des fruits transformés, sans que la qualité ait à en souffrir (voir article ci-dessus).

NEW TWIST IMPROVES CANNED FRUIT—Scientists at the CDA Research Station Summerland, B.C., have introduced a new twist to fruit processing.

The technique markedly improves the quality of fruit packed in the large, 100-fluid oz. containers generally used by institutions. While availability of processed fruit in this size of can offers advantages for the large-scale purchasers, conventional processing of this container requires a longer cooking period and this impairs quality of the fruit to some degree.

The new twist in processing is provided by the Rolltherm cooker developed by specialists at this station. The unit speeds the cooking process by spinning the cans to agitate the contents.

Peaches, pears, apricots and cherries in 100-oz. cans can be cooked in the Rolltherm unit in a quarter of the time required with older, non-agitating cookers. Peach halves, for example, take only 15 minutes instead of an hour.

The result: better flavor, firmer fruit and greater clarity of the syrup.

The improved processing method will make it possible for institutions to buy the large size cans and obtain fruit of the same quality as that in the 14-oz. cans produced for home consumption.—J. A. KITSON, SUMMERLAND, B.C.

MISE EN CONSERVE AMÉLIORÉE DES FRUITS—Les scientifiques de la Station fédérale de recherches de Summerland viennent de mettre au point un nouveau perfectionnement à la technique de la transformation des fruits.

La nouvelle méthode améliorera sensiblement la qualité des fruits conservés dans les gros récipients de 100 onces liquides qu'emploient les institutions. Si elle présente des avantages pour les acheteurs en gros, la mise en conserve employée jusqu'ici dans ce genre de récipient exige, par les méthodes ordinaires, une longue période de cuisson qui altère plus ou moins la qualité du fruit.

Le nouveau perfectionnement est dû à l'emploi de la marmite Rolltherm. Mis au point par les spécialistes de la station de recherche, l'appareil accélère l'opération par un mouvement de rotation qui agite le contenu. Pour la mise en conserve des pêches, poires, abricots et cerises dans les boîtes de 100 onces, la marmite Rolltherm permet de ramener la cuisson à un quart du temps que prennent les anciennes marmites non rotatives. Ainsi, par exemple, les moitiés de pêche ne prennent plus que 15 minutes au lieu d'une heure.

Les résultats, se traduisent par une meilleure saveur, un fruit plus ferme et un sirop plus clair. Grâce à l'amélioration du procédé de mise en conserve, les institutions pourront acheter des boîtes de grande capacité avec l'assurance d'obtenir un produit de la même qualité que dans les boîtes de 14 onces utilisées à la maison—J. A. KITSON, SUMMERLAND, B.C.

SOIL SURVEY AND SOIL TESTING IN NEWFOUNDLAND—The CDA Research Station at St. John's West, Nfld., is conducting a soil survey of the island province.

Facts will be sought concerning the many different soils, slope and drainage properties. There are many natural and chemical features such as the amount of vegetation or peat, organic content, acidity and plant food content.

Each is important. The survey will not only serve agriculture but will provide valuable information for road builders, prospectors and the building industry.

Soils support plants and provide them with most of the necessary plant food. Domestic animals live off plant food and in turn live off our soils. We have to know our plants, their needs and the character of the soil that supports them. Soils differ widely in physical characteristics in Newfoundland, that is in the amount of fine, medium and coarse particles they contain. The resistance they have against changes, and the way they react under different stresses and influences, such as water, plowing and harrowing, are important. Chemically speaking there is also an endless variation of differences from one soil to another and even from top soil to soil a few inches or a foot deep. The vegetation or plant growth developing on a soil often is a reflection of these soil differences. The plant in a limited way adapts itself to the soil and climate in its rooting, feeding, growth and growing habits. Agricultural practices try to give the crop the best conditions physically and chemically that are economically warranted.

The most tame hay produced in Canada's history was 26 million tons in 1966.

A. M. BOSWELL

CHANGES IN CANADIAN BEEF PRODUCTION

Beef production is an important segment of the agricultural economy of Canada and has been expanding rapidly in recent years. In 1966, sales climbed to $886.6 million or 21 per cent of the $4.3 billion Canadian farmers received in 1966 for all farm commodities. This makes beef one of the biggest single sources of farm cash income in terms of money in the farmer's and rancher's pockets.

On a provincial basis Ontario led with $295 million, followed by Alberta with $228.3 million, Saskatchewan $152.2 million and then Manitoba with $77 million. Latest preliminary information available for 1967 leads one to expect that farm cash income from the sale of cattle and calves will be even closer to the one billion dollar level.

Likewise, in the United States the most important single source of farm cash income is beef. In 1966, cash receipts from beef amounted to $10.4 billion, nearly a quarter of the $42.9 billion that farmers received from the sale of all farm products.

INCREASED PRODUCTION

Since the early 1950's beef slaughterings in Canada have more than doubled, from 1,284.7 thousand head in 1950 to 2,641.8 thousand in 1967 (Table 1). The greatest increase occurred in western Canada where 84 per cent of the beef type cows in Canada are now concentrated. The remainder is located primarily in Ontario. The proportion of cattle slaughtered under federal inspection from 1950 to 1967 has shifted 11 per cent (9 per cent from 1958 to 1967) from East to West. The sharp increase in Ontario slaughter, from 408.5 thousand head in 1950 to 877.5 thousand in 1967, reflects in part the increased numbers of Western feeder cattle fed out in Ontario, an average of about 300 to 400 thousand head annually in recent years.

The main factor contributing to the sharp increase in beef output is an ever-growing consumer appetite for more beef. Largely due to the sharp rise in personal income, per capita beef consumption increased from 50.8 to 82.7 pounds between 1950 and 1966, or a rise of 32 pounds per capita. The increase in population of 45 per cent since 1950 has also contributed to the increased demand for beef. Canadian cattlemen have responded by increasing beef production (commercial slaughter in pounds) at an average annual rate of 7 per cent since 1950. In addition to increased domestic production, exports of feeder cattle to the United States have increased sharply since the early fifties.

SEX OF BEEF

Associated with the overall growth of the beef industry have been significant changes in the sex and quality of beef produced. In 1950, dairy cow numbers at 3.1 million head accounted for 76 per cent of the total dairy and beef type cows in Canada. On June 1, 1967, beef cows were up to nearly 3 million head and dairy cows down to 2.7 million, or 47 per cent of total cow numbers. With the changing make-up of the relative importance of the cattle population from dairy to beef type animals, the sex and quality of beef slaughtered has also been greatly influenced. Steer slaughterings have increased proportionately being currently half of total slaughterings (Fig. 2). Heifer slaughterings have shown no significant change but the proportion of cow and bull slaughterings has shown a marked decline. Even with the relatively heavy cow slaughterings in 1965 and 1966, its proportion to total slaughter showed no increase.

The decrease in the proportion of cow slaughterings reflects the reduction in the number of dairy cows and the increasing proportion of calves going into feedlots and later slaughtered as fed beef. In fact, while total cattle numbers since the early 1950's have risen, calf slaughter for veal has not increased. In 1950 federally inspected calf slaughter totaled 773.2 thousand head, 784.8 thousand in 1958 and 738.8 thousand head for 1967.

In the United States big changes have also occurred in the sex makeup of beef produced. During the four

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year period 1964 to 1967, steer slaughter accounted for 53 per cent of the total inspected kill, heifers 24 per cent and cows and bulls combined 23 per cent. Beef type cows have exceeded dairy cow numbers in the United States since 1953, while in Canada numbers were about equal in 1965, for the first time.

GRADE OF BEEF

During the past 15 years beef output by grade has also changed significantly. In the early fifties Choice and Good grade carcasses accounted for less than 30 per cent of total gradings (Fig. 2). Through the mid-sixties over half of the beef graded was within the top two grades, Choice and Good. Although the makeup of the cattle population is becoming increasingly more beef oriented, much of the increased output of beef and of the increase in the proportion of Choice and Good grade carcasses have been the result of the growth and development of feedlot feeding in Canada, especially in southern Alberta and southwestern Ontario.

Since the early fifties production of lower grade beef—Standard, Commercial, Utility, Manufacturing and Bulls—has shown a general increase. However, its proportion relative to total gradings has steadily declined from more than two-thirds to less than one-half.

FUTURE TRENDS

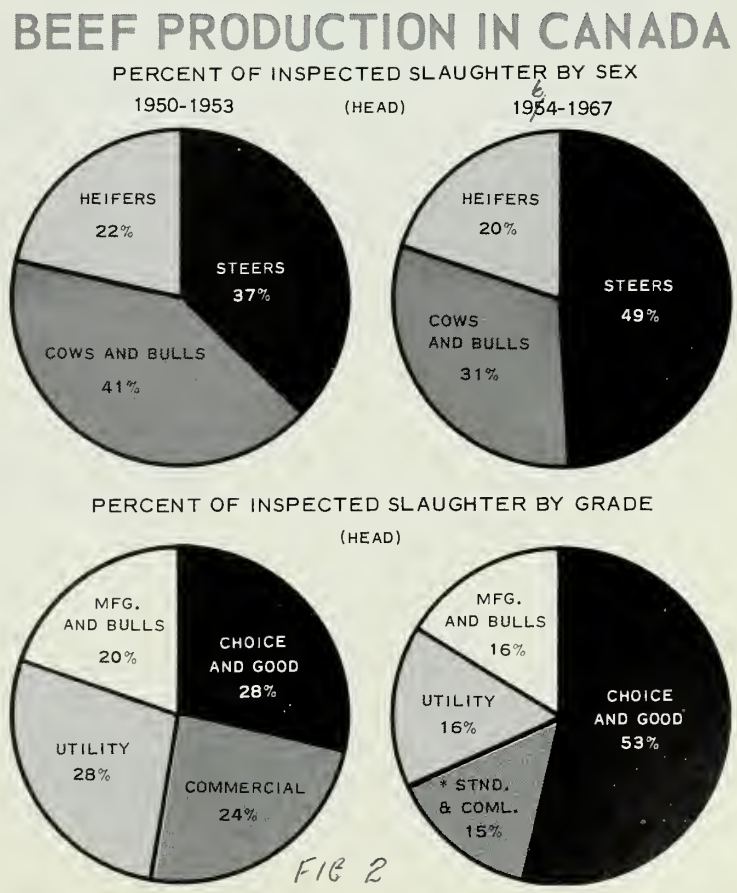
Future changes in the distribution of beef production in Canada by sex and grade are expected to follow the general pattern of recent years but the changes likely will be less dramatic. The proportion of steer beef probably will continue to show some upward trend but the rate is expected to be slower than during the past several years. The proportion of heifer beef should move steadily upward in the years immediately ahead. Improvements in the calfing rates of Canadian beef cow herds could make available more steers and heifers for feeding. Also, as beef animals become an increasingly higher proportion of the total cattle population more heifers and steers could become available for feeding. Furthermore, with continued expansion of feedlot finishing of cattle in Canada more heifers may go into feedlots than in the past. Cow beef's share of total slaughter will likely continue to decline slowly in the years ahead. However, some fluctuations in cow slaughter will probably continue and remain subject to cow liquidation, demand for feeder cattle, weather conditions and feed costs.

The proportion of Choice and Good grade carcasses will probably continue to show some increase in the years immediately ahead. Further development and growth of feedlot feeding could increase the proportion of Choice and Good grade slaughter cattle. Consumer preference for high quality beef is expected to continue strong and could further enhance the growth of commercial cattle feeding. The proportion of lower grades of beef produced will likely be downward. With the decline in the proportion of cow slaughter, the supply of cow beef could become proportionately less.

In summary, significant changes have occurred since the early 1950's in the increase in beef slaughter and in the sex and quality of beef produced in Canada. Future changes are expected to follow those of recent years, but at a slower rate. The proportion of steer and heifer slaughter will likely increase and the level of cow slaughter should be proportionately less. ●

TABLE 1—CATTLE SLAUGHTERINGS UNDER FEDERAL INSPECTION 1950 AND 1967

PROVINCE	1950 No. (000 head)	1950 Per Cent (Canada)	1950 Per Cent (Choice and good)	1967 No. (000 head)	1967 Per Cent (Canada)	1967 Per Cent (Choice and good)
British Columbia	98.8	8	38	81.7	3	62
Alberta	173.8	13	20	846.4	32	63
Saskatchewan	76.4	6	12	153.0	6	54
Manitoba	257.2	20	10	450.7	17	45
WEST	606.2	47	18	1,531.7	58	57
Ontario	408.5	32	21	877.5	33	63
Quebec	247.4	19	08	196.4	7	19
Maritimes	22.6	2	02	36.2	2	10
EAST	678.5	53	16	1,110.1	42	53
CANADA	1,284.7	100	17	2,641.8	100	55



*IN 1958 COMMERCIAL WAS SEPARATED INTO STANDARD AND COMMERCIAL GRADES

SNAPDRAGONS ON TRIAL

GUEULES·DE·LOUP À L'ESSAI

A. R. BUCKLEY

Not very many years ago, planting large beds of snapdragons in a prominent place meant taking a gamble, for it was quite possible that they would either become badly disfigured by rust, spoiled by borers or be knocked down by wind. Trials at the CDA Plant Research Institute test gardens in Ottawa soon revealed that improved cultivars of these plants can now be planted with the utmost confidence, for never have so many kinds produced such a spectacular display over so long a period. Many were in flower until frost stopped their progress in early October.

The introduction of the F_1 hybrid Rocket strain a few years ago led to subsequent development of

(continued on page 22)

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A. R. BUCKLEY

Il y a à peine quelques années, la plantation de vastes plates-bandes de gueules-de-loup était un coup de dé, car elles pouvaient tout aussi bien s'cnlaidir sous l'effet d'une épidémie de rouille, être endommagées par l'action d'insectcs térébrants ou renversées par le vent. Les expériences faites aux jardins d'cssais de l'Institut de recherches sur les végétaux, au ministère de l'Agriculture du Canada à Ottawa, ont démontré que des cultivars améliorés de ces plantes peuvent maintenant être plantés en toute confiance, car on n'en a jamais produit autant de sortes donnant des étalages aussi spectaculaircs et aussi persistants. Un grand nombre étaient encore en fleurs lorsque la gelée vint mettre fin à leur croissance au début d'octobre.

L'introduction, il y a quelques années, de la lignée hybride F_1 Rocket a ouvert la voie à la création subséquente d'autres lignées possédant une force, une vigueur et une floraison égales, mais offrant aussi une plus grande variété de couleurs durant la floraison. Les typcs Rocket eux-mêmes varient en hauteur selon la couleur; c'est ainsi que la Rocket Frosty mesure 24 pouces tandis que la Rocket blanche en mesure 42. La plupart d'entre elles possèdent des couleurs originales reluisantcs très pures, mais d'autres offrent un mélange de deux couleurs comme c'est le cas pour la Rocket Redstone, qui est orange et rouge, et la Frosty Rose qui est une bicolore rouge-rubis et blanche avec lèvre jaune canari. Une nouvelle acquisition de l'année est la Rocket Cherry qui, d'après les tables de couleur de la Royal Horticultural Society, peut être décrite comme étant d'un rouge cardinal étincelant avec tube et gorge rouge rubis.

La série Vacationland donne aussi des lignées à fleurs hautes qui sont très appréciées. On y compte la Glacier à fleurs blanches; la Grand Canyon de couleur rose neyron avec lèvre jaune de Dresde; la Great Smoky, d'un pourpre mauve inondé de blanc et avcc lèvre jaune; la Las Vegas, de couleur orange brûlé avec tube et gorge jaune rubis; la Séquoia rouge rubis; la Sun Valley jaune primivère; la Waikiki rose neyron avec tube plus pâle. Toutes mesurent de 25 à 32 pouces de haut.

La série Pinnacle, de la même hauteur, n'est cotée qu'à un point ou dcux de moins. Les couleurs de cette série sont le cramoisi, lc bronze pâle, le rouge rosé, l'orange écarlate, le blanc et lc jaune. Toutes ces plantes étaient en fleurs depuis le 20 juin jusqu'à ce que se produisent les gelécs vers la fin de septembre. Les fleurs les plus tardives se sont produites sur les tiges de la base après avoir coupé les principales fleurs.

(A suivre page 22)

L'auteur, est un spécialiste en ornementation, à la Section des Jardins d'essais, Institut de recherches sur les végétaux, Ferme expérimentale centrale, Ottawa.

further strains having equal strength, vigor and floriferousness, but having also a wider variety of flower colors. The Rocket types themselves vary in height according to the color selection, from 24 inches in Frosty Rocket to 42 inches in White Rocket. Most of them have very pure glistening self colors, but some are blends of two colors, such as Redstone Rocket, orange and rose red, and the new Frosty Rose, a spinel-red and white bicolor with a canary-yellow lip. Cherry Rocket is another new color added this year; according to the R.H.S. color charts it is described as a glistening cardinal-red with a spinel-red tube and throat.

Another tall-flowered strain that rated very highly was the Vacationland series. It includes Glacier, white; Grand Canyon, neyron rose with a dresden-yellow lip; Great Smoky, mallow purple suffused with white and with a yellow lip; Las Vegas, burnt orange with the tube and throat spinel yellow; Sequoia, ruby red; Sun Valley, primrose yellow; and Waikiki, neyron rose with a lighter tube. These were all 25 to 32 inches high.

The Pinnacle series, of the same height, rated just a point or two lower. Colors in this series were crimson, light bronze, rose red, scarlet orange, white and yellow. All plants were in flower from June 20 until frost occurred in late September. The later blooms arose from basal stems after the main flowers were cut.

Two excellent but unclassified tall-growing cultivars merited attention. One was Burpee's F_1 White Ruffles, a tetraploid hybrid with larger, uniquely ruffled flowers, and Freiland from Mauser of Switzerland, which had flowers of Indian lake with a beet-root purple tube, an extremely glowing combination.

Although the tall kinds were the ones that attracted immediate attention, the highest-rated group was the Frontier strain, which is not quite as tall as the Rocket but taller than the intermediate types such as Sprite and Carioca. Each cultivar in this series came true from seed and had clear colors on very vigorous and floriferous uniform plants. Because of their height they were excellent for cutting, yet they were not too tall for bedding purposes. The orange, rose and white hybrids rated slightly higher than the other three, but all were significantly good.

Because of their semidwarf, uniform, compact and base-branching habit, plants of the Sprite strain rated almost as high as those of the Frontier strain. Their clear glistening colors with lighter lip markings made them excellent bedding plants, and their height, 14 to 20 inches, was short enough for almost any bedding site.

The medium-sized Carioca strain rated as high as the Sprite strain. It contained some extremely colorful, vigorous and uniform cultivars that grew 18 to 24 inches high. Each separate color was really a blend of colors. The cultivar Apple Blossom was neyron rose and yellow; Deep Red was cardinal red with lighter edges; the Orange Bronze cultivar was jasper

Deux cultivars de haute taille mais non classés ont mérité de l'attention aux essais. Il s'agit d'abord de la Burpee's F_1 White Ruffles, hybride tétraploïde avec grandes fleurs ébouriffées de façon très particulière, puis de la Freiland, création de Mauser, en Suisse, dont les fleurs sont de couleur lac indien avec tube de couleur pourpre betterave et offrent un ensemble extrêmement rutilant.

Même si les gueules de loup les plus hautes étaient celles qui attiraient immédiatement l'attention, le groupe le mieux coté appartenait à la lignée Frontier, pas aussi élevée que la lignée Rocket, mais qui donne des fleurs plus hautes que les types intermédiaires comme la Sprite et la Carioca. Chacun des cultivars de cette série se reproduisait fidèlement par la semence et donnait des couleurs nettes sur des plantes très vigoureuses et florifères. En raison de leur hauteur, elles sont excellentes comme fleurs coupées tout en n'étant pas trop hautes pour les semer en plates-bandes. Les hybrides orangés, roses et blancs ont été cotés un peu mieux que les trois autres, mais tous ont été exceptionnellement bons.

En raison de sa tendance à donner des plants semi-nains, uniformes et produisant des branches à la base, la lignée Sprite a obtenu une cote presque aussi élevée que la Frontier. Ses couleurs nettes et étincelantes avec des marques plus pâles sur les lèvres en ont fait d'excellentes plantes de plates-bandes et sa hauteur, qui varie de 14 à 20 pouces, fait qu'elle convient à n'importe quel endroit.

La lignée Carioca de hauteur moyenne a reçu la même cote que la lignée Sprite. Elle comprend des cultivars extrêmement colorés, vigoureux et uniformes qui ont de 18 à 24 pouces de haut. Chaque couleur séparée est en réalité un mélange de couleurs. Le cultivar Apple Blossom est rose neyron et jaune; la Deep Red est rouge cardinal et bordée de teintes plus pâles; l'Orange Bronze est rouge jaspé et soufre foncé; le cultivar Peach Bronze est rouge brique inondé de rose empire. Cette lignée d'une beauté remarquable a enchanté les visiteurs de nos jardins durant tout l'été.

Parmi les cultivars choisis qui ont été hautement cotés, signalons: la Defiance, d'un orange rougeâtre brillant et qui pousse à la hauteur de 15 pouces; la Juno, nouvelle acquisition rose abricot à lèvre jaune qui a été créée dans les jardins de la Royal Horticultural Society, en Angleterre; l'Eclipse, donnant une floraison embrasée de cramoisi qui atteint 18 pouces de haut; la Frosty Pink, hybride F_1 au coloris exceptionnel et dont chaque fleuron est porté sur des épis longs et lourds à fond blanc enduit de rose.

Toutes les gueules-de-loup de taille très naine ont été éclipsées par les petits types parfaits Floral Carpet. Elles se reproduisent parfaitement et sont extrêmement uniformes. Celles qui s'en approchent le plus sont les cultivars de la lignée Clause dans la série Tom Thumb, mais les fleurs en sont plus variables.

red and dark sulphur; and Peach Bronze was brick red, suffused empire rose. This very striking and beautiful strain delighted visitors to our gardens all summer long.

Among the selected cultivars that rated highly were: Defiance, bright reddish-orange, suffused with lighter orange, 15 inches high; Juno, a new apricot pink with a yellow lip that originated in the R.H.S. Gardens in England; Eclipse, a fiery crimson 18 inches high; and Frosty Pink, an F_1 hybrid with most unusual coloring, each floret on the long heavy spikes having a background of white with a pink overlay.

All the very dwarf snapdragons were overshadowed by the perfect little Floral Carpet types. These are true breeding and extremely uniform. Nearest to them were cultivars of the Clause strain of the Tom Thumb series, but they had more variable flowers.

Nearly all large groups of plants contain cultivars that do not fit into any definite classification. In the snapdragons there is the double-flowering strain whose components all rated highly in bedding value. Of these plants, Vanguard, a vigorous base-branching cultivar with large 20-inch spikes of neyron rose, rated highest. Very close was Harris Double Yellow, with sulphur-yellow flowers on spikes 22 to 30 inches high.

Another anomalous group is the Bright Butterflies strain with open-flared trumpet-shaped flowers that are quite distinct. Although many separate true-breeding colors were grown, this strain is only available in a mixture of colors at the present time. This mixture, though, contained the most complete and harmonious color mixture of all those tested.

The so-called Bellflower group also had open-faced florets, and had the same habit as the Bright Butterflies. In this group, Tinkerbell, with neyron rose flowers on long tapering spikes, is the only color selection. This was quite indistinguishable from some of the pink-flowered Bright Butterflies obtained from the mixture.

The snapdragons mentioned here are selected from a total of 144 under test. Doubtless, if space permitted, many more might have been found to be above average. However, the tests showed that the snapdragon has improved considerably and some of the older strains still offered for sale are not now worth growing.

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Presque tous les gros groupes de plantes renferment des cultivars qui ne correspondent à aucune classification déterminée. Il en est de même pour les gueules-de-loup où se rencontre une lignée à fleurs doubles dont chaque élément est hautement coté pour sa valeur pour plantation en plate-bande. Parmi ces plantes, la Vanguard est celle qui a obtenu la meilleure cote avec ses branches vigoureuses produites à la base et ses épis rose neyron de 20 pouces de haut. La Harris Double Yellow la suivait de très près avec ses fleurs jaune soufre portées sur des épis de 23 à 30 pouces.

La lignée des Butterfly brillantes forme un autre groupe exceptionnel avec ses fleurs en forme de trompettes largement évasées. Même si par la semence on produit isolément des couleurs pures, présentement, cette lignée n'est disponible qu'en mélange de couleurs. Ce mélange, toutefois, comprend l'assortiment de couleurs le plus complet et le plus harmonieux que nous ayons essayé.

Le groupe appelé Bellflower possède aussi des fleurons à face ouverte et exhibe les mêmes tendances que les Butterfly brillantes. La seule sélection de couleur dans ce groupe est la Tinkerbell aux fleurs rose neyron portées sur de longs épis coniques. On avait peine à les différencier des Butterfly brillantes à fleurs roses trouvées dans le mélange.

Les gueules-de-loup mentionnées ici ont été choisies parmi les 144 qui ont été soumises aux essais. Il n'y a pas de doute que, si l'espace le permettait, on pourrait en trouver beaucoup d'autres qui dépassent la moyenne. Toutefois, les essais ont démontré une grande amélioration des gueules-de-loup et que quelques-unes des anciennes variétés encore offertes sur le marché ne valent plus la peine d'être cultivées.

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ERRATUM NOTE

Readers are requested to correct TABLE 3 which appeared on page 31 of the Winter 68 issue of CANADA AGRICULTURE by transposing the "Yes" and "No" headings to read as shown herewith. The editors sincerely regret this oversight.

TABLE 3. HAY AND SEED YIELDS OF GRASSES AND LEGUMES, FORT NELSON, B.C. 1965 AND 1966.

	Hay (tons/ac)			Seed (lb/ac)		
		1966–2 cuts			1966	
Crop	1965[1] 1 cut	Fertilizer No	Fertilizer Yes	1965[1]	Fertilizer No	Fertilizer Yes
Carlton brome-grass	.8	.9	2.1	36	75	135
Climax timothy	.8	1.0	3.0	173	180	445
Olds creeping red fescue	.2	.6	2.0	143	178	391
Rambler alfalfa	.6	3.0	5.0	190	247	272
Aurora alsike	1.0	1.4	1.4	216	469	578
Leo birdsfoot trefoil	.8	1.4	1.8	—	240	276

[1]First production year.

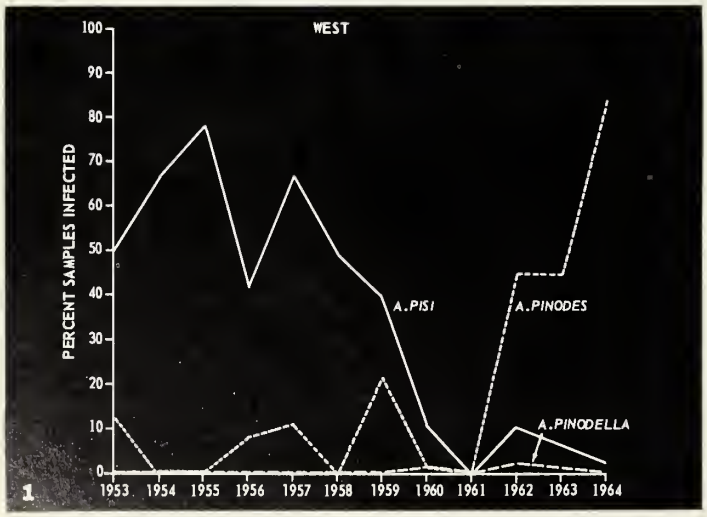
ASCOCHYTA BLIGHT OF

V. R. WALLEN AND T. F. CUDDY

Since 1961, a disease of peas, known as blight, has been steadily increasing in Canadian field peas. This disease, caused by a fungus *Ascochyta pinodes*, is found in most countries and has been the cause of serious disease outbreaks from time to time. Prior to 1961, the disease was present in Canada to a limited extent and not considered to be very important. Leaf and pod spot, caused by a closely related fungus *Ascochyta pisi*, was formerly the most important disease in field pea seed. However, leaf and pod spot is now seldom encountered.

Why did the disease situation in field peas change so drastically? One reason was the introduction of the variety, Century, in 1961. It is resistant to leaf and pod spot disease. This resistance, combined with high yield and excellent cooking quality, assured Century's acceptance as Canada's principal field pea variety. With the increased popularity of Century, leaf and pod spot has all but disappeared; also acreages of Arthur and Chancellor, the older susceptible varieties, have been reduced. Century is susceptible to blight like all field pea varieties.

Dr. V. R. Wallen is Chief, Phytopathology Section, Cell Biology Research Institute, Ottawa, and Dr. T. F. Cuddy is Head, Seed Biology Unit, Plant Products Division, Production and Marketing Branch, Ottawa.



The redistribution and decreased acreages of field peas in certain sections of Canada have had an effect on the incidence and distribution of blight and of leaf and pod spot diseases. In 1954, leaf and pod spot disease of field peas occurred in every province, doing most damage in the eastern provinces. In western Canada, the disease was most severe in areas of high rainfall and least prevalent in the semi-arid areas of southern Alberta and the interior of British Columbia. Field pea acreages have declined from 57,000 acres in Ontario and Quebec in 1946 to 3,961 acres in 1966. However, in Manitoba the acreage has increased from 30,600 acres in 1946 to 46,000 acres in 1966 and comprises over 70 per cent of the total Canadian acreage at present.

From 1959 to 1963, we conducted field experiments which showed that blight could cause losses in the crop of up to 45 per cent. This work was done on older field pea varieties which showed good correlation between disease incidence and loss of yield. However, the variety, Century, with no resistance to this disease, has maintained a higher yield than other varieties, despite its susceptibility. Century has more tolerance to blight than earlier pea varieties.

Results of seed examinations over the period 1953 to 1964 in western Canada show that a relatively low percentage of samples were infected with the blight organism from 1953 to 1961. However, since the introduction of Century, an increasing number of

Fig. 1—Percent infection of A. pinodes, A. Pisi and A. pinodella in field pea seed grown in Western Canada 1953-1964.

Fig. 2—Effect of temperature on blight development. (1) 10°; (2) 15°; (3) 18°; (4) 25°; (5) 30°C.

Fig. 3—Effectiveness of seed treatment for the control of seed-borne A. Pinodes. Left: seedlings treated with captan; Right: untreated.

FIELD PEAS

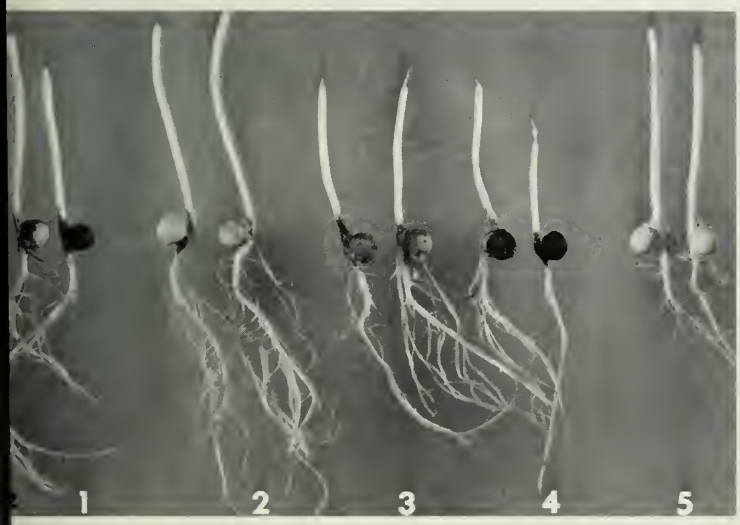
samples have been infected with blight each year. This trend reached a peak in 1964 when over 80 per cent of the samples were infected. With the lack of competition from leaf and pod spot disease, the blight organism has flourished. (Fig. 1).

Our research on blight has shown that, from seed infection, below-ground symptoms may appear over a wide range of soil temperatures, but that soil temperatures of 65° to 70°F. are optimum for disease. Lesions develop above and below the area of seed attachment and vary considerably depending on the severity of seed infection and the environmental conditions (Fig. 2). Lesions appear first as longitudinal black streaks on the hypocotyl and epicotyl, near the point of attachment of the seed. Lateral root development may also be restricted. The young plants may die at this stage or survive to provide a source of infection for spread of the disease to healthy plants. In cases of severe infection, the seed rots as germination begins. If the plant survives, small purple streaks, at the base of the stem, progress up the plant. The streaks become more pronounced at the nodes. Irregular purple-brown spots appear on the leaves and pods may show purple irregular dots which later form large purple areas. Purple streaks are often prominent on the margins of the pods.

In addition to seed as a source of infection, recent research in the Cell Biology Research Institute, Ottawa, indicates that the organism is present in the soil and may overwinter for a number of years in the absence of a pea crop. How the organism maintains itself is not known. However, once introduced into a field it may survive for a number of years. The fungus was recently isolated from a field on the Central Experimental Farm in Ottawa that had not grown peas for over 20 years. The organism can also survive on old pea vines for a period of at least 13 months.

Control of blight must therefore be considered from at least two aspects; the seed and the soil. Our research has shown that a high degree of control can be obtained with the use of proper seed treatments. In our tests, we have found that several fungicides can give effective control but that two of them, thiram and captan, are highly effective in eliminating seed infection as well as increasing germination. Captan and thiram reduced infection from 46 to 2 per cent. At the same time germination was increased from 66 per cent in the untreated seed to over 95 per cent with seed treatment (Fig. 3).

Although our research has just begun on the importance of the soil as a source of infection of Ascochyta diseases, we have isolated the blight fungus, *Ascochyta pinodes*, from the soil in pea fields as well as fields formerly cropped to field peas. Indications are that this fungus lives for many years in the absence of a pea crop and it is now pointed out that future control measures will have to include consideration of soil as an important aspect of the problem. ●



LE CHALCIS

I. RIVARD

Les pomiculteurs sont bien au courant des dommages causés par la Mouche de la Pomme mais ils doivent se garder de confondre les attaques de cet insecte avec celles du Chalcis de la Pomme (*Torymus varians* Wlk.), un insecte qui se propage dans les pommeraies du sud-ouest de la province.

Les dégâts de ce ravageur ont été rapportés pour la première fois au Québec, en 1932. Il pullula dans tout le sud-ouest de la province en 1933 et 1934 mais pendant les trente et une années suivantes on le croyait disparu. Il réapparut, malheureusement, dans les vergers négligés du sud-ouest en 1966 et dans plusieurs vergers commerciaux en 1967.

L'adulte du Chalcis de la Pomme mesure à peine ¼ de pouce de longueur et ressemble beaucoup à une guêpe minuscule. Il est d'un vert brillant avec des reflets métalliques bronzés; ses pattes sont jaune brunâtre et ses ailes, claires. La femelle, munie d'une tarière aussi longue que son corps, s'attaque aux fruits pour y déposer ses œufs. Ses piqûres, marquées à l'extérieur d'un point noir situé au centre d'une légère dépression à la surface de la pomme, ressemblent à s'y méprendre à celles de la Mouche de la Pomme, mais elles sont un peu plus petites et se rencontrent surtout dans la région du calice. A l'intérieur du fruit, la tarière trace des lignes liégeuses brunâtres

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M. Rivard, Station de Recherches de Saint-Jean, est attaché à la section entomologique.

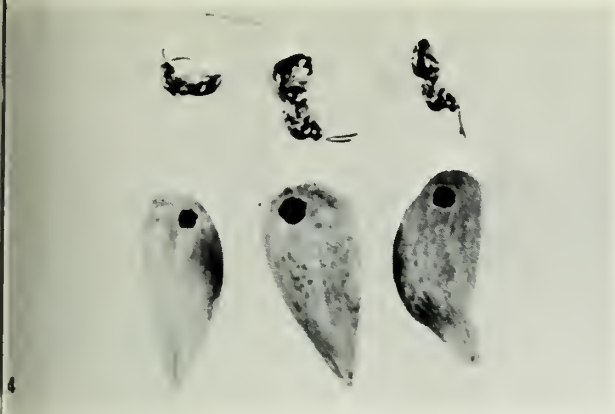

Fig. 1—Piqûres dans la région du caldice sur une petite pomme.

Fig. 2—Coupe longitudinale d'une pomme attaquée montrant une larve dans un pépin.

Fig. 3—Larves matures à l'intérieur de pépins de pomme.

Fig. 4—Adultes de l'insecte (Mâles et femelle) et pépins de pomme montrant les trous de sortie.

DE LA POMME AU QUÉBEC

à peine visibles à l'œil nu, dirigées vers le centre de la pomme et atteignant les pépins lorsqu'il y a eu déposition d'œufs. De plus des piqûres répétées à proximité d'un même point causent parfois une malformation du fruit en produisant des dépressions plus profondes. D'ordinaire les pommes attaquées demeurent quand même sur l'arbre et parviennent à maturité.

D'après nos observations, le Chalcis hiverne à l'état de larve dans les pépins des pommes laissées sur le sol et ne se nymphose qu'au printemps vers le milieu de mai. Dans la région de Saint-Jean, les premiers adultes sont apparus au cours de la première quinzaine de juin et, deux à trois jours après leur sortie, les femelles ont commencé à déposer leurs œufs directement dans les pépins des petites pommes; elles recherchent alors les fruits qui ont ½ à 1 pouce de diamètre tout au plus de façon à pouvoir atteindre les pépins avec leur tarière. La durée d'incubation des œufs est de 6 à 10 jours selon la température. La larve, fusiforme et de couleur crème, se nourrit à l'intérieur du pépin qu'elle dévore en entier, ne laissant que l'enveloppe extérieure. Elle atteint sa maturité au cours de l'été, soit une quarantaine de jours après l'éclosion; elle cesse alors de se nourrir et entre en diapause pour l'hivernement. Fait important à noter, parfois près de la moitié d'entre elles peuvent passer un deuxième hiver dans les pépins avant de se transformer en pupes.

Pour prévenir les pullulations de cet insecte dans nos pommeraies, il serait bon d'enlever des environs les pommetiers et pommiers sauvages pouvant lui servir de plantes-hôtes. La destruction au cours de l'été des pommes tombées contribue aussi à éliminer une partie des larves de la saison.

A cause du mode de vie particulier du Chalcis de la Pomme, l'adulte semble être le seul stade vulnérable aux insecticides. Si des dégâts sérieux par cet insecte sont à craindre, nous recommandons donc l'application d'un bon insecticide de contact tôt après la nouure des fruits afin de tuer les femelles avant qu'elles aient le temps de déposer leurs œufs dans les petites pommes. Ainsi, lors d'essais préliminaires effectués en 1967, avec une seule pulvérisation de DDT 50 p. 100 appliquée le 16 juin à raison de 2 livres par 100 gallons de bouillie, nous avons pu réduire de 62 p. 100 le nombre de pommes attaquées par cet insecte dans une parcelle fortement infestée depuis au moins deux ans. Nous aurions sans doute obtenu de meilleurs résultats encore si nous avions pu effectuer les traitements une semaine plus tôt, car à cette date quelques femelles avaient probablement déjà commencé leur oviposition.

On n'a jamais, semble-t-il, accordé une réelle importance économique au Chalcis de la Pomme dans le Québec. L'accroissement soudain de sa population en 1966 et 1967 constitue cependant une menace que nos pomiculteurs ne devraient pas négliger. Nous nous proposons donc de continuer nos observations et recherches sur ce ravageur dans le but de mieux connaître son comportement et de mettre à point des traitements efficaces de répression. ●

THE PESTICIDE TESTING GROUP AT VINELAND

G.G.DUSTAN

Most of the laboratory and field testing of old and new insecticides and fungicides at the Vineland Research Station is being done by the Pesticide Testing Group. This is a team of three technicians. Their work consists largely of pesticide trials leading to improved control measures for insects, mites and diseases attacking fruit and, to a lesser extent, vegetable crops. Formerly this was part of the work of several scientists at the Station.

The Testing Group was established in 1961 by Dr. D. A. Chant, the former director of the Station. It was an experiment made possible by the presence on the staff of three well trained, capable technicians who had worked closely with the scientists on insecticide and fungicide research.

It did not, at the start, meet with the unqualified approval of the fruit growers, the pesticide industry, the provincial extension service, or some federal research stations. However, with further training and direction, it soon became a success. It now performs a very useful service to agriculture and has the confidence of all concerned.

The time and place for such a group were also suitable. The Niagara area grows more kinds of fruit crops and has more species of insect pests than any other in Canada. The Plant Pathology Laboratory at St. Catharines, the Entomology Laboratory at Vineland and the Simcoe sub-laboratory had a long and varied experience in chemical control studies. Also, they had fairly adequate greenhouse facilities for rearing test plants, insects, mites, and diseases.

By 1961, the new pesticides such at DDT, the organophosphorus compounds and the carbamates had given such good control of most of the serious pests that the 'heat was off' the research scientists to find immediate answers to these problems. They could then devote most of their time to more basic studies of pest control such as principles of application, resistance to pesticides, population dynamics, the integration of natural and chemical controls, and the search for new, more lasting control measures. Furthermore, the extensive work at the Station on the new pesticides had, by 1961, resulted in many new, improved testing methods; and these technicians had helped develop these methods.

The three original members of the Testing Group were graduates of schools of practical horticulture. Two of them have been on our staff since 1947 and they are well versed in the crops, pests, and horticultural practices of the area. The third member, who joined the staff in 1958, later spent three productive years studying fruit diseases and testing fungicides before his untimely death in 1964. His replacement was appointed in 1967 and is being trained to continue the fungicide work.

The Group operates within the Station's Pesticide Section comprising three entomologists, a plant pathologist, a nematologist, a chemist and six technicians. The three technicians of the Group are under the supervision and general direction of a research scientist, currently the author, the Head of the Section. The assignment of work to the Testing Group is flexible; it does not restrict what a research scientist may wish to do. There is close cooperation and sharing of work by the Group and the scientists concerned with pesticide research.

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The members of the Group consult directly with representatives of the pesticide industry and choose materials for testing that offer promise of improved control of various fruit pests. The Station assumes no responsibility to test all or any candidate pesticides though it tries to cooperate as fully as possible with the pesticide industry.

Preliminary trials of some of the new materials are run during the winter in the greenhouse against test species such as the Oriental fruit moth, the two-spotted spider mite, various aphids, the pear psylla and apple scab. These species give valuable leads on effective rates, phytoxicity, and compatibility. Field trials are then planned by the Group in consultation with the research scientists. The trials are run in both the Station's and in growers' orchards. Many of the latter have to be used to provide the necessary crops and pest conditions. Cooperating growers are given contingency liability agreements to provide compensation for damage by pests or spray treatments and for fruit that cannot be used because of pesticide residues.

Formerly, the Station ran many of its control experiments in comparatively large orchard blocks (often of several acres) and applied the materials with large, high-powered spray rigs. Now, largely to conserve time and reduce costs, most of the field trials are run in much smaller blocks, usually in replicated single-tree plots. These give surprisingly good comparisons of materials even against such motile insects as the codling moth, the red-banded leaf roller and the pear psylla. However, to assess the full potential of an insecticide or fungicide, a few trials in large blocks or whole orchards may be needed before it is recommended for general use.

The Pesticide Testing Group now has three small, motile spray rigs that operate equally well on the highways and in orchards, vineyards and fields. These consist of a custom-made sprayer mounted on a 4-wheel drive 'Jeep' or 'Scout' (Fig. 1). The sprayers have a central, 50-gallon tank with mechanical agitation and two, independent saddle tanks of 12.5 gallons each with agitation only by the liquid overflow from the pump. The pumps deliver 12-15 gallons per minute at 200-300 p.s.i. and the sprays are applied by hand-operated guns. Coverage of large trees is slow with sprayers of this size so whenever possible the trials are run on medium or small sized trees.

The members of the Group are assisted in spraying and other operations during the summer by two or three students. Also, they assist each other, especially at harvest time (Fig. 2) when most results are taken.

These technicians analyze and summarize the data from their experiments and write reports for publication by the N.C.P.U.A. and the Canadian Horticultural Council. They also send copies of their reports to the industries whose materials they have tested and to the Pesticide Technical Information Office at Ottawa. To illustrate the scope of the Group's work: between 1962 and 1965 they tested 69 different pesticides against 23 species of insects, mites and diseases on several crops in the greenhouse, orchards and berry fields.

The responsibilities and the scope of work of the Group have increased greatly since it was established six years ago. Two of these technicians (one of whom is now a technical officer) are members of subcommittees of the Ontario Fruit and Vegetable Protection Committee and they give valuable advice on the annual revision of the spray calendars for fruits in Ontario.

The Group relieves the research scientists of much work by diagnosing and making control recommendations for insects and diseases brought or sent to the laboratory by fruit growers and others. In this, they cooperate closely with the provincial extension specialists. One of the group frequently gives talks on insect control to groups of fruit growers, extension personnel, fruit inspectors and others.

Another contribution to the Research Station made by these technicians is the information they obtain on crop and pest conditions through their visits to orchards and contacts with the growers. This background information, which many of the older scientists acquired during their work, is valuable in helping choose and plan research projects. Today, many of the younger scientists lack an agricultural background in their university training, and their research projects do not give them much experience with the practical field problems. The Pesticide Testing Group helps fill this gap in experience as the older scientists retire. ●

Fig. 1—Spraying an apple tree with Jeep-mounted sprayer.

Fig. 2—Recording insect damage on apples.

A LESSON IN ADDITION

Fig. 1—A Shorthorn X Hereford heifer—an example of a profitable crossbred breeding female.

Fig. 2—Crossbred heifers selected for use in an Alberta range herd.

L. J. SUMPTION

Crossbred cows offer cattlemen an opportunity to increase profit per cow. Evidence shows that crossbred cows are more fertile and have greater milking ability, on the average, than their straightbred half-sisters. Production of crossbred calves from crossbred cows has a total advantage of about 15 percent over production of straightbred calves. These conclusions are drawn from a number of North American beef breeding experiments.

Our breeding studies at the Lethbridge Research Station have been designed to evaluate procedures for breed improvement and commercial breed improvement through crossbreeding.

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We have compared the performance of crossbred and straightbred cattle, using a stepwise method for greater accuracy of interpretation. Table 1 summarizes the effects of crossbreeding on calf performance. Crossbred calves have a 3 percent higher survival rate and weigh 5 percent more at weaning time than straightbred calves. Heifers show more heterosis (hybrid vigor) for postweaning growth rate than steers. Furthermore, crossbred heifers reach puberty 10 percent earlier than their straightbred half-sisters. The higher survival rate of crossbreds *adds* more live calves to the calf crop and because each crossbred calf is heavier at weaning this effect is *multiplied* (additional calves × extra weight).

When crossbred females are selected as brood cows, the modest advantages of producing crossbred calves are further multiplied (Table 2). Crossbred cows conceived earlier in the breeding season, a reflection

AND MULTIPLICATION

of their younger age at puberty. They weaned 7 percent more calves that were 6 percent heavier at 200 days of age. Adding or multiplying each advantage shows a total advantage of about 15 percent in pounds of calf weaned for every cow maintained, in favor of crossbred cows over straightbreds.

These comparisons are accurate because dams and sires of each breed were evaluated and each sire produced both straightbred and crossbred progeny. However, our experimental conclusions are conservative. No selection was practiced among the heifers used as dams. Most of the North American research has evaluated crosses among the British breeds, whereas less closely related breeds are expected to exhibit larger heterotic effects.

Some potential advantages are not accounted for in Tables 1 and 2. For example, higher survival and conception rates not only increase the percentage of the herd inventory that can be marketed each year but also permit more intense selection for performance among heifer replacements. Calves born from crossbred dams have an earlier average calving date, weigh more at weaning, have a higher market value, and cost less to develop as heifers for 2-year-old calving than calves born later from straightbred dams.

There is now sufficient evidence on crossbreeding to permit cattlemen to make accurate business decisions. Two general crossbreeding systems are proposed:

ROTATIONAL CROSSBREEDING

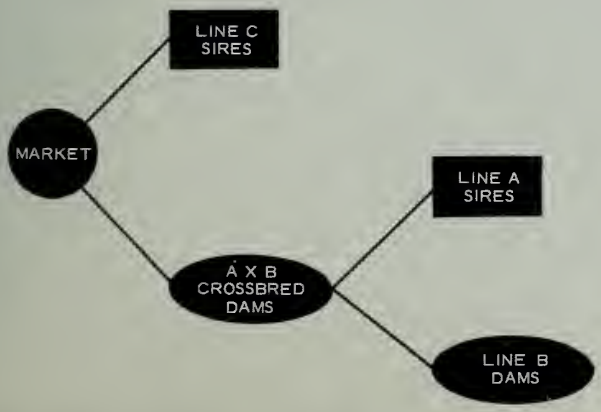
- Select three breeds having the combination of maternal, growth, and carcass traits desired in the crossbred brood cows and the feeder calves (e.g. breeds A, B, and C).
- Mate the existing cow herd continually to bulls of breed A.
- Select crossbred heifers for growth rate and mate them continually to bulls of breed B.
- Mate selected B × A heifers to breed C bulls.
- Select C × (BA) heifers for growth rate and mate them continually to breed A bulls.
- Continue the same system *indefinitely*, always selecting the best-performing replacement heifers and mating them to the breed of sire to which they are *least related.* No evidence exists that herd performance will deteriorate as long as the best-performing crossbred heifers are selected as dams. The genetic stability for this system is provided by the performance merit of the sires used.

SPECIFIC THREE-BREED CROSSING

- Select three breeds for crossbreeding—two (breeds A and B) that will produce crossbred cows with high fertility and milking ability, and a third (breed C) with superior postweaning growth rate and carcass merit.
- Locate and encourage development of reliable sources of A × B heifers sired by performance-selected bulls. Gradually replace the cow herd with purchased crossbred females, to be used as long as they are productive.
- Mate A × B females continually to breed C bulls.
- Market all calves. Continue to purchase A × B replacement females and breed C bulls from a performance selected herd. *(continued on page 32)*

Figs. 3–4—Diagrams illustrating crossbreeding systems.

SPECIFIC THREE-BREED CROSSING SYSTEM



THREE BREED ROTATIONAL CROSSING SYSTEM

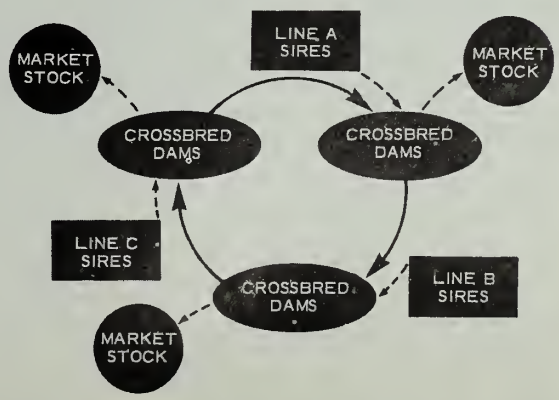


TABLE 1. PERFORMANCE OF CROSSBRED AND STRAIGHTBRED CALVES PRODUCED BY STRAIGHTBRED DAMS

Traits	Straight-bred Index	Crossbred Index
Survival to weaning	100	103
Weaning weight	100	105
Steer yearling weight	100	106
Heifer yearling weight	100	108
Age at puberty	100	90

TABLE 2. PERFORMANCE OF CROSSBRED AND STRAIGHTBRED DAMS PRODUCING CROSSBRED CALVES

Traits	Straight-bred Index	Crossbred Index
Conception at first service	100	110
Pregnancy rate	100	106
Calves weaned	100	107
Weaning weight	100	106
Pounds of calf weaned/100 cows bred	100	115

Under rotational crossbreeding, the producer selects his own replacements but the continual presence of all breeds of bulls is needed to keep the program systematic. Crossbred calves may vary more in performance than straightbreds because of the variability among the calves sired by different breeds and raised by cows of differing backgrounds. The average performance of the crossbreds will still be higher than that of the straightbred calves sired by the same bulls.

Specific crossing permits a breeder to use each breed according to its most favorable performance traits. Only one breed of bull is required at any time, simplifying bull maintenance and contributing greater uniformity to the calves marketed. Reliable sources of crossbred heifers are necessary on a continuing basis. This phase could become a specialized business.

Cattlemen who plan to use crossbred cows should understand the importance of the following:

1. *Wide crosses*—Crosses between breeds yield more consistent heterotic effects than crossing lines within breeds.
2. *Performance*—Once the herd is based on crossbred cows, its future genetic improvement will depend upon the selection program of the breeders from which seed stock is purchased. Crossbreds will reflect the performance merit of their parents. Commercial cattlemen cannot afford the luxury of using bulls with mediocre performance records.
3. *Crossing system*—Either system carefully followed will yield results superior to careless use of any parent stocks conveniently available.
4. *Management and nutrition*—Once a sound breeding program is established using performance-selected sires, the major means of improving production are through providing a better environment for the crossbred cow herd.

For the next number of years many commercial cattlemen will be seeking ways to adapt the present crossbreeding evidence to their own production programs. Cattle breeders will be occupied with developing seed stocks that most nearly meet the requirements of the commercial industry. Beef research will be concerned with identifying the best combinations of breeding, feeding, and management systems to maximize profits from the range and grain resources of Canada. Our breeding studies at the Lethbridge Research Station are designed to evaluate procedures for breed improvement and commercial beef production. We are focusing major attention on the crossbred cow. ●

PUBLICATIONS

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

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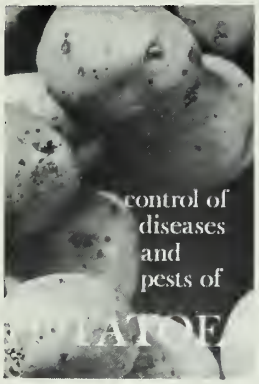

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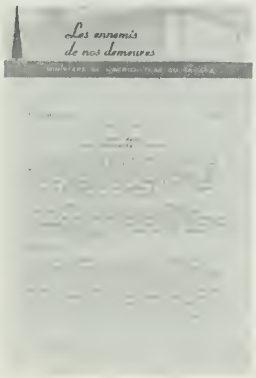

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