Agassiz Research Station 1886·1986

Agriculture Canada

1886 · 1986
RESEARCH · RECHERCHES

Cover photograph
Cows grazing at Agassiz Research Station.
Mount Cheam in background. 1968.

Photograph on the title page
The superintendent's residence, built in 1891,
demolished in 1955.

Agassiz Research Station 1886·1986

Jack A. Freeman

Research Branch
Agriculture Canada
Historical Series No. 33
1986

One hundred years of progress

The year 1986 is the centennial of the Research Branch, Agriculture Canada.

On 2 June 1886, *The Experimental Farm Station Act* received Royal Assent. The passage of this legislation marked the creation of the first five experimental farms located at Nappan, Nova Scotia; Ottawa, Ontario; Brandon, Manitoba; Indian Head, Saskatchewan (then called the North-West Territories); and Agassiz, British Columbia. From this beginning has grown the current system of over 40 research establishments that stretch from St. John's West, Newfoundland, to Saanichton, British Columbia.

The original experimental farms were established to serve the farming community and assist the Canadian agricultural industry during its early development. Today, the Research Branch continues to search for new technology that will ensure the development and maintenance of a competitive agri-food industry.

Research programs focus on soil management, crop and animal productivity, protection and resource utilization, biotechnology, and food processing and quality.

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Foreword

Agriculture Canada's Research Branch celebrates its centennial in 1986. The Agassiz Experimental Farm is one of the five original farms established under the terms of *The Experimental Farm Station Act* of 1886, but the actual land purchase for the Agassiz farm dates back to 1888 and we will celebrate our own 100-year anniversary in 1988.

The Agassiz Experimental Farm, which was later renamed the Agassiz Research Station, has made tremendous contributions to Canadian agriculture. We have come a long way from the initial few chickens, sheep, pigs, and horses, and from the cereal, fruit, and vegetable crops grown in the early years of the experimental farm. One of the most lasting achievements was the 1892 hybridization that produced the world famous Marquis wheat. There are numerous other achievements that are eloquently presented in the text of this historical review.

The Agassiz Research Station has become a center of excellence for a number of agri-food disciplines. Among these are dairy nutrition, beef research, poultry research, berry and vegetable production, postharvest physiology, turf research, and soil science. Although research techniques have often changed during the past 100 years, the objectives of our research efforts have remained the same: to supply the Canadian consumer with high-quality produce at a reasonable cost and to develop technologies to help the farmers and growers of British Columbia meet the challenges of the 1980s and of the next century.

In conclusion, I would like to express my thanks to Dr. J.A. Freeman for the excellent way he has presented this centennial history of the Agassiz Research Station. I am confident that readers will find it both interesting and informative.

J.M. Molnar

J.M. Molnar
Director

Preface

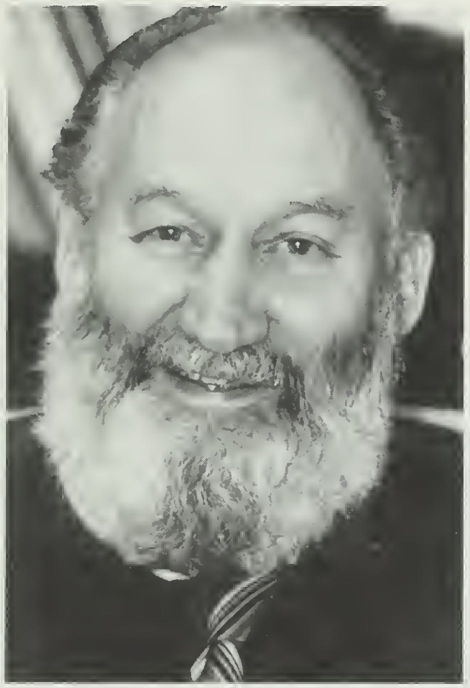
This publication is a summary of the contributions made by Agassiz Experimental Farm/Research Station to agriculture during the past century.

Although activities have been initiated in response to local problems, many of the resolutions to those problems have had a significant impact locally, nationally, and internationally.

My thanks to members of the current staff for their contributions to this summary. Special thanks to Moira Jewell for typing the manuscript and to Victoria Brookes and Rita Bruneski for proofreading the text. Use of the photograph of William Saunders, authorized by the public archives of Canada (PA136872), is gratefully acknowledged.

Jack A. Freeman

Jack A. Freeman



T.A. SHARPE
Superintendent
Dominion Experimental Farm
1889–1911

P.H. MOORE
Superintendent
Dominion Experimental Farm
1911–1916

W.H. HICKS
Superintendent
Dominion Experimental Farm
1916–1953

M.F. CLARKE
Superintendent
Dominion Experimental Farm
1953–1959
Director
Research Station
1960–1972

J.E. MILTIMORE
Director
Research Station
1973–1985

CHAPTER 1

Summary of activities from 1886 to 1986

William Saunders

C.E. Saunders

1886

- The passage of *An Act respecting Experimental Farm Stations* led to the establishment of the Agassiz Experimental Farm.

1887

- Dr. William Saunders, first director of the Experimental Farms, conducted a survey of the settled areas of British Columbia and decided upon the site for the Agassiz Experimental Farm.

1888

- Land was purchased, but because of a delay in perfecting the title, possession was not taken until the fall of 1889.

1889

- Mr. Thomas A. Sharpe was appointed superintendent and work started with specialization in horticulture.
- The Central Experimental Farm supplied four birds each of four different breeds of chickens to establish a poultry program.

1891

- Only 3 years after work started, 772 varieties of fruit were being tested. By the turn of the century, the claim was made that the largest collection of plant material centered at any one place was at Agassiz, where in excess of 3000 varieties were under test.

1892

- Drs. A. Percy Saunders and Charles E. Saunders crossed several varieties of wheat. A cross made at Agassiz between the late-maturing variety Red Fife and the early Indian variety Hard Red Calcutta resulted in the variety Markham. Seed was multiplied and reselected over several years.
- The first sheep were introduced to the experimental farm—a Dorset Horn ram and two Dorset Horn ewes. Represen-

Seed bed preparation on newly cleared land, 1912.

Right

Type of Yorkshire sows bred on Agassiz Experimental Farm.

Below

A. McKay, farm manager (*left*), C.B.A. Lovell, senior herder (*center*), and G.C. Harper, senior herder (*right*) with a Dorset Horn ram and two Dorset Horn ewes, 1920.

tatives of this breed were bred on the farm until 1954, when the flock was transferred to Colony Farm, Essondale, B.C.

- The first swine were received from the Central Experimental Farm—a Yorkshire boar and two Yorkshire sows. Work with swine was ultimately discontinued and the Yorkshire herd was sold in 1959.

1893

- The Agassiz Experimental Farm won a special award at the Chicago Exhibition for a display of fresh fruit.

- Five hundred ornamental trees and shrubs were planted on the lawn area, and the maples were planted along the driveway.

1894

- A meeting of the British Columbia Fruit Growers' Association was held at the farm.

1903

- Dr. Charles Saunders was appointed experimentalist, Central Experimental Farm. He studied the progeny of earlier crosses of wheat varieties. From the progeny of the variety Markham he was able to develop another variety, Marquis. It was released for trial in the Prairie Provinces for the first time in 1909. By 1915, it had taken the lead over all other varieties.

1911

- Mr. P.H. Moore was appointed superintendent. A major change in experimental farm policy resulted in emphasis being placed on livestock operations rather than on horticulture.

- The first Holstein–Friesian cattle were brought to Agassiz. These included 28 grade Holstein–Friesian females and one purebred bull from Ontario.

- A laboratory for animal health was opened, with Dr. S. Hadwen as officer in charge. His main area of study was red water, a disease affecting cattle. In June 1916, Dr. E.A. Bruce came to Agassiz to assist Hadwen. When Hadwen left, Bruce was appointed officer in charge of the laboratory until it was transferred to Saanichton in 1932.

1912

- The first registered Holstein–Friesians were purchased.

- The Entomological Laboratory was opened, with R.C. Treherne as officer in charge. He was succeeded in 1917 by A.B. Baird and in April 1921 by R. Glendenning, whose activities covered a wide economic range of insect control methods in the Fraser Valley. These control methods included both natural control through parasites and cultural practices, and artificial control through poison baits and sprays. Some of the outstanding contributions made by the Entomological Laboratory are the control of root maggots on cabbage and related plants, the control of red spiders, aphids, and flea beetles on hops, the control of flea beetles on cabbage and related plants, poison baits for earwigs, and the introduction of parasites for the control of satin moths and leucanium scale. The laboratory was closed in 1953 after Glendenning's retirement.

Pacific National Exhibition. Clydesdale horses from Agassiz Experimental Farm won Champion Grand Display, 1947.

1913

- For a few years, cheesemaking was an important part of the dairy program. The program continued until 1929 with the production of many different European cheeses.

1915

- The poultry stock at midwinter consisted of 254 Barred Plymouth Rocks and 239 Single Comb White Leghorn chickens, 33 white Peking ducks, and about 50 squab-producing pigeons.

1916

- Mr. W.H. Hicks succeeded Moore as superintendent. Clydesdale horse breeding started with the purchase of two 3-year-old fillies. Stud service was made available and breeding stock was distributed. In 1939 the farm's Clydesdale horses won two championships at the San Francisco World's Fair. Over the years several awards were won at various exhibitions. The final horse exhibition was at the 1952 Pacific National Exhibition. In 1956 all projects with horses were discontinued.

Inspecting part of the string of Clydesdales prior to their being shipped to Golden Gate Exposition, San Francisco, ca. 1938.

Walnut tree after the 1917 ice storm; Health of Animals Laboratory in background.

Agassiz Segis May Echo—world record producer, 1923. In 365 days she produced 14 030 kg of milk and 611 kg of butterfat.

Master-Breeder's shield awarded to the Agassiz Experimental Farm by Holstein–Friesian Association of Canada, 1930.

Apiary, ca. 1920.

1920

- Egg-laying contests commenced, and the records made under these official contests brought much publicity to British Columbia and to Canadian poultry.

1921

- The grade herd of dairy cattle was dispersed and only registered animals were retained. Dairy research became the major emphasis.

1923

- Agassiz Segis May Echo made a world's record of 14 030 kg of milk and 611 kg of butterfat in 365 days, a record that was unbeaten for 6 months. In honor of this accomplishment, the superintendent hosted a banquet and dance, which was held in the loft of the main barn. The guest of honor, Agassiz Segis May Echo, was paraded between the tables and given a toast.

1926

- A pen of 10 birds made a then world's record of 2946 eggs in a year.

1927

- Headquarters for the supervisor of Illustration Stations in British Columbia was moved from Summerland Experimental Station to Agassiz Experimental Farm, with Mr. A.E. Richards as supervisor. He was succeeded in 1932 by Mr. R.M. Hall, who continued to serve the farmers throughout the province until 1955, when responsibility for the Illustration Stations in the Kamloops region was transferred to the Kamloops Range Experimental Station, with Mr. W.L. Pringle as supervisor. Hall continued in charge of Project Farms in the Lower Mainland until his retirement in 1959.

- An apiary with 60 colonies was established, with Mr. J. Fraser as apiarist.

1930

- Master Breeder's Shield was awarded to the Agassiz Experimental Farm by the Holstein–Friesian Association of Canada.

1930s

- Horticultural work was increased when Mr. J.J. Woods became officer in charge. The decline of the Cuthbert raspberry caused much concern, and research on this problem was intensified.

1942

- M.F. Clarke and R.M. MacVicar (Ottawa) developed the perennial ryegrass variety Pacific, which was licensed for distribution in 1942.

Raspberry decline in Cuthbert variety at Perry's farm, 1930s.

1933

- Doreen 10L, a White Leghorn hen bred at Agassiz Experimental Farm, laid a record number of 357 eggs in 365 days.

1938

- On 15 June at the time of the British Columbia Horse Breeders' Association Field Day, Dr. L.S. Klinck, then president of the University of British Columbia, unveiled a plaque located at the main entrance to the farm, commemorating 50 years of service by the Agassiz Experimental Farm.

1941

- An additional 27 ha were secured when the L.A. Agassiz property, adjoining on the east, was purchased.

1946

- Professional staff doubled with the addition of T.H. Anstey, horticulture: D.K. Taylor, cereals: and B.A. Dickson, soils.

1948

- A sudden rise in temperature on 19 May melted snow on the mountains and caused the most disastrous flood ever to occur in the Lower Fraser River Valley.

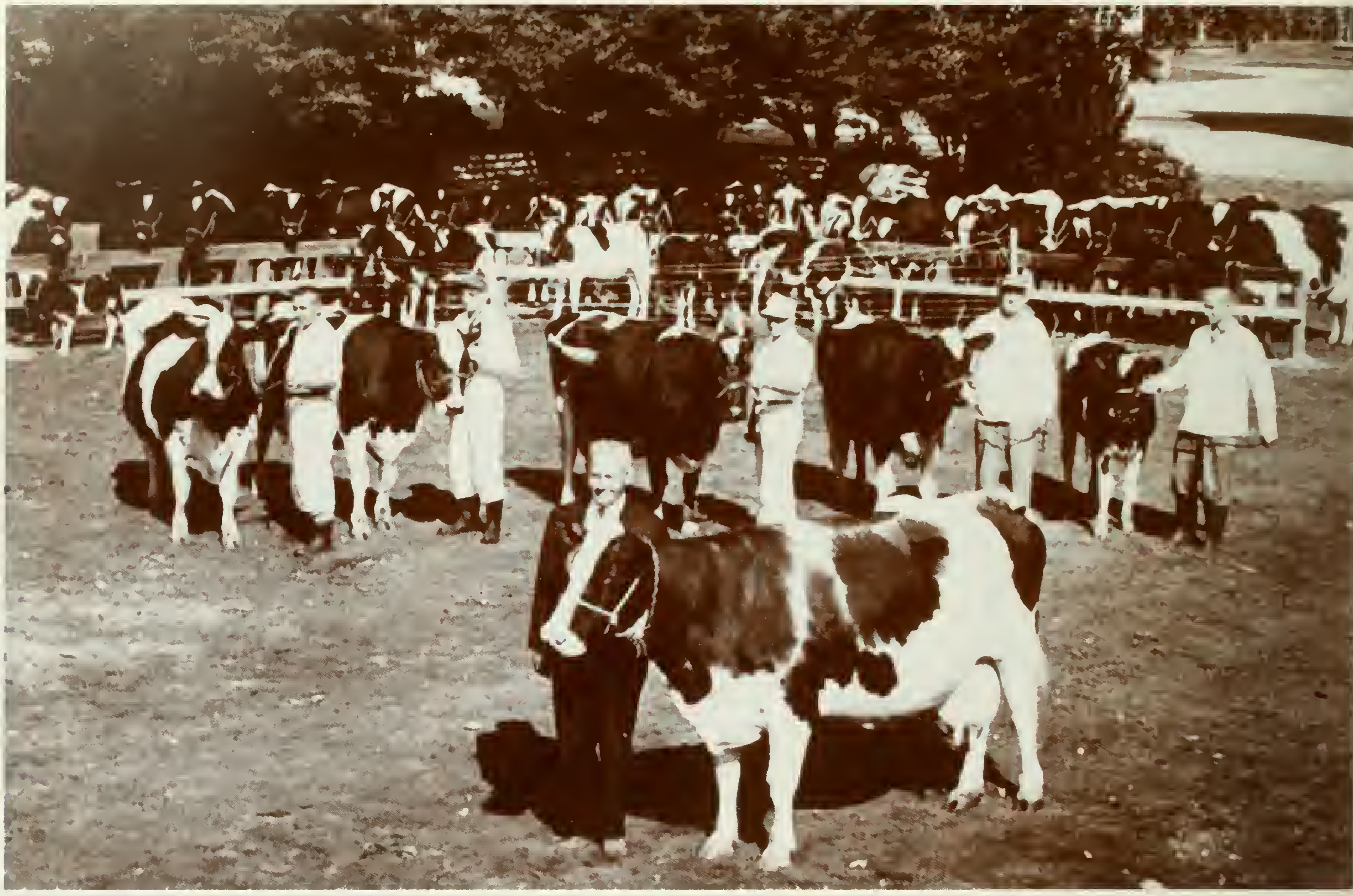
1949

- An experimental substation at Ladner, B.C., was established for the study of potato problems. It was closed in 1962.

1950

- The project on loose housing versus standard stall stabling of dairy cattle was commenced.

On 15 June 1938, Dr. L.S. Klinck, then president of the University of British Columbia, unveiled a plaque to commemorate the 50th anniversary of the Agassiz Dominion Experimental Farm.



Top

Cow herd No. 614, Agassiz Supreme Alert—1090381 (*front*), being held by M.F. Clarke. Herders (from *left* to *right*) are Tony Struys, Rudy Froese, Al Weick, John Wolff, and Stewart Laanstra, holding Agassiz Supreme Alert's female descendants, 1967.

Below

Sawdust mulch experiments on vegetable crops, 1961.

- J.A. Freeman developed the first use patterns for herbicides in strawberries, which had a widespread application in the local industry and in that of Washington and Oregon.

- Chemical weed control practices were developed for several vegetable and seed crops: for example, the use of isopropyl *N*-phenyl carbamate (IPC) for annual ryegrass control in clover stands, and the use of dinitro for weed control in cucumbers—a recommendation that is still followed.

1952

- H.F. Fletcher, J.A. Freeman, and T.H. Anstey released recommendations for the use of sawdust as a mulch for vegetable crops, an alternative practice to chemical weed control. The sawdust mulch method of weed control is again of interest to researchers.

1953

- W.H. Hicks retired after 37 years as superintendent.

1955

- One of the worst freezes in the history of the Fraser Valley occurred on 11 November. Eighty percent of the strawberries were killed, and raspberry tonnage was reduced by 75%. A budding walnut industry was destroyed.

- Dr. D. Blackmore supervised the implementation of the national dairy cattle breeding project that controlled the research function of the herd from 1956 to 1968.

1956

- A small-fruits substation was established at Abbotsford, B.C., with J.A. Freeman as officer in charge. In the same year, Freeman released the strawberry variety Agassiz.

1957

- Under the direction of Dr. A.T. Hill, the genetic foundation for the Agassiz strain of White Leghorns was obtained by crossing two strains from the Animal Research Institute, Ottawa.

1959

- Dairy beef research was initiated, under the direction of Dr. R.J. Forrest.
- Dr. H.A. Daubeny became responsible for the raspberry and strawberry breeding programs.

1961

- Dr. J. Campbell was appointed as a vegetable specialist, replacing Mr. H. Magel.

1962

- Open house was held 20 July, on the occasion of the 75th anniversary celebrations, with more than 2500 visitors taking advantage of the opportunity to visit the Agassiz Experimental Farm.
- J.A. Freeman and F.C. Mellor produced the first report on the effect of specific latent viruses on vigor, yield, and quality of strawberries. This research resulted in the establishment of a virus-free strawberry plant production program for British Columbia.
- Mr. A.R. Maurer was appointed as a vegetable physiology and management specialist.

1963

- Recommendations were developed by Freeman for the use of the herbicide mixture of paraquat and simazine for weed control in established raspberries.
- H.F. Fletcher and V.W. Case summarized fertilizer experiments and proposed fertilizer recommendations.

1964

- A 2-year investigation on the control of strawberry fruit rot showed that certain fungicide spray schedules increased marketable yields by 96–119% over the untreated plants.
- Maurer developed a system for estimating the appropriate stage of maturity at which to harvest sweet corn.
- Research on weed control with strawberries resulted in information on differences in the reaction of varieties to herbicides at different locations.

Exhibit at Fall Fair, Agassiz, B.C., 1956.

Raspberry weed control, using paraquat and simazine. Standard weed control treatment since 1963.

1965

- Dr. D.M. Bowden described the relationship of soluble carbohydrates and protein content to in vitro digestion of forages.

1966

- Investigations on the effects of viruses on raspberries were initiated in cooperation with scientists at the Vancouver Research Station.

1967

- Dr. D.K. Taylor released the oat variety Fraser.
- A start was made on a data processing approach to soil characterization.
- The effects of tomato ringspot virus (Tom RSV) on plant and fruit development of raspberries were described by Drs. J.A. Freeman, H.A. Daubeny, and R. Stace-Smith (Vancouver).
- Forrest demonstrated that a Holstein steer with a weight of about 500 kg could produce beef equal in quality to that obtainable from steers of the beef breeds.

1968

- Daubeny released the Cheam strawberry and the Matsqui raspberry.
- Research in poultry physiology was instituted to develop management procedures designed to overcome some of the stress problems associated with intensive egg production.
- Drs. J.A. Freeman and D.G. Finlayson published the first of a series of papers on the interaction of herbicides and insecticides.
- Maurer and Fletcher published a series of papers on the response of peas to environment.
- The British Columbia regional potato program, coordinated at Agassiz, gave us the Cariboo potato and led to the licensing of Norgold Russet in Canada. Seedlings from the Canadian and American breeding programs were evaluated.
- Dr. D.E. Waldern initiated trials with replacement heifers and bull calves, which established feeding values for processed feeds.

1969

- Dr. D.K. Taylor changed the emphasis of his research from forage to turfgrass management.
- Forrest demonstrated that Holstein bull beef equal in quality to that obtainable from Holstein steers could be produced by bulls reared on a high-energy ration to about 475 kg and slaughtered at about 1 year of age.
- Studies on peas and Brussels sprouts were initiated by Maurer, using growth regulators. Applications of cycocel and dimethyl sulfoxide as growth retardants shortened vine growth and increased pea yield. Extensive work with Brussels sprouts revealed that time of application of Alar was more critical than rate of application for topping sprouts by chemical means.
- A total of 350 ha of Green Mountain, land that was part of the station, was transferred to the Department of Indian Affairs.

1970

- An analytical method for determining phosphorus in soil and plant materials was established by Dr. M.K. John.
- Dr. R.B. Buckland discovered that for broiler production intermittent light was more efficient than continuous light.

1971

- Daubeny released the Totem strawberry, which gained the dominant position in British Columbia within 5 years. In 1984, Totem received the Outstanding Cultivar Award from the Canadian Society for Horticultural Science.
- Cooperative studies by Maurer with the University of British Columbia, British Columbia Ministry of Agriculture and Food, and Vancouver Research Station, on the cause of lateral root die back of carrots, have shown that the causal organism is *Pythium debaryanum*, that the disease is more prevalent under wet rather than dry soil conditions, and that the incidence of infection is reduced by precision seeding.

1972

- Dr. M.F. Clarke, director of the Agassiz Research Station since 1953, and formerly in charge of forage crops research, was transferred to Ottawa as research coordinator (forage crops).
- Mr. W.E.P. Davis was seconded to the Tanzanian agronomy project.

- Dr. D.K. Taylor was appointed acting director.
- Daubeny released the raspberry cultivar Haida.
- E.F. Maas and R.M. Adamson (Saanichton Research Station) coauthored the first of a series of technical publications that summarized research on soilless culture for commercial greenhouse production.
- Dr. M.K. John wrote the first of a series of research publications on studies of contaminant metals in soils.

1973

- Dr. J.E. Miltimore, formerly director of the Kamloops Research Station, was appointed director of the Agassiz Research Station.
- The economics of caged layer hens was shown by Dr. A.T. Hill to decline with increasing number of birds per cage and with decreasing floor space per bird.

1974

- Dr. D.K. Taylor released a new cultivar of orchardgrass named Sumas.
- Extensive testing throughout the Fraser Valley by Maurer led to the introduction of precision seeding in British Columbia. Recommendations for spacing of seeds and plant population levels were made for most vegetable crops.
- Dr. L.J. Fisher transferred from the Animal Research Institute, Ottawa, to Agassiz Research Station to conduct studies on the forage feeding and management of dairy cows.

1975

- Dr. R.J. Forrest showed that offspring from Holstein dams sired by Charolais, Simmental, or Limousin bulls gained faster and produced about 3% more lean beef than purebred Holstein steers when slaughtered at about 500 kg.

1976

- Research conducted in the main onion-growing area by Maurer showed that onions started in soil blocks and then transplanted matured 5 weeks earlier than the direct-seeded crop.
- Drs. Daubeny and Freeman developed cultural and planting systems for maximum yields of Totem and Shuksan strawberries.

Tractor-drawn Stanhay precision seeder. Henry Wiehler inspecting the quality of the seedbeds, 1974.

1977

- Dr. W.T. Buckley arrived at the station to undertake an intensive research program on the metabolism of trace minerals.

- Dr. N.A. Fairey expanded the forage corn-testing program and set up test sites throughout British Columbia to evaluate varietal, planting density, and planting date effects.

1978

- In his studies of sweet corn Freeman discovered a latent phytotoxic effect (at harvest) caused by preseeding treatment of thiocarbamate herbicides and the insecticide fonofos. Follow-up studies have identified 10 sweet corn cultivars as being extremely susceptible to the combination and 9 as being tolerant. It was shown that early maturing types escape injury.

- The weed control research with berries and vegetables culminated in several treatments being raised to recommendation status. In berries these recommendations included the use of napropamide for the control of annual weeds in newly planted dormant raspberry canes and root cuttings, the use of napropamide or pronamide applied immediately after planting strawberries and followed in 6 weeks by an application of chloroxuron, and the use of a napropamide–simazine mixture after hoeing approximately 6 weeks after planting strawberries. The development of spray programs utilizing two-way mixtures of herbicides at reduced rates has proved effective for weed control by broadening the weed control spectrum and by having the overall result of increasing environmental acceptability of herbicides.

- New use patterns were developed for weed control in carrot, lettuce, sweet corn, and potato crops.

- Some gains were made in the control of triazine-tolerant groundsel with bromoxynil and bromoxynil–MCPA mixture being raised to recommendation status for use in corn.

1979

- Dr. P.W. Perrin established a vegetable storage research program.

- Maurer demonstrated that broccoli could be successfully grown and harvested from 20 May to 24 December.

1980

- The British Columbia Chicken Marketing Board provided a 12 m × 75 m building for broiler and roaster research.

- It was demonstrated that the average consumption of acid whey by lactating cows is 70 kg/day, which results in a 50% reduction in the intake of corn silage.

- It was also demonstrated that the yield of milk by cows fed a conventional ration is similar to that of cows fed acid whey, but cows fed acid whey produce more milk protein.

- Freeman developed a use pattern for chemical control of quackgrass in raspberries.

- Stale seedbed techniques for direct-seeded asparagus and pickling cucumbers were developed.

- Dr. S.G. Fushtey assumed responsibility for the turfgrass management program after Taylor's retirement.

- Dr. J.R. Hunt demonstrated that restricting feed intake in layers to 95% of full-feed resulted in increased profits.

- In 2 years of disease surveys, it was found that club root of crucifers and white rot of onions were spreading at alarming rates in British Columbia. Races of club root were identified. Intensive studies were undertaken by Simon Fraser University to combat the onion white rot problem.

1981

- The vegetable storage research facility was officially opened.

- Drs. W.T. Buckley and S.N. Huckin, in cooperation with the Department of Chemistry, University of British Columbia, developed a method of utilizing stable isotopes of copper in the study of copper metabolism in cattle. This method replaced the use of radioactive copper isotopes.

Canadian Plowing Match 1974, Keith Leslie.

- Freeman and Daubeny initiated a study on the chemical burning of primocanes (sucker plants) of red raspberries.

- Canadian plowing championships were held at Agassiz Research Station.

1982

- Dr. E.E. Gardiner discovered that sorghum could be satisfactorily used instead of wheat in diets for laying hens.

- Freeman investigated the influence of weather on the response of potato cultivars to the herbicide metribuzin. Of 11 varieties tested for tolerance of pre-emergence and postemergence applications of metribuzin, Norgold Russet and Epicure were the most tolerant on the basis of average marketable yield over 5 years. Cultivar response was affected by weather conditions, including high temperatures, soil moisture content, and amount of sunshine before, during, and after spraying.

- Experiments with leeks identified the most suitable winter-hardy cultivars for the area. Date of seeding was shown to be critical for the overwintered crop. Recommendations to the industry were implemented.

Steers finished on pasture sometimes have yellow carcass fat. Ron Rodger, 1978.

- Forrest demonstrated that A1-quality beef could be produced by Hereford steers that were slaughtered at about 450 kg after grazing for 9 months on pasture without any grain supplement.

Leeks can successfully overwinter and produce marketable plants for the late winter–early spring fresh vegetable market.

Cauliflowers planted in the Lower Fraser Valley in August will usually successfully overwinter.

Overwintered cauliflower harvest.

1983

- From research conducted by Dr. C.G. Kowalenko, fertilizer requirements of filberts could be more accurately predicted by analyses of leaves than by soil tests.
- Daily milk records were utilized to quantitate the relationship of age or weight at calving to partial or complete first lactation milk yields. It was determined that weight at calving was more effective than age at calving in predicting milk yield for the first 120 days of lactation.
- Drs. Hunt and Gardiner demonstrated that the Marshall strain of roaster would yield 50% more grade A birds than North American strains.
- Gardiner showed that an adverse lysine-to-arginine ratio is a useful tool to study leg problems in broilers.

1984

- Buckley developed a method for determining the absolute rate of dietary copper absorption in dairy cows.
- Keng designed a portable system to apply liquid nutrients and pesticides directly to the root zone of row crops, thus reducing the required amounts of pesticides and increasing efficacy.
- Keng also developed a soil-structure preservation method to study natural soil structure.
- It was shown by Hunt and Gardiner that a low-protein roaster starter diet resulted in lower mortality and superior monetary returns.
- The first documentation of sulfur deficiency in the Fraser Valley was published by Kowalenko.
- Trials with overwintered cauliflower have established that the most suitable varieties belong to the Walcheren type. Tests have also shown that the dates for seeding and transplanting are critical.

1985

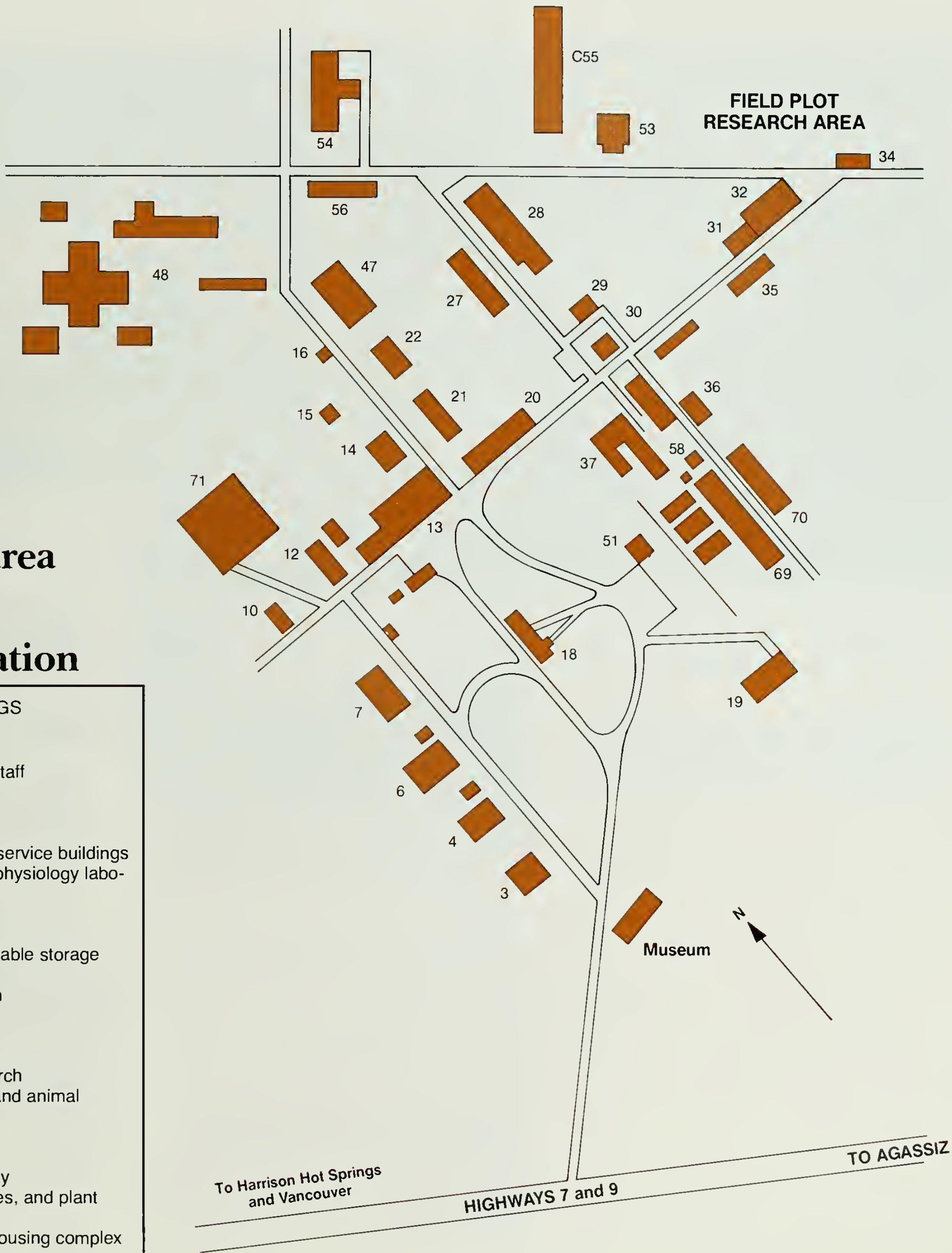
- Six years of trials demonstrated the potential for asparagus production at the coast. Recommendations to the industry led to the reestablishment of this crop in the Fraser Valley.
- Calves housed in narrow pens that had grated floors had lower rates of gain and less favorable feed conversions than calves housed in wide pens that had solid-bedded floors.
- The production of early season vegetables through the use of plasticulture has been successfully demonstrated. Crops such as zucchinis, cantaloupes, and cucumbers can be harvested as much as 40 days ahead of the normal time. Bell peppers produce much greater and earlier yields when grown under protected rather than unprotected conditions.
- The Canadian Society for Horticultural Science conferred an Honorary Life Membership on J.A. Freeman in recognition of meritorious service to horticulture in Canada.
- Miltimore, who was director of the station, retired after 37 years of service, the last 12 years being at Agassiz. Maurer was acting director until the arrival of Dr. J.M. Molnar, the current director. Molnar was formerly director of the research station at Sidney, B.C.

1986

- The feed mill was completed and became operational in early 1986.
- Agassiz Canadian Pacific Railway station, built in 1893 and moved to the research station in 1985, was officially opened after major renovation to house a community museum and archives to be operated by Agassiz–Harrison Historical Society.

CHAPTER 2

Facilities at the station



Building area

Agassiz Research Station

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The Agassiz Research Station, which was established in 1886 as one of five original farms authorized under the terms of *An Act respecting Experimental Farm Stations* of 1886, began operations in 1888. In addition to the station at Agassiz, with 139 ha under cultivation, there is another farm (169 ha) 6 km by road north and east, and there is also a 7.5-ha substation at Clearbrook, near Abbotsford, B.C.

The map of the station presented here shows the buildings that provide research and maintenance support. An aerial photograph in Appendix II also illustrates the layout of the station.

Above
Original office building built in 1919.

Above right
Office building with additions, 1986.

Lower right
Oldest building on the station, built in 1893 originally for dairy cattle. It is now used for rearing heifers.

Office building

The office building, built in 1919, has had three additions. It houses the administrative personnel and most of the scientists. Computer facilities and the research library are also located here. The library, established in 1978, occupies a total of 30 m^2 of floor space. It is a participant in the Libraries Division's automated system.

Heifer-rearing building

The oldest building on the station, built in 1893 to house dairy cattle, is now used for rearing heifers.

Carpenter shop

The barn that used to house Clydesdale horses is now a carpenter shop.

Headerhouse

One of the newer buildings on the station is the headerhouse (built 1957), which serves the greenhouses.

Tunnels

Nearby are the plastic tunnels, built in 1980 and 1981, a vital part of the studies directed at extending the growing season of vegetables.

Poultry unit buildings

The poultry unit consists of five buildings where scientists hatch, rear, and maintain both meat and egg-laying birds. Facilities range from small units for intensive work on individual or small groups of birds to semi-commercial systems to ensure that new findings apply to the poultry industry.

Dairy barns

The registered Holstein herd of 75 lactating cows is housed in a free-stall barn and milked in a modified parlor that has a sawtoothed side opening. The dry cows and pregnant heifers are also housed in a converted free-stall barn; nonpregnant heifers are housed in the former beef barn. There is a calf barn, which is designed to house 80 calves for experimental purposes and to facilitate the early rearing of 15 replacement heifers. A stanchion barn has been converted to a metabolism barn with 12 stalls equipped for restraining cows during infusion and total collection trials. Forages are stored in two hay barns, two horizontal silos, and five upright silos.

Above

Aerial view of dairy center, 1961.

Left

Superintendent's residence and farm office. Built 1891. Cow barn (*left*), built 1893, is still in use. Photograph taken ca. 1895.

General service buildings and wells

There are several general service buildings, including a large steel building (completed in 1958) for housing farm implements. This building also contains a shop for vehicle and farm machinery maintenance and repairs.

Two wells, each 24.4 m deep, supply the station with domestic water.

Residences

The original superintendent's residence, built in 1891, was demolished in 1955 and a new, seven-room residence was built on a site approximately 45 m east of the original house. The site occupied by the first house was converted into a parking lot for staff and visitors. There are now four residences, including the director's. A fifth residence, built in 1947, was converted into a conference room, now called The Anstey Place. Dr. T.H. Anstey and his family lived in the house until 1953, when Dr. Anstey was promoted to superintendent of the Summerland Research Station.

New residence for superintendent, 1956.

Laboratories

Although the laboratories are housed in sundry older buildings or barns, they are equipped for a variety of analytical procedures, including gas chromatography, flow injection analysis and atomic absorption, and inductively coupled plasma mass spectrometry. Many routine analytical procedures requiring less elaborate equipment are also done in these laboratories.

Food processing and plant physiology

The former Horticulture building is now a food processing laboratory. Here, physical and chemical quality tests and taste panels are performed on fresh and processed vegetables. Freezing and canning facilities are on the first floor. The plant physiology laboratory is housed in the top floor of the headerhouse.

Pesticides

Close by is the pesticides building, built in 1972. It is used to store pesticides and includes a laboratory for the preparation of treatments for experimental purposes.

European beech, *Fagus sylvatica* 'Asplenifolia'.

Meteorological measuring equipment, located on the research station.

Soil fertility, soil physics, and turf and animal nutrition

The former agronomy barn houses soil fertility, soil physics, turf and animal nutrition laboratories and three growth chambers. It also services an attached greenhouse. Sample preparation for analyses conducted in these laboratories is done in several associated buildings. The former sheep barn is now used for storage of plant and soil samples plus small plot equipment and supplies and for grinding of dry plant samples. The former poultry office is now used for soil drying and grinding. A forage dryer building, built in 1953, houses heated forced-air dryers capable of processing approximately 165 samples of fresh forage down to a moisture-free basis in 48 h. The forage dryer building is also used as a service area for adjacent meteorological measurement equipment. Meteorological data have been collected since 1889.

Postharvest physiology

A postharvest physiology laboratory is located in the loft of a barn that once stored hay and bedding for Clydesdale horses. The laboratory was completed in 1981 to complement the vegetable cooling and storage facility, which was located in the same loft and also completed in 1981 with the assistance of the British Columbia Coast Vegetable Cooperative Association.

Poultry

A poultry laboratory is located in an extension to the intensive broiler barn. It will soon be moved to the laboratory attached to the feed mill to overcome a shortage of electrical power and provide additional space.

Animal biochemistry and physiology

What was once the dairy is now an animal biochemistry and physiology laboratory.

Feed mill

Construction of a feed mill began in 1985 and it became operational in early 1986. This complex is equipped to produce experimental feeds as well as to prepare new feedstuffs from waste products. The mill also furnishes experimental diets to other research establishments in British Columbia.

Arboretum

Visitors to this farm cannot but be impressed by the imposing array of trees that impart a parklike atmosphere to the farm. Many of these trees are giants of awe-inspiring beauty. As a whole, they form

Main entrance to Agassiz Research Station.

a kaleidoscope of changing forms and colors as the seasons change.

The arboretum was begun in 1893. The original plantings were, for the most part, trees and shrubs not native to this climate. In fact, many of the plants were semi-tropical species. They were planted to determine their suitability for shade and ornamental purposes. Needless to say, many soon died because they lacked the hardiness required to withstand our frequent cold winter winds. Many others, both from the original and from subsequent plantings, died or had to be removed because of disease, floods, overcrowding, or old age. Replacements and additions have been made in an effort to keep this arboretum an historic attraction.

The station has handwritten invoices dating back as far as 1894 of trees shipped to Agassiz from Ottawa for planting in the arboretum. They are written and signed by William Saunders, then director of Canada's Experimental Farms.

One tree of outstanding appearance is the graceful, well-matured European beech (*Fagus sylvatica* 'Asplenifolia'), just west of the horticulture greenhouses. It is over 27 m high, and has a foliage diameter of more than 28 m.

Other species worthy of note are the flowering dogwoods (*Cornus florida*), the pink-flowering variety being most interesting: the various magnolia species, which produce an early profusion of color and have survived remarkably well: and the tulip tree (*Liriodendron tulipifera*) and the London plane (*Platanus* × *acerifolia*), both of which make exceptionally fine shade trees.

Of special interest is the ginkgo or maidenhair tree (*Ginkgo biloba*). It is a living relic of prehistoric genera, a link with the tree fern age.

Each tree in the arboretum is numbered and, except for a few whose botanical names have not been ascertained, each one is named. These names and numbers are printed on labels, which are attached to the trees.

Sycamore maples (*Acer pseudoplatanus*), planted in 1893, line the driveway to the farm.

CHAPTER 3

Research at the station

Agassiz Mercena Wayne Righto, whose dam gave sufficient milk in her fourth lactation period to fill the array of cans shown in this photograph. W.H. Hicks is at right. 1950.

Animal science

Dairy cattle nutrition and management

The first dairy herd was established at the experimental farm in 1911 with the purchase of 28 grade Holstein–Friesians and a purebred bull from Ontario. The first registered Holstein–Friesian cows were purchased in 1912. In 1921, the grade herd was sold in a dispersal sale and since that time the dairy herd has been maintained as a registered Holstein herd. During the first 45 years of its existence the herd was the source of high-quality breeding stock and used for the demonstration of optimum management and feeding practices. The events of those 45 years were highlighted in 1923 by Agassiz Segis May Echo's world record for milk production of 14 030 kg of milk and 611 kg of butterfat, and by the farm receiving a Master Breeder's Shield awarded by the Holstein–Friesian Association of Canada in 1930.

Mr. W. Hicks, who was the superintendent of the experimental farm from 1916 to 1953, was an enthusiastic promoter of Holstein–Friesian cattle and Clydesdale horses, and it was under his guidance that the Holstein–Friesian herd developed a reputation as a source of top-quality breeding stock. Hicks also made a significant personal contribution to the industry through his active participation in the British Columbia Holstein–Friesian Association. He was one of the principals in 1943 involved in organizing what is now the British Columbia Artificial Insemination Association.

During the period 1945-1955, the dairy herd was used to evaluate management practices in a series of pasture studies and in the economic comparison of field versus barn drying of hay. These studies were done under the guidance of forage agronomists Dr. M.F. Clarke and Mr. W.E.P. Davis. Dr. D. Bowden was the first ruminant nutritionist at the station and he concentrated his efforts on establishing the agronomic factors that influenced the soluble carbohydrate content of forages and the relationship between soluble carbohydrate content and digestibility of the forages by livestock. Management studies with the dairy herd during the early 1950s explored the usefulness of loose housing systems versus stanchions for the winter period. and compared the relative effectiveness of zero or mechanical grazing versus the conventional grazing systems for utilizing pastures during the summer. Dr. D. Blackmore was responsible for the design of these management trials and also for the participation of the herd in the national dairy cattle genetics project, which controlled the research function of the herd from 1956 to 1968.

More intensive studies of the nutrient requirements of lactating cows and replacement heifers were undertaken with the arrival of Dr. D.E. Waldern. A series of barley-based rations were fed to heifer calves, utilizing tallow and residues from the extraction of canola oil as energy sources and dehydrated grass as a source of protein. The response of the heifers to these rations established the feeding value of those combinations.

In order to ensure that the results of the research projects are relevant to on-farm conditions, the herd is managed and housed under conditions similar to those used by farmers in the area. Although research projects can limit productivity, every effort is made to maintain a high level of milk production.

The record of performance (ROP) herd summary during the past 6 years indicated an average of 8233 kg of milk and 307 kg of butterfat for a combined breed class average (BCA) of 355.

The herd no longer competes in the show ring nor does it contribute breeding stock to the industry. Its primary objective is the testing of management and feeding practices in order to identify optimum systems for the economic production of milk. In fulfilling this mandate the staff cooperates closely with the Department of Animal Science of the University of British Columbia, the British Columbia Ministry of Agriculture and Food, the feed industry, the Fraser Valley Milk Producers Cooperative Association, and veterinarians.

Trace minerals

Selenium—Dr. L.J. Fisher established that lactating cows could be fed up to 50 times their recommended requirement for selenium without increasing the selenium content of milk, and that milk selenium levels were doubled when dietary intakes of 100 times the recommended levels were fed for short periods of time. An intraruminal selenium pellet, developed by Tasman Veterinary Laboratories in Australia, and marketed by Imperial Chemical Industries, was tested as a long-term source of supplemental selenium for dairy cows. It seemed to be effective in reducing reproductive problems.

In cooperation with Dr. Shelford of University of British Columbia, the dietary interactions of selenium and sulfur were investigated. It was found that increasing dietary sulfur from 0.35% to 0.50% did not alter the utilization of dietary selenium.

Copper—A mass spectrometric and sample preparative technique for the use of copper-65 as a tracer was developed. Compared with radioisotope techniques, this stable isotope technique has major advantages in economy and safety when copper metabolism studies are conducted with large animals and with humans. The stable isotope technique, using copper-65, was used for investigating the rate of copper metabolism by lactating cows. It was determined that the metabolism of copper was not interfered with by higher than normal levels of selenium supplementation.

Dr. W.T. Buckley was involved in the development of two methods for determining the absolute rate of dietary copper absorption in dairy cows. The reliability of these methods was established when it was demonstrated that both of them produced the same results.

Dairy cattle management

The use of milk progesterone as an early indicator of pregnancy has been verified, and its use in monitoring abnormal reproductive cycles has been established in a cooperative study with Dr. Shelford of the University of British Columbia. The economic impact of the interaction between level of production and the number of days between calving and conception is being measured in a cooperative study with University of Alberta and University of British Columbia. Preliminary results indicated that cows with postcalving difficulties responded positively to early breeding.

Treatment of lactating cows and replacement heifers for internal parasites has proved to be economically beneficial for herds in the Fraser Valley.

Nonconventional feedstuffs

The addition of steam-processed aspen to corn silage at rates of 10 and 20%

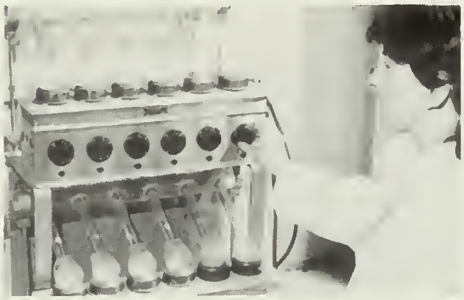
stimulated dry matter intake and milk yield but did not alter rumen fermentation or improve milk fat percentage.

Grain mixtures supplemented with a protected lipid product were not as palatable but were utilized more efficiently for milk production than unsupplemented rations: however, they were not effective in alleviating milk fat depression.

The utilization of acid whey in liquid form and as a lick block was investigated. Its value for nutrient replacement and feeding starter ration. It has been observed that during the first 5 weeks of life there was no advantage to feeding calves three times daily compared with two times daily, but feed conversion was greater for calves fed whole milk at 12% of body weight compared with 10%.

A series of long-term trials with replacement heifers has been undertaken to determine the effect of early plane of nutrition on milk yield and longevity. Preliminary results indicated that a low plane of nutrition may be beneficial.

Protein analysis. Step 1—digestion. Denise Helkenberg.



The Agassiz Holstein herd has one of the highest milk-producing records among institutional herds. This cow produced a total of 90 720 kg of milk. (*Left* to *right*) Bill Engel, Aaron Krahn, John Van Ee, Denise Helkenberg, John Wolff, Allan Leask, Peter Post, and Lorne Fisher. 1976.

levels was established. An investigation was also made on the potential impact of formaldehyde content in human food when ruminant feedstuffs were preserved with formalin. No increase in formaldehyde in meat products was observed, but there was a slight increase of formaldehyde in milk produced by cows fed whey preserved with formalin.

Calf management and nutrition

In a trial with veal calves it was found that canola meal fed as a protein supplement was equivalent to soybean meal in supporting calf performance. The use of ground alfalfa in starter rations for replacement heifers improved intake at the 20% level, and improved the rate of gain and feed efficiency when it comprised 40% of the

Forage utilization

A comparison of corn planted at 60 000 and 100 000 plants per hectare and utilized as silage containing 24.2 and 34.0% of dry matter and 22.8 and 28% of corn ears, respectively, resulted in a higher dry matter intake and milk yield but lower milk fat content for the corn planted at the lower density.

Sodium bicarbonate added to silage prior to feeding resulted in a variable response with corn silage but was not beneficial when grass silage formed part of the forage mixture.

Silage and hay additives have been tested with variable responses. The nutrient content and effluent losses have been quantitated for high-moisture grass silages.

A Limousin–Holstein crossbred steer is being measured for weight gain. (*Left* to *right*) Don Mewburn, Ron Rodger, Kenna MacKenzie, and Bert Forrest. 1976.

Beef

The station's beef research program was initiated in 1959 by Dr. R.J. Forrest. Since that time the program has evolved in three major areas: (*1*) the production of quality beef by the Holstein; (*2*) a comparison of the beef-producing ability of purebred Holsteins with first-generation offspring from matings of Holstein dams with Charolais, Simmental, and Limousin sires; and (*3*) an evaluation of carcass quality and yellow-colored fat of beef steers reared on all-roughage rations.

Several experiments using purebred Holstein steers, conducted over a 10-year period from 1959 to 1969, demonstrated that high-quality steaks and roasts, indistinguishable from meat from the beef breeds, could be produced by the dairy steer. When fed high-energy rations, Holstein bulls gained a maximum of about 3 kg/day and produced meat of quality equal to that of Holstein steers when slaughtered at about 476 kg and approximately 1 year of age. When Holstein steers were implanted with female sex hormones (progesterone and estradiol) in their ear, their rates of gain increased to almost the same level as rates of gain attained by untreated Holstein bulls at the same weight. Hormone treatment decreased the carcass fat levels in steers and increased fat levels in bulls; it had no effect on the quality of meat from either bulls or steers.

In 1967 Canada relaxed its policy of not allowing the importation of foreign breeds of cattle. Subsequently, cattle subjected to a year-long quarantine period and diagnosed as disease-free were admitted into Canada and used with the established British beef breeds. In 1969, sires from three of the newly established breeds, Charolais, Simmental, and Limousin, were bred to purebred Holstein dams in the Agassiz herd and their offspring compared with purebred Holstein steers. When reared to 500 kg on a medium plane of nutrition, and probably because of hybrid vigor, the new crossbreds gained slightly faster and produced about 3% more carcass lean than the purebred Holsteins. There were no differences in quality of meat from the four breeds.

In 1978, a series of experiments, using Herefords, was initiated to evaluate the carcass quality of steers finished on all forage or high-forage rations. The results of these experiments show that approximately 20% of steers finished on pasture have intense amber or yellow carcass fat. A 60-day high concentrate feeding period before slaughter reduces this fat color problem to acceptable meat-packing standards. The results also show that steers grazed on clover pasture gain faster than steers grazed on orchardgrass pasture. Steers reared on orchardgrass pasture and given a supplement of rolled barley (3 kg/day per head) had their rates of gain increased from 0.7 to 1.3 kg/day.

British Columbia egg-laying contest, 1937–1938. Winning pen owned by C. Vroom, Cloverdale, B.C. These Single Comb White Leghorns received 3334 points.

Art Hill testing quality of eggs, 1961.

Current beef experiments at Agassiz are centered on finding the most effective way of using exogenous hormones to improve the rate, efficiency, and economy of gain in cattle.

Poultry

In his report of 1889, Sharpe noted that four birds each of four different breeds were received from the Central Experimental Farm in Ottawa to start a poultry section. A later report of 1894 stated that construction of a proper poultry house was about to start and that this should reduce the loss of poultry to hawks, skunks, mink, and the like. Ottawa continued to supply stock but not always successfully if it was in the form of hatching eggs. Stock was built up and breeding plans were directed from Ottawa. It was decided in 1912 to reduce the number of breeds to those most popular on the coast, namely Single Comb Leghorn and Barred Plymouth Rocks. New housing was provided and a program to test housing and feeding conditions for coastal British Columbia was started.

Many feed formulas were tested to see if skim milk could be replaced but none were successful. They found that breeders could be successfully confined to produce hatching eggs but the progeny had to be raised on range to achieve good results.

In 1919, a chicken house was constructed for the egg-laying contests. In 1918, the federal government initiated a program to allow poultry breeders to submit 10 layers to be tested for a complete year. The results provided farmers with useful information when they purchased birds for egg production. Agassiz Experimental Farm conducted these contests from 1920 to 1938. The farm had significant entries in that a world's record was set in 1930 when a Single Comb Leghorn laid 357 eggs in 365 days.

In 1925 it was decided to work with only the Barred Plymouth Rock breed for selection work and for use in the feed competition and management studies. By the 1930s Agassiz was, for example, testing the usefulness of pilchard oil as a vitamin D source so that local products could be used in poultry feeds. This type of investigation continued until 1952, when all the Barred Plymouth Rock birds were disposed of and the station facilities were used for a national breeding program for poultry.

In 1955 Dr. A.T. Hill was appointed as a poultry geneticist. Although the national breeding program for poultry did occupy most of the facilities, there was an opportunity to measure the effect of feeding and management procedures. Forced molting of laying hens proved to be economically sound, especially when egg prices were low. In 1968, Dr. R.B. Buckland was appointed to study physiology, especially reproductive physiology, of poultry. Broiler profits were enhanced by the use of intermittent light as opposed to continuous light, whereas layer profits declined as the number of birds per cage increased (constant density) or as the density of population (birds per square metre) increased (constant population per cage). The latter effects were additive.

Currently, the poultry program encompasses projects on the nutrition, management, and behavior of laying hens and meat-type chickens. In laying hens, one area of Dr. E.E. Gardiner's study is concerned with the effect of water quality on egg production and eggshell strength. Aspects of water quality under investigation include the levels of various minerals found in the water from different farms and the pH of the water. Dr. J.R. Hunt has initiated a study to determine whether a short (soft) molt will improve the egg production and egg quality of hens that have passed their peak production level, and whether such improvement, if any, would be sufficiently economical under the Canadian egg marketing system, where hens are replaced yearly. Another area of study involves the effect of environmental factors such as cage size, cage shape, and stocking density on the welfare and productivity of laying hens. Dr. R.C. Newberry is measuring stress through the observation of behavioral and physiological responses of the hens.

Current research on meat-type chickens is centered around two major industry problems—leg disorders (crippling) and sudden death syndrome (SDS). Studies are under way on the effects of nutritional factors such as calcium and lysine (an amino acid) on the development of leg disorders in broiler and roaster chickens. The use of barn lighting to increase the activity level of chickens is also being investigated to determine whether birds that get more exercise are less susceptible to leg problems. SDS is a disorder of unknown cause in which rapidly growing, apparently healthy chickens die suddenly. Behavioral observations have failed to indicate which birds in the flock will die from SDS, and attempts to alter the incidence of SDS by feeding different diets have been inconclusive. Efforts to find the cause of SDS are now concentrated on biochemical analyses of tissues taken from dead birds.

Staff members are working on a new housing arrangement for layers. Weights and pen allocations are recorded. When housed comfortably the contented hens sing and chatter, apparently unaware that their progenitors ran around chasing insects. (*Left* to *right*) George Haayema, Will Daems, Bill Brooke, Dan Stobbe, Dane Chauvel, and Lee Struthers. 1976.

Crop science

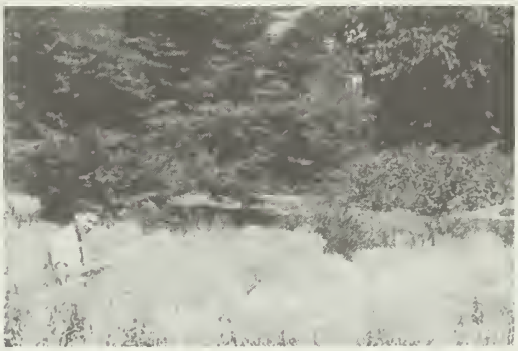
Small fruits

During the 1890s and the first decade of the twentieth century, activities were mainly horticultural. The only living monument to this first horticultural venture is the arboretum. From 1911 to 1925 activities were concerned mainly with variety and small cultural experiments with vegetables and bush fruits. The period 1925–1941 was one of expansion, inaugurating the study of more complex experiments. Raspberry research was intensified during the 1930s because of the decline of the Cuthbert raspberry. Experiments on fertilizer and cultural practices were conducted at Agassiz and at the substation in Hatzic. Much time was spent on testing new varieties. Work with strawberries and grapes consisted largely of testing varieties. In the spring of 1941, J.J. Woods, horticulturist, was promoted to superintendent, Saanichton Experimental Station. His former position was not filled until the spring of 1946, when T.H. Anstey was appointed horticulturist.

In the early postwar period, breeding programs were established by Anstey for both raspberries and strawberries. The varieties of raspberries being grown in the Fraser Valley at that time had serious disadvantages for west coast growers. The Washington variety produced a high-quality fruit but could not be grown on heavy wet soils, whereas Newburgh would grow on heavy soils but produced extremely low-quality fruit. An attempt was made to bring together the better characteristics of both varieties, combined with resistance to virus disease. At the same time, the berry industry was in need of a strawberry that had the quality of British Sovereign but could also resist the root-rotting disease, red stele, and produce fruit of more uniform size than British Sovereign. Varietal studies continued with grapes and gooseberries.

Dr. Anstey was promoted to superintendent of the Summerland Research Station in 1953. His work was continued by E.W. Toop. The experimental farm became responsible for the propagation of virus-free raspberry and strawberry stocks.

The small-fruits substation was established at Abbotsford, B.C., in 1956, with J.A. Freeman, officer in charge, and in November of the same year the Agassiz strawberry was released. Cultural experiments on raspberries and strawberries were done at the substation, whereas the breeding programs were continued at Agassiz until 1973, when Dr. H.A. Daubeny was transferred to Vancouver Research Station. The Cheam strawberry and Matsqui raspberry were released in 1968 and Totem strawberry in 1971. Within 5 years, Totem gained the dominant position in British Columbia. The Haida raspberry was released in 1972.



T.A. Anstey inspecting a crop of New York No. 12 lettuce seed, 1947.

First harvest of 1929 mulching experiment on cucumbers: (*left*) paper mulch, (*right*) bare ground.

Below
J.J. Woods examining azaleas, 1928.

Since the establishment of the Abbotsford, B.C., substation, considerable progress has been made toward the objective: "To accumulate research data that would permit increased efficiency of current raspberry and strawberry production through improved herbicide use, fruit rot control, propagation and other cultural methods." Many of the accomplishments were achieved with the cooperation of scientists from the Vancouver Research Station. Such accomplishments included investigating the influence of viruses on strawberries and raspberries. This research resulted in the establishment of a virus-free

Left
Tomato ringspot virus-infected raspberry plants (*right*) and virus-free raspberry plants (*left*).

Above
The beneficial response of broccoli to boron foliar sprays when a surfactant has been added. (*Left* to *right*) Virginia O'Fallon, Fred Maurer, Marianne Bickle, and Henry Wiehler. 1976.

strawberry plant production program. It also resulted in improved techniques for the inoculation and multiplication of virus-infected clones of raspberries. The investigation on the effects of tomato ringspot virus (Tom RSV) on plant and fruit development of raspberries was the first research to demonstrate, under field conditions, the influence of Tom RSV on raspberries. This research showed a gradation in varietal response to the virus.

The use of several fungicide programs for the control of fruit rot in raspberries and strawberries has been investigated. Programs that included iprodione and vinclozolin proved effective, and are considered as alternatives to captan.

In 1981, a study was initiated on the removal of primocanes (sucker plants) of red raspberries by chemical burning. Current recommendations are based primarily on studies with Willamette. The study will be continued in an effort to determine the optimum cane-burning schedule for each variety.

Vegetables

Vegetable crop research at Agassiz dates back to the earliest days. There were trials to determine the most suitable types of vegetables, and the best varieties within each type, for production in the Fraser Valley. Vegetable trials were, for many years, conducted on a national scale, and all results were forwarded to the Dominion Horticulturist in Ottawa, who was responsible for analyzing them and making recommendations to the industry. One of the most intensive programs involved the national potato trials. Thousands of seedlings were evaluated and the best ones found their way to the regional trials. Intensive vegetable variety trials continued under H. Magel until the late 1950s, and the potato trials continued until 1968. In the

A movable rain shelter and weighing lysimeter facility for studying the effects of soil moisture supply on the quality of peas for canning and for freezing.

A variety of vegetables can be grown in plastic tunnels on a year-round basis. Audrey Nadalin in center of tunnel.

A variety of tunnels and mulches for vegetables, 1984.

1950s, a broccoli breeding program initiated by T.H. Anstey developed some of the first single-headed varieties. In the early 1960s, variety trials concentrated on processing crops, particularly sweet corn, beans, peas, and cole.

In the mid 1960s, under A.R. Maurer, the emphasis changed from variety testing to studies on crop physiology, with particular emphasis on the response of crops to environmental factors.

Intensive work with peas identified environmental factors that limited the pea production in British Columbia. A movable rain shelter and weighing lysimeter facility was developed for measuring the response of vegetables at different stages of development to water stress.

Studies on beans and on broccoli in weighing lysimeters identified the water requirements of these crops at various stages of development.

Crops such as lettuces, peppers, eggplants, globe artichokes, bulb fennels, parsley, kohlrabies, winter onions, giant radishes, chinese cabbages, and spinach were grown successfully in the double-poly tunnels.

The concept of vegetable season extension was developed in the 1970s. Emphasis is now on producing out-of-season vegetables by overwintering and by using protective covers.

Studies under way to determine the effects of mini tunnels and floating mulches on soil and air temperature, soil moisture, and relative humidity show that higher yields and earlier harvests are possible.

Chemical weed control

With the introduction of selective herbicides in the mid 1940s, investigations were undertaken to determine their effectiveness in the control of annual weeds in cereal crops, fiber flax, carrots, parsnips, corn, peas, and spinach. In trials with oats and barley, the application of 2,4-D gave significant increases in yield over the check. The use of dinitro compounds for annual weed control in cereals and peas was effective. Postemergence treatments with Stoddard solvent controlled annual weeds and grasses in carrots and parsnips. By the early 1950s, Jack A. Freeman had tried 12 different materials for preemergence weed control in spinach. Most materials gave poor weed control or proved too expensive for use on spinach. Isopropyl *N*-phenyl carbamate (IPC) applied to strawberries in the fall, following cultivation, showed considerable promise for the control of winter annuals. IPC also proved effective for the control of volunteer annual ryegrass in red clover grown for seed. In 1946, trials were initiated to test 2,4-D in turf. Recommendations established then are still valid.

Ninety percent of raspberries produced in Canada are grown in the Lower Fraser Valley. Chemical weed control studies are undertaken on many varieties of strawberries and vegetables as well as studies on fruit rots. Jack Freeman and John Lanting assess efficacy of chemical weed control in raspberries at the substation, Abbotsford, B.C. 1976.

Jim Campbell (*left*) and Doug Taylor (*right*) conducting rod-row cereal tests at Agassiz, 1947.

The current objective of this program is to evaluate herbicides and herbicide mixtures for efficacy and safety of the crop and to develop use patterns for vegetable and berry crops. Recent achievements of this program include the following:

- Drs. J.A. Freeman and D.G. Finlayson (Vancouver) developed a systems approach to the assessment of herbicides by evaluating them in combination with insecticides. There are many situations when it is necessary to apply both a herbicide and an insecticide either at the same time or serially. This research has demonstrated that economic losses may occur when certain herbicides and insecticides are applied together to field-sown vegetables.

- Dr. J.A. Freeman investigated the influence of weather on the response of potato varieties to the herbicide metribuzin. Variety response was affected by weather conditions, including high temperatures, soil moisture content, and amount of sunshine before, during, and after spraying.

- The weed control work with berries and vegetables has culminated in several treatments being raised to recommendation status. The development of spray programs, utilizing two-way mixtures of herbicides at reduced rates, has proved more effective for weed control by broadening the weed control spectrum as well as having the overall result of increasing environmental acceptability of herbicides.

Cereals, forages, and turfgrasses

Cereal and forage studies were in effect shortly after the turn of the century. For example, in the *1912 Annual Report*, results are given from trials in which 10 varieties of spring wheat, 15 of oats, and 18 of barley were evaluated for yield and other agronomic characteristics; also 9 varieties of Indian corn were tested for ensilage. Trials on grasses and clovers were added in 1915. In addition to these, sunflower, mangel, carrot, sugar beet, swede turnip, soybean, and annual hay varieties were tested for forage use. In 1930, winter wheat varieties were tested for the first time. Testing of annual hays was discontinued because the weather conditions at Agassiz were considered unsuitable for growth of these crops.

Cereal variety testing was expanded in 1937 with the establishment of cooperative trials at three different sites in the Fraser Valley as well as at sites in the interior areas.

During 1936–1947, experimental work with forage crops became a major line of work, with extensive studies being done on the use of grasses and clovers for pasture and hay. Also during this period, seeding of all airports in the Western Air Command of the Royal Canadian Air Force was done under the supervision of M.F. Clarke.

In studies with grasses for seed production at Agassiz, good seed yields were obtained with ryegrass, orchardgrass, meadow fescue, and tall oatgrass, but yields from Chewings fescue, creeping red fescue, Kentucky bluegrass, and redtop were unsatisfactory. A plant-introduction nursery was established and active plant breeding work began with perennial ryegrass and orchardgrass, under the direction of M.F. Clarke and the newly appointed agronomist D.K. Taylor. With the appointment of W.E.P. Davis in 1950, a

Below
Ben Harmsen harvesting experimental grass plots to determine their values for hay and pasture, 1965.

Grass for sports turf is vigorously tested by a specially designed wear machine. Shown in picture are Ben Harmsen (*left*), George Carrol (*center*), and Doug Taylor. 1976.

series of forage management studies were undertaken, among which was one on the establishment and management of orchardgrass–ladino clover under irrigation.

Taylor's breeding program with oats was terminated in 1966 with the licensing of the variety Fraser, and a research program on ornamental turf was established in 1969.

Research on forages was discontinued when W.E.P. Davis was seconded to Tanzania in 1971 and D.K. Taylor devoted most of his time to the turfgrass program. The objective of the turfgrass program was to evaluate turfgrass species, varieties, and mixtures for home and recreational use and to develop management techniques for increased use of turf in the British Columbia coastal region.

The orchardgrass breeding program was terminated with the licensing of Sumas in 1974.

The turfgrass studies resulted in improved turfgrass varieties and mixtures for home lawn and sports turf use, and in more effective control of snow mold and fusarium patch diseases.

Forage research was reactivated when Dr. N.A. Fairey was appointed in 1977. Dr. Fairey's mandate was to conduct management studies to enhance productivity of corn, silage grasses, and legumes and to coordinate the silage corn hybrid evaluation trials on a provincial basis. Work on this program was reduced when Dr. Fairey transferred to Beaverlodge Research Station in 1981.

Dr. Taylor retired in 1978 and was succeeded in 1980 by S.G. Fushtey. A primary objective of Dr. Fushtey's research was the development of management practices that would reduce damage by disease without increasing use of pesticides. Some achievements were the classification of Kentucky bluegrass cultivars according to their relative resistance to the major diseases affecting this species in British Columbia, and the identification of effective chemical controls for fusarium patch and snow mold. Other objectives in the current program include studies on growth regulation to reduce turf maintenance costs, the use of slow-release nitrogen sources for turf on sand base, and the role of sulfur in turfgrass nutrition.

Soil fertility

Although studies to examine the amount of fertilizer and manure required for crop production were conducted in the early stages of work on the experimental farm, it was not until about 1950, with the arrival of H.F. Fletcher, that a program was focused specifically on soil fertility. This coincided with an increased concern by British Columbia soil scientists regarding fertilizer recommendations for the province. A soil-testing service was available as early as the 1920s through the British Columbia Department of Agriculture. Initial tests and interpretations were adapted from European procedures but it was realized that local information was required. Laboratory and field work conducted by H.F. Fletcher, V.W. Case, and M.K. John contributed to modifications and provided the basis of soil test recommendations, particularly for phosphorus and potassium, to the present time.

Concern about the environmental impact of chemicals was growing, particularly with the publication of *Silent spring* by Rachel Carson in 1962. In response to this concern, the soil fertility program, under Dr. M.K. John, conducted considerable research on contaminant metals (lead, cadmium, zinc, and mercury) early in the 1970s. This research had implications beyond the region served by Agassiz Research Station and included environmental as well as agricultural considerations. This work was gradually phased out after M.K. John left the Research Branch in 1974.

Portable sprinkler irrigation equipment designed for studies on the consumptive use of water by crops. Sprinkler may be adjusted to apply water on varying fractions of a circle, 1954.

Despite the emphasis on environmental concerns, soil fertility problems in the south coastal region were addressed. Field, greenhouse, and laboratory studies contributed to the establishment of soil test recommendations for magnesium, boron, and lime by the mid 1970s.

The use of non-soil media (mainly sawdust) for greenhouse plant production was researched during the 1970s, when E.F. Maas transferred from Saanichton Research Station. This work was adopted by the greenhouse industry and, when Maas retired in 1981, the non-soil-media research in the soil fertility program was phased out.

In 1978, Dr. C.G. Kowalenko transferred from Ottawa to focus on soil fertility research. Research was completed on the fertilizer requirement of filberts by 1984, when a leaf tissue testing system was implemented. Recent studies have proved that low boron in soils of south coastal British Columbia can reduce raspberry yields. Research on the fertilizer requirement of raspberries continues. Exploratory field plot studies have documented that

Above

Ted Maas and Chuck Tyler check the rooting of ornamentals in non-soil media, while Bob Klein discusses results from the atomic absorption spectrophotometer that have been read and reduced by the minicomputer under the care of Con Van Laerhoven. 1976.

sulfur deficiencies occur in south coastal British Columbia. The response to sulfur applications varied with respect to location and season. Efforts to derive an objective basis for sulfur applications are continuing. Nitrogen research has been initiated, including the use of a stable isotope as a tracer. Exploratory studies on micronutrients are in progress. Although micronutrient use in fertilizer formulations is increasing, research information is limited.

The high degree of precipitation and the wide range of soil and crop types all combine to make soil fertility research an important and challenging activity at Agassiz Research Station. Progress has been made but much remains to be done.

Soil, water, and crop management

South coastal British Columbia has a wide range of soil, water, and crop management problems. This part of Canada has the longest growth period per year and the highest annual rainfall. The high level of winter rainfall causes problems such as upland soil erosion and lowland drainage. Sea water intrusion increases soil salinity and presents a continuous threat to coastal farmland.

There is a high proportion of cash crops in the region to meet the demands of an urban population of nearly two million. Cash-cropping results in soil abuse. The intensive cultivation and extensive use of heavy farm machinery has turned much of the once prime farmland into low-producing fields. Poor soil management also affects the efficiency of existing drainage systems and increases root disease problems.

In August 1981, a soil and water management specialist, Dr. John C.W. Keng, was transferred from Ottawa to Agassiz Research Station to address the various and serious soil, water, and crop management problems in the south coast. Prior to that, soil and water management was studied periodically by scientists of various disciplines but the work did not have continuity. Through combining intensive crop management technologies and precision land preparation systems, current research objectives are to minimize soil and water pollution, ameliorate exhausted farmland, and ensure stable and lasting farmgate profits. Most of the efforts have been focused on the development of rhizosphere management systems for intensively cultivated horticultural crops and more effective soil tillage methods that will build up soil tilth, thus preventing soil degradation.

These activities have resulted in the establishment of trickle ferti-pesti-gation procedures for integrated crop management, and have generated information to help reclaim compacted farmland.

Vegetable postharvest physiology and storage

As part of the Crop Science Section at the station and also as part of the research program in processing, distributing, and retailing for Agriculture Canada, the vegetable postharvest physiology and storage research program represents the only one in western Canada for the department. It was begun in 1979, under Dr. P.W. Perrin, in response to the need for information on the diversity of crops and the crop production areas in British Columbia, and also in response to the need for interpretation and implementation of vegetable storage information developed in other parts of the world.

In general, this program has as its basis the investigation of changes leading to quality deterioration in vegetable crops after harvest. A major goal, therefore, has been the determination of storage conditions that result in quality maintenance for a number of local crops, including the evaluation and comparison of storage systems for effectiveness and for cost benefit.

Since its inception, this program has evaluated and produced recommendations on a number of topics. These have included the hydrocooling, storage, and retail display handling of broccoli, the postharvest handling of cauliflower, and the loss of vitamin C in cole crops during storage. Other topics include rapid cooling of carrots to control black rot, and the effects of poststorage illumination on greening of cabbage. Storage cultivars of carrots, cabbages, and oriental radishes have been compared, and three different high-humidity systems for vegetable storage have been evaluated.

APPENDIX I

Professional staff, 1889–1986

T.A. Sharpe	Superintendent, 1889–1911
P.H. Moore, B.S.A.	Superintendent, 1911–1916
W.H. Hicks, B.S.A.	Superintendent, 1916–1953
K. MacBean, B.S.A.	Field crops and poultry, 1924–1937
R.M. Hall, B.S.A.	Supervisor, Illustration Stations, 1927–1959
J.J. Woods, M.S.A.	Horticulture and bees, 1928–1941
M.F. Clarke, Ph.D.	Senior Assistant—agronomy, 1934–1952 Director, 1953–1972
T.H. Anstey, Ph.D.	Senior Assistant—horticulture, 1946–1953
B.A. Dickson, M.S.A.	Soil specialist, 1946–1949
D.K. Taylor, Ph.D.	Plant breeding, cereal and forage crops, ornamental turf, 1946–1978
J.A. Freeman, Ph.D.	Student assistant, 1946–1949 Chemical weed control, small fruits crop management, 1950–
W.E.P. Davis, M.S.A.	Forage management, 1950–1973
H.F. Fletcher, Ph.D.	Soils–plant interrelationships, 1950–1966
D.M. Bowden, Ph.D.	Animal nutrition and herd management, 1952–1967
H.A. Magel, M.S.A.	Crop management, vegetables and potatoes, 1952–1960
E.W. Toop, B.S.A.	Plant breeding, small fruits, 1953–1956
D.W. Blackmore, Ph.D.	Animal husbandry, 1954–1957
H.A. Daubeny, Ph.D.	Plant breeding, small fruits, 1959–1973
R.J. Forrest, Ph.D.	Animal physiology, meat studies, 1959–1985
J.D. Campbell, Ph.D.	Vegetables, 1961–1961
V.W. Case, M.Sc.	Soil fertility, 1961–1968
A.T. Hill, Ph.D.	Poultry genetics and management, 1962–1979
A.R. Maurer, M.Sc.	Vegetable physiology, 1962–
R.B. Buckland, Ph.D.	Poultry physiology, 1967–1971
M.K. John, Ph.D.	Soil chemistry, soil fertility, 1967–1974
D.E. Waldern, Ph.D.	Animal nutrition, 1967–1973
E.F. Maas, M.Sc.	Plant nutrition, non-soil media, 1971–1981
J.R. Hunt, Ph.D.	Poultry physiology, 1973–
J.E. Miltimore, Ph.D.	Director, 1973–1985
L.J. Fisher, Ph.D.	Dairy cattle nutrition, 1974–
W.T. Buckley, Ph.D.	Ruminant mineral biochemistry, 1977–
N.A. Fairey, Ph.D.	Field crop physiology, 1977–1981
C.G. Kowalenko, Ph.D.	Soil biochemistry and fertility, 1978–
P.W. Perrin, Ph.D.	Postharvest physiology, 1979–
S.G. Fushtey, Ph.D.	Turf management, 1980–
E.E. Gardiner, Ph.D.	Poultry nutrition, 1980–
J.C.W. Keng, Ph.D.	Crop and soil management, 1981–
R.C. Newberry, Ph.D.	Visiting Fellow, 1983–1985 Poultry behavior, 1985–
N. Ames-Gottfred, M.Sc.	Forage breeding and management, 1984–
S. Freyman, Ph.D.	Weed control, 1985–
J.M. Molnar, Ph.D.	Director, 1985–

Entomology Laboratory

R.C. Treherne, B.S.A.	Officer in charge, 1912–1917
A.B. Baird, M.Sc.	Officer in charge, 1919–1921
R. Glendenning	Officer in charge, 1921–1953

Health of Animals Laboratory

S. Hadwen, D.V.Sci.	1911–1918
E.A. Bruce, D.V.Sci.	1916–1932

APPENDIX II

Staff photographs, 1920–1986

Farm employees, early 1920s. Back row: not identified, Mr. Lunt, Mr. Pennington, Alvin Ogilvie, C.B.A. Lovell, Nelson Hardy, Jim Fraser, Steven McPherson, not identified, not identified, G.C. Harper, Sam Stock, Isaac Duncan, Mr. Rancheau, not identified, Mr. Musselwhite. Centre row: Kenneth MacBean, Miss Archibald, Miss R. Keene, W.H. Hicks. Front row: not identified, not identified, Alex McKay, W.S. Moore, Vernon Kuhn, not identified.

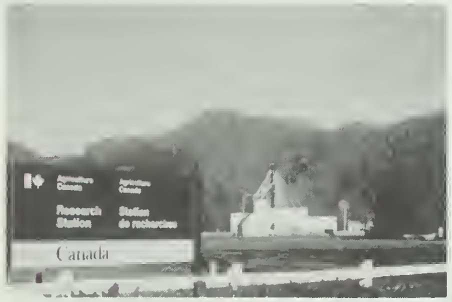
View of Agassiz Experimental Farm, ca. 1890s

[illegible]newith, J.A. Probert, H.C. Ditchburn, [illegible]son, and C.B.A. Lovell, 1962.

Haying, ca. 1900.

Above
Aerial view of Agassiz Research Station, 1986

Below
Agassiz Research Station's official entrance sign. The feed mill is in the background. 1985.

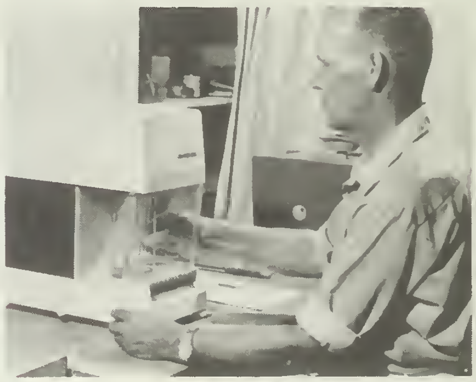


D.K. Taylor, W.E.P. Davis, J.A. Freeman, A.R. Maurer, H.A. Daubeny, H.F. Fletcher, V.W. Case, R.J. Forrest, and D.M. Bowden, 1962.

Don Kickbush, Ernie Willumsen, John Pranger, Herman Knoll, Norm Hanson, Bert Booth, Frank de Zwaan, and farm manager Les Bennewith having a well-earned lunch break. 1976.

Doris Scragg, stenographer: Jack Woods, horticulturist; Eva Sumpter, clerk–stenographer; Mr. Roach, poultry record of performance (ROP) inspector; W.T. Macoun, Dominion horticulturist, and W.H. Hicks, superintendent, 1928.

Ted Maas and Chuck Tyler. 1972.



Ben Harmsen. 1972.

Above

Seated (*left* to *right*); John Tarras, Norman Hanson, Bill Engel, Frank de Zwaan, and John Wolff. Standing (*left* to *right*); Herman Knoll, Aaron Krahn, Bert Booth, and Marvin Hatch. 1972.

Marianne Bickle, Shirley Anderson, Fran Biram, Fred Swannie, Fred Maurer, and Tim Watson. 1972

Dana Starry and Hugh Daubeny. 1972.

Gary Simonson, Ron Rodger, and Bert Forrest. 1972.

Con Van Laerhoven and Mabel Zoost. 1972.

Standing (*left* to *right*); R. Darel, J. Agothay, A. Hill, J. Patko, C. Ingwersen, and G. Akehurst. Seated (*left* to *right*); W. Daems, B. Ovington, and W. Becker. 1972.

APPENDIX III

Staff chart, 1986

J.M. Molnar, Ph.D.
DIRECTOR

L.J. Fisher, Ph.D.
HEAD OF SECTION
Nutrition (dairy cattle)

D. Neve, B.A.
ADMINISTRATIVE OFFICER

A.R. Maurer, M.Sc.
ASSISTANT DIRECTOR
Physiology (vegetable)

J.A. Freeman, Ph.D.
Management (small fruits)
Weed control

S. Freyman, Ph.D.
Weed control

[illegible], Ph.D.
[illegible] biochemistry
(ruminant)

E.E. Gardiner, Ph.D.
Nutrition (poultry)

J.R. Hunt, Ph.D.
Physiology (poultry)

R.C. Newberry, Ph.D.
Behavior (poultry)

D.W. Beaton, Dip. Bio. Tech.
FARM MANAGER

P.W. Perrin, Ph.D.
HEAD OF SECTION Postharvest physiology

S.G. Fushtey, Ph.D.
Management (turf)

J.C.W. Keng, Ph.D.
Management (crop and soil)

C.G. Kowalenko, Ph.D.
Fertility and biochemistry (soil)

D.H. Frey, B.Sc.
Analyst programmer

J.A. Lockyer, M.L.S.
Librarian

APPENDIX IV

Support staff, 1986

Animal science

D. Helkenberg	Dairy cattle nutrition
M. Harrison	Dairy
P. Harrison	Dairy
E. Peterson	Dairy
J. Davidson	Dairy
W. Engel	Dairy
S. Hainstock	Dairy
R. Rodger	Beef
D. Godfrey	Ruminant mineral biochemistry
G. Wilson	Ruminant mineral biochemistry
W. Lambeck	Ruminant mineral biochemistry
A. Nadalin	Poultry
L. Struthers	Poultry
E. Kuhn	Poultry
K. Ingram	Poultry
G. Akehurst	Poultry
H. Fraser	Poultry

Crop science

C. Koch	Turf management
C. Van Laerhoven	Soil fertility and biochemistry
R. Bruneski	Horticulture
J. Lanting	Horticulture
M. Bickle	Horticulture
F. de Zwaan	Horticulture
V. Brookes	Horticulture
B. Frey	Horticulture
B. Harding	Crop and soil management
L. Uzick	Crop and soil management
T. Plain	Postharvest physiology

Office staff

A.D. Slykerman	Office manager
A. Sherlock	Secretary
M. Jewell	Secretary
J. Hoogendoorn	Office staff
A. Slykerman	Office staff
M. Jewell	Office staff

General labor and trades

N. Hanson	Field crew
J. Pranger	Electrician
T. Holm	Carpenter
H. Wiehler	Field crew
H. Knoll	Field crew
F. Belsham	Mechanic
D. Beaton	Farm manager
R. Froese	General laborer

Denise Helkenberg

Maureen Harrison

Left to *right*
Phil Harrison, Erin Peterson, Jim Davidson, Bill Engel, and Susan Hainstock

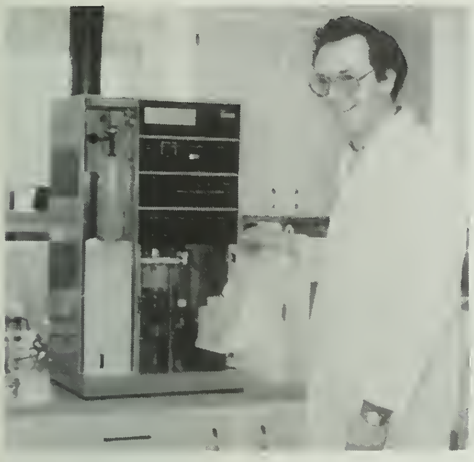
Ron Rodger

George Akehurst and Hilary Fraser

Right
Back row (*left* to *right*);
Bill Lambeck, Audrey Nadalin, and Lee Struthers. Front row; Emil Kuhn and Kathy Ingram

[illegible]

David Godfrey and Gay Wilson



Con Van Laerhoven

Brian Harding

Brenda Frey

Left to *right*
Rita Bruneski, John Lanting, Marianne Bickle, Frank de Zwaan, and Victoria Brookes

Lloyd Uzick

Rudy Froese

Terry Plain

Anne Slykerman

Left to right
Norm Hanson, John Pranger, Thor Holm, Henry Wiehler, Herman Knoll, Fred Belsham, and Don Beaton

Moira Jewell

Anne Sherlock

Josie Hoogendoorn, Anne Slykerman, and Moira Jewell

APPENDIX V

Foreign visitors

Two Malayans visiting Canada to learn about Canadian cooperatives. Omar Khalid and A.B. Hussain flank former superintendent W.H. Hicks and Dr. K. Rasmussen (Ottawa). Dr. Mills Clarke and Dr. Blythe Eagles, Dean, Faculty of Agricultural Sciences, University of British Columbia, look on. 1962.

1960 British agricultural mission on 6-week tour of Canada.

Canada