



Agriculture
Canada

**A
history
of the
research station
harrow, ontario
1909-1974**

The cover illustration is a view of the northeast corner of the laboratory-office building opened in 1969. This is a reproduction of a pencil sketch drawn by Yolanda R. Lamoure, R.R. 1, Harrow, Ontario. The sketch was commissioned by the staff of the Research Station and presented to Dr. Gordon M. Ward on the occasion of his retirement in October 1976.

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Gordon M. Ward

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PREFACE

The contributions made by Canadian scientists to the well-being of the people of the nation and of the world have been substantial and unique. This publication is concerned with the history of the development of agriculture in a designated part of Ontario and the contributions made by agricultural scientists of the Canada Department of Agriculture at the Research Station, Harrow, Ontario.

I have been associated with Canadian agricultural science for over 40 years and a member of the staff of the Research Station at Harrow for 14 of these. The task of examining old documents and consulting a number of retired employees during the preparation of this publication has served to strengthen and confirm my pride in the accomplishments of my colleagues in agricultural research. At this station there have been a number of dramatic discoveries, which have exerted a significant influence on the direction of agricultural progress in Canada. However, the greatest impact has come from the combined effect of numerous small advances that have been made with great patience and persistence over many years. I hope that this account will help to make Canadians more aware of the activities of their agricultural scientists and more appreciative of the great value of their discoveries.

Gordon M. Ward

FOREWORD

As time passes, the events that occur and the accomplishments of people in any setting become dim in memory and it becomes increasingly difficult to write down a factual history of these events and accomplishments. Records that have been kept are usually fragmented and incomplete, are hidden in a variety of files, and usually deal with some specific highlight. Too often the calm, steady development and growth of an organization along with the gradual changes in personnel and philosophy go unnoticed and unrecorded. Frequently the newcomer finds no easy answers to certain questions about the organization and therefore lets them go unanswered.

This was not the case in the autumn of 1972 when some questions were posed to Dr. Gordon M. Ward concerning events in the development of the Research Station, Harrow, Ont. He decided to find answers to the questions and in the process he noted that a number of retired people who had been associated with the Station for much of its history were still available to provide information about its development. Men such as Dr. L. W. Koch, Mr. R. J. Haslam, Mr. W. A. Scott, Mr. J. M. Scatterty, Mr. W. F. Mountain, Mr. T. B. Harrison, and Mr. H. R. Boyce were still living in Harrow or the vicinity. It was therefore agreed that Dr. Ward would accept an important and enjoyable, but time-consuming, assignment to interview the people available, to search the files and printed records, and from these sources to bring together the pertinent information pertaining to the development of the Station. This history will attest to the dedication, perseverance, and thoroughness with which Dr. Ward completed his assignment.

Glenn C. Russell
Director
Research Station, Harrow, Ont.
1970-1975

Seven heads of the establishment



Wilfred A. Barnett, B.S.A., Manager, Tobacco Station, Harrow, 1909-1915.



Dudley D. Digges, M.Sc., Superintendent, Tobacco Station, Harrow, 1915-1923; Superintendent, Dominion Experimental Station, Harrow, 1923-1926.



Henry A. Freeman, M.Sc., Superintendent, Dominion Experimental Station, Harrow, 1926-1928.



Herbert F. Murwin, B.S.A., Superintendent, Dominion Experimental Station, Harrow, 1929-1959; Associate Director, Research Station, Harrow, 1959-1964.



L. Ward Koch, Ph.D., Officer-in charge, Dominion Laboratory of Plant Pathology, Harrow, 1938-1954; Officer-in-charge, Science Service Laboratory, Harrow, 1954-1959; Director, Research Station, Harrow, 1959-1970.



Herbert R. Boyce, M.S.A. Officer-in-charge, Dominion Entomological Laboratory, Harrow, 1948-1954.



Glenn C. Russell, Ph.D., Director, Research Station, Harrow, 1970-1975.

EARLY HISTORY OF AGRICULTURE IN ESSEX COUNTY

Essex County in the Province of Ontario is the most southerly land area in Canada. Its southern tip lies across the 42nd parallel of latitude, which is as far south as the northern boundary of California or Rome in Italy. This geographical fact has important implications for agriculture. The County is in the form of a peninsula surrounded on three sides by water: on the south by Lake Erie, on the west by the Detroit River, and on the north by Lake St. Clair. It includes 13 small islands in the surrounding waters; Pelee Island is the largest. The County extends 35 miles from east to west and 25 miles from north to south at the widest point to make up an area of about 700 sq mi. The topography is exceedingly flat; the highest elevation is only 750 ft and reflects the fact that in early geologic times the whole area was at the bottom of a large lake.

The soil types in Essex County are many and varied and have arisen from a variety of soil parent materials. Much of the area is covered with a heavy clay, and natural drainage is not good in many places although there are numerous small streams. Mineral deposits include some small oil and gas fields and an extensive salt bed. The original vegetation was mostly hardwood forests with a significant area of Pelee southern forest (pseudotropical). There was also a considerable amount of marshland growth.

The southern location of the county and the influence of the surrounding waters have been largely responsible for producing a climate that is milder and more moderate than in any other agricultural area in Canada. Consequently, it is favorable for the production of the widest variety of crops in the country.

The winters are usually mild; the lowest average monthly minimum temperature is about 18°F. The lowest temperature ever recorded was -20°F. The summers are hot and often humid. The highest average monthly maximum temperature is 82°F and the highest recorded temperature was 105°F. The average frost-free period is 170 days, April 29 to October 16, and there are 1956 annual hours of sunshine. This statistic has prompted enthusiastic residents to name their county the Sun Parlor of Canada. The average annual precipitation is 29 in., (13-43 in.), which includes 37 in. of snow (12-57 in.). The distribution of rainfall through the growing season is usually favorable for most agricultural production. Extremes in

weather conditions occur only rarely, but have taken place. Drought, floods, tornadoes, and frost have all taken their toll from time to time.

The area was inhabited in very early times by Indians, but evidence of their activities is scant. Archaeological studies have disclosed that as early as 900 A.D. these inhabitants were conducting a primitive agriculture by raising Indian corn, which could be stored for winter use, and probably beans and tobacco. Their principal means of subsistence was hunting and fishing, and they led a somewhat nomadic existence. One group was the Neutral Nation or Attiwandaronks, who lived along the shore of Lake Erie. A more numerous group, which had a somewhat different type of culture, lived farther to the west of the area, but their tribal identity remains a mystery.

A more sophisticated and extensive type of agriculture was practiced at a later date to the east and north around Georgian Bay in the district formerly known as Huronia. Large tracts of cleared land interspersed with villages were occupied by the Hurons, the Neutrals, the Tobacco, and the Wyandottes. When the first European explorers began making their way across North America in the early years of the seventeenth century, these people were already accomplished agriculturists, who produced large quantities of corn, beans, a grainlike reed canary grass called uncultivated wheat, tobacco, squash, numerous other vegetables, a variety of fruits, and maple syrup.

In 1649 the Six Nations Iroquois moved north from their traditional ancestral territory in the Mohawk Valley of upper New York State and attacked the tribal settlements throughout Huronia and further south. Many people were massacred including the French Jesuit missionaries Brebeuf and Lalemant; the survivors fled in all directions. The tribe of Neutrals was attacked in 1650 and obliterated. Thereafter the Iroquois occupied the area as a hunting ground. Later some of the Wyandottes returned to the area around Detroit and many of the Hurons reestablished themselves in the Seneca country far to the south.

The Essex County peninsula lies along the main inland waterway of North America. This was unknown to the early European explorers, who followed a different route on their expeditions of discovery. Samuel de Champlain with his lieutenant Etienne Brûlé, accompanied by Indian guides of the Huron tribe, ascended the Ottawa River, crossed over to Lake Nipissing, and paddled downstream to Georgian Bay and Lake Huron. In 1615 they were the first white men to view this great freshwater sea. Later that year Champlain returned by way of the Severn River, Lake Simcoe, and the Trent Valley lakes and rivers and discovered Lake Ontario, which he crossed with the Indians. His earlier attempt to ascend the St. Lawrence from Montreal had been thwarted by the treacherous rapids at Long Sault. Thus the northern passage became the main fur-trading route and the existence and location of Lake Erie remained unknown for many years. An additional circumstance that contributed to this development was the hostile Iroquois tribes, which roamed the forests south of the lower Great Lakes and the St. Lawrence. These tribes frequently crossed over to the north and by their warlike activities harassed the French fur traders and their friendly Huron allies. For many years they impeded all passage along these waters.

In 1670 Father Dollier and Father Galinee, Jesuit priests, were the first white men to travel via Lake Ontario and Lake Erie to Sault Ste. Marie. They spent the winter in the vicinity of Port Dover. In the spring they continued along the shore of Lake Erie and camped at Point Pelee. Father Galinee, who was a map maker, prepared the first map that is anything like Essex County.

To support the fur trade the French erected forts at strategic locations throughout the north. One of these was located at Mackinac and at the turn of the century it was under the command of Seur Antoine de la Mothe Cadillac. He had explored much of the surrounding country in search of a suitable site for a settlement. Finally he decided that the best location was the strait between two lakes or Detroit as the French say. After considerable delay, he obtained permission from Paris to proceed with the project and in June 1701 he set out from Montreal with a large party, which included 100 Indians, 25 canoes, and several tons of cargo. He followed the old fur-trading route up the Ottawa River and arrived eventually at Georgian Bay.

He traveled south across Lake Huron down the St. Clair River, across Lake St. Clair, down the Detroit River and disembarked at the narrow point. Cadillac claimed the land for the King of France, built a fort, and called the settlement Fort Pontchartrain. He also invited several tribes of friendly Indians to establish villages under the protection of the post. Carrying out his plan of settlement, he divided the land around the fort into long narrow farms numbered from the fort 1, 2, 3, etc. in both directions. At a later date on the south, or Essex County side, farms were similarly numbered beginning at La Pointe de Montreal, which is where the Ambassador Bridge is now located.

In 1728 a mission to the Huron Indians was started by Father de la Richardie, a Jesuit, on the south side of the river. Because of Indian harassment for 20 years, it was moved first to Bois Blanc (Boblo) Island and then back to La Pointe de Montreal. The village of the Huron Indians was located just below the mission near the road in Windsor now known as the Huron Line. In the spring of 1749 a determined effort was made to increase the population of Detroit on both sides of the strait. The following proclamation from Governor Gallioniere of New France was read in every parish along the St. Lawrence River:

"Every man who will go to settle at Detroit will receive gratuitously one spade, one axe, one ploughshare, and one small auger. Other tools will be advanced to be paid for in two years only. The settler will also be given a cow, which he shall return at the time of the increase; the same for a sow. Seed will be advanced the first year, to be returned at the third harvest. The women and children will be supported for one year. Those men will be deprived of the liberality of the King who shall give themselves up to trade instead of agriculture."

A large number of people from the district of Montreal took up the government's offer and came to Detroit in batteaux. Some of them had seen the settlement previously on fur-trading expeditions. At the same time a number of settlers moved to the south side of the strait and a company of French soldiers was also granted land. More than 2½ miles of water frontage in the vicinity of Turkey Creek were divided into 23 lots,

3 arpents wide and 40 arpents deep. The first settler was Louis Gervais, who arrived from Montreal with his wife and two children on July 26, 1749. A contemporary document called the Cicotte Book records that Louis Plichon on his arrival received a donation of four rations for the first year, which was later increased to five on the birth of another child whose baptism is duly recorded. He also received 2 roebucks for meat, 2 measures of flour, 1 hoe, 1 axe, 1 ploughshare complete, 1 scythe, 2 augers, 1 sow, 7 chickens, 80 roofing nails, 4 lb of powder, 5 lb of lead, 20 bu of wheat, 1 bu of corn, 1 cow, and 1 ox. The last four items had to be returned or paid back.

In 1750 there were 102 farms settled: 52 were on the north side of the river, 15 on the south side, and 35 in Petite Cote. The first census was taken in that year and gives the south shore population as 483: 96 men, 80 women, 146 boys, 128 girls, and 33 slaves. There were also a few soldiers. The names of many of these settlers have been preserved on a map made at the time. For many years Detroit was the only settlement west of Montreal.

The settlers lived in log houses surrounded by gardens. There was an abundance of fish and game. They had guns, but if powder was scarce they used bows and arrows with which they were as expert as the Indians. They had apples, but their favorite fruit was pears. Each family had about two fields in which they alternated crops, which were mainly spring wheat and peas.

At the Battle of the Plains of Abraham in 1759 the English defeated the French and took over the control of Canada. In 1760 Major Robert Rogers of the Royal American Regiment was sent from Montreal with 200 rangers to take possession of the Detroit settlement and Fort Mackinac. The surrender took place without the firing of a shot. British rule at Detroit lasted for 36 years. During this period the American Revolutionary War was fought, but it was not until 1796 that Detroit became a part of the United States and the river became an international boundary. During the war of 1812-14 Detroit was again captured by the British under General Sir Isaac Brock, but it remained under their control for only a few months and was returned to the Americans at the conclusion of the conflict following the Battle of Queenston Heights.

The early settlement gradually spread out along the Detroit River, but the roads connecting the small communities were very poor. Inland roads were lacking because of the difficulty and expense of constructing them in heavily wooded and sometimes marshy country. However, the stage was set for later settlement by the Indian land purchase of 1790 by which a large area in southwestern Ontario, including most of Essex County, passed into British hands. The closing years of the 18th century witnessed the establishment of the so-called "New Settlement" by United Empire Loyalists and others adjacent to Lake Erie in what is now the Colchester-Gosfield section. The term "New Settlement" served to distinguish the section so designated from the "Old Settlement" of French Canadians along the Detroit River. Communication between these areas was mainly by water and apart from these two areas there was little settlement in Essex County until well on into the 19th century. The opening of the Talbot Road (now King's Highway No. 3) in the 1820s started some settlement in the interior of the County, but it was only with the coming of the railways after the middle of the century that any extensive land clearing occurred. The Talbot Road, which was surveyed and engineered by Colonel Talbot, followed the high ridges of the interlobate moraine, a glacial deposit from early times. The use of the higher and drier land made roadbuilding easier and avoided the high water table, which was considerably higher than it is today.

Early in the nineteenth century the influx of land-seeking Americans and immigrants from Britain resulted in a growth of farming activity particularly around the borders of the Essex County area. A number of small hamlets arose and a few lake ports, which soon carried on a flourishing shipping trade. There was a brief period of lumbering when the land was being cleared for farming. The beautiful hardwood forests yielded large quantities of oak, walnut, and hickory, which were shipped to Canadian furniture factories and to the British market through the ports at Union and Albertville, which have long since vanished.

The settlers on their small farms were concerned mainly with growing produce and livestock for the support of their own families and the local inhabitants. However, it was not long before the growing of wheat became such a successful operation that large quantities were soon being shipped first to Montreal and eventually to Britain. To support this trade a large warehouse was located at Union to serve the Olinda-Ruthven district. In those days also an "iron furnace" and foundry were located at Olinda where bog iron ore, which was found in abundance in the vicinity, was fashioned into a variety of tools and other articles required by the farmers.

Most of the farmers grew tobacco for their own use. However, in the early part of the 19th century, when money was scarce and much of the settlers' produce was bartered, tobacco was one of the crops grown to bolster cash income. When the American settlers arrived in Essex County, they brought a certain amount of expertise in tobacco growing and curing as well as a supply of seed of some of the better types and varieties. Early in the century enough tobacco was grown so that the surplus was shipped to manufacturers in Montreal and Kingston. Some Canadian leaf was shipped down the Mississippi River to New Orleans for a short period. By 1840 100-ft barns, which were used in the air-curing of tobacco, dotted the landscape along Lake Erie. In 1850 the crop, most of which was grown in Essex and Kent counties, exceeded 750,000 lb.

In the early days the principal agricultural exports were wheat, tobacco, and pork. Small villages grew up at Oxley, Colchester, and Harrow and each was a trading post or agricultural center. All of the area known as Gosfield Township became settled very early, and the town of Kingsville was started in 1843 with the erection of the first house at the main corner by the founder Mr. James King. Most of these little towns had a sawmill, a grist mill, and a cheese factory. Kingsville also had a woollen mill in the latter part of the century. The farmers were well paid for their locally produced wool, and blankets were shipped to many foreign countries as well as all parts of Canada. The towns of Essex and Leamington were established at a later date, when the Talbot Road was completed. A number of small communities were started along the shores of Lake St. Clair and populated mainly by French Canadian farmers, who had

moved from the towns of Sandwich, Amherstburg, Windsor, and Walkerville. The towns of Tecumseh, Belle River, Stoney Point or Pointe aux Roches, and St. Joachim have retained their predominantly French Canadian and Roman Catholic atmosphere up to the present day. In this part of the County two nonagenarian bachelor brothers are still living in an old shack and are happily supporting themselves on a small patch of ground by using the rudimentary farming practices that were in common use more than a century ago.

By the second half of the nineteenth century most of the arable land in Essex County was cleared for farming. Livestock raising and dairying as commercial enterprises did not exist early in the century. Each farmer had sufficient dairy cattle for his own needs, but fear of competition from the United States discouraged much expansion. Even dressed meat was imported. However, with the importation of purebred animals in the 1850s the livestock population began to increase rapidly and soon the livestock and dairying industries became very important.

The main crop of the area continued to be wheat. Barley and rye were important crops in areas where distilleries existed. The farmers grew oats, corn, grasses, and clovers for forage. Some corn was raised for grain, but this practice did not become general until early in the twentieth century with the advent of hybrid corn. Hops, sorghum, and flax were also grown. The soybean was a latecomer to the agricultural scene. It was not grown in Canada until early in the twentieth century and did not become an important economic crop until after the Second World War. Then it achieved a phenomenal rise in popularity and became one of the principal crops in Essex County.

There was no commercial production of fruits and vegetables in the County in the early days of agriculture. Farmers and home gardeners, even in the towns, grew their own produce for immediate use and for canning or preserving. Apples and pears were in great abundance and grown everywhere. Many settlers had brought seeds of different varieties with them from Europe, and the story is told that the Jesuit priests in

Essex County planted pear trees everywhere they went on their travels like the famed Johnny Appleseed. These trees were very hardy, flourished for many years, and grew to a great size. They produced an abundant crop of small, sweet, hard pears every year and came to be known as the Jesuit pear trees. A few of these ancient giants may still be seen; one is in the city of Windsor and one is on the farm of Mr. Earl Iler in Colchester South Township. This tree, which is pictured here, is estimated to be almost 200 years old. The tree is 60 ft high and its base is more than 30 ft in circumference. Mr. Iler, who is a descendant of the people who established the Iler Settlement in the eighteenth century on the shores of Lake Erie, claims that his grandfather told him that the tree was old when he was a boy. When the picture was taken in 1973, the tree was a mass of spring blossoms.

Market gardening developed in the 1850s in the areas around the urban centers in Ontario and eventually the large-scale production of fruits and vegetables became a successful commercial venture. Although the Niagara Peninsula became the main fruit-growing area in the province, much produce was raised in Essex County for sale and export. Both the soil and the climate were particularly suitable. The most important fruit crop was apples and the second was peaches.

Grape growing became a commercial industry in 1866 when 25 ac were planted on Pelee Island by Mr. Thaddeus Smith and Mr. J. D. Williams. The first crop of grapes was harvested in 1868; a winepress was installed and there was no difficulty in disposing of the wine, which was of rather good quality. The success of these first attempts soon attracted other growers. Although Pelee Island appeared to have the most favorable climate and soil for vineyards and



remained the most intensive center of the operation, the industry did spread to the mainland. The acreage in Essex County grew from 50 ac in 1870 to a maximum of 1784 ac in 1904, when Essex was the third most important county in Ontario for grape production. There were numerous local wineries and the quality of the wines was recognized by connoisseurs far beyond the boundaries of the province. Fresh grapes were also sold locally and shipped to other parts of Ontario. There was even an unsuccessful attempt to ship them to Britain. Early in the twentieth century the commercial production of flue-cured tobacco began in the County, and because of the rapid rise in the popularity of cigarette smoking the tobacco industry expanded very rapidly. High prices were paid for suitable land and it became more profitable to use it for tobacco than for grapes. As a result, the grape industry declined very quickly and in the early 1920s less than 50 ac were in production; this situation remained substantially unchanged for many years. In 1971 a determined effort was made to revive the industry and 120 ac of experimental planting are giving good indications of a promising future.

Jesuit pear tree about 200 years old

A wide variety of market garden vegetables was grown including radishes, onions, tomatoes, and lettuce, but the two major vegetable crops in the latter part of the nineteenth century were potatoes and white beans. Sugar beets gradually came into production. Turnips were grown for stock feed as well as for human consumption. In the 1890s the completion of several direct and rapid rail services saw the passing of the general farming era and the development of specialized intensive agriculture, particularly in the Leamington area. In 1908 in Leamington the H. J. Heinz Co. built a large food processing plant, which served as a further stimulus for the expansion of the vegetable industry. Early in the twentieth century some of the immigrants from Europe began to build glass greenhouses on their farms for the production of vegetables during the fall, winter, and spring seasons after the style of farmers in Holland, England, and Italy. This practice persisted and grew until in the 1960s a thriving greenhouse vegetable industry became one of the main features of agriculture in the Leamington district, where there is the largest concentration of greenhouses in Canada.

The tobacco industry expanded very quickly at the beginning of the twentieth century; flue-cured and burley tobacco were the two principal types grown in Essex County. Tobacco became the most valuable crop in the area and great fortunes were made by both producers and manufacturers. However, in the 1930s the flue-cured part of the industry moved to another part of Ontario that had more favorable soil and climate. At the same time burley production declined because of a decreasing world demand coupled with overproduction caused by too rapid expansion. These developments opened the way for a considerable expansion of the fruit and vegetable industry on the light sandy soil, which had been occupied by tobacco. Processing tomatoes became one of the most important vegetable crops in the area. The Heinz plant expanded to become one of the largest of its kind in the world. Numerous other smaller canning factories were opened. Fresh market tomatoes were grown for shipment throughout the province and greenhouse tomatoes were produced in great abundance. The tomato was so common and important in the economic life of the eastern part of the County that the town of Leamington billed itself for tourists as "The Tomato Capital of Canada." Both slicing and pickling cucumbers became major crops. Large quantities of sweet corn were grown for processing. Cabbage, onions, and asparagus were also major vegetable crops. Many excellent crops were raised on the fertile marsh land of Point Pelee.

Essex County is one of the richest farming areas in Canada. At present there are more than 40 different kinds of crops produced on its varied soils. The history of this development has been one of constant change as agriculture has adjusted to the needs and demands of the Canadian consumer and has been influenced by the shifting economic climate. There are now 353,000 ac under cultivation, which represents 77% of the total area. The annual value of all agricultural products is in excess of \$70 million and approaches 10% of the value of production for all of Ontario. It is much smaller than the value of manufactured good, which are worth \$1.8 billion annually largely because of the automobile industry in Windsor. In spite of its small size, Essex County is one of the most productive areas in Canada. Modern techniques of intensive farming have continued to increase the productivity level of the farms. Unless growing urban encroachment deprives agriculture of much of its valuable farmland, this area can continue to supply a significant amount of food to Canadians. However, if the land is diverted for other purposes in a manner similar to the erosion of the agricultural potential of the Niagara Peninsula in recent years, a valuable and irreplaceable resource will be lost forever.

CANADA DEPARTMENT OF AGRICULTURE

The story of agricultural research in Canada has been well documented in *Fifty Years of Progress on Dominion Experimental Farms, 1886-1936* and *Canada Agriculture: The First Hundred Years*. Canadians may well be proud of what has taken place. In order to present the history of the development of the Research Station at Harrow, it seems appropriate to repeat some of the pertinent historical facts in the unfolding growth of agriculture and government in this country.

Prior to 1867 a Bureau of Agriculture functioned in the Province of Canada under a minister, but its performance was less than satisfactory. With the consummation of Confederation the new parliament passed an act in 1868 for the organization of a Department of Agriculture to be presided over by a minister and a deputy minister. In its first years the Department was responsible for a number of activities quite remote from the context of agriculture such as public health, the census, and patents, but these eventually became assigned to other departments.

In January 1884 a select committee of the House of Commons was appointed to look into the need for agricultural improvement in Canada. It recommended the establishment of an experimental farm. In 1886 Professor William Saunders of London, Ont. was appointed to further investigate this matter. In the same year in which his report was presented to the House of Commons by the Minister of Agriculture, Hon. Sir John Carling, "An Act Respecting Experimental Farm Stations" was passed, which authorized the establishment of five experimental farms. Dr. Saunders was appointed as Director of the new organization, which was called the Experimental Farms Branch and within 3 years he had set up the Central Experimental Farm on the outskirts of Ottawa and branch farms at Nappan, N.S., Brandon, Man., Indian Head, Northwest Territories (later Sask.), and Agassiz, B.C. The Central Farm was organized into five divisions: Agriculture, Cereals, Horticulture, Poultry, and Chemistry. The Veterinary Branch was established in 1869 and the Dairy Branch started in 1889.

This branch system of organization persisted for many years and underwent numerous changes. As agriculture expanded and Western Canada became opened up for farming in the early years of the twentieth century, the activities and responsibilities of the Department grew. In 1902 the Veterinary Branch became the Health of Animals Branch. In 1905 the Livestock Branch, the Seed Branch, and the Tobacco Branch were established. The last of these remained only until 1913 when it became the Tobacco Division of the Experimental Farms Branch. Other branches were created as indicated: Publications 1911, Entomology and Fruit 1914, and Economics 1929.

The number of divisions at the Central Farm gradually increased until in 1923 they numbered 14: Animal Husbandry, Field Husbandry, Horticulture, Poultry, Cereal, Forage Plants, Economic Fibre, Bee, Tobacco, Chemistry, Botany, Bacteriology, Illustration Stations, and Extension and Publicity.

The rapid settlement of Western Canada together with the successful operation of the five experimental farms over the first 20-yr period indicated a need for more branch farms particularly on the prairies. In 1906 a new establishment was created at Lethbridge, Alta., but it was designated as an experimental station rather than an experimental farm. This nomenclature was retained for many years. For the next 10 years new stations were opened every year at some point. This type of expansion continued until 1935. When the Experimental Farms Branch celebrated its 50th anniversary on June 6, 1936, it had grown to include 33 experimental stations and farms, 14 substations, 11 branch laboratories, and 233 illustration stations. The personnel numbered about 1400 and operations extended from the Atlantic to the Pacific, and from the International Border almost to the Arctic Circle, to serve every province.

Dr. Saunders was a man of exceptional ability and stamina. He remained as Director until 1911 and personally supervised and inspected all work on the branch farms. Shortly before his retirement the organization had grown to such proportions that this huge task was impossible for one man and a change in supervision became necessary. Thenceforth the chiefs of the various divisions of the Central Experimental Farm were given supervision, under the Director's

general control, of their respective lines of investigation on the branch farms and stations. This arrangement had important implications for the future development of research programs on the stations, because it frequently tended to fragment the lines of management.

Because of the great diversity found in agriculture, the organization of agricultural research has always posed a problem to managers. They cannot fit it into a neatly designed package. Overlapping and overemphasis of various elements constantly recur. Any system of management must be a compromise because some prefer to organize around crops and species whereas others favor organization on the basis of scientific discipline or activity.

A major reorganization of the Department of Agriculture took place in 1937 when the old structure made up of branches was superseded by a regrouping into services on a functional basis. The work of the Department was fitted into five services, which were each headed by a director. The Marketing Service was responsible for all phases of marketing, grading, and economics. The Production Service included health of animals, plant protection, plant products, and other phases of production. The Experimental Farms Service replaced the Experimental Farms Branch, but some of the divisions of the Central Experimental Farm were transferred to Science Service, which took in botany, plant pathology, entomology, bacteriology, and chemistry. There was also an Administration Service. Subsequent experience over the next 20 years indicated that the rearrangement of the various research functions of the Department into two services, which was designed to foster a combined cooperative effort, resulted rather in a segregation of interest and control.

The Science Service launched into an extensive program of laboratory construction in Ottawa and throughout the country. Many of these laboratories were located adjacent to experimental stations, but had separate programs and administration. The research effort extended into many new fields of activity and made a vital contribution to the advancement of Canadian agriculture.

The Second World War and the period of adjustment immediately following it produced tremendous changes in the Department. Science was having an increasing impact on agriculture and rapid advances in technology were influencing every phase of farming. In keeping with the new problems and new concepts, a second major reorganization of the Department was carried out in 1959. Three branches were established: Research, Production and Marketing, and Administration. The first two of these were each responsible to an Assistant Deputy Minister and administered by a Director General. Within a few years the Administration Branch was divided into the Financial and Administration Branch and the Personnel Administration Branch, and the Economics Branch and the Health of Animals Branch were formed.

The Research Branch brought together the former establishments of the Experimental Farms Service and the Science Service. The new structure included research institutes, research stations, branch farms, and regional laboratories. At many establishments an amalgamation took place between units and research programs were merged. In Ottawa a program directorate composed of senior scientists was provided to assist in the coordination of research.

The aim of Canadian agricultural research has always been service to the farmer or producer in the solving of problems and the development of new ideas. The constant change in the structure of the organization has probably had little effect upon the substance of the program over the years, but it has undoubtedly increased the speed and efficiency with which it was carried out. In 1867 the departmental staff numbered 27. Fifty years later more than 1000 were employed, exclusive of laborers. Now about 11,000 people serve the Department; a fifth of this number are professionals. The Research Branch consists of 6 research institutes, 3 research services, 26 research stations, 11 experimental farms, and 13 substations. It employs a total of almost 1000 research scientists with a support staff of more than 5000 and is the largest research organization in Canada. In regard to the number of establishments in its organization and the far-flung nature of its operations in every province and territory, it is unique in the world.

The achievements of Canadian agricultural research have not generally been widely publicized although they have usually been well documented. However, in February 1973 the Minister of Agriculture, Hon. Eugene F. Whelan, a farmer from Essex County, addressed the Southwestern Ontario Branch of the Ontario Institute of Agrolologists in the following terms:

"In my brief term of office I have earned a new degree of respect for the effort that is put forth by agricultural scientists. I have seen scores of specific factual cases of major gains made possible by your research ... research that has paid off in the form of major benefits for our farmers and our industry. The Canada Department of Agriculture has the best research organization in the world ... The leaders of Canada's largest agricultural research organization have done a good job of defining the problems our industry faces, of taking stock of the money and men available, and of picking projects. The Research Branch has proven its ability to respond promptly to the changing demands of the industry and has produced solid results ... There is no other industry in Canada, which can pick as many examples as we can in agriculture of research being put to practical use so promptly and effectively ... I am on the farmers' side ... If you are not making a valuable contribution, if your work does not in some way help the farmer, I would be just as happy to take away your salary and research funds and give the money directly to the farmers.

In overall terms your record has been one of the solid achievement. I hope you will keep up the good work. We need you, and the more you have to offer us, the more we will need you in the future."

TOBACCO STATION

1909-1915

In 1905 the Minister of Agriculture, Hon. Sydney A. Fisher, undertook to encourage and assist the development of the tobacco industry. He reported to parliament as follows: "In my endeavour to improve the Canadian tobacco industry I came to the conclusion that in order to materially do so, it is absolutely necessary to engage an expert from outside the Dominion to instruct the growers in the best methods of cultivating and marketing this product." As a result, the services of Mr. Felix Charlan, an officer of the French Government, were secured and the Tobacco Branch was established within the Department to carry out this work.

Mr. Charlan conducted a survey of the methods employed in the growing of tobacco both in Ontario and Quebec. The survey disclosed that many of the common procedures were unsatisfactory, the quality of the tobacco produced was inferior, and there was need for experimental work to improve cultural and handling practices. In 1906 a series of experimental plots for fertilizer and varietal studies was established in Essex County on growers' farms. One of the cooperators was Mr. Arthur Ferriss whose farm was east of the town of Harrow. Mr. Wilfred A. Barnett, a student from the Ontario Agricultural College in Guelph, was employed to supervise the plot tests. After 3 years of experimentation, the results were sufficiently encouraging to warrant the establishment of a tobacco station.

In 1909 25 ac of land in the northeast corner of the Ferriss farm were leased for this purpose and the Harrow Tobacco Station came into being. Mr. Barnett, who had now graduated, was appointed manager under the Tobacco Branch, Department of Agriculture, Ottawa. The initial investigations included cultural, varietal, and fertilizer experiments with burley and also with flue-cured tobacco, which had just been introduced into Canada in 1906.

Six oat varieties were tested in 1909 and one field was seeded to registered Dawson's Golden Chaff winter wheat in cooperation with the Canadian Seed Growers' Association. Eighty peach trees were planted in clover sod on the Station in 1911.

In 1913 the work of the Tobacco Branch in Ottawa was transferred to the Experimental Farms Branch and established as the Tobacco Division with Mr. Felix Charlan as Chief under the Experimental Farms Director, Dr. J. H. Grisdale. Included in the transfer were the tobacco stations at Harrow, Ont. and Farnham, Que. The work at Harrow was carried out under the close supervision of the chief of the Tobacco Division. Members of the Ottawa staff were frequently involved in the investigations and research results were usually reported through the Tobacco Division in the annual report of the Minister. In the recruitment of personnel to carry out experimental investigations with tobacco, the Department found it necessary to employ men from the United States who had specialized training and experience in dealing with this crop. Many of the growers in Ontario and some of the industry executives were Americans who came to Canada to profit by the large acreages of productive soil and the attractive living conditions. In 1914 Mr. G. C. Routt from Kentucky was appointed as tobacco inspector for Ontario in the Tobacco Division, Ottawa.

1915-1923

In the fall of 1915 Mr. Dudley D. Digges, a native of the State of Virginia and a graduate with a masters degree from the Virginia Polytechnic Institute, replaced Mr. Barnett as the superintendent of the Tobacco Station at Harrow. Mr. Oscar B. Williams, another American from Virginia and a graduate from the Virginia Polytechnic Institute, was appointed as his assistant. When Mr. Barnett resigned he took up farming in the Harrow district, but later purchased a farm near Leamington where he resided until his death in 1964. Mr. Barnett conducted cooperative plot tests with tobacco on his farm as late as 1922. Mr. Routt was promoted to the position of plant breeder and pathologist in the Tobacco Division and Mr. Henry A. Freeman from South Carolina succeeded Mr. Routt as tobacco inspector for Ontario.

In the same year the Station was increased to 50 ac and an option to purchase the entire Ferriss farm of 200 ac was obtained. The Station was laid out in a series of tobacco rotations for cultural, variety, and fertilizer experiments. The crop rotations were established to meet the needs of tobacco in a mixed farming economy in which were grown hay and grain for cattle and horses and grain corn for hogs. Horses provided the motive power for all farm operations.

On April 5, 1917, the first official meteorological observations were recorded at the Station for the Meteorological Service of Canada. They included temperature readings, the general state of the weather, and the amount and type of precipitation. Mr. Digges was the official observer, a task he performed until October 1921 when it was taken over by Mr. Williams. Daily weather records have been maintained at the Station from that time.

DOMINION EXPERIMENTAL STATION

1923-1929

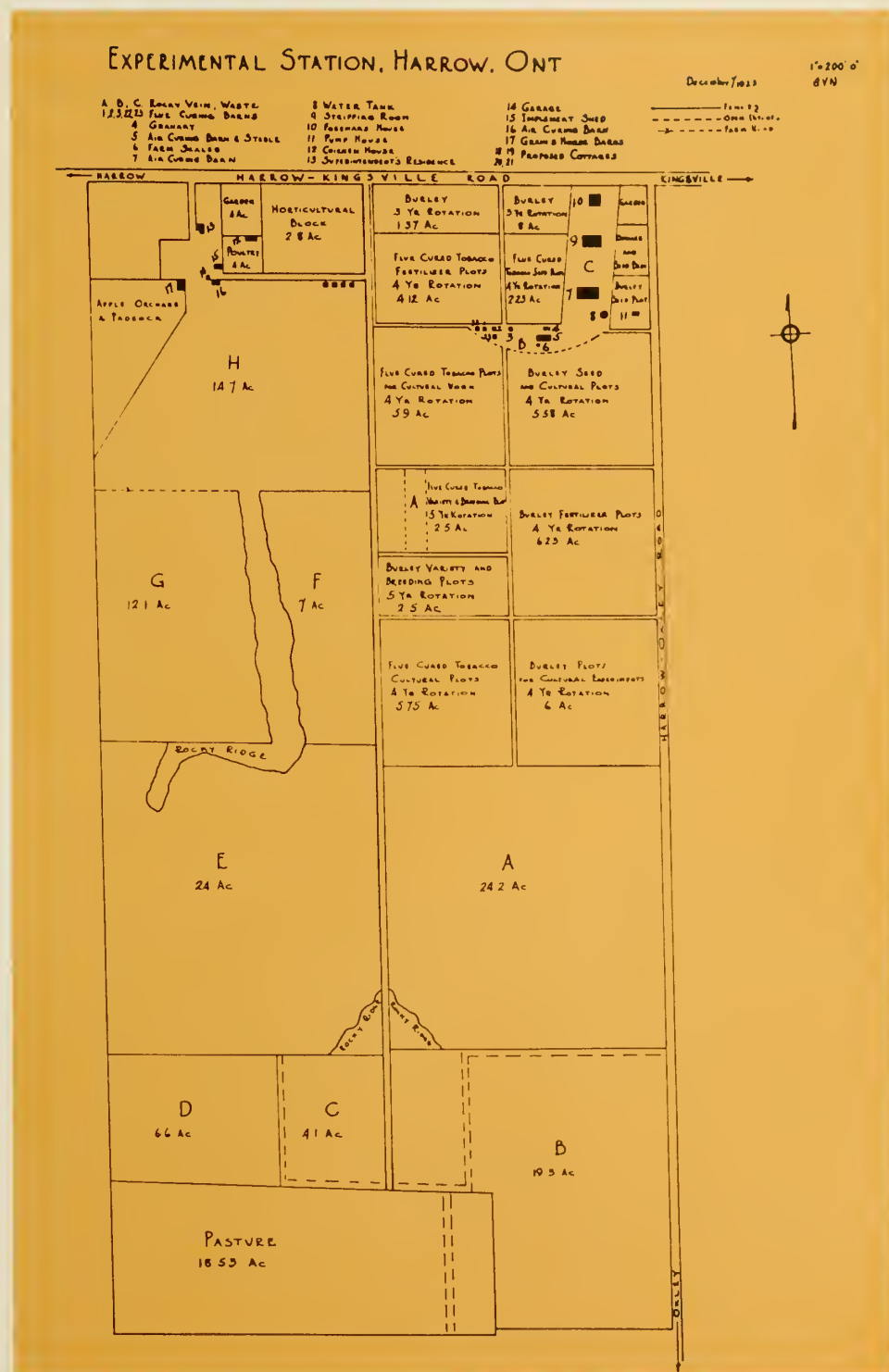
In 1923 the option to purchase the Ferriss farm was exercised and the name Dominion Experimental Station, Harrow, was formally established. The property is designated as part of lot 14 and all of lot 15 in the Gore (Second Range), Township of Colchester South, Essex County. A greatly expanded program of experimentation was undertaken. The tobacco work became even more extensive. Mr. Robert Haslam, a graduate of the Nova Scotia Agricultural College in Truro and a student at Macdonald College, Que., was employed during the summer months of 1923 and 1924 to assist with a new forage crop program. When he graduated in 1925 he was appointed as tobacco inspector with the Tobacco Division in Ottawa, but spent the summer months at the Station until 1929 when he was transferred. Mr. Haslam spent his entire career in tobacco research until his retirement in 1964. As a plant breeder he is credited with having produced a number of important varieties that made a significant impact on the Canadian tobacco industry.

Also in 1923 Mr. Fred Dimmock from the Forage Plants Division in Ottawa organized and carried out a preliminary program of investigation with field corn and soybeans. The first winter feeding of steers on the Station was done in 1923. In 1924 Mr. H. R. Murray of the Horticulture Division in Ottawa supervised the renovation of an old apple orchard, which had been acquired with the Ferriss farm. The trees were thoroughly pruned and top-grafted with 39 promising new varieties. Mr. Murray also started an extensive series of tests with a number of commercial vegetables and made numerous plantings of ornamental flowers and shrubs.

A map of the Station dated December 1923 appears in a report of the *Organization, Achievements, and Present Work of the Experimental Farms*, prepared in 1924 for the Minister of Agriculture, Hon. W. R. Motherwell. It indicates that there were 23 buildings, of which 13 were on the original 25 ac. They included two

residences, a number of tobacco curing barns, a horse barn, an implement shed, water tower, and pump house. There is also a suggested location for four proposed teamsters' cottages. The Ferriss house became the superintendent's residence. It was an eight-room brick house with a stone front and was esti-

mated to be 80 years old at that time. Mr. Digges, who in 1918 had married a local girl, Miss Wright, had been living in the town of Harrow and now moved into this residence. The other residence on the Station was occupied by Mr. Everett Moore, who had become farm foreman in 1917.



In the early years of the Experimental Farms Branch, on each station the superintendent, the farm foreman, and certain other workers with special responsibilities were required to live on the station property and houses were provided for them at a nominal rent. This was done for the protection of the property, to allow for the adequate care of farm animals, and to provide for more efficient control of certain crop practices such as tobacco curing. At one period there were six residences on the Station.

For the 3 years after the enlargement the experimental program continued to expand. A number of new buildings were erected including an office building, a cottage, garage, implement shed, the first heated greenhouse, a potting house, corn crib, several tobacco barns, and flue-curing kilns.

Building construction was carried out in a much more flexible and casual manner than by contract agreements. Mr. Freeman Mortimore, a prominent local carpenter in the Harrow district, was taken on staff as a temporary employee and paid an hourly wage. He directed and carried out the construction of most of these new buildings and remained in government employ until they were completed. This arrangement was used repeatedly for more than 10 years whenever a new building was required. Any helpers required for these projects were also hired on a temporary basis. One of Mr. Mortimore's first helpers was his young son Glenn, who

assisted with the carpentry in the summer months and began an association with the Station that continued until he retired.

The office was a two-story frame building with nine rooms, two rest rooms, and a full basement. The overall dimensions were 52 ft by 26 ft and the cost was about \$6,300. Extensions were added in 1938, 1939, and 1946 until the length of the building was increased by 60 ft. This building remained as the headquarters until 1969 when it had become obsolete and overcrowded.

Upper

Original office building, which was constructed in 1924.

Lower

Office building with three additions.



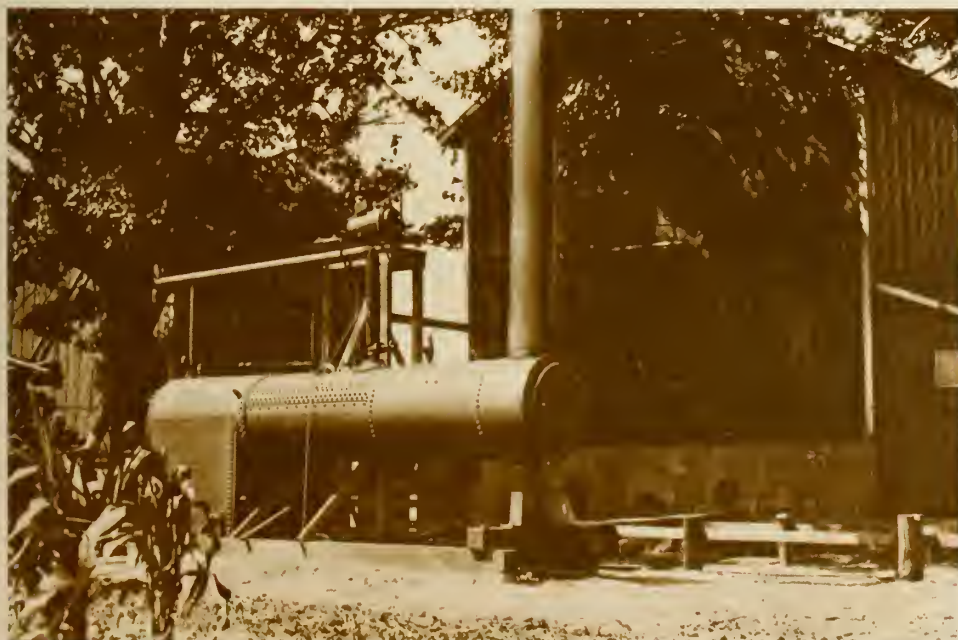
The permanent staff in 1923 consisted of Mr. Digges, Mr. Williams, Mr. Moore, and Mr. Jerry McLean as secretary. In 1925 Mr. McLean left and his position was taken by Mr. J. Milton Page. The load of office work was not onerous and during the busy summer season the secretary was expected to do his share of hoeing tobacco, harvesting, and haying. This practice continued until the late 1940s. Teamsters and laborers were employed as required on a seasonal basis. No record of their names remains in the archives, but the names and pictures of the horses have been

preserved. A number of crop specialists from the staff of the Central Experimental Farm spent the summer months here, and returned to Ottawa at the conclusion of the crop season. The recognized hours of work were from 7:00 a.m. to 6:00 p.m. with an hour break at noon. The Station was self-supporting until 1928, mainly because the tobacco crop yielded a considerable revenue.

The main avenue of communication was the annual report, which was meticulously written in great detail. Most of these reports were printed in Ottawa by the King's Printer. The earliest one at the Station is for 1924. A cost-of-production study was made in connection with every experimental project. Labor for a man and a team of horses was rated at 40¢/hr. Burley tobacco sold for 20¢/lb. flue-cured tobacco 44¢/lb, corn \$1.00/bu, and steers 7¢/lb live weight f.o.b. destination.

Another channel for scientific publication was the Department of Agriculture Bulletin Series. The first recorded publication of the Station was a 44-page booklet entitled *Flue-cured Tobacco in Canada*, Bulletin 38, Second Series, by D. D. Digges and H. A. Freeman, October 1920. It presented a complete set of detailed instructions for producing flue-cured tobacco, a report of an extensive survey of tobacco soils, and an account of a series of cooperative fertilizer experiments. It was prefaced by a letter of recommendation from the Director, Dr. J. H. Grisdale to the Minister of Agriculture, Hon. S. F. Tolmie, and an introduction by Mr. Charlan. A second publication by Mr. Digges, *Tobacco Growing in Southwestern Ontario*, Bulletin 76, New Series, appeared in 1927 after he had left the public service. It summarized the 10 years of experiments during his tenure as superintendent. Other than annual reports, no further publications were prepared until 1935.

Many visitors came each year from all parts of the tobacco belt to discuss and learn about new methods of culture. Members of the staff addressed farmers' clubs in Essex and Kent counties and visited growers' farms to give advice and assistance. Many articles were written for the local press and an exhibit was displayed at the Essex Corn Show.



Upper

Names of horses in teams from left to right (1) King and Barney, (2) Sam and Dock, (3) Net and Minn, (4) Bill and Minn, (5) Daisy and Tops, 1931.

Lower

Steam boiler used in flue-curing tobacco with steam heat

In the summer of 1926 Mr. Digges resigned as superintendent to become manager of the Imperial Tobacco Company's plant in Leamington. He held this position until he retired because of ill health in 1939. He continued to reside in Leamington until his death in 1971.

The next superintendent was Mr. Henry A. Freeman, who had been the tobacco inspector for Ontario for a number of years. He had been closely associated with the work at the Station as well as that of the Tobacco Division in Ottawa. Mr. Freeman had visited all the tobacco growing areas in the province and was experienced in the techniques of flue-curing. He had made some detailed soil surveys, and was an exceptionally capable judge of the suitability of soils and weather conditions for tobacco production. Mr. Freeman and Mr. W. L. Pelton, another American from Wisconsin, grew 21 ac of flue-cured tobacco in the Leamington area in 1921. The following year they grew an experimental crop of 5 ac near Lynedock in Norfolk County and in 1923 they purchased the old Chrysler farm at Lynedock and successfully harvested the first commercial crop of 30 ac of flue-cured tobacco in what came to be known as the "new belt."

During the two years that Mr. Freeman served as superintendent, the main emphasis continued to be on tobacco, but an increasing amount of research effort was devoted to animal husbandry, field husbandry, and horticultural, cereal, and forage crops. Experiments on growing hemp for fibre and seed were carried on for a number of years under the direction of Mr. R. J. Hutchinson, Chief of the Fibre Division in Ottawa. The only building erected on the Station during these two years was a new Lord and Burnham greenhouse. The popularity of the Station and its value to the community and district continued to increase. A great number of growers availed themselves of the opportunities of having their tobacco seed cleaned and tested without charge. Exhibits were displayed at local town fairs, at the Canadian National Exhibition in Toronto, and on the provincial seed-cleaning demonstration train. In 1927 the Station had 1384 visitors, 2070 letters were received and answered, and 1030 telephone calls for information were received.

Mr. Freeman resigned in January 1928 to become the owner of Ontario Tobacco Plantations in Norfolk County. Mr. Milton Page left with him to be the secretary of this large farming operation. Mr. Page's position at the Station was soon filled by Mr. Omer W. Cox.

1929-1941

Mr. Herbert F. Murwin, a native of Wisconsin and a graduate of the University of Wisconsin, was appointed as superintendent in May 1929. He had been employed for several summers prior to this as a tobacco specialist near Windsor at the Walkerville Farms, which was partly owned by his uncle Mr. Biggar and formed part of the huge Hiram Walker distillery complex. Mr. Murwin, who had great ability and vigor, was outspoken and highly regarded by the farmers whom he served. He undertook an immediate revision and expansion of the research program. Shortly before Mr. Murwin arrived, Dr. Nels T. Nelson had become Chief of the Tobacco Division in Ottawa. The two men had come from the same area in Wisconsin and were both graduates of the same university. Their work with tobacco kept them in close association for many years.

A complete reorganization of the fertilizer studies as well as other work on tobacco was carried out in 1929. Mr. R. J. Haslam, a tobacco inspector of the Tobacco Division, was transferred to the Station to assist in this expanded program. In 1930 the experimental work in forage crops, which had been under the direct supervision of the Division of Forage Plants at Ottawa, was taken over by the Station. Mr. Casper W. Owen was appointed experimental farm assistant in forage crops in January 1930 on a transfer from the Division of Forage Plants. A poultry plant, which included facilities for the direction of the Western Ontario Egg-laying Contest, was established in 1930. Mr. W. T. Scott was transferred from the Division of Poultry Husbandry at Ottawa to the Station as head poultryman in April 1930. To meet the requirements of this new program four new buildings were constructed in that year: a poultry brooder house and office, a poultry progeny house, an egg-laying contest house, and a residence for Mr. Scott and his family. Mr. B. Sixten Hoegstedt, who had been a part-time worker since 1927, was given the responsibility for crop testing and Mr. Jack Scatterty joined the staff in 1930 as head gardener. Mr. Omer Cox, Miss



Bob Haslam cross pollinating in the tobacco breeding program with the assistance of Norval Fulmer.



Katherine Webb, who later became Mrs. Brian Harrison, and Miss Jean Rae were hired to work in the office and made up the complement of 10 permanent employees. There were 12 or 14 men in the labor gang and 5 teamsters, all of whom worked a 60-hr week, but enjoyed none of the fringe benefits such as holidays and sick leave with pay. All outside employees adhered to a rigid working schedule under the strict supervision of Everett Moore, the farm foreman. There was a large cast-iron bell mounted on the roof of one of the farm buildings. The bell was rung at 7:00 a.m. to signal the time for all workers to proceed to the field. The teamsters had arrived at 6:30 to feed and water their horses to be ready for the field at 7:00 and for this they were paid an extra 4¢/hr. At 11:45 a.m. the bell rang again and the teamsters left the field for dinner. The bell rang at 12:00 a.m. to signal the laborers to leave the field and at 1:00 p.m. to send everyone back to the field. At 5:50 p.m. the bell rang again for the teamsters to leave the field and at 6:05 p.m. it rang to signal quitting time for the laborers. The extra 5 min past 6 o'clock each day was tallied up and the workers were given the weekend privilege of quitting at 5:00 p.m. on Saturday. The time bell remained as an obtrusive feature of the Station's life until Mr. Moore's period as farm foreman came to an end with his death in 1954, but by this time the hours of work for hourly rated employees had been reduced.

The annual budget was about \$45,000 and from 1929 on there was no returnable revenue from farm production. The superintendent's salary was \$2,840, the assistant superintendent received \$2,230, and teamsters were paid \$600 a year or 27¢/hr and could expect to be laid off for 2 months during the winter. The economic depression of the 1930s was beginning to be felt in all walks of life.



Upper
Egg-laying contest house, 1937.

Lower
Water tank with sunshine recorder on top, 1931.

During the years 1927–1930 there was a phenomenal increase in the production of flue-cured tobacco in the counties of Norfolk, Elgin, and Oxford, known as the "new belt." In 3 years the planted acreage jumped from 1700 to 10,800 ac. In the same period the planted acreage in Essex County decreased by more than 1000 ac. Much of this land that had been devoted to tobacco was turned over to the production of horticultural crops. As a result of this change numerous requests for additional experimental work in horticulture were received. The program was expanded to include fertilizer experiments on early tomatoes and asparagus in addition to the current work with early potatoes, sweet corn, canning peas, and apples.

In spite of the decreasing production of flue-cured tobacco in Essex County, tobacco investigations continued to form the largest part of the research program. A determined effort was made to improve both the yield and quality of burley tobacco by better fertilizer practices, new varieties, and different cultural treatments. Soil-borne diseases were a constant threat and particularly black root rot, which at one period almost eliminated the industry in the Blenheim district. The search for a resistant variety was a major item in the testing program. In 1929 seed from seven strains of White Burley was obtained for testing from Dr. Valleau of the Kentucky Agricultural Experiment Station in the United States. The results obtained in the first year on the fields where there had been black root rot were not promising, but in the second year the strain designated as Valleau Selection No. 22 produced one healthy plant. This plant was spotted by Mr. Oscar Williams in Field C, but there was some disagreement amongst the tobacco specialists regarding its potential value as a producer of high-quality burley leaf. Its growth habit was so different from all other Valleau strains that it is now generally agreed that it was a mutation. The seed from this plant was planted the following year and the results were very gratifying. The new selection produced a uniform healthy growth of plants that were superior in many ways to the parent strain. It was consistently resistant to black root rot and its high standard of performance continued through succeeding years. In 1932 it was given the name Harrow Velvet and released for commercial production. By 1936 it had become the outstanding cigarette burley grown in southern Ontario and occupied nearly half the

burley acreage. This was the first new variety of any crop to be produced at the Station and undoubtedly it rescued the burley tobacco industry from complete oblivion in this country. Harrow Velvet remained the most widely used variety until the late 1950s, and its genetic characteristics were bred into succeeding varieties, which are in use today. It is difficult to assign a monetary value to the consequences of this one piece of scientific research, but we can be sure that it has placed many millions of dollars in the hands of Ontario growers.

Upper

Test for resistance to black root rot of tobacco with a susceptible strain on the right and a resistant one on the left.

Lower

Experimental plots with burley tobacco barn, 1935.



Tobacco Substation, Delhi, Ont.

Because of the increased production of flue-cured tobacco in the "new belt" and the difference in the quality of the leaf from that grown in Essex County, it was decided to do some experimental work in that area. After some preliminary testing and search for a suitable location, a Dominion Experimental Substation was established in 1933 on 50 ac of leased land 1½ miles west of the town of Delhi in Norfolk County. Mr. G. Lloyd Haslam, a brother of Bob Haslam, was appointed Officer-in-charge and was directly responsible to the superintendent at Harrow for both administration and program. In May 1935 Mr. Haslam resigned to take a position with the Imperial Tobacco Company. Mr. Ford Stinson, who had served at the Station as a student in 1932 and joined the staff in 1934, was transferred to Delhi to replace Mr. Haslam. Over the next few years the work on flue-cured tobacco was gradually transferred to the Substation with the exception of the breeding program. The establishment at Delhi dealt solely with flue-cured tobacco. The operation was so successful that in 1938 the government purchased the property that had been leased and bought another 50 ac. Because of the depression, Mr. Stinson, in spite of his position of responsibility, remained as an hourly

rated employee until September 1937 when he was appointed Experimental Farm Assistant, Grade 2. In 1949 Dr. Stinson resigned as Officer-in-charge and became the head of the Soils Department, Ontario Agricultural College, Guelph. Subsequently he spent several years in Rhodesia as a tobacco consultant for the government, but returned to Canada and became Principal of the Kemptville College of Agricultural Technology. He was succeeded as Officer-in-charge by Mr. Lea S. Vickery. Although the Substation was 160 miles from Harrow, it continued to be operated under the close supervision of Mr. Murwin and with much cooperation from the tobacco specialists of the Station. As the years passed a decreasing emphasis was placed on tobacco research at Harrow and the Substation at Delhi became the principal center for tobacco research in Canada. On April 1, 1962 the establishment at Delhi was designated as a research station with Mr. Vickery as the director.

During the depression years of the 1930s when budgets were limited and establishment ceilings were imposed, the Experimental Farms Branch attempted to solve staffing problems for growing research commitments by recruiting young university graduates as casual employees on an hourly rated basis and

calling them graduate laborers. At a later date they were classified as graduate assistants. A few summer student assistants from universities and high schools were also employed. A succession of young men came to the Station under these arrangements. Some stayed for only a short time, others became permanent employees. Mr. C. Glenn Mortimore worked during the summer months from 1930 to 1937 assisting in various research programs. When he graduated from the Ontario Agricultural College (O.A.C.) in 1938 he became a graduate assistant and engaged in forage crop investigations assisting Mr. Cas Owen in soybean breeding. Soybean work began in 1923 with an extensive variety testing program. Selection and cross breeding led to the naming in 1933 of the A.K. (Harrow) variety, which served a useful purpose as one of the few adapted varieties then available. In 1931 Mr. Owen expanded the variety testing program into a full-fledged breeding program, which resulted in the development and release of a number of new varieties over the next 25 years. One of these was named Harosoy, a superior

Soybean test plots in the breeding nursery, C. W. Owen, 1958.



plant that was the result of 15 years of persistent research. Released in 1951, it became the most important variety in Canada, occupied 75% of the Ontario acreage in 1959, and was the most widely grown variety in the United States. It is impossible to estimate the dollar value of this single contribution to the oil seed industry and the economy of this country. Mr. Owen, who was a very shy and modest man, was recognized for his contribution by the Agricultural Institute of Canada when he became the first recipient of the Institute's Grindley Medal in 1968, 6 years after his retirement. The citation mentioned that since the Victory Soya Mills Trophy for world championship soybeans at the Royal Agricultural Winter Fair was donated in 1951, the Harosoy variety had been a constant winner.



The corn breeding program was also being directed by Mr. Owen. Because of the increasing corn acreage in Ontario, Dr. E. S. Archibald, the Director of the Experimental Farms Service, arranged for the transfer of Dr. G. F. H. Buckley, a forage crop specialist, from the Dominion Experimental Farm, Brandon, Man. to the Station in 1939 to direct and expand the corn breeding program. A condition of the transfer was that a residence be provided on the Station and so a new residence was constructed in 1939-40, bringing to six the total number of homes on the property.

After Dr. Buckley's arrival Mr. Mortimore's efforts were gradually transferred from soybeans to corn. For a brief period in 1942-1943 Mr. J. Ritchie Cowan was employed as an assistant in corn breeding. Dr. Buckley directed the corn program and remained as senior assistant in charge of forage work until his retirement in 1958. Mr. Mortimore then assumed full responsibility for corn breeding and developed a wide-ranging program, which has resulted in numerous hybrids and has made an incalculable contribution to the corn industry in southwestern Ontario and many other parts of North America.



Upper

Multiplication field of registered Harosoy.

Lower

Casper W. Owen receiving the A.I.C. Grindley medal for his contribution to agriculture through soybean breeding from S. A. Hilton, past president of A.I.C., 1968. (Photo courtesy Ontario Ministry of Agriculture and Food)



Another summer student assistant who started working in 1931 was Mr. Walter A. Scott, whose father was the head poultryman with a residence on the Station. For the first few summers he assisted with the ornamentals, but later was assigned to the tobacco program. After graduating from O.A.C. in 1937 he joined the staff and continued working with tobacco with Oscar Williams and Bob Haslam. In that same year Mr. Williams contracted pneumonia as a direct result, it is believed, of working under hazardous atmospheric conditions while conducting a tobacco seed-cleaning operation and died. Shortly after this Mr. Haslam was named the assistant superintendent. Mr. Edward S. Moore, who was employed at the substation at Delhi was appointed to fill Mr. Williams' position, but remained for only 3 years and left to go into agribusiness. Mr. Scott was assigned to the position and commenced development of an intensive program of research and investigation. Over a period of more than 30 years he has made major contributions to the production and curing of burley tobacco and has received wide international recognition.



Upper

Shocking corn, an early practice long discontinued.

Lower

Hybrid corn test, C. W. Owen and Dr. G. F. Buckley, 1942.



A program in horticulture was carried on for many years, but it was mainly directed from Ottawa. The work at the Station was carried out by Mr. Hoegstedt and later by Mr. Scatterty, who was appointed head gardener in 1938. The various annual reports mention investigations with tomatoes, potatoes, sweet corn, canning peas, asparagus, strawberries, and grapes. They consisted mainly of variety tests and some fertilizer trials with potatoes and cultural practices with asparagus. There were also apple and peach orchards and large plantings of ornamentals, but these were not maintained for major research purposes. Jack Scatterty prepared an annual mum show which attracted much public attention and compared favorably in size and quality of blooms with any mum show in the country. Many visitors attended this event, even from as far away as Windsor and Detroit. The show was discontinued in 1961 because the extensive greenhouse space used for its preparation was required for research projects. In 1937 Mr. T. Brian Harrison joined the staff as the first resident horticulturist and undertook to expand the horticultural program with particular emphasis on tree fruit research.

A project on feeding steers and hogs was started in 1923. These studies were made in an attempt to market roughage and other feeds produced on the farm at a profit through steers and hogs. The production of manure sufficient for the needs of the farm was also considered in the cost calculations. Over a number of years and under normal market conditions the practice proved to be a financially profitable operation. In 1935 a small herd of purebred Jersey cattle was established to assist in upgrading the herds in this area by the release of high quality bulls as a service to the record of performance program in southwestern Ontario. Ted Hoegstedt, assisted by Bill Searle, was in charge of this program. The increased

Upper

Greenhouse display for the chrysanthemum show, 1931

Middle

Formal garden, 1931

Lower

Jersey herd sire, Brampton Favorite Hal, 1935



production of soybeans in the area had raised the question of their value in a dairy ration. A preliminary test in which ground raw soybeans replaced oil cake in the ration for the first time in Canada indicated that this could be a profitable practice. The animal husbandry work was terminated in 1954 and the Jersey herd was transferred to the Experimental Farm at Lennoxville, Que. In 1935 Mr. Walter F. Mountain joined the staff as a laborer to assist Mr. Scott in the poultry work.

During the 1930s the underlying factor that pervaded all plans and operations was the restricting influence of the economic depression. Very few buildings were erected, salaries were low, and expenses were kept to a minimum. In 1931 Mr. Murwin published the last of the detailed voluminous annual reports. This was a 90-page bulletin with numerous illustrations and summarized the research results for the years 1928, 1929, and 1930, which was the period he had been serving as superintendent. The next report was published in 1938 and was a 27-page booklet summarizing the results of experiments for 1932–1936. No other printed report appeared until 1949. During this decade Mr. Omer Cox was secretary and station clerk. There was a telephone in Mr. Cox's office with an extension in the superintendent's residence. This arrangement sometimes caused some confusion. Members of the staff had to be summoned from all parts of the farm to answer calls. Eventually a second phone was placed in the poultry building with a loud outside bell, but during depression times this phone was removed. Thereafter, whenever a phone call came for Mr. Scott a car was sent to the poultry building to bring him to the

Upper
Jersey herd, 1937.

Middle
Silo, 1935.

Lower
Everett Moore driving Dodge 1½-ton truck, new in 1931.



main office. Transportation at this period and indeed for many years after was a major obstacle. The Station had two vehicles, an automobile assigned to the superintendent and a flatbed truck assigned to the farm foreman. All other research workers were frequently obliged to use their own cars at their own expense for transportation to the plots and often carried seed, fertilizer, and other supplies. Personal cars were also used for traveling around the county and beyond to attend meetings or visit growers who were helping with cooperative experiments. Mr. Cox kept meticulous records and before he left in 1941 he wrote a brief historical summary of the staff and positions at the Station since its inception. He also prepared a detailed set of recommendations for improving the accounting system and financial administration. Mr. Cox was an excellent photographer and has left a valuable legacy of pictures that recorded all phases of the growth and progress during the 12 years he was at the Station. After studying accounting on his own time, he left in 1941 to set up an accounting business, which is still operating in Windsor and Leamington.



In spite of financial restrictions during this period, the work and influence of the Station continued to expand. As many as 5000 visitors a year came for information and advice. All members of the staff were obliged to spend a large part of their time in extension activity because the provincial agricultural extension service had not yet grown to the point where it could give assistance with special crops, and the only officer in Essex County was a beef and dairy specialist. The Station provided free tobacco seed and a seed-cleaning service as well as a soil-testing service for the whole of southwestern Ontario. Talks were given by staff members to farmers' groups and associations in Essex County and in many towns as far east as Simcoe. The Station was the host of the London District Jersey Breeders' Association annual picnic in the summer of 1930. A couple of years later Mr. Murwin instituted the first of the annual station field days, which each year attracted hundreds of visitors. A huge circus tent was erected on the main lawn and talks were given by visiting scientists and members of the staff on all phases of the experimental and research programs. Then tours of the plot areas on horse-drawn wagons were conducted. This was an all-day outing for the farmers and they were invited to eat their lunches at the



Upper

Staff of the Station in 1934:

Front row (left to right): K. E. Webb, J. M. Rae,

U. M. Sanford, O. W. Cox

Middle row: W. T. Scott, O. G. Williams, H. F.

Murwin, B. S. Hoegstedt, R. J. Haslam, E. A.

Moore.

Top row: J. M. Scattery, J. M. Powell, C. G.

Mortimore, F. A. Stinson, W. A. Scott.

Lower

Superintendent's residence in winter, 1940



tables in the tent. Free lemonade was provided. This drink had such an appealing taste and became so popular that it has been made for visitors and social functions every year since and has become a hallmark of the Station. The original recipe has been preserved in one of the early files and is reproduced here.

Lemonade Recipe

6 lb of granulated sugar dissolved in 1½ qt of hot water; boil a few minutes and cool.

2 oz Citric acid

1oz Tartaric acid

1½ oz Epsom salts

Pour ½ cup boiling water and dissolve. Be sure acid is dissolved.

6 lemons, grated rind of two

2 oranges, grated rind of two

Squeeze juice of all. Put in syrup along with acids and let cool. This makes 4 qt and will keep indefinitely. Use 1 qt to a pail of water with ice in it.

At a much later date a group of women food editors visiting the Station during the Annual Ontario Salad Tour were so impressed with the flavor of the lemonade that they asked for the recipe and a number of them printed it in their syndicated columns.



Upper

Spectators at live hog grading demonstration, field day Aug. 1, 1934.

Lower

Big tent where talks and a canning demonstration were given at the field day, July 30, 1936.

ROOT-ROTS IN TOBACCO

Root-rots seriously reduce the returns from the tobacco crop, causing an uneven growth, delayed maturity, low yield, and poor quality.

BLACK ROOT-ROT

(*Thielavia Basicola*)
A Fungous Disease



Harrow
Velvet

Judy's
Pride

CONTROL MEASURES

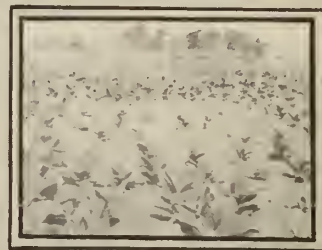
Thoroughly steam plantbed soil.
Practice crop rotation.
Plant resistant varieties.
Test soil before liming.

COMPARATIVE RESISTANCE OF STANDARD VARIETIES.

Harrow Velvet	96 %
Halley's Special	60 %
Kentucky Burley	60 %
Judy's Pride	30 %
Kelley	20 %
Gay's Yellow	20 %
Greenwood	20 %

BROWN ROOT-ROT

(Cause Unknown)
A New Disease



Burley Tobacco following
2nd. crop of corn.

CONTROL MEASURES YET IN EXPERIMENTAL STAGE

ROTATIONS

Brown root-rot appears more prevalent following corn, timothy, tomatoes, beans, and sugar beets. Less brown root-rot occurs following wheat, oats, barley, clover, potatoes, and tobacco.

RESISTANCE

Resistant varieties not yet established but experiments indicate that certain varieties are more susceptible.

Exhibition panel used at local country fairs, 1937.

Another extension activity that engaged the attention of many staff members was attendance at local and county fairs throughout southwestern Ontario. For a number of years elaborate exhibits were prepared in collaboration with the Division of Publicity and Extension in Ottawa and one of the researchers was always on duty at each fair to promote public relations. The services of the staff were in constant demand for judging agricultural competitions. The Station was on very good terms with the newspapermen of the district and received excellent publicity. Preparation of press articles on a regular basis by all members of the staff was an important responsibility.

These many and varied activities served to create a very good relationship with the agricultural public, but they seriously curtailed the amount of time that the various officers were able to devote to research and technical publications. The flow of publications from the Station remained a mere trickle throughout the 1930s and indeed until midway into the next decade. One publication that served as a vehicle for the tobacco scientists in those days was *The Lighter*, a mimeographed periodical prepared by the Tobacco Division in Ottawa. It contained a mixture of industry statistics, crop reports, news, and reports of research from every tobacco station in Canada. It had a very wide distribution in many countries and was sent to growers, manufacturers, buyers, and research workers in the tobacco world. Although this was a nontechnical publication, much of the tobacco research done at the Station was reported in it for almost 30 years.

1941-1959

Second World War to Reorganization

The Second World War brought about a severe disruption of the work at the Station. Several members of the staff left to join the armed services and positions were left vacant. Some returned to their positions after the war, but others did not. When Mr. Cox, the station clerk, left in 1941 his position was not filled and his duties were carried out by the superintendent and the clerk stenographers. For a brief period in 1945 Flt/Sgt J. A. Sutton of the R.C.A.F. was employed as station clerk, but he remained only a few months. Mr. Wilson Abraham took over these duties and remained for more than a year. Mr. Walter Scott was another scientist who left his position to join the war effort, but returned after 4 years. When Mr. Brian Harrison left, Mr. Leslie F. Ounsworth joined the staff in 1941 to carry on some of the horticultural projects, but after 1 year he too joined the armed services. Both men returned after the war. Mr. Ritchie Cowan joined the staff in 1942, but he left after 1 year. Most of the research programs were continued at a reduced level of activity. Some of the staff were attached to local military reserve units and could spend only a part of their time in agricultural duties.

No annual reports were published during this period and only two or three technical papers appeared each year. However, in 1949 a 47-page progress report was published summarizing the results of experimental work carried out in the period 1937-1946. It showed that in spite of the restrictions of the war years, agricultural research had not stood still. During the war the annual field day was discontinued and it was not revived in the same form. Later it was replaced by other meetings and demonstrations for farmers on a smaller and more specialized basis.

In 1946 the business of postwar readjustment commenced. The size of the staff was gradually increased as new positions were established and the research program was expanded to cover new fields. It had been recognized for many years that in Essex County there were two distinct phases of agriculture that were determined largely by two different soil types. Along the shore of Lake Erie there is a narrow strip of light sandy soil, which varies in width up to several miles, and the commonest soil type is a Fox sandy loam. On this soil the tobacco industry had flourished and a wide variety of fruits and vegetables was now being produced on small-acreage farms. The Station is located in this strip. The northern part of Essex County consists mainly of heavy clay soils. There

are approximately 1.75 million acres of clay, clay loam, and silt soil in the five counties of southwestern Ontario. Of the total land area of these counties, about 75% of Essex, 51% of Kent, 78% of Lambton, 47% of Middlesex, and 45% of Elgin are made up of these soils. Brookston clay comprises the greater part of this acreage of heavy soil, and it is characterized by an extremely flat topography and poor natural drainage. The main crops grown are corn and soybeans and for a number of years the Station conducted tests with these crops on rented farmers' fields. In view of the economic importance of these products, it was decided that additional land should be acquired in the Brookston clay area of Essex County in order to conduct a first-hand study of methods of management of these valuable but difficult agricultural soils.

Aerial view of Soil Substation, Woodslee, Ont.



In 1946 the Station purchased 100 ac of land comprising the north half of lot 18, south middle road concession, Maidstone Township near the village of Woodslee, 22 miles northeast of Harrow. The only building on the property was a very old wooden barn, which was subsequently repaired and reroofed. Mr. John Aylesworth, who had been a summer student assistant in 1940 and 1941 and had subsequently spent 3 years in the Canadian armed forces, joined the staff in 1945 and the next year was appointed Officer-in-charge of the Soil Substation at Woodslee. A residence was constructed for him in 1948 and within 3 years several other buildings were completed including a foreman's cottage, an implement shed and workshop, a cottage bunkhouse, two garages, and a greenhouse. Mr. Aylesworth started a vigorous research program in soil management, which included an extensive long-term crop rotation study, green manure experiments, and an investigation of methods for the control of soil physical condition. Experiments dealing with the fertilization of corn were also started, and some of the research officers from Harrow soon became involved in the program at Woodslee.

In 1947 Mr. James M. Fulton joined the research staff as the first soils specialist of the Station. He developed a program dealing with fertilizers, irrigation, soil conditioners, and soil analysis. A part of this program was concerned with the Brookston clay soils at Woodslee. This became such a fruitful field of investigation that in 1951 a second soils specialist, Mr. Everett F. Bolton, was recruited to do a more intensive study of the soil physical condition. He was stationed at Woodslee with John Aylesworth, but his program was under the supervision of Jim Fulton. In 1957 he commenced a study of plant nutrient losses in drainage water collected from tile drains, a piece of pioneering research that has become of historic importance in the context of present-day concern for the natural environment.

The staff of the Substation at Woodslee in 1953 consisted of two research officers, a secretary, a foreman, and two laborers. The Substation was administered by Mr. Murwin, but Mr. Aylesworth enjoyed a considerable amount of freedom of action. In 1955 a 32-page progress report for the Substation summarized the research results for the years 1947–1953. From its beginning, the Substation was popular with the farmers of the district and they took a keen interest in the new methods of management being tested on the plots. In 1948 the first field day was organized for the farmers of the area. It became an annual event, which has been continued. Since 1952 it has been known as the Annual Soils Day and has been organized in cooperation with the agricultural representative of the Ontario Department of Agriculture and Food in Essex. It has frequently attracted an attendance of 800 people.

Mr. Aylesworth was an energetic and persistent researcher and in a quiet unobtrusive manner he soon built up a reputation for excellence and reliability amongst the farmers of the district and the surrounding counties. In 1957 he purchased a 100-ac farm in Rochester Township about 4 miles from Woodslee. He continued to live in the residence at the Substation, but proceeded to work the farm in his spare time and with some

help. He put into practice the soil management procedures that had been developed at the Substation and the enterprise soon became a highly profitable operation. One of the prominent farmers in the district, who had considerable ability as a leader and spokesman, had long been a supporter of the Substation and loud in his praise of the research efforts at the annual field days. However, he tacitly ignored the cultural recommendations on his own farm until he witnessed the success of John Aylesworth's farm not far from his own. Then he admitted that he had been wrong and adopted the new methods. Subsequently, he was able to say that he produced more corn on that farm than his father or grandfather had ever been able to grow.

The postwar expansion of research staff and program at the Station necessitated an increase in the clerical staff. In 1947 Mr. Basil C. Roney took the position of clerk, which had been so difficult to fill since 1941. After he resigned in 1950, Mr. Donald H. Lee was transferred from a similar position at the substation at Delhi. Mr. Lee played an important role in the growth and development of the Station during its reorganization and expansion over the next two decades.



Dr. E. F. Bolton examining soil condition in tillage experiments at Woodslee; Lawrence Fuerth on tractor.

The extension of work in this period involved the erection of several new buildings. New greenhouses were built in the years 1948, 1949, and 1954 and a new fruit and vegetable packing shed was constructed in 1947. These were provided mainly to accommodate the greatly expanded vegetable program. Other construction included a concrete silo in 1950, a burley curing barn in 1953, and a forage seed storage building with controlled temperature and humidity in 1955. Because of the changes in the tobacco research program, most of the old flue-curing kilns were torn down during the 1950s. The livestock work was phased out in 1954, but winter feeding of steers was continued until 1961 mainly for the large amounts of manure required to maintain soil organic matter and fertility in the plots. The first tractor was purchased in 1941 and this took the place of one team. After the war additional tractors were bought from the War Assets Corporation and the Station became completely motorized in 1958. The poultry flocks remained until 1964.

The expanded program required more land, and so in 1947 a farm, located immediately west and adjacent to the Station property, was purchased from Mr. Forrest Monk, whose daughter was married to Mr. John Aylesworth. It was a narrow parcel of land of 40 ac that extended the full depth of the present property. It included a large farm home and two barns; one barn was moved to a more convenient location.

A second piece of property was purchased in 1950 from Mr. Frank Walton. This 9½-ac parcel along the west side of the Monk property did not extend to the main road, Highway 18. It contained a barn, but did not include the farm home, which Mr. Walton retained with a small piece of land on the highway.

The capital investment made at the Station increased very slowly in the 10-yr period following the war. The seven buildings mentioned above cost less than \$40,000. Mr. Murwin was guided in his management policy by the principles of rigid economy, which were so necessary in the days of the depression and during the war. By 1955 there was still

only one telephone to serve 14 professional and administrative people including the superintendent, who had to take calls at the clerk's desk. The main roads through the farm were surfaced with sand or gravel to make them passable in wet weather and were treated with calcium chloride to lay the dust in summer. This practice occasionally played havoc with the adjacent fertilizer plots, but it was many years before these roads were paved. The old office building, which was not insulated until 1950, was heated with coal-fired boilers and in the winter there was a constant struggle against the thick layers of grimy, soft-coal dust, which sifted upwards from the floors below.

Annual reports were not published during this period, but in 1956 a 50-page progress report summarizing the research completed during the years 1947–1954 was issued. In the following few years the Department of Agriculture became deeply involved in planning a reorganization of its services. Policies were undergoing change and for 5 years no report was published although the manuscripts were prepared and are still on file. Even the Minister's Annual Report contained only the very briefest of summaries of outstanding highlights of research achievements, and these were reported under the appropriate crop heading without any reference to where the work was done or by whom.



Upper

Norman Ferriss with wagon rack for harvesting burley tobacco, 1950.

Lower

Monk farm home, which was converted to an office-laboratory.



Following the Second World War there was a surge of interest in Canada in higher education. Returning service personnel were provided with unprecedented educational opportunities and many took full advantage of them. In the reestablishment of normal peacetime business and professional operations many positions had to be filled, and there was a rush to secure qualified personnel. The standard of educational qualifications for these positions continued to rise, and it was not long before a Ph.D. degree became a prerequisite for many research jobs. The Civil Service Commission began to emphasize a plan, which had been in partial operation for some years, whereby qualified civil servants were granted leave of absence for one or more years under a variety of financial arrangements to take post-graduate training in order to improve their educational qualifications for the positions they were holding. At the Station three research officers took advantage of this opportunity at various times. Mr. Aylesworth, Mr. Fulton, and Mr. Bolton all completed the requirements for a Ph.D. under this arrangement.

The Department recognized the growing importance of professional scientific and technical societies in the development of a research officer's program and career and in the exchange and dissemination of research results. Scientists were given more opportunities to attend scientific conferences for the presentation of papers and to participate in the business of the various societies. Organizations such as the Canadian Society of Technical Agriculturists (C.S.T.A.), which was later renamed the Agricultural Institute of Canada (A.I.C.), The Entomological Society of Ontario, the Canadian Phytopathology Society, the Annual Canadian Tobacco Workers Conference, and the American Society for Horticultural Science were supported by members of staff and annual conference travel became a part of the Station's program and budget.



Upper

Dr. J. Johnson and Dr. E. S. Archibald beside the 40th anniversary plaque, 1949.

Lower

Fortieth anniversary, three superintendents D. D. Digges, H. F. Murwin, and W. A. Barnett, 1949



The total staff in the early 1950s was about 40, and the annual budget including Woodslee amounted to \$52,000. The superintendent's salary was about \$5100 and the rate of pay for the laboring staff was 60¢/hr. The research programs and personnel on the Station were organized into six sections: tobacco, forage crops, horticulture, field husbandry, cereals, and poultry. This structure was informal and flexible, but has remained essentially the same.

In 1949 the 40th anniversary of the Station was marked by the placing of a plaque on a stone pillar at the main entrance. On a special field day, August 11th, a number of distinguished visitors were present including Dr. E. S. Archibald, Director of the Experimental Farms Service, two former superintendents Mr. Barnett and Mr. Digges and a guest, Dr. James Johnson, a geneticist and plant breeder from the University of Wisconsin whose accomplishments in tobacco breeding had a great influence on the work done at the Station.

In 1950 the first annual Station picnic was held. In the middle of the summer the staff, together with their families, gather on an evening on the lawns for an outdoor picnic. Barbequed chicken has always been the menu for the occasion and the name of Mr. Walter Mountain has been associated with the picnic because he regularly superintended the construction of the large barbeque pit and the cooking of the chicken with his renowned, specially prepared barbeque sauce. Wally had succeeded Mr. Scott as the head poultryman. This social event was eagerly anticipated each year because it was usually the only time when all the families met together for a visit. It became traditionally the time when new members of the staff and their families were introduced and welcomed. Organized games and movies for the children and young people were often a part of the program and occasionally dramatic and musical presentations disclosed hidden talents.

In the late 1950s three new members were added to the research staff. Dr. G. Howard Clark came in 1956 and carried on a program of plant breeding with white beans and winter wheat until 1970. In 1957 Dr. W. I. Findlay, a specialist in soil fertility, joined the staff and Mr. William Shumovitch became a member of the Horticulture Section where he worked on tomato culture until he resigned in 1960.

The station acquired an additional piece of property from Mr. Fred Affleck in 1957. This farm was located directly across the road on the north side of Highway 18. It was 52 ac in area and extended a short distance across the tracks of the Chesapeake and Ohio Railroad, which runs through southern Ontario from Detroit to Buffalo and services the towns of Harrow, Kingsville, Leamington, and Wheatley. The Affleck farm is designated as the southwest part of lot 12, concession 2, Township of Colchester South, Essex County. It contained a large barn and a house, which was demolished soon after the purchase as it was of little value without extensive repairs and remodeling. This property provided the research workers with some additional soil types that were not available on the land south of the highway.

SCIENCE SERVICE LABORATORY 1935-1959

The black root rot problem with tobacco was only one of a number of plant diseases that afflicted the crops of southwestern Ontario. There were also numerous insect pests to contend with. In the early days there was no trained plant pathologist or entomologist on the staff to deal with these problems. The various divisions at the Central Experimental Farm usually supplied the expertise on a part-time basis. Mr. Routt was the first pathologist of the Tobacco Division to assist in disease investigations at the Station and Mr. T. Grant Major did this work at a later date. Mr. Richard Painter was an entomologist from Ottawa who studied the corn borer and livestock insects in the 1920s.

The Department of Agriculture had made provision for the specialized study of plant pathology and entomology in agriculture by establishing, through the Botany Division and the Entomology Branch, branch laboratories at strategic locations across the country. A Dominion Entomological Laboratory was established in 1911 at Vineland, Ont., and a Plant Pathology Laboratory was opened in 1912 at St. Catharines. Dr. L. Ward Koch, a young graduate in plant pathology from the University of Toronto, joined the St. Catharines staff in 1929.

In 1935, in response to a request for assistance from Mr. Murwin, Dr. Koch was given the task of making a survey of tobacco diseases in the Harrow area. He concluded that certain root diseases of tobacco, particularly the recognized fungus disease black root rot, were causing widespread damage wherever burley and dark-type varieties were grown in Essex and Kent counties. In 1936 Dr. Koch and Mr. Bob Haslam again conducted a disease survey and they observed that brown root rot, a disease of undetermined cause, was also contributing to the damage of tobacco. With the continuing support of Mr. Murwin and the tobacco industry, plant disease investigations were further expanded the following year and Dr. Koch was provided with a small office-laboratory in the east end of the administration building for the summer.

In 1938, after the departmental reorganization in Ottawa had created the Experimental Farms Service and the Science Service in 1937, Dr. Koch was transferred to the Station and his unit was established as a Plant Pathology Substation of the Plant Pathology Laboratory, St. Catharines, under the immediate supervision of Dr. G. H. Berkeley, Officer-in-charge. This arrangement lasted until 1940 when a Dominion Laboratory of Plant Pathology was set up at Harrow with Dr. Koch as Officer-in-charge under the authority of Dr. H. T. Gussow, the Dominion Botanist in Ottawa.

At about the same time that Dr. Koch was investigating the root rot diseases, Mr. Peter G. Newall, also of the laboratory at St. Catharines, began a summer study of the frenching disease of tobacco, chiefly in the Delhi area but also at Harrow. In 1940 Mr. Newall was transferred to Harrow, but remained less than a year before joining the Canadian armed forces in 1941.

Dr. Koch's attention was inevitably directed to other crops besides tobacco. Disease problems were evident in soybeans, corn, and sugar beets as well as in many of the vegetable crops, and he realized that many crops in southern Ontario were suffering appreciable damage from a wide variety of diseases. Despite awkward administrative problems, he worked in close cooperation with Mr. Murwin and the staff of the Experimental Station. He quickly concluded that a greatly expanded effort would be required if the agricultural industry in the area was to receive the usual benefits from plant pathological research. Because Dr. Koch and Dr. Alex A. Hildebrand had been cooperating in their research programs at St. Catharines since 1929, Dr. Koch managed to have his colleague join him in 1941. Dr. Hildebrand immediately undertook the investigation of soybean diseases and soon became involved also in a study of black root rot of sugar beet. He was a conscientious and meticulous scientist and his work won wide acclaim. He remained until his retirement in 1962 and he won an international reputation for his contribution to the agricultural industry.

An interesting feature of initiating and conducting investigations into plant diseases in southwestern Ontario was the genuine and continuing interest

shown by both industry and growers in the field of experimental work on plant diseases. Both companies and growers consistently displayed a willingness to provide land and in many cases material assistance. The emphasis was beginning to shift from research to extension. At one period Dr. Koch devoted a large part of his time to extension activities not only in plant pathology but also in other fields of plant production. He was of great assistance to the greenhouse vegetable growers and on many occasions his services on Saturdays and Sundays were willingly given in a regular and routine manner at a time when the concept of overtime pay had not even been thought of.

During the war years it was not possible to recruit new pathologists to fill the pressing needs for research. However, in 1944 Dr. J. J. Miller arrived and carried out an intensive investigation of the melon wilt disease. He remained for only 2 years. Soon after the war ended it became easier to find additional scientific staff. Dr. Colin D. McKeen, the first of the returning service personnel, joined the Plant Pathology Laboratory in 1946 and was assigned to the investigation of vegetable diseases. In the same year his brother Mr. Wilbur E. McKeen was awarded a fellowship for postgraduate study at the University of Toronto, provided by the Canada and Dominion Sugar Company of Chatham, Ont., for the study of sugar beet diseases in collaboration with Dr. Hildebrand. After graduation Dr. W. E. McKeen also became a member of the staff where he made a number of important contributions until 1951 when he was transferred to a plant pathology position at Saanichton, B.C. A second scientist who came by way of a fellowship at the University of Toronto was Dr. R. H. Stover, whose studies were sponsored by the Imperial Tobacco Company of Canada. He was appointed to the staff in 1947 and was an active and enthusiastic researcher. Although his stay was short, he produced seven publications before he left in 1951 to accept a research position with the United Fruit Company at La Lima, Honduras. In 1946 Dr. J. T. Slykhuys was appointed to the plant pathology staff after previous experience in the study of cereal diseases in Western Canada. He began an investigation of forage crop diseases with emphasis on

sweet clover failure particularly on the Brookston clay soils. In 1949 he accepted a research post in South Dakota, but later returned to the Department as a cereal pathologist in Ottawa.

During the years that a research unit in plant pathology was being built up, the interests of agricultural entomology were also being served. In 1938 Dr. W. E. van Steenburgh, who had made a significant study of biological control of the oriental fruit moth at the Belleville Laboratory, was appointed as Officer-in-charge of a separate Dominion Entomological Laboratory at Harrow with an office in the old administration building. His time was devoted to survey work and extension concerning fruit insects. However, the Canadian war effort was accelerating at that time and Dr. van Steenburg's interests were more concerned with military matters and so in 1941 he joined the armed services. After the war he became Associate Director of Science Service under Dr. Kenneth W. Neatby with responsibility for planning all new construction. He developed the so-called van Steenburgh laboratory unit, which was a model for many of the new laboratories built by the Department in the postwar years. Later he became an Assistant Deputy Minister in the Department of Mines and Technical Surveys. Dr. van Steenburg was followed in the Entomological Laboratory by Mr. Richard Hutton, who was transferred from Delhi in 1941 and continued the fruit insect investigations. After less than a year he accepted a position with the Shell Oil Company. During the summer of 1947 Mr. Frank Morrison was engaged in some entomological studies for a brief time. For a few years there was a break in the continuity of this work until 1948 when Mr. Herbert R. Boyce, an experienced entomologist who had worked at both the Vineland and the Belleville laboratories since 1931, was asked to resume the work with fruit insects. On April 1 he became Officer-in-charge of the Dominion Entomological Laboratory, Harrow, and the research program in this field continued to advance and expand under his able direction.



Science Service Laboratory, later West Building.

About this time it became more obvious that the facilities of the office building were becoming inadequate to provide sufficient office and laboratory space for the increasing staff in all three administratively separate units. Two additions had been made to this building, but some other arrangement was now necessary.

In 1947 a fine home on the Monk farm was handed over to Science Service. It was remodeled and enlarged considerably. A research greenhouse and a large garage were built at the rear of the building. In April 1949 the staffs of the Plant Pathology Laboratory under Dr. Koch and the Entomology Laboratory under Mr. Boyce occupied the new facility, which was officially known as the Science Service Laboratory — Plant Diseases and Fruit Insects. The staff consisted of six research officers, two recently appointed secretaries, Miss Ann Toth in plant pathology and Miss Florence Snyder in entomology, and three laboratory-greenhouse assistants. About this time the employment category of technician entered into the staffing program. Assistants to research officers at the Experimental Station had always been classified as plotmen, greenhouse-men, teamsters, or laborers, but Science Service introduced the classification of technician to describe the duties of the people who were engaged primarily in laboratory work. The first technicians on the staff were not specifically trained for technical work. They gained their knowledge from experience and training on the job. Several people who joined the Science Service staff in this capacity in the next few years developed a consid-

erable expertise in various fields, and they have mostly remained for many years and made a valuable contribution to the achievements of the research scientists. Among this group are Mr. Harry Thorpe, Mr. Jay Richardson, and Mr. Elmo Murray. During the following 10-yr period another addition was made to the Science Service Building and several additions were made to the greenhouse facility. Headerhouse areas were constructed at both ends, another small laboratory area was erected at the south end, and some of the garage space was remodeled for other uses.

Mr. Boyce concentrated on the study of fruit insects and methods for their control in Essex County. At this time the problems of vegetable and field crop insects in southwestern Ontario were being dealt with by entomologists at the Dominion Entomological Laboratory at Chatham in Kent County, which had been established in 1926 with Dr. Stirrett as Officer-in-charge. However, Mr. Boyce came to realize that a great number of insect problems affecting local agriculture were demanding attention and there was an immediate need for additional staff at Harrow. In 1950 he was joined by Dr. E. J. LeRoux, who assisted in fruit and vegetable insect investigations until he was transferred to St. Jean, Que., in 1953. Later Dr. LeRoux left the Public Service to engage in university teaching and research, but returned to the Research Branch and became the Director General, Operations Directorate.

Over the next few years the entomology group increased. In 1952 Mr. Robert W. Walsh joined the staff, in 1953 Mr. William H. Foott, and in 1956 Mr. R. Dave McMullen, who was transferred from an entomology unit in Suffield, Alta. Each of these men became involved in different phases of the fruit insect program and early in their stay took advantage of the postwar opportunity for obtaining leave of absence to take post-graduate training. Mr. Foott was at the University of Minnesota from 1955 to 1957. Mr. McMullen obtained a Ph.D. from the University of California after a 4-yr absence, 1958–1962, but 2 years after his return he was transferred to the Research Station at Summerland, B.C.

The division of responsibility between federal and provincial departments of agriculture has been that extension and routine service to agriculture should be carried out by the provinces and research should be mainly the responsibility of the federal government. In 1907 the Ontario Department of Agriculture, through an act of the legislature, appointed six district representatives for extension, four of whom were graduates of O.A.C. Mr. A. McKenney was assigned Essex County. This was the first attempt to carry out organized agricultural extension work in North America. The first report of these six "district reps," as they came to be called, stated that progress with their work could only be made with young people because the average farmer had little sympathy with scientific agriculture as promoted by theorists. Despite these difficulties, which are sometimes still present, the agricultural representatives have made a tremendous contribution to the profits of the farmers of Ontario. The headquarters for representatives in Essex County has always been in the town of Essex, known as the hub of the county. The men who have served the area have devoted most of their time to problems of general farming, field crops, and the dairy industry. In the 1940s and 50s they were not able to render much assistance to the fruit and vegetable and tobacco industries, which had particular insect and disease problems. This accounted for the fact that so many members of the staff of the Station were called upon constantly to give their time and services in direct assistance to growers and industry.

Because Dr. Koch and Mr. Boyce had both experienced the frustration of this time-demanding duty in their own programs, they promoted the idea of a scientific liaison officer. In 1952 Mr. J. Clem Fisher was appointed by the Canada Department of Agriculture to provide extension services to all aspects of the industry with special reference to disease and insect problems. Mr. Fisher, a graduate from O.A.C., was well fitted by training and temperament for this work and he rendered excellent service, which greatly enhanced the reputation of the laboratories with the growers. In a short time a problem arose in regard to salary and advancement because this was a lone position in an organization where merit and promotion depended almost exclusively on research productivity measured by the flow of scientific papers. And so Mr. Fisher resigned after 3 years to accept a position as a radio announcer in Leamington. Later he entered private business in the agricultural supply line. His position was taken by Mr. Bob Walsh, who had been working with Mr. Boyce since 1952. However, Mr. Walsh encountered the same problem and in 1959 he left to become a high school teacher.

When the staffs of the Plant Pathology and Entomology laboratories moved into the new Science Service Building in 1949, it became possible to consider expanding the program to meet the pressing needs in southwestern Ontario. In addition to the new positions for entomologists, Dr. Koch found positions for four new pathologists in 1952. Dr. W. G. Benedict, who had been a summer student assistant for several years, was appointed to work with forage crop diseases, mainly of sweetclover, alfalfa, and red clover. He resigned in 1957 to accept a teaching position at the University of Windsor. Dr. Ralph N. Wensley joined the staff upon completion of graduate studies at the University of Toronto where he was supported by fellowship funds provided by the Dow Chemical Co. for microbiological investigations relating to root rot diseases of plants. He was eminently qualified to fill an important role in Dr. Koch's wide-ranging research program with soil-borne diseases and made a significant contribution to plant pathology in the field of microbiology until his retirement in 1973. A third newcomer was Dr. Norman J. Whitney, who with Mr. Glenn Mortimore undertook the investigation of corn diseases with particular emphasis on root and stalk rot. This was a phase

of work that had previously been neglected in spite of the long history of corn research at the Station, mainly because of the confusing nature of the symptoms of this disease. The investigation developed into an involved study of biochemical relationships in the search for a resistance mechanism. Dr. Whitney continued this search until 1961 when he resigned to study to become a minister of The United Church of Canada. The fourth pathologist who came in 1952 was Dr. Z. A. Patrick, another graduate from the University of Toronto, and he too became associated with the root disease program, particularly tobacco diseases. In the course of his work he developed an interest in soil toxins and eventually broadened the scope of his research to include tree fruit diseases, particularly the peach replant problem. Dr. Patrick was an outstanding scientist and soon developed a reputation as an international authority in the field of soil toxins. He cooperated closely with a colleague in plant pathology, Dr. T. A. Toussoun of the University of California, and together they produced a definitive monograph, which is considered to be the foremost authoritative statement on this subject. Dr. Patrick returned to the University of Toronto in 1965 to accept the position of professor of plant pathology, which had been so capably filled for many years by Prof. D. L. Bailey.

Another enemy, which had been recognized for some years as a hazard to agriculture, was the nematode. This creature is a small microscopic eellike worm, which inhabits the soil and invades and feeds on plant roots causing great damage to crops under certain conditions. The problem was known in this area, but had never been studied. Recognizing this gap in the crop protection research program, Dr. Koch obtained permission to establish a position in nematology in the Plant Pathology Laboratory. There were some doubts in the minds of Ottawa administrators be classified as pathology or should be classified as pathology or entomology. In 1951 the position was taken by Dr. William B. Mountain, a recent graduate from the University of Toronto, who had been a summer student at the Station. Dr. Mountain's program of pioneering research in this special field grew to such an extent that in 1958 he was joined by a second nematologist, Dr. Richard M. Sayre from the University of Nebraska. Dr. Mountain



became known as one of the leading nematologists of North America and his international reputation was recognized when in 1963 he was invited to act as a short-term consultant to a large fruit company whose plantation was seriously threatened by a nematode problem in Panama. He left in 1964 to become the Director of the Research Station at Vine-land Station. In 1969 Dr. Mountain was transferred to Ottawa to be the Director of the Entomology Research Institute until 1973 when he became Assistant Director General, Central Division.

Upper

Dr. W. B. Mountain and T. B. Harrison evaluating nematode resistance of peach seedling rootstocks.

Lower

Corn in greenhouse microplots for root and stalk rot investigation being examined by Dr. N. J. Whitney and C. G. Mortimore, 1960.



The story of the Station to this point has traced the beginning and development of three administratively separate organizations, the Experimental Station under the Experimental Farms Service with Mr. Murwin as Superintendent, the Plant Pathology Laboratory under Science Service with Dr. Koch as Officer-in-charge, and the Entomology Laboratory also under Science Service with Mr. Boyce as Officer-in-charge. Each group had its own administrative staff, library, equipment, and greenhouses. In the early 1950s Mr. Don Lee was the clerk for the Experimental Station with a staff of stenographers. Miss Florence Snyder was secretary to Mr. Boyce, and Miss Ann Toth, followed by Miss Marie Staddon, was secretary to Dr. Koch. In spite of these separate lines of responsibility and communication, all groups worked with the same crops and a good spirit of cooperation grew up amongst the scientists in the various disciplines, marred only occasionally by individual ambitions and rivalries. A few examples of achievements arising from such cooperative efforts will underline the progress in research made in that decade. The first is the advance made in the tobacco industry through the control of root diseases by plant breeding. This story has already been outlined. A second area is in corn research where Mr. Mortimore and Dr. Whitney cooperated in a study of root and stalk rot of corn. This team approach has been particularly fruitful and has continued to the present time between Mr. Mortimore and Dr. Whitney's successors in that position. A series of scientific papers that have increased our knowledge of this unusual disease has been published. Another unique example of the team approach was the attack on the peach replant problem, a mysterious disorder that had been plaguing peach orchardists for many years. Young seedlings planted on the site of old peach trees that had been removed when they ceased to produce flourished for a year or two and then languished and died. Dr. Koch assembled and directed a group of researchers that included Dr. Patrick, a pathologist; Dr. Wensley, a microbiologist; Dr. Mountain, a nematologist; Mr. Harrison, a horticulturist; and Mr. Boyce, an entomologist. Mr. Fisher acted as coordinator and Dr. Gordon M. Ward, a chemist from the Chemistry Division in Ottawa, participated because there was no biochemist on the staff. The group met once a year to report findings and plot strategy for the following season.



This collaborative effort continued for 9 years and resulted in a series of 11 scientific papers, which disclosed that the disorder is a complex series of events. Soil toxins are produced that arise from a glycoside in the root bark of the old tree. Both nematodes and micro-organisms are involved. Various methods of avoiding or solving the problem were suggested. The peach replant problem has been studied in many places, but never with such a concerted effort as at the Station.

In 1954 Dr. K. W. Neatby, the director of the Science Service, and his associates decided to combine the two laboratories at Harrow into one administrative unit, the Science Service Laboratory, with Dr. Koch as Officer-in-charge. A plant pathology section was created with Dr. Hildebrand as head and an entomology section with Mr. Boyce as head. The staff consisted of 12 scientists. The Science Service units did not publish annual or periodic reports similar to those that had always been put out by units of the Experimental Farms Service. Science Service relied upon scientific papers to act as the means of communication and only an abbreviated summary of activities appeared in various sections of the Minister's report. In May 1952 an article appeared in the Agricultural Institute Review giving a detailed illustrated account of the research program being carried on at the Laboratory. Reprints of this article were used as publicity material for many years and have served a useful purpose as a historical record.



Upper

Breeding corn after record rainfall of 4.18 in between 4 a.m. and 11 a.m., July 8, 1957

Middle

Irrigation potato plots, July 8, 1957, Don Lee

Lower

Tobacco root rot plots, July 8, 1957

RESEARCH STATION

1959–1969

After the Second World War new technology changed the old ways of farming, and many new problems arose that demanded the attention of agricultural research scientists. To meet these pressing demands the Department of Agriculture decided to regroup their research forces and in 1959 the Experimental Farms Service and Science Service were combined to form the Research Branch. The Experimental Station and the Science Service Laboratory at Harrow now became known as the Research Station, Harrow. Dr. Koch became the director and moved into a large office in the old Experimental Station office building, which had become known to the staff as the East Building. Mr. Murwin was named as associate director with responsibility for several functions including supervision of all buildings and construction. The administrative staff under Mr. Don Lee was also located in the East Building with the exception of one stenographer-receptionist in the West Building. Mrs. Joyce Ford, who had worked in the Science Service office since 1953, became the director's secretary and held this position for more than 20 years. Her cheerful efficiency made a significant contribution to the smooth operation of the director's office. The research officers retained their laboratories and offices, but there was now a freer exchange of equipment and facilities. The process of integration took place slowly, but personal differences were overcome.

The formation of the Research Branch coincided with the 50th anniversary of the establishment of the Station. To mark the occasion a special field day was held on July 29, 1959, and a bronze plaque was unveiled by the Minister of Agriculture, Hon. Douglas S. Harkness. Also present were Dr. J. G. Taggart, Deputy Minister, Dr. C. H. Goulden, Assistant Deputy Minister, and Mr. Richard Thrasher, M.P. for Essex South. The Minister's visit was widely publicized and a large crowd of growers came to the Station to hear him speak. A special illustrated brochure was printed to commemorate the anniversary and it highlighted some of the outstanding achievements of the scientists.



The salaries of civil servants had not kept pace with the expanding economy even though they had increased markedly immediately following the war. The teaching profession, particularly high-school teaching, attracted an unprecedented number of scientists from the government service including Mr. Bob Walsh and Mr. Brian Harrison of the Station in 1959.

Mr. Harrison's position was immediately filled by Dr. Gerald M. Weaver, a young scientist from Nova Scotia, who took charge of the horticulture research program and launched into a very extensive peach breeding project, which was destined to have a tremendous impact on the whole tree fruit industry of south-western Ontario. The search was on for new varieties of peaches that would be resistant to the onslaught of the cold winters and to the ravages of the terrible disease known as peach canker. For the first 3 years he set out 15,000 seedlings each spring. He also started a project for the irradiation of seed with radioactive gamma rays and was instrumental in having a cesium 137 unit installed in one of the station greenhouses. This technique, which was designed to assist plant breeders through an accelerated production of mutations, was being widely advocated at this time, but it did not live up to its original promise as a method for speeding up evolution. After 10 years of extensive testing, the project was discontinued and the unit was removed.



Left

Fiftieth anniversary plaque unveiled by Hon. Douglas S. Harkness, July 29, 1959.

Right

Dr. G. M. Weaver selecting dwarfing peach root stock.

The decade following the formation of the Research Branch continued to be a time of expansion for the Station. Every year new scientists were taken on staff; some were replacements and others filled new positions to work on new programs. In 1960 Dr. Gordon M. Ward, a specialist in plant nutrition and physiology, was transferred from the Plant Research Institute in Ottawa to begin a program of research for improvement of the nutrition and production of greenhouse vegetables. This was done at the urgent request of the greenhouse vegetable growers in the Leamington area, who were desperately in need of assistance. To accommodate this program two new research greenhouses were erected in 1961; each one was 160 x 32 ft with ground beds for the production of tomatoes and cucumbers on a semicommercial scale and had modern environmental controls and partial supplementary lighting. A basement laboratory in the West Building was fitted up for conducting related biochemical investigations. Although the space was inadequate and the safety of the working conditions was questionable, chemical research continued in this location for 9 years.

The facilities of the Station had become so sorely taxed by the building extensions to house the expanding programs and increasing staff that there was not enough boiler capacity to heat the two new greenhouses. The director and his associate had been looking to the future and for some time plans had been under consideration for the erection of a new building to accommodate the whole staff. Although there was no immediate prospect of such a building, it had been included on the priority list in the long-range plans of the Department. When the two new greenhouses were completed, the heating problem was solved by purchasing two new oil-burning Cleaver Brooks package boilers of 200 hp each, which would be used as the primary heating units in the proposed new building. They were placed on a cement pad adjacent to the greenhouses and covered by a temporary wooden shed. The plan to use such units for this purpose created a staffing problem because boilers of over 50 hp capacity using high pressure steam could be operated only by qualified stationary engineers and there were none on the Station. In 1962 Mr. Jack Fawdry was employed as chief engineer, and he was provided with a staff of four qualified stationary engineers to run the boilers and carry out maintenance duties. Over the next few years their services were in great demand when the various barns and farm buildings were remodeled to provide improved facilities for the expanding research program.

Dr. Koch organized the Station on the basis of eight sections: Entomology Section with Mr. Boyce as head; Nematology Section, Dr. Mountain head; Plant Breeding and Genetics, Field Crops Section, Mr. Mortimore head; Plant Breeding and Genetics, Horticultural Crops Section, Dr. Weaver head; Plant Pathology Section, Dr. Hildebrand head; Plant Physiology Section, Dr. Ward head; Soil Science Section, Dr. Fulton head; Poultry Section, Mr. Wally Mountain head poultryman; and Soil Substation Woodslee, Dr. Aylesworth, Officer-in-charge. In addition, Dr. Koch was also responsible for the Tobacco Substation at Delhi where Mr. Vickery was the Officer-in-charge.

Included with the professional personnel at this time were two extension officers from the Ontario Department of Agriculture. The first to arrive in May 1958 was Mr. Jack Cutcliffe, a fruit and vegetable specialist, who was provided with an office in the East Building and used the Station for his headquarters to service Essex County. This arrangement had been worked out by Mr. Murwin even before the departure of Mr. Walsh from the Science Service Laboratory when it was recognized that the duties of extension could be more adequately directed by the provincial department. The arrival of Jack Cutcliffe marked the beginning of a program of close cooperation between the federal and provincial staff, which greatly enhanced the usefulness and the reputation of the Station. In 1960 Mr. Cutcliffe was joined by Mr. James R. Rainforth who assumed responsibility for extension in the greenhouse vegetable industry. He remained until 1969 when he left to take a responsible administrative position with the Ontario Department of Agriculture and Food. In 1962 Mr. Cutcliffe joined the Research Branch at the Research Station, Charlottetown, P.E.I. A succession of extension specialists have worked out of the Harrow office, J. R. Chard 1963–1967, D. B. George 1969–1970, J. F. Hopkins 1969–1973, and W. E. Kayler 1969–1973. In 1971 Mr. Clem Fisher returned to take up extension duties again, but this time with the provincial department. In 1973 Miss Helen Fisher joined the staff as a fruit specialist; she was the first woman in the history of the Ontario extension service to hold such a position.

When the research program began to expand, the size of the technical staff was gradually increased. The Research Branch management had established a policy that usually there should be one technician with each research scientist. To help meet this requirement the educational system of Ontario established institutes of technology and community colleges at various locations in the province. One of these was the Western Ontario Institute of Technology, Windsor, which was later renamed St. Clair College of Applied Arts and Technology. This school provided excellent training for technicians, and many of its graduates found a place on the staff of the Station. After 1970 university graduates in science began to compete for these positions. The number of technicians grew to a total of 33 in 1974 and they made a significant contribution to the advancement of the various research programs.

The horticulture program under Dr. Weaver made great strides in the 1960s. Mr. Les Ounsworth, who had returned to the Station after the war, had been quietly conducting a far-ranging program of vegetable breeding and variety testing. He started it in 1942 with tomatoes, melons, and asparagus and resumed work in 1946. In 1951 he released a tomato variety named Harrow, and in 1954 a new melon called Harper Hybrid, which for a time became a leading variety in North America and is still widely grown. It combines resistance to fusarium wilt disease with good eating quality and the ability to be shipped without damage. Mr. Ounsworth continued this program with vegetables, including potatoes, asparagus, and onions until 1969 when he was transferred to the Pesticide Technical Information Unit in Ottawa. His place was taken by Mr. V. Walter Nuttall, a competent geneticist and plant breeder from the Ottawa Research Station. Mr. Nuttall was a leading authority on cucumbers and he launched a vigorous breeding program with both pickling cucumbers and seedless greenhouse cucumbers. His program of vegetable culture and testing included studies with potatoes, field tomatoes, cucumbers, onions, carrots, and asparagus.

In 1961 Dr. Tom K. Toyama joined the staff and during a 2-yr stay made an appreciable contribution to the horticultural research program in the breeding of cucumbers, pears, and apricots. When he left in 1963 to return to the United States to a research post in the State of Oregon, his position was taken by Dr. Richard E. C. Layne, a native of the British West Indies, whose training in both pathology and genetics fitted him admirably to undertake a study of the devastating bacterial disease called fire-blight, which had destroyed hundreds of acres of pear orchards in Ontario and threatened the whole pear industry. This disease had caused distress to orchardists for many years, and a renewed effort was made through plant breeding to obtain a tree with some degree of resistance. Dr. Layne followed this line of investigation and made large pear plantings on the Station.



Upper
Early tomato variety Harrow, which is resistant to cracking.

Middle
L. F. Ounsworth with Harper Hybrid melon.

Lower
Ridge farm.

In 1962 a program of weed research was launched and was attached tentatively to the horticulture section. Although weed control measures and tests had been carried out for many years as part of the management practices of both field and horticultural crops, this was the first recognition of the necessity for a definite program. It arose because of the rather sudden appearance of so many new herbicide chemicals on the market and the urgent need for good advice for farmers. Dr. Walter J. Saidak had been with the Plant Research Institute in Ottawa for a number of years as a

specialist in this relatively new field and was transferred to the Station in 1962. He proceeded to organize an extensive program of herbicide testing with field crops, vegetables, and tree fruits.

The Station had large plantings of peaches and pears, but more land was required to continue these investigations and to provide space for the weed experiments. The areas of suitable soil on the main farm and the Affleck farm were all in use and there was little room for expansion. In order to accommodate some of these new programs, another farm was purchased in 1964. A 49-ac property designated as part of lots 2 and 3, plan 178, Township of Colchester South, was purchased from Mr. George Ellenberger for \$68,000. It was located on the Ridge Road a distance of 3 miles from the Station and it became known as the Ridge Farm. The soil was a very light sandy loam and the farm was equipped with a house and a barn, both in good condition. The house was very old, but had been recently remodeled. There was a good well on the property, but the requirements for irrigation on the experimental plots soon taxed its capacity and in 1965 a plastic-lined irrigation pond was built for the storage of water. This farm was divided roughly into two parts; the north half was used for weed research, and the south half was devoted to the peach breeding program. The intensive investigation with peaches soon began to produce some interesting results. There was great excitement amongst all the horticulture workers one fine summer morning when it was discovered that one peach had matured and ripened on July 19, the earliest date for ripening ever recorded in Essex County.



In 1968 Dr. Weaver named and released the first two peach cultivars to come from the new breeding program. They were called Harbelle and Canadian Harmony. The following year Dr. Weaver left to become director of the Research Station, Vineland Station. Dr. Dick Layne was appointed head of the horticulture section and assumed responsibility for the research on peaches. It was difficult at that time to find a competent scientist to replace Dr. Weaver, and it was not until 1971 that Dr. Harvey A. Quamme arrived to take over the pear breeding research. He was transferred from the Research Station, Morden, Man., where he had worked on problems of winter-hardiness of fruit species. He came to the Station from the University of Minnesota where he had been on leave of absence doing postgraduate work in the same field of research.

During the 1960s the strong plant pathology program that Dr. Koch had built up over a period of years began to see some changes. When Dr. Hildebrand retired in 1962, Dr. Colin McKeen became head of the section. Dr. McKeen had become involved in a far-reaching program covering not only a wide range of vegetable crops, but also the full gamut of pathogenic organisms known to attack these plants. He maintained a strong research program, contributed many scientific papers, and earned an international reputation for himself and the Station in vegetable pathology. Among other accomplishments he produced a definitive monograph on tomato diseases.

In 1961 when Dr. Whitney left, he was replaced by Dr. Ronald E. Wall as the pathologist on the research team along with Mr. Mortimore studying the root and stalk rot of corn. Dr. Wall remained for 3 years and then returned to research in forest pathology, the field in which he was trained and interested. In 1966 Dr. Leslie F. Gates, an experienced English pathologist who had spent a number of years in Southern Rhodesia, arrived to take charge of the corn disease program. In view of his long experience with virus diseases, he was also able to add this valuable capability to the pathology program and undertook to devote some attention to the virus diseases of corn and cereals that were then appearing in Ontario.

In 1962 Dr. Jerry H. Haas was engaged to study the diseases of soybeans and white beans, particularly bacterial blight and another mysterious disorder called bronzing. The latter results in flecking and browning of the bean leaves and is thought to be caused by high levels of ozone produced by atmospheric pollution.

In 1965 Dr. B. N. Dhanvantari, a native of India and a graduate from the University of Toronto, came to undertake investigations of tree fruit diseases, particularly peach canker, in order to strengthen the peach breeding program at the Station and to render assistance to the growing peach industry in Essex and Kent counties.

The field crops research program under the direction of Mr. Glenn Mortimore was considerably altered during the 1960s to meet the changing needs of agriculture. In 1962 Mr. Cas Owen retired after 33 years as a soybean breeder. Dr. Richard I. Buzzell then joined the staff and took up the soybean breeding program and continued to produce new varieties better suited to the needs of this very important industry. A few years later it was decided to broaden the scope of soybean research, and Dr. Brian R. Buttery was taken on staff as a crop physiologist to study some of the complex production problems of soybeans. Dr. Buttery, a graduate of English universities, had gained considerable experience in this type of crop assessment on rubber plantations in Malaya.

The team of Buzzell and Buttery set out to overcome the problem of the so-called yield plateau in crop response to fertilizer increments. In the course of this work they developed a series of improved selection techniques based on growth characters. The result has been two new varieties, Harwood released in 1970 and named for Harrow and Woodslee, and Harlon released in 1974 and named for Harrow and London. Harwood has resistance to lodging and to *Phytophthora* root rot. Harlon has early maturity suitable for the London district and resistance to *Phytophthora*.

In 1970 after the departure of Dr. Clark, the white bean program was completely reorganized. Dr. John Aylesworth was given the responsibility of managing the breeding program, which was aimed at developing new

disease resistant varieties while retaining or improving on quality, earliness, and yield potential. Dr. Aylesworth organized a cooperative arrangement with American researchers in the State of Idaho for a seed increase program in connection with his breeding stock, because that location is considered to be a disease-free area for white beans. White beans are also called field beans or navy beans. None are grown in Essex County, but there are large acreages in Lambton, Kent, and other parts of southwestern Ontario.

In 1964 Mr. Lawrence J. Anderson was transferred from the Research Station at Lacombe, Alta., to assist in the field crops section. He has helped to maintain a modest program of variety testing of winter wheat, barley, and oats.

Also in 1964 Mr. Bob Haslam retired after 41 years of service in tobacco research. By this time the Research Station at Delhi had been officially separated from Harrow and the decision had been made to eventually transfer all tobacco research there. Mr. Haslam's position was not filled and Mr. Walter Scott was left as the only tobacco research scientist with the prospect that upon his retirement all tobacco research at the Station would end. He continued to fill a key role as the outstanding Canadian authority on burley tobacco production, but the pendulum of time had swung a complete round and the establishment that had started in 1909 as a tobacco station produced one acre of tobacco in 1974.

The year 1964 also saw the conclusion of the poultry investigation. Although no resident research officer had ever conducted research on the Station, the cooperative breeding and feeding experiments directed from Ottawa had made a substantial contribution to the national poultry program for 34 years. Mr. Wally Mountain and other members of the poultry staff were transferred to other sections and assumed new duties dealing with crop plants. A food processing program was started about this time as an adjunct to some of the horticultural projects and Mr. Mountain became the technical specialist in this field.

With the formation of the Research Branch in 1959 the Department of Agriculture entered upon a period of coordination and consolidation of research effort. The principle of management by objectives, which had been locally recognized for many years as an ideal guiding philosophy, was now actively pursued. A detailed assessment of the Branch research resources in terms of man-years of effort devoted to all disciplines, crops, and livestock disclosed some striking inequities. In relation to the economic value of specific agricultural products and the economic impact of the problems under consideration, it was evident that some segments of agriculture were receiving too much attention and others were being neglected. This was a natural result of the phenomenal growth of the organization over a period of 60 years and of the enthusiastic response of the Department to numerous appeals for help during this period, but the time had come to correct these anomalies. A number of the smaller establishments were closed and this proved to be a much more difficult operation than opening new ones.

The Station at Harrow was designated as one of the principal research centers in the Branch with continued or increased emphasis on fruit and vegetable research. At a somewhat later date it was also named as one of two main centers in Canada for weed research.

In 1964 the Research Branch recommended the closing of the Entomology Laboratory in Chatham and the Minister of Agriculture gave his approval. However, considerable opposition to this decision was encountered from Kent County farmers who had been well served by entomologists in the Chatham Laboratory since 1926 and were apprehensive that their problems might be ignored by scientists at more distant locations. Consequently, it was not until 1967 that the laboratory was finally closed. In the meantime the Officer-in-charge, Mr. George Manson, retired and members of the staff were transferred to other establishments across the country. Dr. Robert J. McClanahan, who had done considerable work on the control of tobacco insects, came to the Station in 1966 and engaged in a project for the study of greenhouse vegetable insects. He developed an interesting and effective procedure for the biological control of

the greenhouse whitefly using a predator insect. This technique has been widely accepted by the greenhouse vegetable industry both in Canada and abroad. Mr. Harry B. Wressell was the only member of the laboratory staff to remain in Chatham where he was established in a downtown office with a secretary, Miss Margaret Ronson. He was attached to the Station, but continued to perform an extension function out of Chatham until his retirement in 1973.

In 1972 the Research Institute at Belleville, Ont., was closed and members of the staff were transferred to other research establishments. Mr. Bernard C. Smith came to the Station and commenced a study of corn insects.

A considerable expansion in the entomology program took place under Mr. Boyce's direction in the late 1960s beginning with the arrival of Dr. McClanahan. Because of the advent of so many new insecticides and particularly the discovery of effective systemic insecticides, Mr. Boyce recognized a definite need for support in the entomology program from a pesticide residue chemist. Dr. Fred von Stryk, who had been trained in Germany and spent several years in the research department of an agricultural chemicals company in Canada and was the inventor of a number of patented materials, came to the Station in 1965. He made a valuable contribution in pesticide residue methodology and eventually expanded his research to include the study of herbicides and fungicides to provide service to both the plant pathology and weed programs.

In 1966 Dr. William M. Elliott, a graduate from the Imperial College in London, joined the staff to work on problems of vegetable insects. In 1967 Dr. Robert P. Jaques was transferred from the Research Station at Kentville, N.S. He was a specialist in a most unusual type of insect control in which an insect virus is sprayed on a crop to kill the cabbage looper and cabbageworm. He continued this work and became a recognized international authority in his special field although the technique has not yet been widely accepted as a recommended procedure.

In 1968 Dr. C. D. F. Miller was transferred to the Station from the Entomology Research Institute in Ottawa to study the cereal leaf beetle, which had begun to invade wheat fields in Ontario with a potential for widespread damage to cereal crops as experienced in other parts of the world. Dr. Miller helped to organize an international cooperative effort that included the United States and several European countries. When Mr. Boyce retired at the end of 1969, Dr. Miller became the head of the Entomology Section and remained until 1973 when he was appointed as the research coordinator for entomology and returned to Ottawa.

During the period that Dr. Dick Sayre was the nematologist he served in the entomology section. When he left in 1965 he was replaced within a year by Dr. George W. Bird who remained for 2 years and then took a university teaching position. The next nematologist was Dr. P. Wade Johnson who arrived in 1969 and made some significant studies of the movements of nematodes in greenhouse soils and in peach orchards.

When the Station was named as the main weed research center of the Research Branch in Eastern Canada, it became necessary to recruit more research scientists who had special training in this type of work. In 1968 Dr. Paul B. Marriage, a plant physiologist, joined the staff to study the mode of action of herbicides in order to obtain a better understanding of chemical weed control, which might assist in framing more intelligent herbicide recommendations. In 1971 Dr. Allan S. Hamill, a recent graduate in weed science, arrived to study the ecological reasons for the changing weed populations resulting from herbicide application and other weed control procedures. In 1973 Dr. Walter Saidak was appointed as research coordinator for weeds for the Research Branch in Ottawa. His position was filled about a year later by Dr. George H. Friesen, an experienced weed research scientist, who had worked in Western Canada and for a brief period in India.



*Laboratory-office building officially opened
in 1969.*

1969–1974

With the formation of the Research Branch and the subsequent designation of the Station as one of increasing importance, it became increasingly evident to Dr. Koch and Mr. Murwin that the facilities were quite inadequate for the efficient conduct of modern agricultural research on the scale that was planned. Many of the laboratories that had been set up in the old main office building and in the Science Service Building were lacking in standard safety features, and there was a constant problem in finding space to locate new staff or even new instruments and equipment. As early as 1961 definite plans for a proposed new building were being sketched in consultation with the Architectural and Engineering Section of the Research Branch. Various floor plans and types of construction were considered and the designated site was surveyed and inspected on several occasions. The confirmation of a relatively high water table in the area and an unstable subsoil structure precluded any possibility of underground construction or of a very high building at reasonable cost.

Mr. Murwin took an active part in the early planning for the new building, but in 1964 he retired after 36 years of outstanding service. He had left his mark on agriculture and on the community and was officially honored both by his colleagues at the Station and by the growers whom he had served for so many years. He went to live in the town of Amherstburg, but he had been in poor health for some years and died within a year of leaving.

In 1967 the architectural firm of Giffels Associates was employed to prepare plans for a new building in consultation with the Public Works Department, the Architectural and Engineering Section of the Branch, and the research scientists of the Station. On February 24, 1968, the contract was awarded to the W. A. McDougall Construction Co. of London, Ont., and on March 28 the sod-turning ceremony was presided over by Mr. Herb Boyce, who had been appointed associate director after the retirement of Mr. Murwin. Attending the ceremony were Dr. Jim Wright, acting assistant director general of the Research Branch, Mr. Eugene Whelan, M.P. for Essex South, and Mr. J. M. Murphy of the Department of Public Works.

Several farm buildings, including the old superintendent's residence, were removed to make way for the new structure and construction proceeded rapidly. The building is in three sections around a central courtyard and consists of a single-story administration wing, a service wing, a two-story laboratory wing, and three penthouse areas. Construction is of precast, fluted, concrete slabs on a steel frame with a 5-ft roof overhang equipped with illumination on most parts of the exterior. The building has a floor space of 77,680 sq ft divided into 188 rooms and numerous small cupboards and storage areas. The laboratory wing has two rows of laboratories in the center of the building abutting a central service corridor where all services are open for easy access. Offices with windows are located around the perimeter. The internal structure includes concrete and gray tiled floors, painted concrete-block walls, and gypsum-board office partitions giving the whole interior a bright atmosphere. The administration and laboratory wings are air-conditioned.

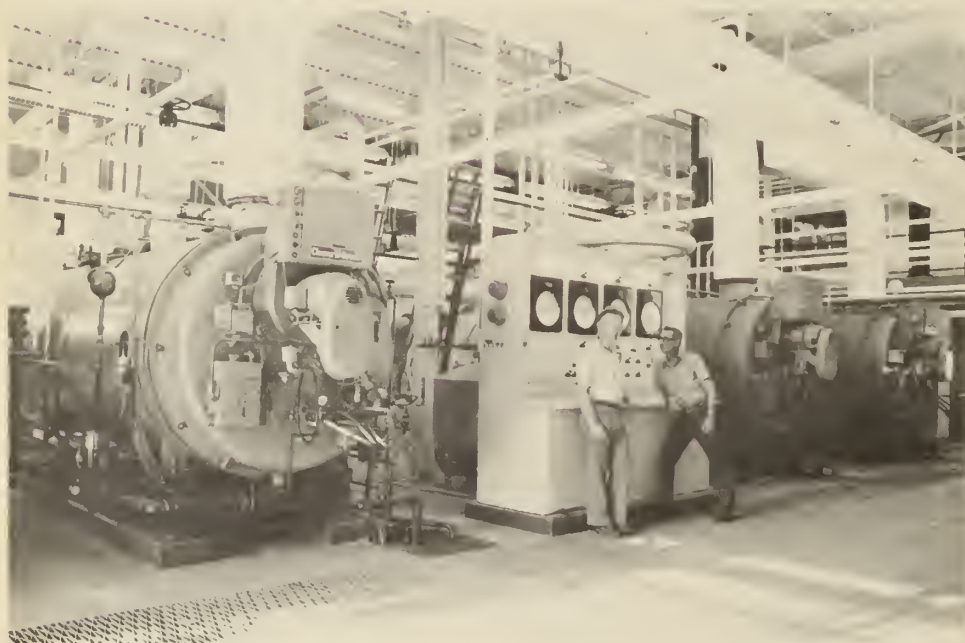
A separate power house with a floor space of 6200 sq ft is located 100 ft south of the main building with which it is connected by a sidewalk and canopy that covers all the service pipes. It was designed to house four boilers and a water treatment system. The two Cleaver Brooks boilers on the Station were moved in and one new one was installed. A fourth boiler was installed when two new greenhouses were constructed in 1973.

The McDougall Company maintained construction well ahead of schedule until a few weeks before the anticipated date of completion in June 1969 and then a strike in the construction industry forced postponement of the opening. Finally the building was completed at a cost of \$3,584,000 and the staff immediately started to occupy the new quarters. As soon as the old West Building was vacated, it was demolished. The East Building was retained to service the greenhouses, which were attached to it. The west greenhouses were now being serviced by the new power house.

On Friday November 7, 1969, Dr. Koch acted as host for the official opening of the new building. The ceremony was attended by the Hon. Arthur Laing, Minister of Public Works, the Hon. H. A. Olson, Minister of Agriculture, Mr. Eugene Whelan, M.P. for Essex South, several Research Branch officials, and other representatives. On the following Saturday and Sunday the Station held an open house for the public with numerous displays and demonstrations. About 3000 people were shown through the building and great interest was expressed in the work of the Station.

Modern chemistry laboratory in the new building, George Zajacz, Marcia Miller, and Dr G. M. Ward, 1970.





It was a proud day for Dr. Koch when the whole staff was finally moved under one roof. It represented the fulfillment of a dream of long standing and the culmination of years of planning. But it was now more than 40 years since Dr. Koch had joined the public service and there was no time left for him to consolidate the organization after the move into the new quarters. He retired on February 23, 1970; and was honored by members of the local community, the growers of Essex County, and his scientific colleagues particularly in plant pathology.

Dr. Glenn C. Russell, who had been director of the Research Station at Charlottetown, P.E.I., since 1966, was appointed as the new director. Prior to that he had been a member since 1951 of the staff of the Research Station at Lethbridge, Alta., where he had built up a reputation in the field of soil science as a recognized authority on irrigation and dryland farming.

Upper

Food testing laboratory in the new building, W. F. Mountain and Dr. L. W. Koch, 1970.

Lower

Power plant for the new building, 1970.

There was no unusual increase of staff, program, or equipment as a result of occupying the new quarters. Indeed the facilities besides being fully functional were almost completely utilized. There was now enough space for setting up all the instruments that were on hand and for carrying out efficiently the numerous scientific operations involved in a broad program of research. The staff now consisted of about 30 research scientists and 75 support staff. The business of administration was much different from the operating of an experimental farm and a science service laboratory just 11 years before. Agricultural research in the Research Branch had entered a new era. An act of Parliament had introduced collective bargaining into the Public Service in 1967. This had definitely altered the climate of employer-employee relationships. The administration at the Station was confronted with the problem of having to consult and interpret nine different contract agreements, which were constantly changing with each bargaining session.

The Experimental Farms Service and later the Research Branch had operated on a project system with each scientist responsible for conducting a definite program of research. In the late 1960s the executive of the Branch undertook the practical application of the principle of management by objectives. The total research effort of the Branch was coordinated in a definite number of specific programs with clearly defined goals and objectives and a requirement for accountability. Dr. Russell was faced with the task of completing the organization of this structure when he became director in 1970. He assumed a very definite role of leadership and established a flexible committee structure with a certain delegation of authority and decision making particularly to section heads. At this time there were six sections: Crop Science, Mr. Mortimore head; Chemistry, Dr. Ward head; Entomology, Dr. Miller head; Horticulture, Dr. Layne head; Plant Pathology, Dr. McKeen head; and Soil Science, Dr. Fulton head. Some months later the Horticulture Section was discontinued and the staff was assigned to other sections, which were appropriately renamed: Chemistry and Weed Science, Dr. Ward head; and Horticultural and Soil Science, Dr. Fulton head. The administration of the Substation at Woodslee was also changed. In line with the general program of consolidation throughout the Branch the management was completely transferred to the Sta-

tion. There was no longer a separate budget or separate office services. The two research scientists were given offices and laboratories in the new building. Dr. Bolton was assigned to the Horticultural and Soil Science Section and Dr. Aylesworth joined the Crop Science Section.

The research effort was organized into nine separate programs: soybeans, tree fruits, field and greenhouse vegetables, potatoes, winter wheat, grain corn, cigarette burley tobacco, white beans, and weeds. These were indexed and coordinated with corresponding Branch programs. A program leader was appointed for each with the responsibility for summarizing annually the accomplishments in each field of endeavor and for charting the future course of the program. This was to be a collaborative exercise involving all scientists in the program and was a somewhat new departure and reflected the modern trend in research management.

When the new building was opened in 1969, it became necessary to increase the size of the engineering staff to meet the legal requirements for the operation and maintenance of such a large establishment. Mr. Jack Fawdry was placed in charge of the operation of the power house and the number of shift engineers on staff was increased to six. The position of chief engineer was awarded to Mr. J. Donald Youngman, a qualified first class engineer who had held a similar position at the Research Station in Swift Current, Sask. Mr. Youngman arrived while the building was still under construction to assist in the inspection job and to become more familiar with the structural details of the building for which he was to be responsible. He quickly became a key person in the life of the Station and was frequently asked to make recommendations and decisions about the research facilities.

Some of the older buildings were demolished to make room for the new structure and several others were removed after it was completed to provide open space for an extensive surfaced and well-lighted parking area. Some of the buildings that had to be removed had been used in the past for the housing and storage of farm machinery. In anticipation of this change a large machinery shed was obtained in 1968 while the new building was still under construction.

This shed measured 192 by 60 ft, was constructed of ribbed steel at a cost of \$35,000, and provided ample space for all the farm machinery on the Station. It was conveniently located immediately south of the parking lot and at a later date a lean-to was added on the north side to shelter all the cars and trucks.

In the 3 years following Dr. Russell's arrival there were numerous staff changes, some of which have already been mentioned. In 1971 Dr. John Dueck joined the plant pathologists as a specialist in the study of bacterial diseases. He concentrated on the problems of fireblight of pears and bacterial diseases of vegetables, but he left in 1973 to accept a position in Ottawa with the Production and Marketing Branch. Within a few months Dr. W. Gordon Bonn replaced Dr. Dueck. The same year three of the senior scientists received appointments as research coordinators for the Branch at Ottawa. Dr. Colin McKeen became coordinator for plant pathology, Dr. Doug Miller became coordinator for biosystematics, and Dr. Walt Saidak became coordinator for weeds. This was a considerable complement to the Station on the merit and ability of its scientists, but it did pose a serious problem for Dr. Russell in finding suitable replacements. In 1973 Dr. Victor A. Dirks joined the staff as a statistician. His terms of reference were to provide assistance in the field of statistical design of experiments and data analysis for any of the research programs requiring such aid. He was also to act as regional statistician to give similar assistance to the research stations at Vineland Station, Delhi, and London.

From the very earliest days the Station had accumulated a number of printed reports, periodicals, and farm papers in a library. The filing and cataloguing of these papers was the job of one of the secretaries and eventually a considerable amount of space in the East Building was required to store them. When the Science Service Laboratory was established, a second library grew up in the West Building. In Ottawa before 1900 the Department of Agriculture had established a library, which grew from modest beginnings to become eventually the most comprehensive assembly of agricultural and related literature in Canada and one of the great agricultural libraries of the world. Books and periodicals from this library were always available on loan to any of the branch farms or stations. In 1959 the two libraries of the Station were

consolidated and it became necessary to have the services of a full-time librarian. The Departmental Library in Ottawa arranged to send a member of the staff to the Station and Mrs. E. B. Haddow arrived in 1960 to take over these duties. She stayed until 1962. After an interval of two more years, Miss Helen A. Thurston was librarian from 1964 until 1966. Then Mrs. Audrey A. Munro was acting librarian until the arrival of Miss Kathleen M. Sutherland in 1968 by which time the duties had increased to the extent of requiring the full time service of two people. Miss Sutherland and Mrs. Munro helped to design the library in the new building and superintended the move of the many books into the new location. Miss Sutherland also acted as regional librarian in charge of libraries at the research stations at London, Delhi, and Vineland Station.

From the earliest days of agriculture in Ontario there has been a proliferation of farmers' organizations of many kinds. Members of the staff of the Station have always maintained a good relationship with many of these organizations. They have used them as a channel for communicating research findings and for rendering assistance to farmers, and frequently they have been connected with some of these groups in an official capacity. The Essex County Associated Growers was organized in 1952 to embrace all the fruit and vegetable producers in the county. This group has held an annual convention and equipment show at which invited speakers from many places in Canada and abroad have discussed all phases of the industry. A large part of the program has usually been contributed by scientists from the Station. In 1974 the convention, which had always been in Leamington, was held in the new building at the Station in March. The facilities proved to be quite adequate and the venture represented still another example of service to agriculture.

The Western Ontario Fruit Testing Association (WOFTA) was formed in 1965 on the initiative of Dr. Weaver and Dr. Koch. Membership was open to any individual interested in testing new varieties and advanced selections of tree fruits. Dr. Weaver, and later Dr. Layne, was the executive vice-president of the group and in 1971 Mr. Brian Harrison became the general manager and the

association operated from an office at the Station. Mrs. Harrison acted as office secretary and thus these two devoted people renewed their connection with the Station after an absence of many years. WOFTA has materially benefited the plant breeders at the Station as well as orchardists in many places by reducing the time lag between the introduction and commercial planting of new varieties and rootstocks.

Other farmers' groups that have received support and assistance from members of the staff are the Ontario Fruit and Vegetable Growers Association, the Canadian Horticultural Council, Essex County Soils and Crops Improvement Society, Ontario Tender Fruit Institute, Ontario Foundation Seed Distribution Committee, and the Canadian Seed Growers Association. Crop specialists of the staff have always been in great demand as judges for the Royal Winter Fair in Toronto, the Harrow Annual Fair, and other fairs and exhibitions in the province. A number of marketing boards have used the services and expertise of the scientists. Among these are the Ontario Greenhouse Growers Marketing Board, Ontario Soybean Marketing Board, Ontario White Bean Marketing Board, Ontario Tender Fruit Growers Marketing Board, Ontario Fresh Fruit Growers Marketing Board, and Burley Tobacco Marketing Association of Ontario.

The Research Branch of the Canada Department of Agriculture has seven establishments in Ontario, outside of Ottawa, where agricultural research is carried on. Agricultural research in Ontario is also sponsored by the Ontario Ministry of Agriculture and Food at four locations and by the agricultural educational institutions: the University of Guelph and the colleges of agricultural technology at Ridgetown, Kemptville, and Centralia. Over the years a general spirit of cooperation has existed among these varied units in spite of occasional bursts of rivalry characterized at times even by personal animosity. In recent years cooperation, which at one time was voluntary, has been organized by management, and all agricultural research effort is assessed by the Ontario Agricultural Services Coordinating Committee, a body composed of all directors of establishments and deans and principals of colleges. An extensive superstructure of committees and subcommittees covers every working scientist in the province.

The research scientists of the Station have taken an active part in the work of many of these committees and in addition to reporting their own contributions to the field of knowledge annually they have helped to chart the course toward future accomplishments. Without detailing the full structure of this scientific hierarchy, the following committees should be mentioned as having had a direct bearing on the life and work of the scientists of the Station: Ontario Vegetable Research Committee, Ontario Fruit Research Committee, Ontario Corn Committee, Cereal Crop Committee, Field Bean Committee, Oil and Protein Seed Crop Committee, Plant Protection Committee, Ontario Weed Committee, and Advisory Fertilizer Board of Ontario.

Most scientists find it a distinct advantage in the promotion of their careers to maintain a membership in one or more professional societies related to their particular discipline. The research scientists of the Station have followed this trend and have taken an active part in the operation of many of these organizations. They have attended annual conventions for the presentation of scientific papers to their peers, for the general exchange of ideas, and for establishing contacts with coworkers and collaborators. The Department of Agriculture encourages and supports this effort by the annual assignment of conference travel funds, recognizing that the free interplay of scientific thought has contributed largely to the great advances in technological progress made in our modern world. A list of these professional organizations includes the Agricultural Institute of Canada (A.I.C.) and its affiliated societies, Ontario Institute of Agrologists, Canadian Phytopathology Society, Entomological Society of Ontario, Entomological Society of America, Canadian Society of Plant Physiologists, Chemical Institute of Canada (C.I.C.), American Society for Horticultural Science (ASHS), Weed Science Society of America, International Society for Horticultural Science (ISHS), International Tobacco Workers Conference, American Society of Nematologists, and American Society of Agronomy.

Numerous honors have come to members of the staff over the years by way of the professional societies. The Tobacco Workers Conference awarded long service certificates of merit to Mr. Walter Scott, Mr. Bob Haslam, Mr. Murwin, and Dr. Koch. Mr. Murwin also served for one term as president of this international organization. Dr. Colin McKeen served for a term as president of the Canadian Society of Phytopathology. Dr. Ev Bolton and Mr. Clem Fisher have served as national directors of the A.I.C., and Dr. Fred von Stryk has been a national director of the C.I.C. Dr. Gordon Ward served for a number of years as Canadian representative on the International Commission on Protected Crops of the International Society of Horticultural Science. Dr. Koch was given an award of merit by the Ontario Fruit and Vegetable Growers Association. Dr. Bill Mountain served on the first executive of the Society of Nematologists and is the only Canadian to be president. For several years he was the editor of the international journal *Nematologica*. Dr. Mac Weaver and Dr. Dick Layne both received the Paul Howe Shepard award of the American Pomological Society for the best paper appearing that year in the society's journal. Dr. Harvey Quamme received the Joseph Harvey Gourlay award of the American Society for Horticultural Science for the best paper appearing in their journal. Mr. Herb Boyce served a term as president of the Entomological Society of Ontario.

Most of the Station employees have lived in Harrow and the surrounding vicinity, but in later years, when transportation became easier, more of them found residences in other towns of the district: Kingsville, Leamington, Amherstburg, and even Windsor. Over the years many of the staff have taken an active part in the social and political life of the town and district and have made a significant contribution in their extra-curricular hours. Both Dr. Ward Koch and Mr. Les Ounsworth served terms as mayor of the town and on the Harrow Hydro Electric Commission. Dr. Hildebrand was a high school trustee for several years and Mr. Glenn Mortimore was on the public school board. Mr. Russell Beaudoin and Dr. Jim Fulton were on the township school board. Dr. Bill Mountain and Mr. Walter Scott served on the Advisory Vocational Committee of the Essex High School Board. Dr. Ralph Wensley took an active interest in national politics, an activity which in former years was forbidden to public

servants, but later was permitted and even encouraged. Dr. Wensley was a candidate of the New Democratic Party on three different occasions. He also gave a lot of his time to the encouragement and promotion of junior hockey. Mr. Cas Owen and Dr. Dimmock were instrumental in organizing a tennis club in Harrow, which flourished for many years, and they remained trustees of the organization. Dr. Bob Jaques was an active member of the Harrow Area Recreation Association when it was engaged in building the Harrow arena. A number of Station people were associated with Boy Scouts including John Slykhuis, Glenn Mortimore, Mac Weaver, Jim Fulton, and particularly Alvin Sellick, who devoted a lifetime to this service. The Harrow Parks Commission and the Harrow-Colchester South Fair Board frequently had representatives from the Station. The local service clubs and lodges were widely supported and a large number of the staff were active church members. Dr. Gordon Ward was the organist and choir director for 7 years at First Baptist Church in Leamington.

At the end of 1974 Dr. Glenn Russell was the director of a large and vigorous organization, which has had an illustrious history. The staff at this time consisted of 33 research scientists, 76 administrative and support personnel, and 9 people in affiliated organizations. The total area of property amounted to 450 ac including the main farm, the Affleck farm, the Ridge farm, and the Substation. Of this amount about 336 ac were in cultivation for research purposes and allocated in this particular year to the following crops and programs: peaches (including apricots and nectarines), 89 ac, pears 39, apples 5, corn (+ sorghum) 21, soybeans 22, white beans 5, tobacco 1, cereals (wheat, oats, barley) 3, rotations 30, cover crops 25, forage crops 3, vegetables (+ melons) 20, potatoes 5, weeds (herbicides) 61, and miscellaneous (lysimeters, ornamentals, etc.) 7. In addition a number of acres have been rented from area farmers each year for special projects and demonstrations. The facilities now include more than one acre of research greenhouse space that is used on a year-round basis for most of the research programs. The laboratories are well equipped with the most modern scientific instruments and facilities, many of which are very costly. The annual budget now amounts to \$1,800,000.

The reputation of the Station has continued to grow each year, particularly since the new building was erected in 1969. The work and accomplishments of the scientists have been regularly publicized by press, radio, and television and the number of visitors has reached an all-time high. Various groups and professional organizations have used the facilities for meetings, and others have visited the Station to tour the building and grounds. During the summer months there has been a steady stream of casual visitors who are taken on a conducted tour on scheduled days. The tour has included the showing of a short film describing the research and accomplishments of the Station. In June 1970 Prime Minister P. E. Trudeau arrived by helicopter on the parking lot for a luncheon meeting. In September 1971 the Hon. Ross Macdonald, the Lieutenant Governor of Ontario, paid an official visit and expressed great interest in some of the fruit breeding programs.

Since 1909 the Station has passed through several stages of development, but has continued to make important contributions to agriculture in Essex County, in other sections of southwestern Ontario, and in various parts of the North American continent. This history has been an attempt to describe these contributions and to indicate their value to the Canadian people in return for the considerable investment that has been made in this one research establishment. It is impossible to make a monetary assessment of the real and total value of such things as a new plant variety or a crop management recommendation. Nevertheless, there are four products of agricultural research that may be considered in assessing accountability. These are publications, recommendations, new varieties, and inventions. In the 65-yr history from 1909 to 1974 the Station has employed a total of 1050 people, of which 75 were research scientists who contributed 890 man-years of effort. These scientists have produced 661 publications, a countless number of crop management recommendations, and the following list of significant new varieties: peaches 8, nectarines 2, apricots 1, soybeans 9, tomatoes 2, melon 1, cucumber 1, tobacco 8, white beans 2, and corn 36 widely used inbred lines and 12 hybrids.

RESEARCH PROGRAM AND ACCOMPLISHMENTS

Tobacco

Tobacco research has been conducted principally with two of the main types of tobacco, burley and flue-cured. There are so many variations of the ubiquitous tobacco plant under cultivation throughout the world that classification is based chiefly upon the curing method used. All tobacco leaf must be dried or cured before use and the four main methods are flue-curing, air-curing, sun-curing, and fire-curing. Flue-cured tobacco derives its name from the metal flues originally used to distribute heat and carry off the products of combustion in the curing barn or kiln. Burley tobacco is an air-cured type. The history of the industrial development of these two types in Canada is as divergent as the techniques employed for their production or the research programs initiated for their improvement.

The tobacco grown by many of the early settlers of Essex County, which became the tobacco of commerce in the nineteenth century, was a burley type, but apparently not the light-bodied burley favored by smokers in later years. One early writer characterized it as heavy rank tobacco for pipe, plug, and snuff. Mr. Felix Charlan, the first tobacco specialist to be employed by the Canada Department of Agriculture in Ottawa, evidently agreed with this assessment when he laid the plans for the establishment of the Station for the purpose of improving both the quality of the product and the procedures for handling it. Flue-cured tobacco was first grown in Ontario in 1906 and in 1913 commercial production commenced with about 100 ac grown at Ruthven in Essex County.

The original experiments at the Station in 1909 included some varietal tests, fertilizer tests, and some demonstrations of cultural practices with both burley and flue-cured types. The first printed record of research appeared in the minister's report for 1912 and indicated that work was continuing with white burley and yellow Virginia. Larger seedbeds with better protection were recommended and a renewal or at least a disinfection of the "mould." Many fertilizers were on the market and it was planned to test all of them. Poisoned bran, which was a mixture of bran, Paris green, and molas-

ses, was recommended as a control for cutworms. Rotations under test included cereal, tobacco, and Indian corn. Clover sown with the grain was plowed under in the spring.

In 1913 new flue-cured varieties in the test included Warne, Virginia, Erzegovine, and Virginia Erzegovine Gigante. The recommended fertilizer for flue-cured tobacco was 3-8-3 at 500 lb/ac. The burley tests had 14 fertilizer treatments, but a severe hail storm damaged the crop so badly that it could not be harvested. About this time considerable difficulty began to be encountered both in the seedbed and in the field in the form of a root rot that affected the whole tobacco growing area as well as the Station plots. Farmers spoke of a burley-sick soil and one frequently heard the expression "my ground is burleyed out." Advice on how to deal with this matter included recommendations never to use the same seedbed soil twice, to disinfect with steam or formaldehyde, to change fields, to use longer rotations, and even to apply superphosphate at the rate of 1000 lb/ac. Eventually the root rot was identified by Mr. James Johnson of the College of Agriculture in Madison, Wis., as a disease caused by a fungus called *Thielavia basicola*. The Station planned to cooperate with Mr. Johnson in breeding for a resistant strain of burley tobacco.

The tone of the experimental program for tobacco had now been set. The work continued, and became a little more elaborate each year. In 1914 eight varieties of flue-cured and four of burley were tested, numerous disinfection tests were conducted, and a moveable scaffolding for harvesting burley was used for the first time. By 1915 the Station was producing a considerable quantity of tobacco seed, the practice of stalk splitting at harvest was tested, and artificial heat was tried in the burley curing barn for the first time. In 1916 the first occurrence of tobacco mosaic virus was reported and an extensive soil study was undertaken. From 1917 to 1922 the Station produced all the seed necessary for the total Canadian production. This seed was cleaned and sampled for germination testing without charge and sold to the growers. It was generally considered that this Canadian-grown seed was superior to imported seed. Fall plowing and early transplanting were now recommended, arsenate of lead was suggested as a control for cutworms and the tobacco hornworm. The only control

for mosaic virus was roguing the diseased plants. The variety Burley Resistant offered some protection from disease. The recommended fertilizer for flue-cured tobacco was 180 lb/ac of sulfate of ammonia, 400 lb/ac of superphosphate, and 200 lb/ac of sulfate of potash. For burley tobacco the amounts were 400 lb/ac of sulfate of ammonia, 400 lb/ac of superphosphate, 170 lb/ac of sulfate of potash together with 12 tons of manure. Experiments were soon started to compare the effects of applying fertilizer by drilling and by broadcasting.

A considerable volume of experimental data had been accumulated and by 1922 recommendations for improvements in seedbed construction and use were based on the results of 6 years of effort. Similarly a 6-yr experiment had demonstrated the advantage of crop rotation by showing a consistent yield reduction from plots under continuous tobacco. Flue-cured varieties grown were Warne, Hickory Prior, and Gold Leaf. Eleven burley varieties were under test. Researchers were beginning to experiment with the flue-curing process by checking the effects of varying relative humidity and the heat distribution in the kiln. Steam was used experimentally for flue-curing and a large 30 hp boiler was purchased. In 1923 three varieties of the Green River type were introduced; fertilizer tests were greatly expanded to include more than 60 treatments. For 2 or 3 years exceptionally good crops were grown and the effects of root rot were considerably diminished, probably due to a coincidental combination of climatic factors. For a number of years cooperative fertilizer tests were conducted with growers located at points as widely separated as Leamington, Rodney, and Pelee Island. Conclusions as to the amounts of fertilizer required for optimum production of the various types of tobacco coincided closely with the amounts quoted from the Station experiments. Two interesting comments were that sulfate of ammonia was the best source of nitrogen, and many growers felt that home-mixed fertilizers were more economical and effective than the ready-mixed products.

When Mr. Digges left in 1928, he prepared a summary of the 10-yr progress of research during his tenure as superintendent. He stated his assessment thus, "Although marked improvement has been noted during the past 10 years in the cultural methods of a large portion of the tobacco growers, and although there has been a resultant improvement in quality, it is felt that we are not yet producing, on the average, either as high a quality or as large a yield of tobacco per acre as our natural advantages warrant. Further improvement in quality is greatly desired and would undoubtedly result in an increased demand from our home market and would strengthen our hold on our fast-developing export tobacco market." The report gives a detailed summary of the results of all experimental work and a set of recommendations covering every operation in the production process including plant-bed construction, seedling production, rotations, soil preparation, transplanting, fertilizing, cultivation and topping, insect and disease control, harvesting, curing, seed production, and variety selection.

The arrival of Mr. Murwin as superintendent occurred during the period when the tobacco industry was undergoing extensive change. Flue-cured production was becoming relocated in the "new belt" in Norfolk and Oxford counties. The burley business was booming. Production reached a peak of 22 million pounds in 1927, resulting in a glutted market because of a promised export trade that did not materialize. Expansion of the industry was too rapid and overproduction and lower prices resulted. From this time on production declined although the burley acreage in Essex and Kent counties increased by at least 4000 ac in 1930.

A complete reorganization of the fertilizer studies was effected in 1929. A very extensive series of tests was inaugurated for flue-cured, burley, and dark-fired tobacco. A standing committee on tobacco fertilizers was appointed in January 1930 to consider the results of experimental work and to formulate fertilizer recommendations for the various types of tobacco grown in Ontario. The committee was eventually integrated with the Ontario Fertilizer Board and has continued to function to the present time.

A new type of plant bed was introduced at this time, the greenhouse A-shaped bed. Investigation soon showed that more seedlings of larger size could be produced in a shorter period in this house than was possible in the semihot bed or the cold frame, which were in general use. An ambitious experiment was undertaken with a view to classifying all commercial strains and varieties as to type, botanical differences, and cropping potential in Canada. There was no breeding program, but the researchers had a cooperative understanding with certain plant breeders in the United States and continued to examine numerous varieties and strains from various sources particularly for resistance to black root rot. The change in the method of harvesting from stalk cutting to priming eliminated the old flue-cured varieties such as Warne, Hickory Pryor, and Gold Leaf. The flue-cured varieties introduced from the United States that were particularly adapted for priming under Ontario conditions were White Mammoth, White Stem Orinoco, Bonanza, Yellow Mammoth, Gold Dollar, and Duquesne. The priming method of harvesting flue-cured tobacco had resulted in higher yields and improved leaf quality and had reduced the risk of total crop loss due to an early fall frost.

A distinct change had also taken place in varieties of burley tobacco due to a demand by the domestic trade for a thinner, brighter, cigarette burley. The old varieties such as Broadleaf, Broadleaf Resistant, Station Standup, and Standup Resistant were no longer acceptable except for the export market. The continued search for new and better varieties finally paid off with the selection in 1929 of a resistant burley plant that led to the naming and release in 1932 of the variety Harrow Velvet. It was very resistant to black root rot and had many other desirable characteristics that soon led to its becoming the leading burley variety in Canada. Thus began a breeding program that continued for many years and produced a number of outstanding varieties largely through the efforts of Mr. Bob Haslam.

The Substation at Delhi was established in 1933 and although it was administered from the Station, it assumed full responsibility for all research with flue-cured tobacco. All programs were transferred there except variety testing. However, in 1938 the testing of flue-

cured varieties was discontinued at the Station except the breeding and testing program for resistance to black root rot. With this exception the program was now directed toward burley and a small effort with dark tobacco.

Fertilizer tests continued to occupy a large place in the tobacco research program. By 1936 recommendations were being made to suit the wide variety of soils used in burley production, and great attention was being paid to individual nutrients as well as the chemical source of each nutrient. For example, it was recommended that one-quarter of the applied nitrogen be from organic sources, one-quarter from nitrate of soda, and the remainder from other standard materials. It was preferable to have a part of the potash derived from muriate because chlorine improves the moisture-holding capacity of the leaf and helps to avoid shattering. The amount must be limited to protect the burning qualities of the leaf and critical percentages of chlorine were recommended for each type of tobacco.

An intensive study of crop rotations was carried on for many years. Recommended rotations depended on the type of tobacco to be grown and the type of soil. It was demonstrated that the proper rotation had an important influence on the maximum yield. Plant spacing, plowing, and cultivation methods were also studied to find the right combination of techniques to get the most benefit from the light sandy soils.

The story of tobacco production in Canada has been one of constantly changing varieties. To meet the demand of a steadily increasing cigarette trade, the trend in tobacco production in southern Ontario, particularly during the years of the Second World War, was toward milder brighter leaf tobaccos. Although large stocks of pipe and chewing tobacco were used during this period, the production of heavy-bodied tobacco was not stimulated to the same extent as cigarette tobacco. This increasing demand for bright tobaccos stimulated the production of the flue-cured type. With burley there was a shift from the heavy varieties formerly used for pipe and chewing to lighter standup varieties for manufacturing blended cigarettes and mild pipe tobaccos.

Harrow Velvet may be considered the leader of the cigarette group of burley varieties because with its introduction in 1932 a new class of burley tobacco came into existence. It was one of the first varieties to have an erect growing habit in contrast to the drooping types, which were formerly grown. It had high resistance to black root rot and was a useful variety in the breeding program. Haronova was introduced in 1941 and Harmony in 1945. Both had high resistance to black root rot, high-quality cigarette leaf, and slightly higher yield under average conditions. Resistance to brown root rot had not yet been achieved, but this disease was controlled to some degree by following a proper rotation schedule.

In the years following the Second World War the demand for burley tobacco began to decline and the area in production decreased from 13,200 ac in 1947 to 1096 ac in 1953. However, the research program at the Station was continued in an effort to improve quality and to meet the changing demands of the industry. Fertilizer studies, cultural practices, rotations, and disease investigations were a part of the program. Three new varieties were named and released: Harrow Broadleaf, Haronic, and Briarvet. All three were examples of the heavy-bodied type of burley designed for the export market and each had high resistance to black root rot. But their usefulness to the industry in its current state was limited and they were never widely used.

The only part of the flue-cured research investigation remaining at the Station was the breeding program, and in 1948 it made a significant contribution to the industry with the naming and release of the variety Delcrest, which had been developed by Mr. Bob Haslam. This variety was resistant to black root rot but was susceptible to brown root rot. It produced a consistently high-quality bright leaf and outyielded any flue-cured variety then in use. Delcrest remained the most popular variety for many years and its characteristics were bred into succeeding varieties.

The trend toward thin bright cigarette burley made it necessary to change some of the cultural practices that had been in use for many years. There was now more need than ever to control the rate of water loss during air curing so that it would be neither too slow during wet weather nor too fast during dry windy weather. Mr. Walter Scott started a series of experiments that continued for a number of years using a variety of ingenious techniques to achieve this control. A specially designed calcium chloride dehydrator was built and tested and proved to be very effective. Later, heaters with automatic temperature and humidity controls were used and did an even better job. Subsequently, an automatic, forced, warm-air system with plywood and polyethylene ducts was tested. Each new improvement in the system resulted in higher-quality cured leaf and an increased dollar value for the product. It was observed that on the rare occasions when weather conditions remained favorable throughout the whole curing season, it was possible through judicious control of ventilation to obtain a high-quality leaf product.

Some consideration was given to the method of harvesting burley tobacco. A new method of stalk cutting was tried and found to be advantageous. The tobacco was speared onto the lath and then left to wilt on the standing stick in an inverted position until it was ready to be taken to the curing barn. This procedure caused less bruising of the tender leaves by eliminating much of the handling required in the conventional method. It kept the tobacco cleaner, allowed it to wilt under ideal conditions, and resulted in less damage from sunburn. This technique of harvesting burley has been almost universally adopted. Priming of burley was also tested and was shown to produce a superior quality of leaf, an increased yield, and much higher returns. However, the industry has never seen fit to adopt this method of harvesting even though it would be greatly to its advantage to do so.

During the 1950s a disease called tobacco etch virus caused serious losses in burley tobacco in Ontario and it became the subject of intensive study. It was found to have two insect vectors, the green peach aphid and the potato aphid, and the intensity of the disease fluctuated with the seasonal prevalence of these insects. Numerous burley varieties and lines were screened for resistance to the virus. None was found to be immune, but eventually the Station released a variety that had some measure of tolerance.

In 1963 a new burley variety called Harwin was licensed and released for commercial production. Under test on a range of sandy loam, gravelly loam, and clay soils the yield was 5–10% higher and the quality slightly better than the standard commercial variety of that period, Burley 1. Harwin showed more tolerance for etch virus than Burley 1 and good resistance to black root rot and brown root rot. It had a lower alkaloid content than other cigarette burley varieties. This represented Bob Haslam's final contribution at the end of a long career in tobacco research and it came a year before his retirement. Harwin possessed many of the desirable features that breeders had been attempting to build into burley tobacco for many years. It was also an answer to a more recent challenge to find a lower nicotine tobacco after it was shown that smoking is a health hazard.

The story of the changing aspect of the burley tobacco industry in Ontario as well as the research at the Station is well illustrated in the following list:

Sequence of burley tobacco varieties in production in Ontario

Period	Variety	Characteristic type	Black root rot resistance	Average yield (lb/ac)
1910 and previous	Red Burley	Drooping	Susceptible	925
	Gold Seal	Drooping	Susceptible	
	Broadleaf White Burley	Drooping	Susceptible	
1911-1915	Gold Seal	Drooping	Susceptible	1078
	Broadleaf White Burley	Drooping	Susceptible	
1916-1920	Broadleaf White Burley	Drooping	Susceptible	1009
	Gold Seal	Drooping	Susceptible	
1921-1925	Johnson's Broadleaf	Drooping	Resistant	1014
	Hope's Standup	Drooping	Susceptible	
	Station Standup	Drooping	Susceptible	
1926-1930	Station Standup	Semierect	Susceptible	1014
	Johnson's Broadleaf	Drooping	Moderately resistant	
	Standup Resistant	Erect	Moderately resistant	
1931-1935	Standup Resistant	Erect	Moderately resistant	1142
	Station Standup	Semierect	Susceptible	
	Judy's Pride	Erect	Susceptible	
	Kelley	Semierect	Susceptible	
1936-1940	* Harrow Velvet	Erect	Moderately resistant	1200
	Halley's Special	Semierect	Moderately resistant	
	Judy's Pride	Erect	Susceptible	
	Kelley	Semierect	Susceptible	
	Gay's Yellow	Semierect	Susceptible	
1941-1945	* Harrow Velvet	Erect	Resistant	1225
	Halley's Special	Semierect	Moderately resistant	
	Kelley	Semierect	Susceptible	
	Green Briar	Drooping	Susceptible	
	Ky 16	Erect	Moderately susceptible	
1946-1950	* Haronova	Erect	Resistant	1163
	* Harrow Velvet	Erect	Resistant	
	* Harmony	Erect	Resistant	
	Green Briar	Drooping	Susceptible	
1951-1955	* Haronova	Erect	Resistant	1577
	* Harrow Velvet	Erect	Resistant	
	* Harrow Broadleaf	Drooping	Moderately resistant	
	Green Briar	Drooping	Susceptible	
	* Briarvet	Erect	Moderately resistant	
1956-59 (4 yr only)	Burley 1	Erect	Resistant	1602
	* Harrow Velvet	Erect	Resistant	
	Green Briar	Drooping	Susceptible	
1961-1963 (3 yr only)	Burley 1	Erect	Resistant	1811
	* Harrow Velvet	Erect	Resistant	
	Green Briar	Drooping	Susceptible	
1971-1973	Burley 1			2217
	* Harwin Ky 21X10			

*Originated at the Research Station, Harrow.

Burley production in southwestern Ontario never returned to the levels it had reached in the 1920s or in 1947. It did reach 7000 ac in 1958, but because of the continuing decrease in demand for burley, stocks on hand were greatly in excess of need. It became necessary to curtail production through controlled acreage with the result that in 1960 no burley tobacco was permitted to be grown in Ontario. This situation caused great distress among primary producers.

Meanwhile there existed at the Station the anomalous situation of persistent research continuing to make outstanding progress in improving the production of burley to the extent that in 20 years the yields were doubled with a concurrent rise in quality. This was accomplished by a combination of new cultural practices and new, more suitable varieties that would respond to this method of culture. Growers were advised to:

- select a recommended cigarette variety,
- use a glass- or plastic-covered plant bed to get early seedlings,
- observe a strictly defined program of fertilizing the plant bed and field,
- transplant the tobacco seedlings early in the season,
- grow the crop on very fertile well-drained land and avoid clay soils,
- space the plants 16 in. apart in the row,
- top the plants high when the crop was well out in bloom,
- remove the large suckers just before harvest rather than do frequent suckering throughout the season,
- follow detailed recommendations for disease and insect control,
- observe a crop rotation in which tobacco followed wheat or rye, but did not immediately follow corn, soybeans, tomatoes, or alfalfa.

Over several years in a methodical fashion Mr. Walter Scott worked out the details of these new procedures as well as the improved techniques for harvesting and curing. The industry was slow to adjust to the new cultural practices, but by 1971 there was a complete acceptance and producers began to enjoy the benefits of increased returns. By this time most of the objectives of the research program had been attained, burley tobacco had assumed a position of relatively minor importance in Canadian agricultural economy, and the Station at Delhi had been designated as the principal tobacco research center for the Research Branch. The program at

Harrow gradually diminished and in 1974, when Mr. Scott retired, all active research came to an end. The industry that had prompted the formation of the Station had declined to a production of 8 million pounds of flue, burley, and black tobaccos in 1973 in Essex and Kent counties. It had been well served by the Station for more than half a century.

Cereal Grains

The Station was established in 1909 for the sole purpose of conducting research on the production of tobacco, but farming in those days was never a one-crop operation. From the very beginning it was known that a system of crop rotation was essential for the best use of the land and for the optimum production of tobacco. Cover crops were also necessary. Horses provided the motive power for all farm operations, and steers and dairy cattle were often maintained primarily for the ready supplies of manure for keeping up the fertility of the land. These animals had to be fed and cared for and the farm fields supplied the fodder. The whole system was established with the aim of maintaining tobacco production in a mixed-farming economy. Although for many years there was no official research project dealing with cereals or forage plants, these crops were regularly grown on the Station and test results were reported annually.

Early reports showed that in 1909 six oat varieties were planted and one field was seeded to registered Dawson's Golden Chaff winter wheat in cooperation with the Canadian Seed Growers Association. In 1912 a 3-yr rotation included cereal and corn sown with clover that was plowed under in the spring. The winter of 1911-12 was so severe that the winter wheat was killed and the fields were resown with spring wheat. In 1913 hairy vetch was mentioned as a cover crop, and in 1915 the cover crops were rye, hairy vetch, and clover.

Oats

The earliest record of any significant study of oats is a report by Mr. Digges for 1924 indicating that 13 varieties were tested in rod-row plots. The varieties are named, and yields recorded together with "days to ripen." The leading variety was Prolific O 77 with 1291 lb/ac and 90 days to ripen. Banner and O.A.C. No. 3 are also named for outstanding performance. The poorest variety, Laurel, yielded 760 lb/ac and required 87 days to ripen. It was mentioned as a footnote that owing to drought the varieties did not ripen normally and yields were seriously affected. Banner was the popular variety of the day and large quantities of registered seed were produced.

This modest program of variety testing was continued on about the same scale for many years. It represented a rather small segment of an immense cereal breeding program being conducted by the Cereal Division at the Central Experimental Farm in Ottawa where almost all the breeding work was carried out. The numerous varieties and strains arising from this program were distributed to most of the experimental stations across the country for local testing under the various climatic conditions. Striking differences in response were constantly observed; varieties that gave top performance in certain parts of the country were totally unsuitable in other areas. No variety was discarded until the researchers were completely certain that it could not be adapted to some particular agricultural location.

In 1926 the leading oat variety at the Station was Mansholts with a yield of 1704 lb/ac; Irish Victor P, O.A.C. 72, and Alaska also gave high yields. In 1927 Mansholts was again the best variety. By 1936 the variety tests indicated that early-maturing varieties outyielded the late varieties partly because they were far enough advanced to escape injury from the midseason heat. Alaska remained the highest-yielding oat over a 7-yr period and became the most popular variety in southwestern Ontario. In the early 1940s Alaska gave way to Ajax and Beaver because both had resistance to rust and a stiffer straw, a very important factor in Essex and Kent counties where lodging was frequently experienced on the more fertile soils. In the early 1950s an attempt was made to find varieties that were adapted to

different soil types and Ajax, Beaver, Clinton, and Simcoe were found to be superior. Yields by this time were being expressed as bushels per acre and the maximum yield of Clinton was 80 bu/ac.

In 1956 with the arrival of Dr. Howard Clark the testing and selection program was expanded in a search for varieties with wider tolerance for heat and greater strength of straw. Promising selections were made each year. Although no new oat variety ever originated at this station, many of the selections made here showed superior performance in comparative tests at several locations in the province. In 1962 the varieties Russell, Rodney, and Gary were being used. In 1964 Stormont was added to this list. By 1966 the plot yields of these varieties had climbed to 90 bu/ac. In 1967 yields were still further increased. In an advanced trial at Woodslee the still popular variety Gary produced 94 bu/ac. This testing program has continued to the present time.

Wheat

Wheat has always been one of the principal farm crops in Ontario. The early settlers in Essex County grew it for the use of their own communities and took it to the local grist mills to obtain flour. A good deal of wheat was made into whiskey. The most common variety of winter wheat grown then was White Flint and in general winter wheat was considered to be more valuable than the spring varieties. In the early years of the 19th century a brisk export trade grew up mainly to supply the British market; the grain from Essex County was shipped by water through the ports of Union and Albertville. Southwestern Ontario eventually became the largest winter wheat growing area in Canada.

In 1909 the popular variety was Dawson's Golden Chaff and a field of this wheat was grown on the Station in the first year. No further mention of winter wheat is made in any of the early reports, other than the brief reference to the 1911-12 disaster mentioned earlier, until 1924 when Mr. Digges reported briefly that 25 varieties were sown in a variety test. This was the beginning of a variety testing program directed by the Cereal Division in Ottawa similar to the program for oats. In 1925, 25 varieties of fall wheat were planted, but the plots

became flooded and then frozen so that all the plants were killed. This condition was general throughout the whole area in that season.

In 1926 the variety Minturki proved to be the highest yielder in the test at 3007 lb/ac. Dawson's Golden Chaff appeared high on the list and Ohio was lowest at 1330 lb/ac. In 1936 Dawson's Golden Chaff was still the most popular and the most suitable variety as a pastry flour wheat. Also named was Junior No. 6. Both were high-yielding, beardless, stiff-strawed, large white-grained varieties that were low in gluten.

In 1943 the winter wheat improvement work was expanded from simple variety testing to include the selection of desirable strains from segregating populations. The researchers, working in close cooperation with the Cereal Division, were searching for resistance to leaf rust and loose smut in white and red winter wheat, while still retaining the desirable features of high yield and good milling quality. Dawson's Golden Chaff still ranked high in quality and yield, but was very susceptible to rust. Two American varieties, Fairfield and Cornell 595, had some disease resistance and gave slightly higher plot yields than Dawson's Golden Chaff, a 3-yr average of 46 bu/ac. However, Fairfield was a red wheat that was too high in protein to be properly classified as a soft winter wheat. Cornell 595 remained a popular variety until the introduction in the early 1950s of Genesee, a variety of very similar qualities but having slightly higher yield ability. By 1960 Kent had become the highest-yielding variety and was also resistant to rust and smut, but it was a red wheat and never became popular. By 1962 the selection program was also concerned with resistance to septoria leaf blotch and powdery mildew in addition to the other diseases. The varieties Avon and Talbot were added to the list of leading winter wheats. By now average plot yields had reached 63 bu/ac. Yorkstar, another American variety, was tested and found satisfactory. In 1971 the variety Frederick was introduced and by 1974 it had become the most widely grown winter wheat in southwestern Ontario, which was now the only region in Canada where winter wheat was grown. Production in 1974 was over 19 million bushels from 420,000 ac. The variety testing and selection program has continued at about the same level up to the present time.

In addition to the longtime variety testing of wheat, the research program has included the study of several serious disease and insect pests. Sometime in the mid 1960s an insect known as the cereal leaf beetle surreptitiously crossed the water boundary of the Great Lakes from the United States and commenced an invasion of Ontario wheat fields to pose a potential threat that could have serious consequences to the wheat industry. The cereal leaf beetle had been known for many years in other parts of the world and had caused great damage in the past to grainfields in Europe and the United States. By 1967 this insect was found over an area of 70 sq mi in Essex County and by 1968 it had reached Elgin and Middlesex counties and was well established in Essex, Kent, and Lambton. An intensive study of its life history and habits was undertaken by Dr. Doug Miller. A sampling procedure was developed for assessing the density of the insect in the annual surveys, and in 1971 a foreign parasitoid was introduced as a control measure. However, contrary to the apprehensions of many people the cereal leaf beetle never did reach epidemic proportions in Ontario and was eventually found to be adequately controlled by naturally occurring predators and parasites.

In recent years the spindle streak mosaic virus has been a cause of much concern to the wheat producers. Annual plant disease surveys have indicated that it is fairly widespread. As yet no effective control measures have been found, but an attempt is being made to breed resistance into new varieties.

Forage Crops

Corn

Corn, or maize, is believed to have been indigenous to the Americas and widely cultivated by many tribes of Indians as a source of food that could be stored for winter use. Hence the name Indian corn. It was grown as a farm crop by the early settlers of Essex County. Although the grain was used to a certain extent, corn was grown then mainly as a fodder crop. In the 1890s the varieties in use had such colorful names as Mammoth Southern Sweet, Red Cob Ensilage, White Flint, Pearce's Prolific, Angel of Midnight, and Smutnose Longfellow. However, corn was one of the less important agricultural crops in Ontario until the twentieth century.

In the early years of the Station Indian corn was used as a rotation crop. In 1912 an excellent yield of 145 bu/ac was obtained and the average yield for the local farming area was 115 bu/ac. In 1913 the varieties used were Golden Glow and Improved Leaming. The fertilizer program consisted of 12 loads of manure per acre, 100 lb muriate of potash, and 275 lb superphosphate per acre. Because of hail damage the yield was reduced to 100 bu/ac. The modern farmer or researcher would probably be quite incredulous and skeptical about the yield figures quoted from these old reports until he realized that the word bushel meant a bushel basket filled with ears of corn, or unshelled corn as we call it today. The old timers' working rule used to be that two baskets of ears yielded one bushel of shelled corn. In 1915 the varieties grown were Golden Glow, Yellow Dent, and Leaming and it is duly noted that "Mr. Barnett does not consider the application of fertilizer to be an economical practice in corn growing."

The value of Indian corn as a succulent food for livestock had long been appreciated, and the low cost per ton of dry matter secured by growing corn had led to a very considerable increase in corn acreage in many parts of Canada. However, many farmers held the view that it was not a suitable crop for their district because of soil and climatic conditions. This led to a search for ways to overcome this restriction. It was shown, mainly through demonstrations on illustration stations, that by selecting

suitable varieties corn could be much more widely grown than was ever thought possible in Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and even in Saskatchewan and Alberta.

At the same time a considerable amount of breeding work was begun, and when the Station was expanded in 1923 a large part of the Department's breeding program was established here under the direction of Dr. Fred Dimmock of the Central Experimental Farm in Ottawa. It had been found that the crossing of unlike varieties of corn gives hybrid plants that in the first generation possess many of the desirable characteristics of both parents. For example, a cross between one of the early-maturing but low-yielding flint corns and one of the later-maturing and higher-yielding dents gives first-generation plants that are almost as early maturing as the flint and yet almost as high yielding as the dent parent. However, these desirable characteristics are not perpetuated in succeeding generations and it is always necessary to obtain hybrid seed by controlled pollination. Dent corn is the name given to those varieties that have a high percentage of soft starch in the endosperm; it shrinks upon drying, resulting in a shrunken dimpled appearance on the crown of the kernel. Flint corn has a higher percentage of hard horny starch, which does not shrink and produces no dimple on the kernel.

The Station was designated by the Dominion Agrostologist, Dr. G. P. McRostie, as the center where improved strains and varieties would be originated to be disseminated as rapidly as possible to the various agricultural zones for which they were best suited as indicated by the illustration station test programs. Thus began the hybrid corn era and the breeding program, which over a long period of years made such an outstanding contribution to the corn industry in Ontario, Canada, and other parts of the world.

In 1924 over 600 inbred strains of corn, representing early, medium, and late types of both flint and dent varieties, were included in the breeding block. They were again inbred; the work necessitated the making of about 15,000 artificial pollinations. About 300 strains were selected for further work. The variety test included commonly grown varieties, and records of yield both for fodder and grain were made. Some rather remark-

able results were obtained from the corn hybridization program. Seed from a cross between Howe's Alberta, a small flint corn that matured in 92 days, and Wisconsin No. 7 that matured in 135 days produced hybrid plants that matured in 95 days and gave a yield of both fodder and grain almost equal to that of Wisconsin No. 7, the larger and later parent. Other hybrids gave equally exciting results. Work was begun on a classification of corn varieties grown in Canada. For this purpose 160 varieties were grown and examined for numerous characters so that they could be classified into seasonal groups.

This ambitious program made excellent progress and was continued at about the same level for 3 years, but in 1926 it was overtaken by disaster in the form of a heavy infestation of the European corn borer. This pest was not unknown in Ontario and observations had indicated that populations had been building up for several years. Many of the tests had to be abandoned, but a good number of results were salvaged. Observations were made of those varieties and strains that appeared to offer some resistance to this insect, and work was immediately started to find some solution to the problem. The following year the breeding program was greatly reduced and some of the work was transferred to Ottawa. In succeeding years the corn borer attacks continued unabated and threatened to eliminate the growing of corn in southwestern Ontario. One American corn specialist predicted that corn would never again be grown in Ontario. However, the research and observations continued and it was discovered that by planting late it was possible to escape the worst effects of the annual infestation. Corn was planted at weekly intervals not only to determine the effect of late planting on the amount of borer infestation, but also to find out just how late the corn could be planted in order to secure a high yield coupled with good maturity. The corn borer presence became the most important factor in corn production, but over a period of years it was observed that there was a great fluctuation of infestation. The following relative figures calculated from actual counts illustrate this point very clearly: 1929, 14.0; 1930, 2.0; 1931, 0.85; 1932, 1.33; 1933, 2.83; 1934, 0.16; 1935, 0.63; 1936, 1.66. The results of the late planting experiments over a number of years indicated that a considerable reduction

of borer infestation could be achieved by delaying the planting date until June 1. Further delay would result in immature corn at harvest unless early-maturing strains were used and this indicated the direction the breeding program had to take. In spite of the threat posed by the corn borer problem, the corn acreage gradually increased in Ontario up to 1935 and the hot, dry weather during the egg-laying period of the borer moth remained the principal method of control until the advent of DDT in 1950.

Meanwhile the breeding program continued. In the 1923–25 period maximum yields in the test plots had been about 55 bu/ac of shelled corn. These yields were quoted on a moisture-free basis. From 1927 yields were expressed on the basis of corn containing 15% moisture and in that year maximum plot yields had reached 75 bu/ac although average farm yields were only about 29 bu/ac. Continuous inbreeding was beginning to result in the isolation of desirable inbred lines and a program of recombination was commenced to obtain hybrid vigor. In the early 1930s a considerable change took place in the character of corn being grown in the district, particularly the yellow dent class of corn. This came about principally through the mixing of strains in an attempt by growers to produce strains that could be planted later than normal and still mature before frost. The Corn Improvement Committee was formed to control this development and to direct the collection and testing of numerous local strains. It worked in cooperation with the Canadian Seed Growers Association and the Station and performed a useful function in connection with seed registration. This group was the forerunner of the Ontario Corn Committee, which was formed in 1938 by the Minister of the Ontario Department of Agriculture in consultation with the Dominion Department of Agriculture.

During the 10-yr period 1937 to 1946, there was almost a complete changeover from the use of open-pollinated varieties of corn to that of hybrids. Prior to 1938 very little hybrid corn was grown in Ontario even though research had been going on since 1923 and had clearly demonstrated the general superiority of hybrids. It was proved that they would outyield open-pollinated varieties of

similar maturity rating by 10–20% in addition to having stronger root systems and sturdier stalks resulting in less lodging and more tolerance for the corn borer. By 1941 about 75% of the corn acreage in Essex and Kent counties was planted to hybrid seed due in large part to an intensive advertising campaign of the commercial hybrid seed producers and much encouragement from the Ontario Corn Committee and the federal and provincial departments of agriculture. By 1946 the acreage in hybrid corn was 95%. Corn was now grown in Essex and Kent counties almost exclusively for grain, but the use of hybrids for fodder corn was growing and was extending rapidly eastward into what came to be known as the ensilage corn area.

The operation of a corn breeding program for the development of new hybrids became a very complex procedure. When Dr. Buckley took charge of the program in 1939 it was being conducted along two lines, the improvement of open-pollinated varieties and the development of inbreds and hybrids. The first step in the development of a hybrid is the establishment of inbred lines by self-pollination for five or six generations accompanied by rigid selection. Hundreds of inbred lines had been developed, but only 20 had been retained for breeding.

Both single and double crosses were produced for testing on a trial and error basis, but in 1941 a new system was introduced of predicting double cross yield and maturity values from single cross test data. It became possible to select the best double cross combinations before crossing and before submitting them to test. Many of these were tested in different parts of Ontario. The breeding program of the Station was just beginning to bear fruit. Three hybrids, designated Harvie 222, 300, and 333, were licensed for production and sale in Canada and performed exceptionally well in Ontario, New York State, and Wisconsin. The second of these was later renamed King 300.

The Canadian producers of Wisconsin hybrids obtained their crossing stocks from the University of Wisconsin during the first few years of hybrid corn production in Canada. In 1940 the Ontario hybrid seed producers were notified by the authorities in Wisconsin that no further crossing stocks would be exported. The Ontario Corn Committee moved quickly to avoid an embarrassing situation and arranged to have inbred

lines maintained and multiplied at the Station. The single cross parent stocks were made up at Ridgeway. The Ontario Corn Committee became responsible for sponsoring the annual hybrid corn tests and for preparing a recommended list of hybrids. By 1946 over 50% of the hybrid seed planted in Ontario was the product of this program. A zone map was prepared each year showing the hybrids best suited to each zone on the basis of heat units required to bring the corn to maturity.

By 1954 corn had become a leading crop in Essex and Kent counties and was rapidly gaining in importance in Lambton, Middlesex, and Elgin counties. The provincial average yield of shelled corn increased in 10 years from 43 to 55 bu/ac because of improved hybrids and better cropping practices and yields of over 100 bu/ac were not uncommon in some areas. The newest research development was the incorporation of cytoplasmic male sterility into some inbred lines; this eliminated the necessity of detasseling in hybrid seed production and was an important labor-saving procedure. However, the technique never did come into general use. The breeding work continued unabated under Dr. Buckley and four new hybrids were released from the program and licensed. The work of the Corn Committee was now well organized and remained an important factor in the whole breeding program.

The corn borer problem was still very much alive and resistance through breeding was being sought. In 1950 a study of chemical control was started and in a few years recommendations were issued for spraying with DDT, parathion, and Ryania.

A disease known as root and stalk rot of field corn became important in southwestern Ontario in 1949. During the next 25 years it became a major project in the corn program at the Station. The first approach was an attempt to develop inbred lines resistant to the disease. When Mr. Mortimore assumed leadership of the corn program in 1958, he began cooperative studies of the etiology of the disease and the mechanism of inhibition. Two main organisms were identified as pathogens. An elaborate biochemical procedure disclosed the presence of a series of five phenolic compounds in corn roots that were believed to be implicated in the inhibition mechanism. But this proved to be an elusive lead.

Root and stalk rot attacks corn late in the growth season after the plant has reached physiological maturity. There is a subsequent breakage of the stalk a short distance above the ground and a particularly difficult problem for mechanical harvesting results. The situation is further complicated in that corn is left standing in the field after most tissues of the plant have become senescent to permit the kernels to dry down naturally to a commercially acceptable moisture level. In his continuing observation of the disease Mr. Mortimore noted that it appeared to be intensified by a variety of stress factors during growth, and he became convinced the disease was predominantly physiological in nature and that the pathogens were largely coincidental. Following a study of the sugar content of the pith tissues that confirmed his ideas, he proposed the theory that root and stalk rot of corn is a physiological disorder. The plants became predisposed by stress factors to the onset of premature senescence characterized by rapid disappearance of life-supporting reserve carbohydrates and the consequent invasion of necrotic tissues by naturally occurring saprophytic organisms. Glenn Mortimore's keen insight into the nature of this disorder was not recognized by his colleagues at other research centers in Canada or abroad, and it was several years before this concept was generally accepted by corn researchers.

A vigorous breeding program was now pursued and all the physiological and morphological factors and cultural practices that might contribute to increased plant vigor were assessed and employed in making selections for resistance to stalk rot. These included leaf area, plant dry weight, pith density, plant spacing, irrigation, photosynthetic efficiency, and others. Year after year the corn breeding program emphasized isolation of inbred lines resistant to root and stalk rot and to the European corn borer. From time to time some of these lines were released to commercial seed companies and much of the genetic material found its way into hybrid corn in many parts of the continent. Over a period of 30 years 12 outstanding hybrids were produced by Glenn Mortimore and of the hundreds of inbred lines 36 were widely distributed on request to private and public corn breeders in Canada, the United States, and France. Many breeders

reported that these inbreds made significant contributions to their breeding programs. Between 1969 and 1974 the program led to the release of seven good hybrids with stalk rot resistance.

In later years a number of other problems in the corn industry were investigated. In 1964 a disorder that displayed a red striping of the kernel pericarp appeared. It was later called kernel red streak and eventually was believed to be caused by a virus with possibly an insect vector. Southern corn leaf blight occurred for the first time in Canada in 1970 and was the cause of widespread concern. It never reached epidemic proportions but was closely observed by researchers in succeeding years. The corn leaf aphid and the corn rootworm were two insect pests that began to cause considerable damage to the crop and methods of control were diligently sought.

In the early 1960s a new idea was promoted that with some of the newer hybrids a greatly increased yield could be obtained by increasing plant populations with row spacings as narrow as 20 in. The practice received limited acceptance, but research at the Station helped to keep the matter in proper perspective and indicated that the recommended planting rate of 18,000–20,000 plants per acre in 38-in. rows was the best. Also in the 1960s an organized weed control research program was started. Weed control had always been practiced with the traditional procedures, but with the advent of many new herbicides it became necessary to test these in a controlled program and to formulate recommendations for the guidance of corn producers.

For 50 years the Station has been the principal corn research center in Canada, and the achievements of the scientists have contributed to the fact that corn has become such an important item in the national economy. Today grain corn is grown in almost every agricultural area of Ontario. The 1974 crop amounted to 110 million bushels produced on 1¼ million acres. The general average yield was 80–85 bu/ac and some of the best yields were 150 bu/ac. For the past 3 years the corn crop, due to phenomenal prices, has held the leading place in farm value in Ontario, supplanting even tobacco, which for many years was the top money-maker in this province.

Soybeans

The soybean, or soyabean, is a leguminous plant and native to southeast Asia. It yields an edible oil and flour used for cattle and human food. The whole plant can also be used for hay. Although a staple product of China and Japan for many centuries, soybeans were not grown in Canada until the early years of the twentieth century and did not become an economically important crop until after the Second World War.

When soybeans were first introduced, the Department of Agriculture took an interest in finding suitable varieties for Canadian farmers from a number of foreign sources. A very modest variety-testing program was started at the Station by Dr. Dimmock in 1924 and continued until 1929 when it was taken over by Mr. Owen. The first hybridizations of soybeans were made in 1931. In considering the characters of the numerous varieties that have been tested over the years, it appears that hybridization and reselection were the principal means of evolving strains adapted to various districts and uses. By 1933, after years of testing and selecting, four varieties were recommended to meet the requirements of various sections of Ontario, namely Mandarin, O.A.C. 211, Manchu, and AK (Harrow). The latter was a strain developed at the Station and was particularly suited to Essex County. It matured in 127 days and was the tallest and highest yielding. Thereafter the Station produced elite stock seed in sufficient quantities to supply the demand. All varieties were tested at that time for hay as well as for seed and this required certain particular procedures. The beans were drilled in 7-in. rows and the crop was cut for hay when the pods were about half filled. The best method for curing hay was to cut it in the morning after the dew had dried off and rake it into windrows the same evening. Curing was completed in the windrow or in small cocks. This eliminated raking when the hay was too dry and reduced the loss of leaves. Many tests of the time of planting were made and it was concluded that the most suitable period was May 15 to 20. Tests of row spacing were also made and numerous strains were tested for oil and protein content. In 1934 the breeding program was extended by making use of greenhouse facilities in the winter months with the aid of artificial light.

During the 10-yr period up to 1946 an extensive breeding program was conducted in an effort to produce new improved varieties with a suitable maturity period, high yielding ability, high content of oil with the proper color, a high-stemmed sturdy plant habit, and resistance to disease. At the same time there was a great expansion in the soybean industry in southwestern Ontario due to the increased requirements for oil and protein brought about by wartime conditions and the higher prices. The crop was well adapted to the climate and soil of the district and its leguminous properties had an appeal to farmers from the standpoint of soil fertility. The establishment of an additional soybean oil extraction plant in Ontario increased the crushing facilities beyond the indicated potential producing capacity of the district.

Crosses were made to obtain new segregating material for selection purposes. Backcrossing was employed and hundreds of pollinations were made each year by hand. It was a slow tedious process, but the researchers persisted diligently. The crosses were carried to the second generation and hybrid lots were bulked until the fifth or sixth generations; eventually several thousand selections were made and a number of promising strains were obtained. Some of these were multiplied and stabilized. In 1943 Mr. Owen released his first new variety called Harman, which was well received by the industry and was soon widely grown. It was an earlier-maturing soybean.

The variety Harman contributed largely to the early expansion of the soybean industry, but it was soon followed by other new introductions: Harley in 1948; Harosoy in 1951, which was destined to be the most famous of them all; and Hardome in 1953. Harosoy matured a little earlier than Harman and was well adapted to growing in Essex, Kent, and Elgin counties and the southern part of Lambton and Middlesex. Hardome matured about 2 weeks earlier than Harosoy and was better suited to areas farther east in Ontario.

Hardome was awarded the World's Championship Seed Sample in the 1953 Royal Winter Fair at Toronto. Harosoy won the champion award at the Royal in 1951 and at Chicago in 1953. It won the reserve championship at Chicago in 1952 and at the Royal in 1953. In 1954 Harosoy was awarded the world cham-

pionship at the Royal and the reserve award at Chicago. The Station was responsible for the maintenance of foundation stock seed of the varieties produced there and provided stocks for elite and registered seed growers. In 1953 Harosoy and Harman accounted for 95% of the total production of registered seed in Ontario.

In 1953 and 1954 a physiological disorder of soybeans known as manganese deficiency became quite widespread in Essex County, particularly on the clay soils. However, recommendations were soon being made to spray the plants with a dilute solution of a manganese fertilizer and this usually brought about a complete recovery when applied soon enough. Experiments in row spacing, rates of seeding, and alternate planting continued to be a part of the research program.

In the mid 1950s a destructive root and stock rot of soybeans began to cause grave concern for the industry in Ontario. After intensive study, the fungus *Phytophthora megasperma* was identified by Dr. Hildebrand as the causal organism. This was an original discovery and Dr. Hildebrand's name has now been officially appended to the scientific name of this organism to indicate that he is credited as being the first person to identify and describe it. It was found that most of the commonly grown varieties and all of the Station introductions except AK (Harrow) were highly susceptible. It was also observed that incidence of the disease was related in some way to soil compaction. Afterwards the obtaining of resistance to *Phytophthora* became one of the main objectives of the breeding program. In 1963 the Station cooperated with the United States Regional Soybean Laboratory in Urbana, Illinois, in the testing and release of Harosoy 63, a backcross strain of Harosoy resistant to *Phytophthora*. About this time a new technique for selecting high-yielding plants in a segregating population was studied. Plants with a high bean-to-straw ratio were selected and it was found that these plants tended to be associated with high yield. This provided breeders with a new criterion for judging the value of new strains.

In the early 1960s the study of growth regulators became fashionable and there were hopes that the substance TIBA (triiodobenzoic acid) might stimulate great increases in crop yield in soybeans

and other crops. Although the scientists were skeptical of the value of growth regulators, the technique was tested at the Station and on several district farms. The results fell far short of expectations and as an aid to agriculture the idea faded into history.

It had been recognized for a number of years that one of the main problems in soybean production was the poor response to the direct application of fertilizer. This problem was attacked by starting a long-range study of the physiology of the soybean plant, which eventually became closely integrated with the breeding program. In a series of brilliant researches Dr. Buttery, the physiologist, and Dr. Buzzell, the geneticist, cooperated in an interesting study of biochemical genetics. First the soybean plant was subjected to an intensive growth analysis to learn something of its photosynthetic efficiency. Then the effect of the day length on different cultivars was studied because soybeans were known to possess a sensitive photoperiodic response mechanism. This was found to be controlled by a major gene. Then peroxidase in seed coats was studied and its genetic inheritance was traced to a single main gene. A biochemical spot test was developed that was a useful tool for the plant breeder in identifying genotypes. An elaborate study of the leaf flavonoids was undertaken. Eventually nine different flavonol glycosides were identified and their inheritance determined. This enabled the researchers to separate as many as 100 soybean varieties into 15 specific groups. All these studies provided background information that helped to explain the varying behavior of different cultivars and contributed to the progress of the breeding program.

In the meantime the breeding program itself continued unabated. Dr. Buzzell, who had assumed responsibility for this work in 1962 when Mr. Owen retired, and Dr. Aylesworth produced the variety Harwood, which was licensed and released in 1970. This variety was resistant to *Phytophthora* and gave slightly higher yields than Harosoy 63; it was shorter and more resistant to lodging and the seeds contained 21% oil and 41% protein. Soon it became the important variety of commerce and when soybeans were being exported to Japan in 1974, the Harwood bean was requested by name.

A further program with soybeans that has been pursued in recent years is the search for adequate weed control procedures. One particularly obnoxious invader is a large broad-leaved plant called velvetleaf, which can cause serious crop losses if allowed to proliferate unchecked. Continued research has produced a wealth of information on the habits of weeds and a set of herbicide recommendations that is updated annually and enables the soybean grower to meet the threat of weeds.

The following table illustrates the spectacular rise of the soybean industry in Ontario and the contributions of the Station in keeping pace with this growth.

White Beans

The familiar white bean of agriculture and commerce belongs to the common leguminous bean group *Phaseolus vulgaris* L., which includes the dry beans: the white bean (pea or navy bean), kidney bean, pinto bean (yellow eye); and the fresh beans: salada bean, runner bean, snap bean, French bean, and haricot bean. The white bean is the one that is used in the preparation of those well-known Canadian dishes pork and beans or brown baked beans; the brown color appears on cooking because of added dextrose or molasses. White beans have been a commercial agricultural crop in southwestern Ontario for many years, particularly in Kent and Middlesex counties, but almost none are grown in Essex today.

Studies were begun at the Station in 1956 on the development of commercially acceptable varieties with resistance to anthracnose, root rot, and virus diseases. The varieties in most common use at that time were Sanilac, Seaway, and Michelite. Saginaw appeared at a later date. A limited amount of variety testing was carried out by Dr. Clark. A breeding program was continued on a modest scale for some years with emphasis on improving the agronomic and productive characteristics of the currently popular varieties. In 1966 the variety Harkell was named and licensed for sale in Canada.

Development of the Soybean Industry in Ontario

Year	Acreage	Value (\$)	Harrow introductions
1939	8,000		
1941	10,000		
1943	36,000	981,000	Harman
1946	60,000	2,370,000	
1948	94,000	4,200,000	Harley
1951	155,000	10,570,000	Harosoy
1953	231,000	12,280,000	Hardome
1954	245,000	11,470,000	
1959	248,000	12,680,000	
1960	256,000	11,500,000	
1961	212,000	14,900,000	
1963			(Harosoy 63)
1967	290,000	21,600,000	
1970	335,000	28,870,000	Harwood
1972	405,000	53,703,000	
1973	470,000	79,407,000	
1974	415,000	70,057,000	Harlon

In 1967 bacterial blight and bronzing of white beans came under scrutiny. The latter was soon found to be associated with air pollution that under certain atmospheric conditions results in an abnormally high concentration of ozone. Numerous protective sprays were tested, varietal differences in sensitivity to bronzing were observed, and the effect on leaf senescence and yield was measured.

In 1967 Dr. John Aylesworth took over the breeding program and expanded it considerably. More work was done in greenhouses in the winter to multiply seed and to double the number of generations produced each year. Disease problems continued to be a main feature of the breeding plan and annual observations of the occurrence of bronzing supported the contention that it was caused by atmospheric ozone. Cooking quality and total protein content were now included as criteria for assessing the desirability of new lines. In 1973 a new variety, developed by Dr. Aylesworth, was licensed and released to seed growers. It possessed resistance to three races of anthracnose and to two strains of common bean mosaic and considerable tolerance for root rot. This variety named Kentwood was less affected by bronzing than other common ones, matured earlier, and produced higher yields. It was a bush type with slightly larger seed and tended to hold its pods off the ground, which was a distinct advantage.

The acreage of white beans in Ontario remained very steady for many years. From 1941 it fluctuated around 75,000 ac until 1971 when it suddenly increased and reached 122,000 ac in 1973. The orderly marketing of this crop has been carried out by the well-managed Ontario Bean Producers Marketing Board and more than 70% of the crop goes to foreign markets, mainly Great Britain. Dr. Aylesworth has cooperated closely with the bean producers in his research program and has made a substantial contribution to the advancement of this industry.

Fruit and Vegetable Crops

Although peach and apple orchards had been planted and maintained by the best methods of husbandry since the Station was started, investigational work in horticulture was not started until 1923. Attractive ornamentals were always a part of the farm scene. The first serious testing with apples consisted of a program of top grafting on old trees. At the same time an extensive variety testing program with vegetables was started for sweet corn, radishes, lettuce, peas, beans, carrots, beets, celery, onions, and parsnips. The first reports do not list tomatoes, but they were soon added to the tests and in 1925, 24 varieties were tested and 40 varieties of sweet corn. Variety tests were also carried out that year with potatoes and peanuts. In 1927 fertilizer tests with potatoes were started. The variety testing program soon became narrowed down to a more concentrated examination of a smaller number of commercially important vegetables, mainly tomatoes, asparagus, sweet corn, and lima beans. Fruit investigation included studies of strawberries, raspberries, grapes, and muskmelon, although agriculturally the melon is classed as a vegetable. A limited amount of work was done on the study of cultural practices and fertilizer requirements of some of the vegetable crops, but the whole horticultural program continued on a rather modest scale in comparison with research on other crops until the arrival of Mr. Brian Harrison in 1937.

At this time peach growing in southwestern Ontario was becoming more important; one reason was that the climate gave a slight advantage over that of the Niagara District in terms of earlier maturity. Mr. Harrison immediately launched into an extensive peach variety testing program and by 1946 there were 80 varieties in the Station orchards. The market demand was for an attractive yellow-fleshed freestone peach that could be shipped to distant markets and sold locally on roadside stands or to the canning factories. The best varieties were also to be early ripening and able to withstand severe frost and cold. This investigation marked the beginning of a study that eventually became one of the

main research programs of the Station and exerted a major influence on the peach industry not only in Essex County, but in other parts of Canada and the United States. It was interrupted for a time during the Second World War, but was resumed and broadened to include a study of bacterial spot disease, which was causing some concern in the area. Fortunately an adequate measure of varietal resistance was eventually encountered. It came to be recognized after some time that the peach rootstocks currently in use were not providing proper protection from damage due to low temperature, root aphids, nematodes, and root toxins. A search was started for new and better rootstocks and many sources were tested, including apricot, which was not considered at that time to be a commercially profitable fruit by itself. Another interesting study was a comparison of chemical and mechanical methods of peach thinning. Each annual report contained a wealth of observational data on all facets of the growing of peaches.

In the summer of 1951 an early-maturing mutation of the Redhaven peach was located by one of the local fruit growers, Mr. Garnet Bruner, in his own orchard. The mutating branch was brought to the attention of Mr. George Whaley of Olinda who suggested that it be shown to Mr. Harrison for guidance as to its possible use. This was done in 1954. An examination of the numerous fruits on the branch indicated that it was of the sectorial chimera type with ideal on-type fruit on shoots emerging from a narrow strip on the branch and off-type fruits on shoots at the perimeter. A wide variation in fruit appearance was evident and was caused by maturity differences and shape abnormalities. Buds were taken from shoots associated with on-type fruits differing from the parent Redhaven only in maturity and a number of trees were budded at the Station and elsewhere. The resulting fruits were checked and selected for further budding. In 1957 two separate times of ripening were evident representing two possible strains. The name Garnet was proposed for one that ripened 10 days in advance of Redhaven. This strain was propagated in quantity and released for distribution in 1958, but the name was changed to Garnet Beauty because prior use of the name Garnet had been discovered. This variety proved to be very useful and popular and is still being

grown in some areas. Although it did not originate as the result of a breeding program at the Station, it was developed to the point of usefulness by Mr. Harrison with the assistance of Mr. Alvin Sellick and became the first peach variety to originate through the Station efforts.

In 1951 Dr. Koch began a collaborative study of the peach replant disorder, which had been recognized for many years and was beginning to cause widespread concern in Essex County. For several years it occupied a major place in the peach program at the Station.

Although the peach investigations comprised the largest part of the fruit research program, work was continued with grapes until 1939 and with raspberries for a considerably longer period. Apple orchards were maintained and several studies of lesser importance were conducted including a study of a form of winter damage known as southwest injury or sunscald.

The vegetable research program was taken over by Mr. L. F. Ounsworth in 1942. He started a program of tomato breeding, which was interrupted for 4 years by war service but continued with great vigor later. The commonly grown early tomato was a variety named Bounty, which had many fine characteristics. The object of the breeding program was to produce disease-resistant varieties or hybrids more suitable to the district. This program resulted in the production of a superior tomato, which was named Harrow and released in 1951. It was a consistently high yielding early tomato that was conspicuously free from cracking, a disorder that reduced the quality of many common varieties. Les Ounsworth pursued this tomato breeding program along with variety testing as long as he remained. This was an extremely varied study because different types and varieties are required for the different uses. Processing tomatoes are different from the early market or the late market tomatoes and all of these are quite distinct from greenhouse tomatoes. Numerous characteristics of this interesting fruit were examined including earliness, size, firmness, freedom from cracking, vitamin C content, color, and resistance to diseases such as verticillium wilt, fusarium wilt, mosaic virus, and bacterial canker.

Insect control, nutrition, and nematode damage were also studied. An inbred selection derived from hybridization was named Harbon and released in 1966. It was an excellent tomato in many respects, but it could not compete in yield with several other commonly used varieties when grown on a clay soil. The tomato breeding program was discontinued when Les Ounsworth left the Station in 1969 and has not been resumed. In the meantime some of the larger processing companies have assumed a share of the responsibility for producing new varieties of processing tomatoes.

Mr. Ounsworth was also involved in a melon breeding program, which was started in 1942 with the aim of introducing resistance to wilt and increasing earliness. This was accomplished by 1954 with the introduction and naming of the Harper hybrid. This hybrid was resistant to fusarium wilt, produced a good yield of relatively early fruit, was a good shipper, and had high quality with excellent flavor. However, it was subject to powdery mildew. It quickly became very popular and has remained a favorite with growers ever since, particularly on account of its ability to withstand damage during handling and shipping. Many more selections were made over the next 15 years of breeding, but none could equal the Harper hybrid. Fusarium wilt continued to be one of the most serious problems facing melon growers in Essex County. An intensive study of the etiology of the melon wilt disease and a search for practical measures to control it was carried on for many years in a series of meticulous researches by Dr. Ralph Wensley.

With the formation of the Research Branch in 1959, the horticultural research program began to take on a new appearance. Dr. G. M. Weaver replaced Mr. Harrison as head of the horticulture section. He undertook a peach breeding program to incorporate resistance to peach canker and to bacterial leaf spot into commercially acceptable varieties and to increase the level of winter-hardiness. A search was made for desirable breeding parents and the program soon gathered momentum. Two plastic greenhouses were erected for the production of seedlings and 15,000 of these were set out annually in nurseries for three successive years. The amount

of land devoted to peach orchards was greatly increased and the research developed many new facets. Variety and thinning trials were carried out. A survey of peach canker in the orchards of the district was made. Insect problems were under continuous study. The peach replant problem continued to receive attention. 1963 was a bad year for peaches in Essex County. Winter temperatures as low as -17°F resulted in severe damage to many orchards. This spurred on the search for new winter-hardy varieties with both bud hardiness and root hardiness. Methods for identifying and testing this characteristic were developed. Electrical resistance of woody stem tissue seemed to provide a useful index. Artificial freezing at controlled temperatures with subsequent inspection for mortality rates was carried out also and this became a standard technique. At a later date exotherm analysis was also used along with this procedure.

In conjunction with the breeding program an intensive study of several insect and disease problems was conducted. The peach tree borer, the lesser peach tree borer, and the oriental fruit moth were the three leading orchard pests that received much attention from Mr. Boyce and Dr. Foott. The life histories and habits of these insects were studied and many methods of control were tested. Peach canker, also called perennial canker, was intensively studied and some attention was given to crown gall. Many of the pest control studies included annual surveys of the commercial orchards in the surrounding district.

In 1964 Dr. Layne started research with apricots. Sufficient interest had been shown by local growers and processors to justify a varietal improvement program. The first two problems involved a search for resistance to bacterial spot and a study of the effect of temperature on microsporogenesis to discover why so few fruit were being set. Eventually the study developed into a full-fledged breeding program, which was carried on in conjunction with the peach breeding.

Almost all phases of tree fruit production were included in the peach and apricot investigation over the next 10 years. Under the direction of Dr. Weaver until 1969 and then under Dr. Layne, many of the scientists contributed to this program. Mr. Boyce continued to work on fruit insect control until his retirement in 1969. Dr. Wensley and Dr. Dhanvantari studied peach canker, crown gall, bacterial leaf spot, and peach X-disease. Dr. Saidak developed effective methods of weed control in peach orchards and conducted a long-term study of the persistence of herbicide residues. Nematode damage was studied and control measures were applied. Dr. Fulton contributed to the program in a series of soil management studies and irrigation experiments. Dr. Ward collaborated in a study of peach rootstock influence on leaf nutrient levels of scion varieties and a study of the relationship between winterhardiness and carbohydrate metabolism in twigs and buds during the winter months.

The main thrust of this wide-ranging program was an attempt to produce new varieties that would possess all the desirable factors of resistance, high quality, and healthy growth and would have the desirable processing characteristics required by the local canning companies. To assess this latter factor a well-equipped processing laboratory was established on the Station in 1965. Peaches from many experimental trees were canned, stored, and subsequently tested by official taste panels for eating quality, color, texture, and flavor.

The breeding program began to produce tangible results in 1967 when Dr. Weaver named and released two new peach rootstocks, Siberian C and Harrow Blood. Following this the output of new varieties became prolific; Harbelle and Canadian Harmony appeared in 1968 and Harbrite in 1969. After Dr. Layne assumed leadership of the program, there was Harken in 1970, Harbinger in 1971, and two new nectarines Harko and Hardired, and one new apricot, Haggith, all in 1974. Dr. Layne's work has been widely recognized in Canada and also in Europe and the United States.



Harko nectarine released in 1974.

Breeding of pears was begun in 1962 to incorporate resistance for fire blight into commercially acceptable varieties. This program of Dr. Layne gathered momentum slowly, surveys were made, and breeding material with some measure of resistance was assembled. Several thousand seedlings were inoculated and the long slow process of selection was started. New screening techniques were devised; much preliminary work was done in the greenhouse. In one year over 8000 seedlings representing 39 progenies from controlled hybridizations and 6 from open pollination were screened for resistance to fire blight. The pear nurseries and orchards on the Station began to increase in size. No new varieties have originated from this program, but when Dr. Quamme assumed leadership in 1971 it was broadened to include a study of the epidemiology of fire blight and tests of some methods of chemical control. A testing program was also started to select a winter-hardy dwarfing rootstock that lends itself to easy clonal propagation.

The vegetable research program was greatly expanded after 1959 and continued to occupy an increasingly important place in the activities of the Station. Numerous insect and disease problems were studied, methods of control were devised, new pesticides were tested, and the results of this research appeared in the annual plant protection recommendations that are coordinated and published by the Ontario Department of Agriculture and Food. The list of these accomplishments is impressive and it is only possible to name the various studies here in an approximate chronological order:

- northern root-knot nematode in carrots;
- root-lesion nematode in eggplants;
- fusarium wilt in muskmelons;
- onion bloat caused by the bulb and stem nematode;
- breeding early tomatoes for resistance to verticillium and fusarium wilts, anthracnose, and mosaic virus;
- powdery mildew of greenhouse cucumbers;
- cucumber necrosis virus;
- greenhouse whitefly and two-spotted spider mite;
- pepper maggot;
- verticillium wilt in eggplant;
- root-knot nematode in greenhouse tomatoes and cucumbers;
- verticillium wilt in early potatoes;
- European corn borer and green peach aphid in peppers;

- mite control in greenhouse plants;
- root-rot fungi in greenhouse soils;
- bacterial canker of tomatoes;
- fusarium wilt and mosaic virus in greenhouse tomatoes;
- aphids on early tomatoes;
- nitidulid in tomatoes; and
- cabbage looper and cabbage worm.

In recent years as both scientists and laymen became more conscious of the possible dangerous side effects from pesticide chemicals, there has been a reaction against the wide use of these materials for plant protection. This reaction was too extreme and many ardent spokesmen for public safety have seen danger where no danger existed. However, scientists in this field have met the challenge and since 1965 a program of pesticide residue monitoring in food-stuffs and in the environment has been in effect at the Station under the direction of Dr. Fred von Stryk. Furthermore, new systems of pest control have been devised that make use of the natural enemies of crop pests. Dr. McClanahan has developed an ingenious method of biological or integrated control of the greenhouse whitefly by introducing a natural predator insect into the greenhouse to keep the whitefly population under strict control. In addition there is a continual search for new effective pesticide chemicals that do not have any dangerous side effects on people or on the environment, and many of these are coming into general use.

When Mr. Wally Nuttall replaced Mr. Les Ounsworth in the field of vegetable management in 1970, he reorganized and expanded the small cucumber breeding program, which had been started some years earlier. He undertook an ambitious project for the improvement of pickling cucumber varieties to incorporate resistance to a number of the prevalent diseases and to produce a cucumber with earliness, white spines, and adaptation to a single machine harvesting. He also produced a medium-length, seedless, greenhouse cucumber of excellent quality, which was named Harlinton, and he continued a breeding program of incorporating disease resistance. Seedless cucumbers have only recently become popular with the Canadian consumer. He also managed an extensive schedule of variety testing and crop management, which included potatoes, processing tomatoes, early market tomatoes, carrots, onions, and asparagus.



Irrigation is an important feature of vegetable production in Essex County. Dr. Jim Fulton studied the soils and climate of this region for many years and succeeded in developing reliable irrigation schedules for a number of the vegetable crops. These have ensured successful optimum production by the growers year after year. Correct soil management practices based on long-term fertility studies have been developed and recommended by Dr. Wally Findlay.

The greenhouse vegetable industry forms an important segment of the vegetable business in Essex County. It comprises 250 ac under glass and plastic. In 1960 Dr. Gordon Ward undertook to solve some of the production and nutritional problems of the tomato and cucumber growers. He instituted a system of tissue testing or tissue analysis to be used in conjunction with soil tests for assessing the nutritional status of the plants and managing the fertilizing program. Later he developed fertilizer schedules, which provided guidelines for growers. He studied the physiology of these plants and made a detailed investigation of nutrient deficiency and toxicity symptoms. Dr. Ward also conducted research on many innovative cultural practices including soilless culture and hydroponics.

Vegetable production in Essex County today is a \$30 million business, which is a large fraction of the total production in Ontario. The Station has made many contributions to the improvement of most of the vegetables grown here and continues to be a vital part of the industry.



Upper
Harlinton seedless cucumber released in 1974

Lower
Dr. J. M. Fulton checking available moisture supply in cucumber irrigation project.

Soils

Scientific studies of soils of Essex County were started by Dr. Jim Fulton in 1947. On a very broad front he conducted fertilizer experiments with early potatoes, corn, oats, and alfalfa; he carried out irrigation experiments with potatoes and took over the management of a soil testing service for the farmers of southwestern Ontario. The service had been started many years before by Bob Haslam for the tobacco growers and had been carried on by Walter Scott. Dr. Fulton also undertook soil physical and soil fertility studies with Brookston clay at the Substation at Woodslee, which had been opened in 1946. These three separate but interconnected lines of soil research were continued to the present time. In 1951 Dr. Ev Bolton was placed in charge of the soil physical studies at Woodslee and in 1957 Dr. Wally Findlay took over the soil fertility program. Dr. Fulton continued the research on irrigation and all phases of the water relations of soils and crops.

The soil testing service for growers was discontinued in 1962 because the number of samples had increased to the point where time and facilities intended for research were becoming diverted into nonresearch activities. A well-organized soil testing service had been in operation at the University of Guelph for a number of years, and this laboratory now assumed the responsibilities that had been carried at the Station.

About 1950 there was a marked increase in the use of sprinkler irrigation for the production of fruit and vegetable crops on the light textured soils of Essex County. The investigations at the Station were carried out to determine the level at which available moisture should be maintained, the rate of application, the stages of crop development at which water supplies are most critical, and relationships between irrigation and fertilization. A simple schedule was devised as a guide to irrigation practice using the calendar and a rain gauge. Recommendations were soon issued to growers; the first set was for potatoes. Later the moisture requirements for maximum yields of other high-acre-value row crops were determined, particularly burley tobacco, early tomatoes, and cucumbers. Eventually this was also done for corn and later for peaches.

Several useful instruments and items of equipment were employed in these studies over a period of years. Moisture meters that indicated a conductivity measurement were used at first. In 1960 five floating lysimeters were installed in a field where crops were grown, and they measured daily evapotranspiration and the influence of fluctuations in meteorological environment, especially soil moisture stress. In 1962 a portable rain shed was constructed to evaluate the feasibility of protecting plots of soil from rainfall and to establish higher natural soil moisture tension for purposes of immediate comparison. These instruments provided data that helped researchers to set irrigation schedules and to recommend optimum planting density for certain crops. Later a root observation chamber was constructed. This was a long narrow subterranean room located in a field between rows of plants. It was lined with glass walls through which the roots of plants growing outside the chamber could be observed. It was used for observing and measuring the amount of growth and the rate of extension of the roots of different crops under various moisture regimes. The information obtained in this way proved very useful in preparing irrigation recommendations. Dr. Fulton became a leading authority on matters pertaining to irrigation and is one of the recognized leaders in soil science in Canada.

Dr. J. M. Fulton with portable rain shed.



During the 1960s and 1970s there arose a widespread and growing public concern for the safety and preservation of the natural environment. Many modern industrial practices were suspected of polluting this environment, and loud demands were made for investigation and corrective action. Agriculture was thought to be one of the contributors to pollution through pesticides, animal wastes, and fertilizer leaching. The soil scientists anticipated this outcry by a number of years and had been quietly conducting well-planned investigations in which they monitored tile run-off water from a series of agricultural sites on a year-round basis for its content of fertilizer nutrients and certain pesticides. Although the aim of this project was to help in assessing the effectiveness of agricultural practices, the data obtained provided a wealth of information for the environmental scientists and showed in general that there was less cause for alarm than had been anticipated. An elaborate series of gauges and flow meters was used in this project and an ingenious device was invented to solve a tricky problem. A battery-operated mechanical toy car was adapted in such a way that it would run for considerable distances through a tile line with a tow string that could then be used to position gauges and meters at various locations underground. The mouse, as it was called, became a standard part of the equipment for checking the condition of tile lines. From these studies Dr. Bolton produced a clear picture of the extent of losses of nitrogen, phosphorus, potassium, calcium, and magnesium by leaching under a wide variety of cropping situations and climatic conditions.

The soil fertility experiments that were started by Dr. Findlay in 1957 developed into a long-term project, which included studies of crop rotations, fertilizer practices, and many thousands of soil and plant analyses. It has made a vital contribution to a better understanding of soil management in Essex County.

Soil physical studies at Woodslee were undertaken to discover how best to manage the Brookston clay of the county. The crumb structure of the soil was measured and its air and water pore space and total porosity. Determinations were made of the soil moisture equilibrium points, wilting point, field capacity, and maximum water-holding capacity.

Various cropping systems were studied and for a time synthetic soil conditioners were tested. Tillage traffic and various tillage methods were observed. A close watch was kept on soil compaction. These studies were all carried out in conjunction with fertility trials, crop rotation, and the changing weather pattern. Eventually the scientists came to a clear understanding of how to manage the difficult clay soils of the county, and their recommendations for the production of corn, soybeans, tomatoes, and sugar beets made a direct and significant contribution to increasing the yields of these crops over a period of years.

Crop Protection

A major part of the agricultural research program at the Station has been devoted to the protection of plants from various pests since the early 1930s when Dr. Koch undertook the study of tobacco root rot diseases. Because these studies are intimately connected with the different crops that they affect, most of the story has already been told on previous pages, but it would not be complete without some reference to the whole program.

Plant Pathology

The approach to plant disease problems has usually involved an identification of the disease and the causal organism, a survey to determine the severity and extent of the disease, a study of the nature and life history of the organism, and finally a search for methods of control by cultural practice, pesticide application, or the development of plant resistance. Many of the new varieties of crop plants from the Station had disease resistance incorporated into their gene structures. Plant pathologists were frequently a part of the team that produced a new variety. The search for pesticide control required the screening of numerous fungicides and other chemicals and an elaborate system of testing. As new procedures were developed, they were quickly added to the annual protection calendars to give growers the advantage of the most recent research.

The full extent of this program as it stretched out over 40 years can only be indicated by listing the various diseases that were studied.

- L. W. KOCH Black root rot of tobacco, brown root rot of tobacco, blue mold of tobacco, tobacco seedbed diseases, cucumber diseases, apple rust, and peach replant problem.
- A. A. HILDEBRAND Black rot of sugar beet, savoy disease of sugar beet, macrophomina of field beans, bud blight of soybeans, seed treatments for various crops, phytophthora root rot of soybeans, brown stem rot of soybeans, downy mildew of soybeans, pythium in soybeans, stem canker of soybeans, and gummosis of sugar beet.
- J. J. MILLER Macrophomina of field beans and fusaria.
- C. D. McKEEN Soft rot of peppers, fusarium wilt in tomatoes, pythium root rot in Spanish onions, damping off, fusarium in melons, botrytis in Spanish onions, gray mold in cucumbers, stem rot in cucumbers, tobacco etch virus in peppers, trichothecium rot in cucumbers, powdery mildew in cucumbers, phomopsis black rot of cucurbits, cucumber necrosis virus, verticillium in egg plant and tomatoes, tomato ring spot virus, and southern bacterial wilt in tomatoes.
- W. E. McKEEN Sugar beet root rot, corn seedling blight, corn rust, and pythium in corn.
- R. H. STOVER Black root rot of tobacco, tobacco etch virus, and tobacco mosaic virus.
- J. T. SLYKHUIS Sweet clover failure.
- W. G. BENEDICT Stemphylium in alfalfa, sweet clover failure, rhizoctonia stunting of clover, ringspot virus of red clover, and root rot in wheat.
- N. J. WHITNEY Violet root rot of carrot, ear rot of corn, violet root rot of celery, and root and stalk rot of corn.
- Z. A. PATRICK Peach replant problem, black root rot of tobacco, brown root rot of tobacco, and soil toxins.
- R. N. WENSLEY Fusarium wilt of melons, peach canker, and the peach replant problem.
- R. E. WALL Red striped pericarp of corn, root and stalk rot of corn, and wheat streak mosaic in corn.
- B. N. DHANVANTARI Peach canker, bacterial leaf spot in peach, peach crown gall, and peach X-disease.
- R. E. C. LAYNE Fireblight of pears, southwest injury of fruit trees, bacterial canker of tomatoes, and development of a fungicide-containing and rabbit-repellant paint for fruit tree trunks.

- J. H. HAAS Sclerotinia wilt of soybeans, root and stalk rot of soybeans, bronzing in white beans, and bacterial blight of white beans.
- L. F. GATES Spindle streak mosaic of wheat, southern corn leaf blight, root and stalk rot of corn, tobacco mosaic virus, and other virus diseases.
- J. DUECK Bacterial toxemia of soybeans.
- W. G. BONN Bacterial canker of peach, bacterial canker of tomatoes, and angular leaf spot of cucumbers.

Entomology

Entomology research was confined to the study of fruit insects for many years. Mr. Herb Boyce spent many years in research on the oriental fruit moth, which was a serious pest in Ontario. He studied its habits, set insect traps throughout the district, and made daily counts to determine the rise and fall in population density. Mr. Boyce also studied the parasites of the moth, made twig collections, and assembled enough data to enable him to predict the exact times of the peak of infestations even though these varied in different districts. Therefore, he was able to determine and recommend the exact timing for insecticide spray applications and so rendered a great service to the fruit growers of Essex County. He set the pattern for future programs of control and trained several young entomologists, who came to work at the Station, in the techniques that he had developed. Over a period of 20 years Mr. Boyce also worked with the peachtree borer, the lesser peachtree borer, the European red mite, and the greenhouse whitefly. In consultation with Dr. McKeen he established the fact that aphids act as insect vectors in the tobacco etch virus disease. He made the first identification of the cereal leaf beetle when it began to invade Ontario from the United States. Agriculturists were alerted to the possibility of a serious problem and Mr. Boyce kept a close watch on the progress of this invader until the investigation was turned over to another entomologist, Dr. Doug Miller.

Dr. Ed LeRoux assisted Mr. Boyce in the fruit insect investigations. He also worked briefly with certain greenhouse insects and prepared one of the first comprehensive collections of insect species commonly found in southwestern Ontario. Dr. Bill Foott also worked with fruit insects when he first arrived, but later became a leading authority on insects affecting vegetable crops. He

studied the biology of the pepper maggot, determined its host range, and developed successful methods of control. Formerly the severity of annual infestations had ranged from 40 to 90%, but there were no reports of any insect damage for 8 years after treatments were started. Dr. Foott also studied the plum curculio, European red mite, two-spotted spider mite, green peach aphid, corn leaf aphid, sap beetle, and European corn borer.

Dr. Dave McMullen's work included a study of aphids, scale insects, mites, and certain predators. Dr. Bob McClanahan worked out methods for dealing with greenhouse insects, particularly the greenhouse whitefly, which he controlled by the introduction of a small parasitic wasp called *Encarsia formosa* that preyed on the whitefly nymphs, eggs, and pupae. Other insects studied were spider mites, leaf miners, thrips, and aphids.

Dr. Bill Elliott made a long and detailed study of the green peach aphid and gave advice on the control of the tree cricket. He also worked with the European corn borer. Dr. Bob Jaques was a specialist in the use of bacteria and viruses for control of the cabbage looper and the imported cabbageworm on cruciferous crops. Dr. Doug Miller worked on problems of the cereal leaf beetle, the alfalfa weevil, and the armyworm. As a result of his study of the alfalfa weevil Dr. Miller recommended a change in the cultural practice of growing alfalfa in order to avoid attacks by the insect.

Mr. Harry Wressell was a vegetable insect specialist with many years of experience in Kent County. He was an authority on the European corn borer. Mr. B. C. Smith conducted research with the northern corn rootworm.

Entomological studies included the testing and screening of insecticide chemicals as they came on the market. An added complication arose when it was discovered that some insect species developed a resistance to certain insecticides. Thus the program is never finished and the search for new methods of control continues.

Nematology

The study of soil-borne root rot diseases and disorders of plants became a specialty of the Station over a period of years under the able direction of Dr. Koch. He soon came to recognize that nematodes might be implicated in many of the root troubles and organized a program in this specialized field of research. Dr. Bill Mountain, the first nematologist, made a study of nematodes in relation to brown root rot of tobacco and observed nematode damage in field tomatoes. He showed that nematodes were a factor in the complex chain of events that leads up to the peach replant problem. His work disclosed a relationship between a fungus and a nematode in a root rot of winter wheat and a similar situation in eggplant.

Dr. Dick Sayre joined Dr. Mountain in the nematode program and they reported that the bulb and stem nematode on onions, which was found for the first time in the Point Pelee marsh area in 1957, had been introduced from the United States and constituted a serious threat to onion production in Ontario. After an intensive study of the host range of this organism and the ecological factors in population dynamics, they recommended that the nematode could be controlled by crop rotation and in a few years it was practically eradicated. In succeeding years it has appeared sporadically where onions are grown, but it persists only when the recommendation has been ignored.

Another major study that was continued for many years was the investigation of nematodes affecting greenhouse tomatoes and cucumbers. This was begun by Dr. Sayre and continued by Dr. George Bird and later Dr. Wade Johnson. Much information has been accumulated concerning the persistence and the movements of the root-knot nematode in greenhouse soils, and many methods of control have been tested. Recommendations for growers have been regularly included on the annual protection calendars. Soil steaming still remains the best method of eradicating nematodes and soil-borne diseases from greenhouse soils.

Weeds

Traditionally weeds have been removed from crop areas by hand weeding or by cultivation. Chemical weed control is a fairly recent innovation and weed science is one of the newest branches of agricultural research.

The first experiments with herbicides or weed killers were conducted by Mr. Brian Harrison in 1946 when he tested the effect of 2,4-D on broad-leaved weeds in oats, flax, and sweet corn. He also tested its effect on lawn weeds, bindweed, and Canada thistle. Afterwards, recommended weed control procedures were used to a certain extent in crop production, but very little experimental work was done until 1962 when it was decided to undertake a major weed research program. Dr. Walt Saidak began an extensive long-term investigation of weed control procedures covering a wide range of crops including field corn, soybeans, early tomatoes, snap beans, sweet corn, processing tomatoes, and peaches. His trials included many new herbicides at a time when a flood of new chemicals was coming on the market. He maintained a close liaison with the chemical companies and was in a position to capitalize on the very latest developments for the benefit of the farmers. He became a leading authority on weed control measures and took an active part in formulating annual recommendations through provincial and national weed committees.

After Dr. Saidak's program had become well established, the Station was designated as the principal weed research center for Eastern Canada and an expansion of staff was started. When Dr. Saidak left, Dr. George Friesen assumed leadership of the program and continued much of the testing work that had been in operation for several years. Dr. Paul Marriage was given the responsibility of investigating the physiological action of certain herbicides. He helped to clarify the chemical mechanism of some of the herbicides that function as photosynthetic inhibitors and described their action on annual grass weeds. Dr. Al Hamill undertook the study of some of the ecological factors that influence the distribution and spread of weeds and showed that competition between plant species must be clearly understood before adequate control measures can be devised. He managed an extensive weed survey of several counties to help in defining local problems in southwestern Ontario and set up a demonstration weed garden. This was an imaginative innovation designed to help farmers and home gardeners identify weed species without having to consult the weed scientists.

In a very short period weed research has become an important part of the total crop protection program and has made significant contributions to agriculture in reducing crop losses.

ACKNOWLEDGMENTS

I express my appreciation to Dr. Glenn Russell who suggested that I undertake the task during a conversation in late 1972 and continued to give his support and encouragement. Mr. Walter Scott and Mr. Glenn Mortimore checked the accuracy of my statements and supplied many details not recorded in printed reports. Mr. Herb Boyce, Dr. John Aylesworth, Mr. Bob Haslam, Mr. Brian Harrison, Mr. Don Lee, Dr. Ev Bolton, Dr. Dick Layne, Dr. Jim Fulton, Dr. Dick Buzzell, Miss Kathleen Sutherland, and other members of the staff both past and present contributed suggestions. Mrs. Marian Price prepared the typescript.

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APPENDIX A

List of Professional and Administrative Staff Members at the Research Station, Harrow, 1909–1973

Names	Dates of service	Years	Names	Dates of service	Years
W. A. Barnett, B.S.A.	1909–1915 r*	6	R. D. McMullen, Ph.D.	1956–1964 t	11
D. D. Digges, M.Sc.	1915–1926 r	11	G. H. Clark, Ph.D.	1956–1970 r	14
O. B. Williams, B.A.	1915–1937 d	22	W. I. Findlay, Ph.D.	1957–	16
E. Moore	1917–1954 d	37	W. Shumovitch	1957–1960 r	3
R. J. Haslam, B.S.A.	1923–1964 s	41	R. M. Sayre, Ph.D.	1958–1965 r	7
J. McLean (Admin.)	1923–1925 r	2	G. M. Weaver, Ph.D.	1959–1969 t	10
J. M. Page (Admin.)	1925–1928 r	3	G. M. Ward, Ph.D.	1960–	13
H. A. Freeman, M.Sc.	1926–1928 r	2	E. B. Haddow, Mrs.		
B. S. Hoegstedt, Agronome	1927–1954 d	27	(Librarian)	1960–1962 r	2
H. F. Murwin, B.S.A.	1928–1964 s	36	T. K. Toyama, Ph.D.	1961–1963 r	2
O. W. Cox (Admin.)	1928–1941 r	13	W. J. Saidak, Ph.D.	1962–1973 t	11
C. W. Owen, B.S.A.	1929–1962 s	33	R. E. Wall, Ph.D.	1962–1965 t	3
W. T. Scott	1930–1946 s	16	R. I. Buzzell, Ph.D.	1962–	11
J. M. Scatterty	1930–1966 s	36	J. H. Haas, Ph.D.	1962–	11
C. G. Mortimore, M.Sc.	1930–	43	R. E. C. Layne, Ph.D.	1963–	10
W. A. Scott, B.S.A.	1931–	42	L. J. Anderson, B.S.A.	1964–	9
F. A. Stinson, Ph.D.	1932–1935 t	3	H. A. Thurston, Miss		
L. W. Koch, Ph.D.	1935–1970 s	35	(Librarian)	1964–1966 r	2
W. F. Mountain	1935–1971 s	36	B. N. Dhanvantari, Ph.D.	1965–	8
P. G. Newall	1936–1940 r	4	R. J. McClanahan, Ph.D.	1965–	8
E. S. Moore, B.S.A.	1937–1940 r	3	F. G. von Stryk, Ph.D.	1965–	8
T. B. Harrison, M.S.	1937–1959 r	22	B. R. Buttery, Ph.D.	1965–	8
W. E. van Steenburg, Ph.D.	1938–1941 t	3	G. W. Bird, Ph.D.	1966–1968 r	2
G. F. H. Buckley, Ph.D.	1939–1958 s	19	W. M. Elliott, Ph.D.	1966–	7
J. S. Aylesworth, Ph.D.	1940–	33	L. F. Gates, Ph.D.	1966–	7
A. A. Hildebrand, Ph.D.	1941–1962 s	21	A. A. Munroe, Mrs.		
R. Hutton	1941–1942 r	1	(Librarian)	1966–	7
L. F. Ounsworth, M.Sc.	1942–1969 t	27	R. P. Jaques, Ph.D.	1967–	6
J. R. Cowan, M.S.	1942–1943 r	1	C. D. F. Miller, Ph.D.	1968–1973 t	5
J. J. Miller, Ph.D.	1944–1947 r	3	P. B. Marriage, Ph.D.	1968–	5
J. A. Sutton (Admin.)	1945– r	1	K. M. Sutherland, Miss		
W. Abraham (Admin.)	1945–1946 r	2	(Librarian)	1968–	5
C. D. McKeen, Ph.D.	1946–1973 t	27	P. W. Johnson, Ph.D.	1969–	4
W. E. McKeen, Ph.D.	1946–1951 t	5	H. B. Wressell, B.S.A.	1969–1973 s	4
J. T. Slykhuis, Ph.D.	1946–1949 t	3	G. C. Russell, Ph.D.	1970–1975 t	3
J. M. Fulton, Ph.D.	1947–	26	V. W. Nuttall, M.S.A.	1970–	3
R. H. Stover, Ph.D.	1947–1951 r	4	A. S. Hamill, Ph.D.	1971–	2
B. C. Roney (Admin.)	1947–1950 r	3	H. A. Quamme, Ph.D.	1971–	2
H. R. Boyce, M.S.A.	1948–1969 s	22	J. Dueck, Ph.D.	1971–	2
D. H. Lee (Admin.)	1950–	23	B. C. Smith, B.A.	1972–	1
E. J. LeRoux, Ph.D.	1950–1953 t	2	W. G. Bonn, Ph.D.	1973–	
E. F. Bolton, Ph.D.	1951–	22	V. A. Dirks, Ph.D.	1973–	
W. B. Mountain, Ph.D.	1951–1964 t	13			
W. G. Benedict, Ph.D.	1952–1957 r	5			
R. N. Wensley, Ph.D.	1952–1973 s	21			
N. J. Whitney, Ph.D.	1952–1961 r	9			
Z. A. Patrick, Ph.D.	1952–1965 r	13			
R. W. Walsh, B.S.A.	1952–1959 r	7			
J. C. Fisher, B.S.A.	1952–1955 r	3			
W. H. Foott, Ph.D.	1953–	20			

*d: died, r: resigned, s: superannuated, t: transferred

The earliest records of casual help are missing, but the available documents indicate that from 1909 to 1973 a total of 1050 people served at the Station. This number includes the casual help and students. During this period there were 75 professional personnel.

APPENDIX B

New Plant Varieties Originated at the Research Station, Harrow, 1909-1974

Name	Date of release	Originators	Name	Date of release	Originators
TOBACCO			PEACHES		
Harrow Velvet	1932	O. B. Williams & R. J. Haslam	Garnet Beauty	1958	T. B. Harrison, Garnet Bruner, & G. Whaley
Haronova	1941	R. J. Haslam	Siberian C (rootstock)	1967	G. M. Weaver
Harmony	1945	R. J. Haslam	Harrow Blood (rootstock)	1967	G. M. Weaver
Harrow Broadleaf	1947	R. J. Haslam	Harbelle	1968	G. M. Weaver
Haronic	1948	R. J. Haslam	Canadian Harmony	1968	G. M. Weaver
Delcrest	1948	R. J. Haslam	Harbrite	1969	G. M. Weaver & R. E. C. Layne
Briarvet	1950	R. J. Haslam	Harken	1970	R. E. C. Layne & G. M. Weaver
Harwin	1963	R. J. Haslam	Harbinger	1971	R. E. C. Layne & G. M. Weaver
SOYBEANS			NECTARINES		
AK (Harrow)	1933	C. W. Owen	Harko	1974	R. E. C. Layne & G. M. Weaver
Harman	1943	C. W. Owen	Hardired	1974	R. E. C. Layne & G. M. Weaver
Harley	1948	C. W. Owen	APRICOT		
Harosoy	1951	C. W. Owen	Haggith	1974	R. E. C. Layne & T. B. Harrison
Hardome	1953	C. W. Owen	TOMATOES		
Harman B	1959	C. W. Owen	Harrow	1951	L. F. Ounsworth
Harwood	1970	J. W. Aylesworth & R. I. Buzzell	Harbon	1966	L. F. Ounsworth
Harlon	1974	R. I. Buzzell	MELON		
Harcor	1975	R. I. Buzzell	Harper Hybrid	1954	L. F. Ounsworth
WHITE BEANS			CUCUMBER		
Harkell	1966	G. H. Clark	Harlton	1975	V. W. Nuttall
Kentwood	1973	J. W. Aylesworth			
CORN					
King 300	1946	G. F. H. Buckley & C. G. Mortimore			
Warwick 800	1952	G. F. H. Buckley & C. G. Mortimore			
Warwick 450	1953	G. F. H. Buckley & C. G. Mortimore			
Warwick 650	1953	G. F. H. Buckley & C. G. Mortimore			
Haapala H81	1964	G. F. H. Buckley & C. G. Mortimore			
Pioneer 3909	1969	C. G. Mortimore			
Stewarts 2913	1971	C. G. Mortimore			
Pride R552	1971	C. G. Mortimore			
Pride R252	1972	C. G. Mortimore			
Pickseed 323	1972	C. G. Mortimore			
Pickseed 185	1974	C. G. Mortimore			
Co-op S320	1974	C. G. Mortimore			
36 widely used inbreds	1955-1974	C. G. Mortimore			



