A Century of Soybeans: Scientific Research and Mixed Farming in Agricultural Southern Ontario, 1881-1983

by

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A Century of Soybeans:  
Scientific Research and Mixed Farming  
In Agricultural southern Ontario, 1881-1983

This thesis is an investigation of the history of scientific field crop agriculture in Ontario from 1881 to 1983, with soybeans as the case study crop. Four chronological time periods, each with different economic, social, environmental and social challenges, are identified. In each period, the introduction and development of soybeans from an exotic curiosity to a commodity of major economic and agronomic importance coincided with significant changes in mixed farming. During the first period (1881 to 1925), scientists and educated farmers improved soybeans, and the first variety was registered and released in Canada. In the second period (1925 to the late 1930s), discourse and activity among plant breeders, educated farmers, processors and politicians failed to overcome economic and environmental challenges to replacing more familiar field crops with soybeans, and acreages remained small. The third period (late 1930s to the early 1950s) encompassed World War II, when a shortage of oilseeds stimulated the demand for soybeans. Producers responded by organizing the Ontario Soya-Bean Growers’ Marketing Board and joining the Ontario Crop Improvement Association. Specialized agricultural scientists applied plant physiology and molecular biology to weed control and breeding. During the fourth period (1950s to 1983), soybean acreages increased: in the 1960s, high-yielding varieties with disease resistance were widely planted in southwestern Ontario and the northern USA. By the 1970s, short-season varieties with tolerance to low temperatures spread through eastern Ontario. Research and experiment were part of a public and private sector network of co-operation and support between farmers and scientists, as both groups renegotiated the complex relationship between field crop agriculture and Ontario’s environment. Improvements were achieved by scientists at public institutions and freely
communicated through extension programs. Farmers used recommendations as guidelines to increase efficiency on their own farms. With the post-war period, agribusiness became the context in which crop production occurred. This included private seed companies, which exploited public research to market improved seeds and supporting products as profitable business. In 1983, King Agro released a soybean variety, shifting the balance of research and production from public to private enterprise, and signalling the end of mixed farming in Ontario.
Dedication

To Steve, who is with me every step of the way, with love.
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List of Abbreviations

ADM - Archer-Daniels-Midland
Ag Rep - Agricultural Representative
Ag Union - Ontario Agricultural and Experimental Union
Ag Union Annual Report - Annual Reports of the Agricultural and Experimental Union
AIC - Agricultural Institute of Canada
ASA - American Soybean Association
ASB - Agricultural Supplies Board
CAT - College of Agricultural Technology
CCC - Canadian Chamber of Commerce
CEF - Central Experimental Farm
CPSC - Commodity Prices Stabilization Corporation
CSGA - Canadian Seed Growers’ Association
CSTA - Canadian Seed Trade Association
CSTAg - Canadian Society of Technical Agriculturists

Dominion Annual Reports - Ag Canada Reports (various names including Dominion Department of Agriculture, Canadian Department of Agriculture)
DSI - Dominion Soya Industries, Dominion Soya Products Limited

FA - Farmer’s Advocate
HRS - Harrow Research Station
MG - Maturity group
NCC - National Chemurgic Committee
NRC - National Research Council
NSPA - National Soybean Processors’ Association

OAC - Ontario Agricultural College
OAC Annual Reports - Annual Reports of the Ontario Agricultural College and Experimental Farm
OCIA - Ontario Crop Improvement Association
OFA - Oils and Fats Administration
OFCSGA - Ontario Field Crop and Seed Growers’ Association
OSC - Ontario Soybean Committee
OSCIA - Ontario Soil and Crop Improvement Association
OSGMB - Ontario Soya-Bean Growers’ Marketing Board

SBOMC - Soya Bean Oil and Meal Co-operative
USDA - United States Department of Agriculture
USFCC - United States Farm Chemurgic Council
Introduction. The First Century of Soybeans in Ontario Field Crop Agriculture: Interpretation of the Topic and Materials and Methods Employed

Scientific Agriculture: A Tool for Improving Crop Production

In its seedling stage, this research project was planned as a history of agricultural science and technology in twentieth century Ontario, specifically field crop agriculture. As I proceeded, however, I began to understand that a history of crop science could never be separated from social, economic and environmental histories if a meaningful narrative was to be the result. While I situate the history of soybeans under the umbrella of rural history, it is because crop and livestock production and the various systems of mixed farming which mix these two enterprises are the livelihood of farm families and agricultural scientists. The farm itself – its physical resources and weather patterns – determine seasonal patterns of work and leisure, which further affect farm income and consumption, and the expenditure of public funds on relevant research projects. Like all taxonomies, ‘rural history’ is arbitrary, but for the purposes of this project it serves as a construct which comfortably encloses the social, economic, environmental and scientific forces which influenced the history of soybeans.

The first century of soybeans, from 1881 to 1983, was a period of ongoing research, experiment and application of the principles of agricultural science, as scientists and farmers struggled to renegotiate the relationship between crop production and the environment. The agricultural community sustained the network of communication and practice around soybeans for a hundred years because, with every success and despite every setback, scientists and farmers believed that soybeans had the potential to be an economically successful crop in agricultural southern Ontario. The evolving relationship between research and experiment on the one hand,
and management and production on the other, forms the central theme on which this thesis develops.

In their philosophical essay on agricultural science in the United States, physiologists André Mayer and Jean Mayer raise an interesting point about the application of science to farming. They argue that prior to the creation of agricultural colleges and experiment stations, farmers could not afford scientific research, so they successfully pressed for government funding, including programs dedicated to solving specific regional problems. This line of reasoning is supported by the later studies of Margaret Rossiter, Alan I. Marcus and Deborah Fitzgerald. Mayer and Mayer further argue that, from their earliest years, publicly-funded institutions needed to show some practical benefit from agricultural research in order to justify their existence to farmers and other constituents. As a result, agricultural science developed in isolation from other sciences and liberal arts, with its own parallel ancillary disciplines (agricultural chemistry, agricultural economics, rural sociology), its own scientific, professional, trade and social organizations, its own technical and popular magazines, and its own public.¹

In Ontario, institutionalized agricultural science was linked to the wider farming community through the Ontario Agricultural College (OAC) and to a much lesser extent the Central Experimental Farm (CEF) system, thereby reinforcing its sense of being a distinct and independent discipline as well. The system of publications (bulletins and circulars) distributed at no charge to farmers is clear evidence of this; these documents, featuring information condensed from the latest research and experiments, were written by expert scientists for working farmers to read and use when planning their work. They had no other intended audience. These

publications demonstrate the integration of scientific and applied agriculture on which successful farm management and crop production relied.

Soybeans were first introduced to Ontario in 1881, at the very time that scientific agriculture was taking hold in the farming community. At Guelph, the OAC was founded in 1874 as an institution where research, experiment and education would elevate farming to the level of other professions in the province by sharing innovation with farmers and their families. At Ottawa, the CEF and satellite stations situated in five distinct regions across the country were founded in 1886, in a system that was philosophically and practically as different from the OAC as could be. The CEF system was mandated to administer matters of national importance, as opposed to the provincial focus of the OAC. William Saunders, the first Director of the CEF, used the national policy as his guide as he limited his focus to crops with proven economic potential. When federal politicians and scientists acknowledged the regional diversity of Canadian farming, they also engaged in limited soybean research. Scientists at the OAC, led by Charles A. Zavitz (1863-1942), charted the early course that soybeans would take: first a hay crop, and then a seed crop and an oilseed for production in southwestern Ontario. Added to these programs was the influence of American scientists who encouraged soybean research by sharing information and seeds.

As agricultural science developed, interested farmers (most of whom were OAC alumni and their families) were influenced by the innovative ideas, crops and varieties, and techniques

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2 Charles A. Zavitz was born in Coldstream, Middlesex County, Ontario, to Danial and Susan Zavitz, Quaker farmers. His parents ensured that their sons were well-educated; Charles completed the OAC two-year diploma program in 1886 at the top of his class, and received a BSA in 1888 from the University of Toronto. His decision to pursue a profession in agriculture was not typical of young rural men, because farming was considered a practical occupation, and OAC was only ten years old in 1884. Throughout his life, Charles Zavitz stayed connected to his rural roots through his extended family in southwestern Ontario. In 1927, he retired to Poplar Hill, close to Coldstream, where he continued some breeding projects in his garden. See Laura Quirk, Dr. Charles Ambrose Zavitz: Agriculturalist, Experimentalist, Professor and Friend (Guelph, 2004).
that were disseminated through the countryside. While the Ontario Agricultural and Experimental Union (the Ag Union) was in fact founded by College graduates who wished to maintain professional and social connections with classmates and faculty with the goal of improving their own farms and farm life, it was Charles A. Zavitz of the Department of Field Husbandry who shaped the organization and managed it as a two-way conduit through which he could distribute standard crop experiments to Ag Union members and receive their results. Participation was voluntary, and from 1916 to 1938, when the Ag Union was discontinued, a few farmers grew soybeans in variety tests every year. Without the interest of farmers, soybeans’ future as a field crop in Ontario was tentative.

The hierarchy where scientists controlled the direction of research and farmers deferred to their recommendations was never absolute. Rather, the innate cautious conservatism expressed by farmers who preferred to observe innovation in demonstration plots, or adopt new things on a small scale, was the norm, especially at times when environmental and economic challenges made farming a very risky business.

Therefore, despite OAC scientists’ suggestions that farmers replace corn with soybeans as the corn borer epidemic spread, or plant soybeans as an emergency annual hay crop, or even grow soybeans for seed, soybeans were a regional crop of marginal importance through the 1930s. Difficult economic times, where commodity prices fell and markets disappeared, were exacerbated by unpredictable and unfavourable weather, in rural Ontario just as on the Canadian prairies. Farmers could find no reliable place for soybeans in their mixed crop rotations, either as a crop for home consumption or for sale. And while scientists at the OAC and in the CEF system continued to study them in research and experiment programs, progress was very slow. The search for varieties adapted to the diverse regional climates of southern Ontario, from the
research station at Harrow (HRS), Essex County, to Ottawa, continued, as did limited studies of oil and protein content. Federal politicians, preoccupied with assisting constituents in all parts of the country to weather the economic and environmental storms, and then with impending World War II, did not see value in soybeans as a commodity crop for southern Ontario farms.

Ontario crop agriculture experienced a turning point in 1938, when the Ag Union was replaced by the Ontario Crop Improvement Association (OCIA). The demise of the Ag Union signaled the disinclination of institutionalized science to involve farmers in experimental work, as scientists became more specialized, and experimental design and statistical analyses of results guaranteed more quantitative accuracy at the expense of anecdote, observation and description. Farmers responded, with no apparent fuss, by organizing the umbrella OCIA (a move endorsed by provincial politicians and OAC faculty), encompassing county Crop Improvement Associations, to maintain the links with OAC for the uninterrupted transfer of scientific information. Like their counterparts who formed various other commodity groups, soybean farmers formed the Ontario Soya-Bean Marketing Board (OSBMB) to manage sales and lobby for best prices in national and global markets.

By organizing in groups, farmers took the lead away from scientists and began to influence the direction of scientific research. Soybean acreage had increased in Ontario in response to a strong market for oilseeds stimulated by World War II. Innovative scientific research continued at the OAC, Ottawa and HRS, both federal research stations. Beginning during the war and continuing afterward, demonstrates an awareness of farmers’ responsiveness to markets for soybean oil, soybean protein, and whole soybeans driven by farmers’ demands for an annual crop which would complement corn in rotations on mixed farms. Soybeans, initially a
hay crop with value as feed, evolved to become a commodity grain crop, sold mainly off the farm in local, national and international markets.

The introduction of soybeans to Ontario began with a seed sample sent by a private company, John A. Bruce of Hamilton, to William Brown, Farm Superintendent at OAC, a fact which has been buried in the archives until now. As the success of soybeans in southwestern Ontario became more and more assured over one hundred years, and public research institutions added to the inventory of regionally adapted varieties created to succeed in specific environmental niches, private plant breeders, seed producers and retailers once again found them to be an attractive and lucrative article of trade, and used a century of public research to quickly establish profitable businesses. The balance between public and private sector research and production shifted. In 1983, a Canadian soybean variety was released for the first time by a private breeder, King Agro of Chatham. Soybeans in rotations with corn and winter wheat gained favour among Ontario farmers who depended on commodity sales to pay for inputs like chemicals, equipment and fuel. Mixed farming in Ontario was slowly and steadily coming to an end, and a new era of exclusive cropping in limited rotations with no livestock was beginning in many parts of the province.

This was the trajectory that soybeans followed in the century between 1881 and 1983. The agents remained the same throughout: soybeans themselves, as well as farmers (individuals and groups) and scientists, and to a lesser extent politicians, seed merchants, processors of soybeans and manufacturers of soybean-based products. Their interrelationships were complex and dynamic, and, despite challenges and setbacks, soybeans expanded from a crop of marginal regional importance to a crop with varieties adapted to all environmental niches in southern Ontario.
Soybean (*Glycine max* (L.) Merr.) was an unfamiliar plant when it made its first appearance at the OAC at Guelph in 1881: a curiosity, with possible uses as vegetable, feed grain and forage. It was an exotic botanical specimen too; the Japanese herbarium collection, part of OAC’s Museum of Agriculture and Horticulture, boasted a dried and pressed specimen of *Glycine*, also known as *Soja*, of the order Leguminosae, which had been classified and donated by an unnamed Japanese botanist.³ No one in Ontario knew quite what to do with it. How then did this Asian crop, starting from a batch of mixed seed imported from central Europe by a family of Scottish emigré seed merchants who ran a business out of Hamilton, Ontario, come to be one of Ontario’s most ubiquitous and valuable commodity crops? The story unfolds over one hundred years. During these years, the Ontario agricultural community was subject to the same social, economic and environmental challenges as other rural Canadian communities; this is why it took soybeans so long to catch on.

**Rural History: Social, Economic, Agricultural and Environmental Histories**

By the 1880s and continuing through the first eight decades of the twentieth century, farming continued to be an important part of the social and economic context of rural southern Ontario. Rural historian R.W. Sandwell attributes certain typical characteristics to the lives of rural Canadians, including their desire for land and their willingness to exploit the wealth of resources available on their property for exchange in local and wider markets. Such landowners worked out of a “land-based household”; in southern Ontario, this was almost universally the farm family, whose members engaged in agricultural production supplemented by off-farm employment (often waged) to maintain and improve the physical and social circumstances of the

family. Sandwell argues that the rural economy was flexible and provided a broad range of support and places of refuge against “the vicissitudes of life imposed by landlords, employers, and rapidly growing industrial capitalism generally”.\textsuperscript{4} In addition to these social and economic stresses, long-term climate and short-term weather, as well as local soil, topography, flora and fauna challenged farmers’ efforts to use the land.

In contrast to this theme of struggle and escape, I argue that rural people created opportunities; in a region of social and environmental diversity that was rural southern Ontario, farmers and their families, as well as groups of specialists which emerged as farming became more regionally specialized, made the choices which allowed them to survive and hopefully prosper.

In addition to documentation of the physical and cultural boundaries of Canadian rural life using statistics compiled from Census returns (which Sandwell uses very effectively), individuals’ stories can fill in unsatisfying empty spaces around means and standard deviations plotted in a graph or itemized in a table. Many rural historians (including Sandwell herself) use microhistory to great advantage. For example, she combines aggregate data and case studies to illuminate the complex and ambiguous behaviours of various settlers who made farms on Salt Spring Island, Canada, in the late 1800s. Likewise, rural historian Terry Crowley blends macro- and microhistory in his work. For example, he introduces “Rural Labour” with comparative accounts of George Arthur Disbrowe, whose unremitting hard work reduced him to tears, and Elizabeth Smith, born into economic privilege and relative ease, and satisfied with her place in

Personal stories bring the rural history narrative to life. They allow contemporary readers to empathise with persons who lived and worked in times past. The extent to which current events are rooted in decisions made in the rural communities of the late nineteenth and twentieth centuries can be appreciated.

Quantitative history can also overlook outliers: individuals functioning efficiently outside the most probable boundaries of population behavior expressed by statistical models. Soybeans were one such outlier whose story owes much to the behavior of individuals: scientists who influenced soybeans through research and extension programs which reached out to the countryside, and farmers who made it their own business to learn about soybeans, grow them and promote them. It is crucial that names and personal circumstances be added to augment accounts of historical events, which are themselves set in particular times and places. The history of soybeans itself might have been missed because its beginnings were already documented, albeit incorrectly, and because they were of negligible importance to provincial or national Canadian economies until World War II. The persistent presence of soybeans, however minor, is an example of how a rural community of characters and agents – farmers and farm households, in co-operation with their allies, scientists – ignored larger economic forces and invested scarce assets in a biological innovation. At the same time, the history of soybeans testifies to other rational choices made by the same agents, to avoid risk by using familiar crops that were known to grow in southern Ontario’s climate, and had a confirmed market.

The importance of the market was understood by farmers and agricultural scientists, as well as other groups with interests in soybeans. OAC was founded in 1874 at Guelph in part because it was a transportation and marketing hub in an important agricultural district, western

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Ontario. The College was administered by a government which sought to satisfy its rural constituency of farmer-taxpayers. Its mandate was the execution of scientific research and field experiments, and the teaching of theory and practical farming to current and future generations of farmers, for the improvement of farm life and “increased receipts” from efficient production of field crops, horticultural crops, and livestock.6

Scientific agriculture, which combined social and economic concerns, was new and exciting and it was applied to field work as part of the OAC curriculum. By the 1890s and early 1900s, as specialized mixed farming became philosophically and practically entrenched in southern Ontario, soybeans were one of the innovative crops added to Charles Zavitz’s scheduled summer trials. They remained on his roster of crops deemed worth testing. Due to the groundbreaking research and experiment co-ordinated at the OAC, scientists at other institutions in Canada and the United States used Zavitz’s innovative field plot techniques as well as his plant material to test and improve field crops for an entire century.

In fact, “mixed farming” and “cash crop farming”, which in the rural vernacular came to mean the production of crops exclusively for sale, are artificial and imprecise terms, and no such mutually exclusive systems existed in Ontario. In his thoughtful treatment of agriculture’s influence on shaping nineteenth-century Canada, historian Peter A. Russell synthesizes the work of several eminent rural historians on the existence of a wheat staple, and whether early Ontario farmers relied on export wheat sales for supplementing farm income to the extent that economist Harold Innis claimed. Historian Douglas McCalla admits that wheat was a valuable cash commodity, although his work on rural consumption using storekeepers’ account books demonstrates clearly that many products were bought and sold in local and wider markets.

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Economic historian Marvin McInnis agrees with McCalla that marketable surpluses of all kinds of produce often entered the marketplace, as early as the first recorded statistics in 1851. Economic historian Marjorie Griffin Cohen attributes the success and expansion of the rural economic system to the gendered division of work which farms demanded. The labour commitment to this kind of enterprise was divided among all members of the farm household, including some hired help. Their arguments generally point to one conclusion: as important as wheat was (and continued to be) in the Ontario farming economy, it functioned as a part of a system of raising complementary crops and livestock on the same farm, where surplus products were sold for cash at any time. This definition of mixed farming is used throughout this thesis. The household functioned most efficiently in a mixed farming system, where all members contributed to the maintenance of the productive and affective family unit.7 Farm families had been selling surplus commodities for cash since the first harvest, including but not only wheat. What was known as mixed farming – crops and livestock combined – allowed them to avoid risk and spread work and cash flow over the year.

It is accurate, then, to describe “mixed farming” as a system which relied on the operational and managerial input of the farm household to produce field crops in rotation as well as livestock which consumed most of the crops. Between 1882 and 1910, numbers of poultry, swine, dairy and beef cattle, and horses were raised on farms in every region. All major field crops were still grown in almost every Ontario county; pasture and orchard and small fruits were likewise ubiquitous. Any surplus which accrued after the subsistence needs of the farm were met was sold, either as a primary product or with value added by some kind of processing on the farm. But as scientists and farmers became more familiar with Ontario’s environment, they

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understood that the quantity and quality of certain crop and livestock combinations were most efficiently maximized in certain regions, and individual mixed farmers produced a narrower selection of crops and fewer kinds of animals. Beginning in the early 1920s, unproductive and inefficient crops were abandoned in some regions. New introductions like soybeans were integrated slowly into a system which needed to conform to the requirements of a global market, and its expectations of standardized high quality.\(^8\)

On the other hand, “cash crops” and “cash crop farming” suggest a shift toward the production of crops raised solely for sale as commodities. By the 1950s, soybeans were promoted by scientists in the Department of Field Husbandry at the OAC as a grain “cash crop” for the following reasons: they usually commanded a good price, they lent themselves almost completely to mechanization, and they fit into rotations with other annual crops, including corn and small grains which were also primarily commodity crops.\(^9\)

Cash crop soybeans were neither consumed nor fed on the farm where they grew. From 1949, they were marketed through the OSBMB, and purchased after processing as margarine, shortening and salad oil, or as pork, poultry meat and eggs, all consumed enthusiastically in post-World War II Ontario. As scientists developed more regionally adapted field crops and varieties, regional specialization became even narrower. This type of farming became popular in southwestern Ontario, where the climate and soils were excellent for growing field crops demanded by processors, including soybeans. Thus the history of soybeans extended beyond social and economic history to include environmental history.


The physical environment of agricultural southern Ontario was intimately connected with the introduction and eventual success of soybeans. In his ground-breaking book, *Changes in the Land*, historian William Cronon describes the effect that soils and climate had on colonisation and farming in New England. No detail about land use was trivial in Cronon’s study; the changing ecology of the region shaped its future as forests gave way to fields and pastures, and Native American as well as European immigrant farmers were “inextricably bound to the wheel of the seasons.” This was the same routine that bound farmers and families to their crops and livestock in southern Ontario.¹⁰

Environmental historian Donald Worster graphically expresses, in prose and photographs, the ecological and social disaster that ensued when farmers plowed up the prairie and planted acre after acre of wheat. Worster’s claim – that wheat monoculture upset a balance which had existed for millennia and exposed the topsoil to a hostile natural environment – has been challenged by historical geographers Kenneth Sylvester and Geoff Cunfer, who observe that monocultures, including wheat, were rare and mixed husbandry remained common on the Great Plains through the Dirty Thirties.¹¹

Canadian historian John Herd Thompson wove a similar theme of ecological and human catastrophe through his chronicle of Canada’s discordant history from 1922 to 1939. He failed to mention Ontario agriculture, however, and only emphasized prairie wheat as a staple commodity which suffered during the Great Depression with serious harm to the Canadian economy. As a matter of fact, Ontario led the country in total value of both livestock and animal products and specialty products, and was an important producer of field crops through the 1920s (a category

which was dominated by Saskatchewan). Between the two wars, the percentage decrease in improved acreage as crop land was developed or taken out of crop production was at most twenty per cent: as industrial land use increased, agriculture endured.12

The historical debates highlighted by Russell and enlarged and enriched by other historians and geographers underscore the inclusive nature of rural history, which expands to cover physical environments as well as social and cultural narratives, and the ways they interact. Agriculture is a managed environment and its process depends on soil, water and weather, features which are, to all intents and purposes, unmanageable. In Canada, soybeans only grew successfully in southwestern Ontario, a peninsula which came to be known as the Canadian Corn Belt. Its latitude was similar enough to soybeans’ ancient centre of origin in Asia that the earliest trials grew and set seed, albeit not every year, tempting scientists and farmers with promises of bountiful harvests in the future. The American Midwest enjoyed a much more hospitable climate: longer days and higher temperatures in the growing season. Even though they were introduced to Canada and the US at approximately the same time, soybean acreage took off in the American Corn Belt by the mid-1920s, largely because it partnered well with corn in annual crop rotations. There was also a market for soybean oil and high protein oilmeal, as the growing American population demanded more food and feed. American soybean breeders and chemists, especially at the University of Illinois, as well as growers and processors, influenced how Ontarians accepted and developed soybeans in their own unique environmental context.

Scientific agriculture was the vehicle through which the management of the farm environment occurred. The history of soybeans expands the discussion of Ontario rural history by integrating the history of agricultural science. Soybeans came to Ontario at an exciting time when plant breeding was transforming from a private concern, where farmers saved seeds from a successful crop with desirable qualities, to a specialty carried out by trained and educated scientists at public institutions. As a result of the slow pace of soybean breeding at both provincial and federal institutions, it is possible to observe the simultaneous development of other areas of agricultural science: genetics; chemistry, especially for oilseeds; soil science; plant physiology and biochemistry; and plant pathology.

Agricultural science in Ontario was influenced by mixed farming and the search for adapted food and feed crops, as well as by processing and the related sub-search for productive commodity crops with components that were amenable to manufacturing and consumer demand. By the 1950s, the oil and protein content of their seeds had guaranteed soybeans’ value as both a feed crop and a food crop. By the 1970s, a new paradigm in Ontario agriculture was established: specialized plant and soil sciences (fundamental and applied science) and on-farm management of resources and inputs had become separated but were still connected by a common belief in the value of scientific agriculture to optimize crop production. Some crops remained regional specialties; for example, tobacco was concentrated in Oxford and Norfolk Counties on Lake Erie, and field bean production moved up the western coast of Ontario to Lambton and Huron Counties. Soybeans, however, represented a new kind of crop; its genetic identity and heredity were studied and manipulated to exploit particular regional environments. New varieties were created for farms in regions which had hitherto been unable to grow them successfully. Thus soybeans spread out of the southwestern and southern counties to central and eastern Ontario,
where cooler temperatures prevailed during the day and at night, and growing seasons were generally several days shorter than areas further south and west.

The field notes of Professor Charles A. Zavitz, written on foolscap in pencil in duplicate, brought soybean breeding to a personal level; although I was never a plant breeder, I have participated in many field and laboratory experiments and I understand the patience and care that were required to collect and record this data. The annual reports published by the Ontario Department of Agriculture (OAC) and the Dominion Department of Agriculture (including reports compiled by the Ottawa and Harrow Stations), and bulletins and circulars released by them and by the United States Department of Agriculture (USDA), were extremely useful. Each of these public institutions took their duty of research, experiment, education and extension seriously, and released many original pamphlets, as well as revisions and updates, on a host of timely topics.

I also relied on the annual reports of the Ag Union to tell me what issues farmers themselves deemed important. These reports included questions posed to experts by individual farmers, and complemented the questions and answers, editorials and articles about farmers of interest which were reported in the Farmer’s Advocate (FA), the London, Ontario based Chatham Daily News and the American Soybean Digest. What emerged was the presence of an open and amiable conversation between publicly-funded scientists and private farmer citizens, with the final word on growing soybeans going to the farmer and the farm family.

Details about production were much more difficult to find, but the widely-circulated FA was a valuable window on what farmers were doing. Reporters and editorial staff travelled the breadth of southern Ontario, from Essex to Carleton Counties. Often soybeans were buried in articles about crop performance over a growing season. Periodically a question about soybeans
from a farmer who was thinking of planting a few acres, or a comment from an experienced grower, offered a glimpse into the reality of decision-making. Weekly editorials kept current issues of crop and livestock production, economics, politics, and the weather highly visible for readers then and now.

Agriculture has always been a fundamental sector of a stable and sustainable Canadian economy. The crop which is most often associated with Canadian agriculture is bread wheat, grown primarily on the Canadian prairies, and the rich and fascinating history of regional farming in other parts of this vast and environmentally diverse country requires more scholarly attention. Soybeans were introduced into Ontario at about the same time as hard red spring wheat in Manitoba, Saskatchewan and Alberta, and thus the development of the two crops in the two disparate regions was subject to many of the same economic, social and scientific influences. A comparison between bread wheat and soybeans will remain largely in the background, but the congruent development in the American and Canadian Corn Belts of corn and soybeans is a fascinating part of Ontario rural history.

**Rural History and the History of Science**

Rural southern Ontario is a region of farming, and soybeans were introduced to Ontario at a time when the principles of scientific agriculture were first becoming accessible to rural people as tools to improve farming efficiency. Thus the history of agricultural science, and specifically the history of soybeans, connects two important disciplines: rural history and the history of science.

Rural historian Catharine Wilson explores the lives of individuals and communities in Ontario in her work on land tenure and reciprocal work bees in the nineteenth century. Much of
her research and writing is devoted to understanding attitudes and responses to the resources they explo
ted in living and working, including land and labour. Farm family life functioned in accordance with the
daily and annual cycles of the changing seasons. Experience was prized, and expert performance, often on
display at seed fairs and exhibitions, was a benchmark used to guide future plant and animal husbandry
decisions. By the time OAC was founded, agricultural science was beginning to offer knowledge based
on the scientific principles of breeding and nutrition of plants and animals, as well as soil physics and
chemistry and pest control. As vigorously as some vocal detractors of book learning denied that scientific
agriculture had any merit, it was nevertheless the framework on which twentieth century farming would rest.
In order to understand farmers and communities in the twentieth century in comparable detail to Wilson’s
work, it is necessary to situate their productive and affective lives in the context of scientific agriculture.

Furthermore, agricultural science was offered through a new formal system of adult education. This included
OAC, which was connected to other institutions in the province (for example, the University of Toronto, which
formally granted the BAS degree for many years), as well as in other provinces. By about 1915, Nova Scotia,
Quebec, Manitoba, Saskatchewan, Alberta, and British Columbia also had institutions (either colleges or
universities) where scientific agriculture was taught. Their curricula varied, which suggests that the
history of scientific agriculture is a central theme which might also facilitate contrast and comparison of
entire provinces and regions. It is also a theme which underpins studies in education; for example

Scientific agriculture is based on theoretical principles, although it has a definite practical application. For example, early plant breeders such as Charles Zavitz and William and Charles Saunders were able to predict within reason the outcome of certain crosses, and discard the rest, thus optimizing the use of scarce resources (land, labour) and maximizing yield parameters (bushels per acre). While it is true that scientific agriculture shares a theoretical framework with other disciplines, I suggest that scientific agriculture should be more adequately integrated into the history of science. The development of soybeans from an unimproved forage crop to a high-yielding oilseed with expanded environmental adaptation to all regions of southern Ontario relied on science in concert with social and economic factors, and is therefore a valuable reference for historians of science as well as rural historians.

\textbf{Ancient History in Asia to the Nineteenth Century in North America}

Scientists and farmers are the principal human characters in this narrative: scientists at public institutions and farmers as family providers and entrepreneurs. Seed merchants, politicians, processors and manufacturers are other groups which move in and out of the narrative. Soybeans, however, are at the centre of the story. The ancient origins of soybeans and their early history in Asia, Europe and the US make a fascinating prelude to their history in rural Ontario.
According to Chinese tradition, Emperor Shen Nung, who had the body of a man and the head of an ox, taught his people how to plow a field and sow grain; his herbal *Shen nung pen ts’ao*, published sometime between 2300 and 2800 BC, contains a reference to the medicinal value of the soybean. Although Shen Nung, honoured in China as the Father of Agriculture and Medicine, is reputed to be a mythical character, nevertheless the very existence of this story highlights soybeans as a cornerstone of farming, nutrition and cuisine in Asian culture.

In 1602, the States-General of the Netherlands granted the newly-chartered Dutch East India Company a 21-year monopoly to carry out colonial activities in Asia. Traders, supporting staff and supplies travelled on outward-bound voyages; homeward-bound, ships carried trade goods, but most of the million or so emigrants who left Europe between 1595 and 1795 remained behind in Asia. Many were young men escaping crowded homes and limited inheritances. In the course of these long voyages, some of which took years, curious travelers took note of plants and animals that might have commercial, medicinal or culinary value at home. Engelbert Kaempfer, medical officer with the Company, was interested in Asian plants. In *Amoenitatum Exoticum* (1712), he describes soybeans as a plant whose seeds were prepared for human consumption in a variety of ways, and he includes a detailed recipe for soy sauce and an accurate drawing of the aboveground parts of a mature soybean plant.\(^\text{14}\)

This was an age of European expansion and colonization on foreign continents. Other nations besides the Netherlands sought to make territorial inroads into Asia; their representatives also encountered native soybeans. One of the most famous collectors of botanical specimens, Swedish taxonomist Carolus Linnaeus, describes the soybean in his *Hortus Cliffortianus*, published in 1737, from his observations in the garden at Hartecamp, the Netherlands. Linnaeus

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was commissioned to create this garden of exotic imported plants by banker and director of the Dutch East India Company, George Clifford. He included cultivated soybeans from specimens already growing in his personal garden in Uppsala. French missionaries to China sent seed to the Jardin des Plantes at Paris in 1739. Soybeans were planted at the Royal Botanic Gardens at Kew, England, by 1790. These gardens, public and private, illustrate in a tangible way the fascination many Europeans had with wonders gathered from all points of the globe and collected for display in zoos, gardens, museums and curiosity cupboards. At least twenty different varieties of soybeans were on exhibit at the 1873 World’s Fair in Vienna, where methods of cultivation as well as nutritional properties of soybeans were advertised.\footnote{Ibid.}

Such collections should not imply that there was much interest in growing soybeans in Europe, or in eating them for that matter. Austrian agricultural scientist Friedrich Haberlandt collected seed at the Vienna Exhibition and cultivated soybeans at various locations in Europe from his headquarters at the University of Natural Resources and Applied Life Sciences in Vienna. Haberlandt’s efforts to introduce soybeans to European farmers failed; he died in 1878 before he could demonstrate any promising results, and his experiments were largely forgotten there. Europeans were accustomed to beans as vegetables, and did not appreciate the long cooking time required to tenderize soybeans to the point of being edible. It was only at the beginning of the twentieth century that they became interested in soybeans as an oilseed, when poor yields of American cotton and flax, usually exported to Europe in quantities sufficient to satisfy consumer demands, created a demand for alternative sources of oil for margarine, soap and other household products. Soybeans for processing and planting were imported to Europe from northern China during the Russo-Japanese War (February 1904 through September 1905), and these seeds grew successfully. When farmers discovered the by-product of oil extraction –
oilcake or oilmeal – was high in protein, the crop gained new respectability, and research on soybeans began in earnest.¹⁶

Soybeans were first imported to America in 1765 by Samuel Bowen, who farmed near Savannah, Georgia, and patented a process for making soy sauce from “Chinese vetches”. In 1804, Bowen sent seeds to the American Philosophical Society in Philadelphia for testing. With the creation of the USDA in 1839, the utilitarian goal of domestic cultivation of foreign plants and raising of livestock manifested itself at the federal level. It is generally agreed that soybeans continued to enter the United States through the nineteenth century: privately by traders and migrants, and more publicly by naval personnel returning home from Asia. Charles V. Piper and William J. Morse, forage and feed specialists, in their definitive text, *The Soybean*, explain that soybeans grew in Massachusetts in the 1830s as a botanic specimen only, and soy sauce, a well-known luxury, was imported from China and Japan. In 1854, Admiral Matthew Perry brought seeds back from Japan. These were distributed by the Commissioner of Patents and grew well in Connecticut; at latitude roughly 41° with a marine climate moderated by the Atlantic Ocean, trials on the eastern American seaboard were encouraging for this foreign introduction which had originated and thrived in a similar environment.

The spirit of innovation which soybean booster Friedrich Haberlandt tried but failed to impart to Austrian and other European scientists and farmers flourished in North America. At about the same time Haberlandt’s experiments were suspended by his death, American visitors to Europe brought back seed to experimental farms in New Jersey and North Carolina. They may have collected seed from visiting his experimental plots. Another likely source was the Vienna World’s Fair of 1878, an international showcase of commodities and crops that was visited by

agricultural scientists from around the world. Soybeans quickly spread through the network of scientists at USDA stations to Massachusetts, Kansas, and other states. By at least 1912, cottonseed crushers in North Carolina were processing soybeans and shipping oilmeal to Chicago and Canada, where livestock feed was in great demand. In the meantime, soybean seeds made their way west from the American Cotton Belt to the more northerly Corn Belt. Eventually, the University of Illinois and the associated Experiment Station at Urbana became the epicenter of soybean research and production in North America.\textsuperscript{17}

The true origin of soybeans in Ontario has been a secret hidden in plain sight until now. For many years, in countless iterations (written and oral) of their earliest introduction, historians and crop scientists explained that Charles Zavitz received a gift of seeds from crop breeders at the USDA Experiment Station Kansas and planted them at the OAC in small plots in 1893. This fact is reported by Zavitz himself, who was at that time Experimentalist in charge of field crop trials in the Department of Field Crop Husbandry. Of the five varieties of fodder plants growing in the sample plot, only “Yellow Soy” and “Edamaine” reached a sufficient stage of maturity to produce a crop of beans and thus earned a place in summer field trials.\textsuperscript{18}

But a close reading of Annual Reports of the Ontario Agricultural College and Experimental Farm from 1874, when the College opened, reveals that William Brown, Professor of Agriculture and Farm Superintendent, planted “Soja beans” in 1881 as one of seven “Sundry Small Experiments” with unusual or unfamiliar crops. The seeds had been “obtained from Mr.


\textsuperscript{18} OAC Annual Report, 1893, 79.
Bruce, of Hamilton”. They grew successfully: “some individual plants had 125 pods, with two and three in each pod”.

Thus the private and public sectors collaborated from the very outset in a common goal: efficient and profitable farming and associated agricultural industries. John Bruce & Company, seed merchants, took advantage of OAC’s policy of testing new crops as a service to Ontario farmers and used the information to promote sales. William Brown offered public space and scientific credentials to provide an unbiased assessment of the new crop. Soybeans became familiar to Canadian farmers and gardeners through the Bruce catalogue for at least a decade before research and experiment began at OAC.

While soybeans were a constant presence in Ontario agriculture beginning in 1881, their story is not an easy one to tell. For much of the time, to 1983 when the first registered variety was released by a plant breeder employed by a private company and the publicly-funded domination of soybean breeding broke down, their participation in the history of Ontario crop agriculture was so small as to be almost invisible. They persisted because, in the words of William Brown himself, “no volume of brain activity and practice is able to farm unless accompanied by that measure of madness called enthusiasm.” Without scientists’ optimistic certainty that research and experiment would succeed at developing adapted varieties and a crop and soil management program for Ontario’s mixed farming system which depended on soybeans, and farmers’ cautious conservatism and willingness to wait until the market was just right for large-acreage planting, Ontario’s agricultural history might have unfolded differently. As it is, soybeans appeared in intermittent episodes over a century, and each cast light on private farming

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19 OAC Annual Report, 1881, 199.
20 Ibid., 206.
as it developed with the support of publicly-funded agricultural science. These episodes are presented as chronological chapters.

An Outline of the Narrative: A Century of Soybeans in Ontario

Chapter 1, “The Early Years: From a Curiosity to a Registered Variety”, examines the period from 1881 to 1925 when the earliest registered soybean variety in Canada, OAC No. 211, was released from the OAC. Even though soybeans were a proven palatable and nutritious forage crop, the greater emphasis during this period was on plant improvement for seed production: mainly for sowing but to a very limited extent beginning in the early 1920s as a grain or oilseed.

According to contemporary science, including the ground-breaking work on breeding and inheritance by Gregor Mendel, Hugo DeVries, Carl Correns and Erich von Tschermak, the seed held the key to performance and productivity of a mature plant. The main goal of researchers was therefore the identification and selection of plants that grew successfully and set seed in southern Ontario. At the OAC, this work was co-ordinated by Charles Zavitz during his long tenure as Experimentalist, Professor and Head of the Department of Field Husbandry. He maintained professional connections with scientists and breeders in the US and Canada, including at the Central Experimental Farm at Ottawa.

Although both the OAC and CEF were administered by Departments of Agriculture, their mandates were decidedly different. At the provincially-funded OAC, research was designed to benefit Ontario mixed farmers, and research initiatives could include the study of curiosity crops with unproven potential, like soybeans. In the CEF system, the Dominion Cerealist limited research and experiment at Ottawa and satellite stations to crops with proven economic benefit to
the national economy. Due to the political nature of federal research, soybeans disappeared from federal crop research until the 1930s.

In 1925, when OAC No. 211 became available to grower members for increase and sale, soybean boosters were few in number. Some seed was available, both registered and common, with no pedigree. In order to break into mixed farm rotations, soybeans had to compete with well-established introductions: grain corn and alfalfa, both valuable feed crops. Soybeans came up against the cautious conservatism which farmers naturally exhibited when considering biological innovations.

Chapter 2, “Discourse and Activity”, documents the years from 1925 through the late 1930s, when impending conflict in Europe and finally the onset of World War II added a new urgency to crop and livestock production. This was a period of continuing discourse between farmers and scientists which reflects each group’s way of thinking and acting about the value of biological innovation in scientific agriculture.

By the mid-1920s, corn growers in southwestern Ontario were challenged by a catastrophic epidemic of European Corn Borers; corn was a premier seed, grain and forage crop, grown on most farms in the south and southwest, and farmers were loathe to substitute it with anything else in order to break the insect’s life cycle. The close connection between corn and soybeans is introduced in this chapter. During the Borer epidemic, the productivity and profitability of corn hindered farmers’ adoption of soybeans, as they chose familiarity over innovation.

The Borer epidemic eventually stabilized at a level which persisted through the next decades, due in part to the Ontario Corn Borer Act of 1927, but a new environmental challenge – abnormal weather which devastated annual crop production through the late 1920s and first years
of the 1930s – renewed farmers’ resolve to grow what was known to be successful. Once again, soybeans were relegated to demonstration plots and small acreages. A few farmers co-operated with the OAC in conducting field trials as members of the Ag Union, but, in 1938, the Union came to an end. Scientific research and experiment were delegated to trained scientists; this included a very slow expansion of breeding programs at the OAC and a relatively new Dominion Experiment Station at Harrow.

Meanwhile, farmers who continued to believe in soybeans’ potential as a marketable commodity created the Soya Bean Oil and Meal Co-operative (SBOMC) in 1932 at Chatham, in partnership with American processor Archer-Daniels-Midland (ADM). The co-op failed in 1935; Depression prices were too low to entice enough Ontario farmers to supply the mill, and soybean husbandry was still uncertain. Nevertheless, federal politicians and scientists employed at the Dominion Department of Agriculture and the National Research Council (NRC), in a search for viable crops to grow on the Canadian prairies, focused on soybeans. Three conferences held in the spring of 1936 constituted a cursory effort to determine if soybeans fit with prairie agriculture or Canadian manufacturing, and ultimately the current and potential value of soybean products in the Canadian economy. The conferences concluded with no definitive results.

These isolated initiatives added to the general pool of familiarity and knowledge about soybeans. Through the formation of the co-operative at Chatham, southwestern Ontario farmers endorsed soybeans as a commodity crop, although mixed farming remained the norm. And although the conferences failed to produce any action for Ontario farmers, the industrial potential of soybeans became more familiar to politicians, scientists and manufacturers. In the 1940s, increased supplies of oil and protein were vital for the war effort. The groundwork of information and communication to supply this need had been laid since 1925.
In Chapter 3, “Things Come Together: the Late 1930s to 1950,” a nascent “agri-food system” begins to coalesce, and soybeans finally become an integral part of this important sector of the provincial economy. The agri-food system encompassed policy, research, production and processing of agricultural commodities.

Chemurgy, an early form of industrial chemistry, was an active movement attracting Canadian scientists and entrepreneurs as early as the mid-1930s, when it was touted as a solution to certain aspects of the farm problem: industrial chemists would convert surpluses and by-products from all kinds of crops into useful goods, profits from which would accrue at least partly to farmers themselves. Chemurgy was supported in principle by government policy and actively by professional chemists, agriculturists and industrialists, who demonstrated limited interest in soybeans until E.P. Taylor constructed Victory Mills on the Toronto waterfront in 1946.

By the late 1930s, Ontario farmers were experiencing another kind of farm problem: the loss of soil fertility after years of drought, wind and soil compaction from intensive cropping. To address this problem, farmers organized two new associations. The first group, the OCIA, filled the gap left when the Ag Union ended; it was created to preserve and maintain access to scientific agriculture, but without permitting members opportunities for co-operative research or experiment.

The second group had a vested interest in soybeans. In 1949, growers in southwestern Ontario formed the OSBMB. The OSBMB was empowered to negotiate prices for all soybeans sold in Ontario to purchasers in Canada, the US and Europe. Wartime orders for oil products and post-war consumer preferences for high-quality protein foods like meat placed soybeans in growing demand: they were both an oilseed and a feed protein supplement.
Breeding programs at Harrow and Ottawa accelerated. At the OAC, the partitioning off of a new Department of Soils from the original Department of Chemistry signaled a move toward the specialized study of applied science and production issues, in accordance with the expressed needs of Ontario farmers. An early project undertaken by the new department was a study of Essex County soils which had been planted almost exclusively to corn for many years; a critical recommendation for the amelioration of these compacted clay soils was the addition of soybeans to crop rotations.

Thus, by about 1950, soybeans were seen to have marketable and agronomic value. As prices rose and soils improved, acreages began to climb, but the numbers of farms growing soybeans increased slowly. Scientists turned their attention to myriad problems, the most pressing of which was the development of varieties adapted to the different soils and climates in southwestern and eastern Ontario.


Ontario growers maintained a close relationship with the American soybean industry, in terms of both geography and commerce. On one hand, this connection gave them access to a global agribusiness network, but, on the other hand, it imposed prices which did not always reflect Ontario growing and marketing conditions. The OSBMB actively represented its members in negotiating support prices with the federal government.

Science responded to markets. Genetics and heredity, biochemistry, plant physiology and weed control, and soil science and agricultural engineering (including various tillage systems and
the required field equipment) were emerging disciplines in agricultural science. Breeding programs run by the Dominion Department of Agriculture reflected a change to research for the development and improvement of crops which were regionally specialized and therefore more economically viable.

At HRS, breeders and pathologists collaborated to develop consistent high yielding soybean varieties, including Harosoy and its progeny, with resistance to indigenous soil diseases. At Ottawa, the research focus continued to be on cold tolerance and adaptation to short seasons; to this end, scientists introduced germplasm from northern Europe and developed Maple Arrow and subsequent varieties in the Maple series. At the OAC, the Department of Field Husbandry officially became the Department of Crop Science, a name which reflected its mandate to conduct both laboratory and field work.

Farmer adoption of soybeans occurred in two stages: a modest up-tick in the mid-1950s, when acreages in southwestern Ontario increased, and a sharper rise in the 1970s when soybeans spread onto new farms in eastern Ontario. Throughout this period, mixed farming remained the norm but commodity crops grew in importance. The purchase of inputs like fuel and chemicals, essential if the recommended soil and crop management systems were going to work, depended on the net income from sales of soybeans and corn.

The revenue potential of soybeans did not go unnoticed by seed merchants. The earliest of these new seed companies were founded shortly after the war, and were largely local or regional with customer bases of mixed farmers with special needs, mostly for forage and pasture seed. As regionally-adapted varieties of soybeans became available, private seed merchants collaborated with public breeders to more effectively market the innovative commodity crop. Private companies eventually hired scientists to develop their own breeding programs; the first
soybean variety to be developed in Canada by a private breeder, KG20, was released by King Agro of Chatham in 1983.

**Private Farming and Public Interest**

Throughout the first century of soybeans in Ontario, publicly funded scientists worked to release improved varieties in order that private producers (farmers) could use them to increase the overall productivity of their farms. Pedigreed seed of registered varieties – genetically pure and free of weeds and other detritus – was available to the farming population through grower members of the CSGA. Granted, the system was unpopular with seed producers and seed retailers, and farmers who deemed pedigreed seed too expensive. Nevertheless, soybean breeding for regional adaptation to regional soils and climates typical of Ontario was almost exclusively the domain of scientists employed at public agricultural institutions.

During these years, the majority of farms were privately owned, managed and operated by individuals and their families. Some labour was hired at busy times, for example at harvest, or for livestock operations, especially milking. Farm families merged their private and professional lives to produce surpluses so the Canadian public could be comfortably fed and clothed, and so they could also maintain a comfortable standard of living.

As owners of small businesses, farmers and farm families demonstrated their desire to be efficient, with a cash flow sufficient to pay fixed costs such as taxes, meet variable costs such as operating loans and inputs, and pay expenses and bills associated with maintaining a household and raising a family. Farmers and farm families were deeply interested in succeeding at the business of producing food and feed. They joined professional organizations like the Ag Union and the OCIA, the OSBMB, and rural educational initiatives. Their desire to continue at farming as nuclear and extended families was almost universal, and is a goal common to rural people in
many parts of Canada. Quebec sociologist Gérard Bouchard calls this *réproduction familiale*, a system whereby an extended rural family integrates the exploitation of accessible natural resources (farming, forestry, fishing) in an annual cycle of productive and affective activity to sustain itself on neighboring properties at the present and into the future.21

This philosophy of applied agrarianism was familiar to Ontario farmers, and the drive for efficiency and the continuation of the farm family fuelled the move to regionally specialized mixed farming. Similarly, scientists (who were as interested in rural *réproduction familiale* as farmers themselves) designed their research programs and experiments to optimize crop yields. The relationship between individuals who lived and worked in these public and private institutions was co-operative and mutually supportive. Agricultural scientists and scientific farmers, who used the results derived from scientific research to increase the efficiency of their farms by managing their resources and increasing yields, tacitly agreed that food production was honest work, the results of which were important and contributed meaningfully to social stability and the well-being of individual consumers and their families. When these conditions were threatened, as during the Depression or World War II, research into crop production proceeded apace, and farmers applied their resources unstintingly to satisfying the food and feed needs of Allied troops and Canadian citizens.

The 1950s began a watershed period for Ontario agricultural science and production. The high prices and steady demands which persisted after the war encouraged other business interests, which were far removed from day-to-day interactions with soil, crops and livestock, and the unpredictable vagaries of weather, to usurp some of the traditional responsibilities of the farmer. These included shipping and storage, value-added activities like processing and

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manufacturing, and advertising and promotion of new products. This was possible because agribusiness was growing. Economies of scale (increased capital investments, more intensive use of farm land, and larger farms) and an exploding population converged by the 1960s.\textsuperscript{22}

Soybeans, as a major ingredient in margarine, salad oil, shortening, as well as new industrial products, along with their rotation partner, corn, were integrated smoothly into the intensive system.

As subsidiary industries to agriculture, all part of John H. Davis and Ray A. Goldberg’s “agribusiness”, became lucrative, and assumed a larger fraction of the agricultural sector,\textsuperscript{23} agriculture in the public interest began to disappear, and agriculture for corporate profit began in earnest. In time, vertical integration allowed conglomerates to offer bundled goods and services such as seeds, herbicides and other inputs as convenient complete management and production packages.

This concept was not new to Ontario. In the earliest days of mechanization, tractor manufacturers offered complete sales, parts, repair and maintenance services through their agents and service depots in rural towns. Likewise, since the late 1930s, hybrid corn seed companies had employed local farmers as sales representatives and incidentally product demonstrators, as many of them were corn farmers themselves. As the narrative of soybeans’ history unfolds, however, and mixed farming continued to be the mainstay of Ontario agriculture, private encroachment into research and production escalated. With it came a systematic separation of food and feed from climate and soil, and a shift from the scientific management of natural resources to the maximization of private profits in other sectors in other locations. Eventually, in

\textsuperscript{23} John H. Davis and Ray A Goldberg, \textit{A Concept of Agribusiness} (Boston: Harvard University, 1957), 29-60.
developments that occurred after the time period of this project, traditional mixed farming disappeared.
Chapter 1. The Early Years, 1881 to 1925: From a Curiosity to a Registered Variety

Between 1881 and 1925, soybeans in Ontario evolved from a curiosity to a feed crop which boasted a registered variety, OAC No. 211, available through growers of Elite and Pedigreed seed for farm scale production of both grain and hay. Scientific agriculture, where educated farmers applied the results of fundamental research and practical experiments to improving their own unique farming systems, was at the heart of this evolution.

The Dominion Department of Agriculture, Central Experimental Farm (CEF) system, which was mandated to advance agricultural improvement on a national scale, terminated its early experiments on soybeans in 1906 when they failed to grow to maturity at most experiment stations across the country.

The transformation of soybeans through modern selection techniques and field trials therefore occurred almost entirely at the Ontario Agricultural College (OAC) at Guelph in western Ontario as a result of the research and experiments of Professor Charles A. Zavitz, Professor of Field Husbandry. Zavitz, who was devoted to the improvement of agriculture in Ontario, added soybeans to his roster of summer field trials in 1893 and studied them continuously for over 30 years. By 1916, he had enlisted the co-operative assistance of members of the Ontario Agricultural and Experimental Union (the Ag Union) in this project. Both scientists and farmers believed that soybeans had potential to be a useful crop if varieties adapted to the Ontario environment could be developed, and to this end seed production was emphasized. Thus, the collaborative relationship between Ontario farmers and agricultural scientists at OAC which was institutionalized late in the nineteenth century gave rise to new varieties and crops, including soybeans, in the early twentieth century.
Scientific Agriculture in Ontario in the Early Twentieth Century: Setting the Stage for Soybeans

Scientific agriculture has three components, and in late nineteenth and early twentieth century Ontario, a complex relationship existed between them. The first component was innovation, or something new. Alfalfa, soybeans and the well-known Red Fife wheat were all new to North America. The second, which followed innovation, was improvement. An innovative crop was subjected to research and experiment by scientists in laboratories that were actually plots and ranges on the OAC campus. Improvements generally made crops more useful to farmers (anything that wasn’t an improvement was dropped from the experimental roster). The third was use; farmers became familiar and comfortable with a crop’s requirements for temperature and rainfall, certain types of soil, and days to maturity, and were reluctant to replace it with a crop that was still at the stage of innovation or even improvement. Innovation, improvement and use were not simply sequential stages in agricultural science; they represented overlapping strategies as humans sought to transform plants and animals into useful products for consumption.

This was how soybeans entered the repertoire of scientific agriculture in Ontario: first as an innovation, then as an improving crop familiar to agricultural scientists and some farmers, and finally as a successful and familiar crop in its own right. In the meantime, other crops competed with soybeans, more or less successfully. Scientists and farmers had the same goal – developing a crop with a purpose which would add value to Ontario farming and comfort to Ontario farm families – and each group worked within the framework of scientific agriculture. Nevertheless,
they began to develop as two separate but collaborating groups. This institutionalized structure facilitated the early development of soybeans in mixed farming Ontario.

At OAC, the research and experiment programs which were responsible for the development of soybeans into a promising feed crop evolved because of a greater acceptance of the value of formal education for farmers, and the understanding that scientific agriculture, taught by experts, was a repository of knowledge that, when applied to farm problems, would produce useful results. Most innovative and improving farmers were OAC alumni, and were already predisposed to value scientific agriculture. While this small subset of the rural community was not truly representative of all farmers, it was nevertheless very important for introducing and embracing changes.

The philosophy of the College was eloquently interpreted by Charles A. Zavitz, Assistant Superintendent of Experiments to Professor Thomas Shaw, in 1889 as he began his long and influential career with the Department of Field Husbandry:

Farming is a perpetual trying of experiments with soils, manures and crops; with cattle and cattle food; with milk, butter and cheese; with plows, harrows and harvesters; with an almost endless list of things. The most successful farmers – those who get the most out of their land, their cattle, their crops, their fertilizers, their implements, and their labor – are those who experiment themselves most industriously, most skillfully, and most intelligently, and who take the fullest advantage of the experiments of others. The best agriculture is that which, in old countries, on worn and intractable soils, has learned by long continued and varied experiment to make the gain of farming sure. Within recent times farmers and men of science interested in farming have seen the advantages of using the resources of science to improve the practice of agriculture, and have established agriculture experiment stations.

These aims were to be achieved by investigative research, experimentation and teaching. The teaching was by demonstration, as the College campus would become a model farm, and also by instruction in the classroom and laboratory. The curriculum included studies of Agriculture, Chemistry, Geology and Natural History (all three subsumed under the heading of Science),
English and Mathematics, and Veterinary Subjects. Thus students would receive a well-rounded education in the art and science of farming, and its place in contemporary society.\(^1\)

Without a comparable commitment to teaching, and the inevitable face-to-face interaction with farmer constituents that the college experience engendered, the CEF system was removed from day to day issues facing crop agriculture in Ontario. The two Departments of Agriculture – Dominion and provincial – considered innovation from different standpoints. The Dominion department was committed to the whole country, and the improvement of crops that would grow successfully and increase national prosperity. Bread wheat grew exceptionally well on the prairies but nowhere else; export sales of bread wheat grain and flour represented substantial income to Canada, and for many years Canadian agricultural policy was devoted to wheat research, production and distribution.

On the other hand, the provincial department was committed only to its own farmers. OAC was centrally located in the heart of southern Ontario; scientists and farmers willingly availed themselves of opportunities to meet and confer at countless meetings and demonstrations at all times of the year, locally and at Guelph, as a central location. The two departments were poles apart, physically and philosophically.

Expanding reliance on the educated expert is comparable to “professionalization” of the middle class and higher education in America in the second half of the nineteenth century as described by historian Burton J. Bledstein. Bledstein’s time frame coincides with the development of scientific agriculture in Canada (OAC opened in 1874, and the CEF system was inaugurated in 1886); his broad concept of a professional man applies mainly to businessmen and administrators, but a few of his professionals were farmers. Bledstein’s mid-Victorian

\(^1\) Ontario. Department of Agriculture. *Annual Report of the Ontario School of Agriculture and Experimental Farm, for the year ending 31st October, 1875* (hereafter cited as *OAC Annual Report*), 3, 17-18; *OAC Annual Report*, 1889, 123.
professional “penetrated beyond the rich confusion of ordinary experience, as he isolated and controlled the factors, hidden to the untrained eye, which made an elaborate system workable or impracticable, successful or unattainable”. ² Agricultural scientists were just such a group; for example, in the Department of Field Husbandry at OAC, specialists devoted their attention exclusively to field crops. By holding certain variables constant, such as location, they attempted to simplify the complex, and separate uncontrollable environmental factors from manageable and even malleable parameters. Some field studies compared crop management variables like drilling with broadcast seeding; they also compared planting densities, which were easily manipulated. Others determined the best dates for important practices like planting and harvesting, and at different locations. In each case, optimum yield was the desired result. Experiment stations were designated spaces where scientists could take risks with field crops, and where a crop failure could provide some useful results.

Scientists and farmers each occupied separate niches in the process of improving farming in Ontario: using a scientific method in a modified laboratory – the field plot – the scientist studied a fundamental problem and tested it through research and experiment; when the experiment was deemed successful, the farmer applied it to real life, and formulated new questions which required new rounds of research. The process, and the relationship which developed between agricultural scientists and farmers, were mutually rewarding.

This inexorable trend towards scientific agriculture, where both scientists and farmers participated, encompassed all kinds of innovation on the farm and at the experiment station. Agricultural economists Alan L. Olmstead and Paul W. Rhode interpret the challenges of farming and creative innovative responses in America as the “Red Queen” syndrome: since the

beginning of crop agriculture, farmers have had to run fast just to stay one step ahead of insects, diseases, and weeds which share the managed environment. Farmers achieved this competitive edge by keen observation and deliberate selection and cultivation of the most appropriate crops and varieties as part of their farming operation.

Olmstead and Rhode use alfalfa (*Medicago sativa* L.) to illustrate their argument that biological innovations allowed farmers and scientists to “create abundance” by not just keeping ahead of but outrunning natural competitors for the products of the soil. Early selections of alfalfa, also called Lucerne, were made by a European immigrant farmer, Wendelin Grimm, who arrived in Minnesota in the mid-1850s to take up dairy farming, and brought alfalfa seeds with him. He selected repeatedly for tolerance to the cold winters by saving seed from surviving plants. The result was Grimm alfalfa, a hardy perennial hay crop planted by farmers across the milkshed covering Minnesota, Wisconsin, central Ontario and eastern Quebec. Alfalfa was an early addition to OAC field husbandry experiments, where selections for improved performance in Ontario conditions were planted by dairy farmers. In fact, alfalfa’s success and widespread adoption is one factor that tempered interest in soybeans at OAC and on farms, even though soybean hay was known to be equally nutritious and palatable to livestock. In order to replace an innovation which had been accepted by farmers, something new like soybeans had to offer an even greater competitive advantage.

**Soybeans Arrive in Ontario: The Role of the Seed Merchant in the Spread of Innovation**

The first known soybeans to arrive in Ontario travelled a well-established route, from Asia by way of Austria and Hungary and across the Atlantic Ocean. They were imported by a

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hitherto unknown and unexpected agent: a seed merchant, the John A. Bruce Company of Hamilton, Ontario. The date of arrival is also much earlier than 1893, the year Charles Zavitz collected seed samples and initiated his long-running soybean experiments at OAC. In 1881, in his report on the “Garden” at his campus residence, William Brown, Professor of Agriculture and Farm Superintendent at OAC, commented briefly on seven “Sundry Small Experiments,” of which Soja beans were the second. That summer they did well, “half crops producing fifteen bushels per acre. A low-branched bush one foot high, some individual plants had 125 pods, with two and three in each pod.” These samples were gifts of “Mr. Bruce, of Hamilton” who donated seeds for testing and demonstration.

Soybeans were therefore already known at OAC when Charles Zavitz arrived to study agriculture in October 1884. The seeds he used in 1893 to plant his first trials of “Yellow Soy” and “Edamaine” came from the Kansas Experimental Station and from Ontario. Some of these may have been an annual gift of John A. Bruce and Company, which continued to send seed to OAC for testing. Others may have been saved from the OAC garden, and, if this was the case, they were already selected by William Brown for their ability to grow and mature in Ontario conditions.4

Seed houses and seedsmen were a specific group which has been overlooked in accounts of early crop improvement in Ontario, yet they played an important role in promoting scientific agriculture and in distributing the products of research and experiment (in this case, improved seed). In their capacity as seed retailers who advertised widely, seed merchants made innovation available to risk-taking farmers even before OAC opened. As early as 1871, “Lucerne or French Clover” was one of many different clovers advertised in the John A. Bruce and Company catalogue. By this time, clovers were well known as nutritious hay crops which also added

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4 OAC Annual Report, 1881, 199; OAC Annual Report, 1893, 79.
nitrogen to soil while improving soil structure and tilth. By the late 1880s, the Bruce Company also offered many varieties of fodder corn. The catalogues featured Compton’s Yellow, a seed corn recommended for northern latitudes, and the widely grown Mammoth White Southern Red Cob. They sold a variety of field crop seeds, and their selection of the latest vegetable and flower seeds was exceptional.  

Figure 1-1. Advertisement for “A New Agricultural Plant”, Soya Beans. *John A. Bruce & Co.’s Illustrated and Descriptive Catalogue of Seeds for the spring of 1883*. Hamilton, Ontario: 1883. 30. This advertisement appeared in the catalogue for several years subsequent to 1883. Archives, Royal Botanical Gardens.

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Soybeans’ arrival at OAC, where work was centred over the next century to develop
regionally adapted varieties, was born of the business perspicacity of brothers John and Frank
Bruce, who had supplied a Canadian market for quality seeds of all kinds since 1850. While the
Bruce Company maintained a seed farm and trial grounds on Main Street East, Hamilton, in
addition to its offices and warehouse at the corner of King and McNab Streets, many seeds sold
in Canada were imported from Britain, France, California, and a few from Holland and
Denmark. More favourable climatic conditions and cheap labour in those countries, as well as
many years of experience by European growers, made it possible for dealers to procure the
highest grade of seeds at much better prices than they could be produced in Canada.
Consequently prices to farmers were as low as could be. Moreover, the importation of new lots
of seed broadened the number of available entries into breeding programs, and the genetic base
of desirable characteristics.

Beginning with the 1883 edition of the Illustrated Catalogue of Seeds, John A. Bruce and
Company advertised the sale of seed of “Soja” or soya, a new agricultural plant (Figure 1-1). The
description is accompanied by a charming black and white drawing of a mature plant with pods
peeking through open leaves, and a smaller sketch of a branch with several filled pods, all
reminiscent of Engelbert Kaempfer’s 1712 illustration. In 1883, seed was priced only by the
pound; by 1905, lots of one pound, five pounds, peck or bushel were available for shipment by
parcel post to Canadian destinations.6 Clearly, by offering larger quantities of seed at more
favourable prices per unit, the Bruce Company targeted farmers who intended to plant soybeans
as a field crop, not a garden or vegetable crop. It seems likely that farmers who purchased

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6 John A. Bruce & Co.’s Illustrated and Descriptive Catalogue of Seeds for the spring of 1883, Hamilton, Canada: 1883), 30; John A. Bruce & Co. Seed Merchants, Hamilton, Canada: 1905, 36.
soybean seed from the Bruce Company were innovators themselves, purchasing enough to plant an acre or two for observational and demonstration purposes.

OAC recognized the important niche filled by seed merchants by setting up a “botanical and chemical laboratory to which vendors of seeds and artificial manures may send such seeds and manures, in order that after the proper inspection and tests their purity and strength may be reported for the benefit and protection of the agricultural community.”7 By the time John A. Bruce and Company first offered soybean seed for sale, it had an established reputation for introducing new and improved varieties of field crop, vegetable and flower seeds, tools, and ideas to farmers and gardeners throughout the Dominion of Canada. The exhibit mounted by the Bruce Company at the Chicago World’s Fair in 1893 was awarded the World’s Fair Medal and a diploma “for the superior quality of our exhibit of Oats, Peas, Rye, Millet and Timothy Seeds.”8

A prize-winning inventory such as this was years in the making.

The company strengthened its own reputation in several ways that displayed a keen sense of awareness about the needs of farmers who practiced scientific agriculture. It published testimonials from satisfied farmers, a tactic which capitalized on the close agricultural community in Canada and in Ontario, and the exchange of advice through formal and informal channels that went on in that community. Company catalogues also reprinted news from OAC about developments in scientific agriculture, especially about the value of clean seed. The Bruce Company specialized in re-cleaning seed prior to sale “by the most modern machinery for a farmer’s trade”, in order to attract the business of “a class of the agricultural community” which appreciated the advantages of planting clean seed and reaping a clean crop.9

7 *OAC Annual Report*, 1880, 3.
9 *John A. Bruce & Co. Seed Merchants*, Hamilton, Canada: 1901, 1.
This was at a time when the Macdonald-Robertson Seed Growers’ Association, precursor to the Canadian Seed Growers’ Association (CSGA), was actively promoting good field crop seed through its annual competitions for farm youth. In partnership in the late nineteenth and early twentieth centuries, Sir William Macdonald and James W. Robertson endorsed a consolidated education system; Robertson extended this to add special courses and activities in agriculture and rural living for farm youth. The seed competitions, which ran for three years beginning in 1899, were meant to expose farmers, whose permission was required before their children could appropriate land for small competition plots, to the benefits of planting plump, clean seed as a regular practice, and to demonstrate that seed production itself could be a profitable sideline of farming. This was an especially significant development for forage crops like silage corn, clovers (including alfalfa), and other hay crops like soybeans, which were harvested green, before they set seed. Nutritious feed crops were a mainstay of mixed farming, especially dairying, and therefore were integral to scientific agriculture in Ontario.

**Soybeans at OAC: Research**

According to William Brown, scientific investigation was to be conducted without regard to cost, and the results of investigative research must always be brought home to the farmer himself. Alexander M. Ross, who chronicled the history of OAC during its first hundred years, describes Brown as a man who believed in teaching practical knowledge using a hands-on approach: handling soil, testing manure, judging crops. He regularly addressed farmers’ meetings, and published the results of OAC research in the *Annual Reports* and in handbooks. Crop “failures” were reported, as well as successful results; for example, seeds obtained at the 1876 Philadelphia Exhibition (referred to in his report as “Centennial Seeds”) were tested at
OAC in 1877 with variable results. While Brown was interested in all aspects of field crop and livestock management, Zavitz dedicated his professional career to field crop husbandry.10

Charles A. Zavitz was a member of the first OAC class to graduate from the Bachelor of Science in Agriculture (BSA, 1888) program. He was a charter member of the Canadian Seed Growers’ Association (CSGA), which was founded in 1904, and a member of the Canadian Society of Technical Agriculturists founded in 1921 by a group of Macdonald College alumni. His professional life was devoted to advancing the cause of scientific agriculture on Ontario’s farms. While he was in fact a farm boy, he believed that formal education beyond the level of a college diploma, combined with continuing education through membership in associations and visits to experiment stations elsewhere in Ontario and other countries, were the credentials which proved that a scientist had the knowledge and skills required to apply scientific principles to agricultural problems. At OAC, the research program administered by the Department of Field Husbandry had as one of its objectives the selection of improved varieties of field crops which were suitable for growing on Ontario’s mixed farms. Even though they were a curiosity, Zavitz made room for soybeans in the program.

When Zavitz’s soybean program started in 1893, “changing seed” was popular among farmers who saved seed for the next year’s crop. Changing seed was the practice of bulking a sample of seed from a field whose productivity had declined after years of cropping and planting it at a distant location, preferably one where the climate was milder and the soil more fertile. In theory, the new generation of seed (from the original population of plants) should produce a crop with renewed vigour when it was planted back on the home farm – higher yields of fodder, grain, or both. Crops flourished in a favourable environment, and it was believed that potential for

inherited desirable characteristics like large size (vegetative growth) and abundant offspring (fruit and seeds) accumulated in seeds of healthy plants. Seeds were bulked in a process known as mass selection, and subsequently planted.

By about 1910, only a few years after it was founded in 1904, the CSGA had adopted a new breeding technique used by scientists at Svalof in Sweden. It was called pure line breeding, where superior single plants were identified and their seeds saved and planted individually in rows over repeated generations. Because each pure line was derived from a single seed, each constituted a population of genetically homogeneous individuals. This technique was most easily applied to plants that were self-pollinated, like wheat and soybeans.

Open-pollinated crops like corn presented serious obstacles to breeders who were attempting to develop pure lines. Not only was it necessary to physically move pollen from a desired male to a desired female parent plant, it was also imperative that pollen from the female parent be prevented from fertilizing itself or any other random plant. Corn hybridization was the focus of expensive and time-consuming breeding programs in the US. The theoretical challenges to corn breeding were likewise daunting, as contemporary understanding of genetics was based mainly on Mendelian principles of independent segregation and exchange of material during sexual reproduction. Breeders had no adequate explanations for why pure corn lines were generally of mediocre vigour, the first generation cross was exceptionally vigourous and productive, and thereafter vigour declined drastically. Breeding and growing hybrid corn was unlike the open-pollinated varieties that farmers and scientists were used to, and traditional open-pollinated varieties for seed, grain and fodder persisted for many years in Canada and the US.

During the field trials that were the primary tool of crop breeders, natural environmental stresses such as drought, high or low temperatures, diseases and insects damaged many plants.
The seeds of the survivors, which displayed a naturally-increased tolerance to the stress, became new pure lines and ideally, pedigreed varieties or cultivars (cultivated varieties). William Saunders and Sir Charles Saunders, of the Dominion Department of Agriculture, used the pure line technique to develop Marquis wheat at Ottawa and test it in Manitoba and Saskatchewan where it would eventually be grown. By 1920, over 90% of the 17 million acres of wheat in western Canada were planted with Marquis. Its hardiness and early ripening allowed farmers to grow wheat further north than ever before, effectively doubling the amount of arable land on the prairies, and its excellent milling and baking qualities earned Canada the distinction of producing the best hard spring wheat in the world.11

Pure line research required careful planning prior to planting and close attention to plant growth by an experienced scientist during the growing season. Zavitz took copious notes as he applied pure line selection techniques to soybeans. He measured plant height, growth habit (branching or upright), and vigour (a subjective measurement on a scale of one to ten), all while the plant was still growing. He also recorded pod and bean colour, numbers of pods per plant and beans per pod, and number of beans per 16 ounces, all after the mature plants had been pulled up and stored indoors. These last measurements were done over the winter with some help from technicians and students.

Zavitz pioneered the use of small plots for grain research, including soybeans. Each plot was $1/100^{th}$ of an acre in area, normally 10 links (6.6 feet) wide by 100 links (66 feet or 22 yards) long. Each small plot contained several rows, and plots were spaced widely enough for a note-taker. Zavitz’s innovative small plots enabled a researcher to test and compare hundreds of crops and varieties at a single location in a single year. Some of his contemporaries, including

Samuel W. Johnson of Yale, expressed doubts about the practical value of small plot data for comparisons over locations and years, but when it was supplemented by larger observational and demonstration plots, and continued over many growing seasons, small plot breeding became a standard tool in North American agricultural science.12

Charles Zavitz incorporated soybean samples from a number of locations. The original Early Yellow seed was sent to OAC by Dr. C.C. Georgeson of the Manhattan, Kansas, Agricultural Experiment Station; it was part of a lot imported to the US from Japan in the early 1890s. OAC also obtained seed from Khabarovsk, Siberia, and Niguta, Manchuria, both by way of the United States Department of Agriculture (USDA) in the early 1900s; the sample from Khabarovsk was the original source of Habaro, parent of OAC No. 211. Zavitz also ordered seed directly from the College of Agriculture, Sapporo, Japan.

Natural selection for the Guelph location in central Ontario, especially under the varied environmental stresses that occurred in every growing season, was easily spotted by walking through the rows and plots. At OAC, Zavitz tested and made selections from one hundred varieties of soybeans, most for at least five years and a few for over thirty years. By continuous selection of both Early Yellow and Ito San over a quarter century, annual yields had increased from levels measured when they were first introduced to OAC.13 Small plots facilitated pure line research by allowing researchers to concentrate on plants that showed desired improvements, and discard the rest. In the case of soybeans in western Ontario, it meant increased production of grain, fodder, or ideally both. The next stage in soybean research at OAC was therefore the selection of single plants which consistently set seed at OAC, and the eventual creation of a


variety for the production of seed for increase, distribution and sale to Ontario mixed farmers who grew soybeans as a field crop.

As his variety tests progressed and his methodology became familiar to other soybean breeders, Zavitz added samples from Macdonald College at Montreal and Manitoba Agricultural College at Winnipeg as well as several northern states to his summer trials. His work was known to American scientists, who regularly included the Guelph variety (sometimes called Medium Green) in their own field tests. Both John A. Bruce and Company and Steele, Briggs of Toronto submitted samples, although not every year. In 1923, a “very heavy frost” overnight on September 15 killed several entire entries, including the Bruce and Steele, Briggs samples which had failed to set seed. Summer field tests in following years mostly included varieties from OAC’s ongoing trials as well as experiment stations in the American Midwest, an area that was already known as the Corn Belt. In 1924, two “new entries” were tested: Illini and AK 2, both from the College of Agriculture, Urbana, Illinois. With this exchange, official collaboration in breeding soybeans between scientists at OAC and Urbana, the burgeoning epicenter of soybean research and development in the United States, began to flourish.\(^\text{14}\)

Zavitz foresaw the potential value of soybeans to Ontario farmers as a feed and cash crop and challenged himself to create a variety, widely adapted to the Ontario climate and soils, for hay, grain and seed production. An earlier selection, OAC No. 81, was a standard entry in field tests. OAC No. 81 was available to farmers, but it was a poor producer, and not recommended for widespread planting. In 1918, Zavitz turned to his ongoing variety trials and selected thirty-four exceptional individuals from about 10,000 plants of Habaro No. 20405 which were under observation in the field.

This specific project was based on over twenty-five years of research and investigation into pure line breeding, soybean anatomy and agronomy, and seed production, and resulted in the release of OAC No. 211, the first soybean variety to be registered by the CSGA. The individual plants earmarked by Zavitz were ancestors of the original Khabarovsk, Siberia, sample sent by USDA in the early 1900s. Tolerance to short days and low temperatures was transmitted through generations of parents and their offspring, until the best thirty-four soybean plants were selected for yield of dry matter and seed. The progeny of the best twenty-two of these were carefully tested under uniform field conditions in 1919 and again in 1920. (The other twelve plants were discarded.)

Over these two summers, the progeny of one of the 1918 sub-population of thirty-four yielded consistently more grain per bushel (measured in pounds), as well as tons of straw per acre and bushels of beans per acre. Seed from this outstanding performer was planted in the regular small plots in 1921. The same phenotypic characteristics were recorded, in the field during the growing season and indoors following harvest, as for all entries in OAC summer variety tests. By about 1923, it was clear that these characteristics had stabilized, and a new variety, now called OAC No. 211, was registered by the CSGA (Figure 1-2). OAC was thereby authorized by the Seeds Acts of Canada to produce Elite seed of OAC No. 211 soybeans for free distribution to registered CSGA grower members, who would increase it under strict conditions, subject to inspection at any time, for sale to farmers in official bags each tagged with an inspection certificate. Only these farmers were licensed to increase Elite seed every year, and sell it or plant it themselves. The objectives of the CSGA – to encourage farmers to plant clean seed

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of recommended varieties, and make seed production and seed cleaning lucrative business ventures – were adopted by a significant number of seed producers across the country, but very few offered registered soybean seed for sale through the late 1920s and 1930s.

Figure 1-2. Canadian Seed Growers’ Association registration certificate, issued to OAC for 10 bushels of OAC No. 211 soybean seed. Archival Collections, University of Guelph.

Nevertheless, soybean research at OAC achieved the results which Charles Zavitz had planned. Zavitz and his associates, including Professor W.J. Squirrell who succeeded him when he retired in 1927, investigated soybeans under standardized field conditions. By 1925, they were able to report to officials of the Ontario Department of Agriculture and to farmers, all of whom
funded their work, that pedigreed seed was available for growing OAC No. 211, the best possible variety for southern Ontario.

In Ontario, some farmers had already begun to show interest in soybeans, although not necessarily in seed production. Soybean oil meal, a high-protein by-product of oil extraction added to the rations of some livestock, had been sold in Canada for many years, although some livestock farmers purchased cottonseed meal, or flaxseed meal from local mills. One soybean promoter was James T. Campbell, livestock breeder from Ontario County. He urged farmers to consider planting soybeans as a hay crop, but he also called their attention to soybeans’ exceptional value as an oilseed, or a commodity crop, for selling off the farm. He reported that the United States annually imported 200,000 tons of soybean oil from the Orient, chiefly for the manufacture of soaps, paints, and butter and lard substitutes. Campbell saw no reason why Ontario farmers should not take advantage of this profitable market, and sell soybeans to American mills.16

While oilseed production did not take off as Campbell believed it should, a few innovative farmers were already experimenting with soybeans under the direction of scientists at OAC. By the early 1920s, farmers who looked to the OAC for guidance about planting soybeans would have learned that the planting density used in prior research and experiments had been 30 to 45 pounds per acre, and weight per bushel averaged about 57 pounds. When Zavitz concentrated on selecting for higher grain or seed yield (in addition to other experiments for dry matter or hay production), he increased experimental planting densities to one and two bushels

per acre, broadcast or seeded in rows, and worked only with selected varieties.\textsuperscript{17} By this time, seed samples from “Bruce”, as well as “Steele Briggs” of Toronto, while still included in some summer field trials, were inferior to varieties from Canadian and American agricultural colleges and experiment farms.

**Co-Operative Experiments: The Department of Field Husbandry and the Ontario Agricultural and Experimental Union**

At OAC, investigation and research were followed by experiment, to bring science to the farmer himself with special reference to practical economy and the application of the results of research to working farms. Charles A. Zavitz, who by 1889 was Assistant Superintendent of Experiments, declared that research and experiment were partners of equal importance to Ontario agriculture:

Experimental work is of no value without it gives results that are either positive or negative, and but few experiments should be regarded as final or conclusive that are not repeated under the same conditions. Some of them require repeating many times owing to the variableness of the seasons and other attendant conditions. When so repeated and the results point generally in the one direction, it may be that even then it is the general trend of the experiments that becomes of value rather than the exact results obtained. This is true both in experiments with grains and animals. With the former important variations may result from climate as affected by locality. This, so far, impairs the worth of all field experiments, hence the great value of having them repeated simultaneously in several sections of the one province.\textsuperscript{18}

This philosophy guided the co-operative experimental work initiated jointly by the Department of Field Husbandry and the Ag Union, and which continued until 1938.\textsuperscript{19}


\textsuperscript{18} *OAC Annual Report*, 1886, 155; *OAC Annual Report*, 1889, 106.

The Ag Union had been conceived in 1879 by students and alumni of OAC who invited faculty to join. They wished to maintain close connections with the College for the purpose of keeping actively involved in the latest in scientific agriculture. The Minister of Agriculture granted a special stipend to the Ag Union to cover costs such as answering letters and postage (including mailing packets of seeds), but after only a few years, farmer members felt their organization had drifted into a “debating society” with an annual convention, guest speakers and lively discussion, but only an abstract connection between the innovative research going on at OAC and their own working farms. When Chemistry Professor Hare, who oversaw the first experiment on crop rotations, died in 1885 when it was only half-completed, the participants were left without direction. In 1886 Charles Zavitz, already editor of the Ag Union’s newsletter, agreed to serve on a committee to plan future experiments.²⁰

Zavitz quickly took over the planning and design of experiments that fit the mandate of scientific agriculture as it was practiced at OAC. The first of these concerned the effects of several fertilizers, all available in Canada and all in common use in Ontario, on grain growth over the growing season. The six treatments were salt, superphosphate, ground apatite (a phosphate mineral), wood ashes, farmyard manure, and no added fertilizer; the grains were wheat, barley and oats. Zavitz wrote up a detailed set of “Instructions for Experiments with Fertilizers”. This was comparable to standard research protocol used by scientists, but it acknowledged the individual conditions faced by farmers who lived in different soil and climatic regions in the province. For example, each of the twelve participants in this initial groundbreaking experiment was instructed to mark off six plots (one per treatment) of prescribed size and shape which were located on soil typical of the arable soil of his own farm, and plant one-sixth of the grain received as close as possible to one inch deep. When all participants

²⁰ Ibid.
followed directions, and submitted a standard report, the twelve locations plus the location at OAC could be analysed as repeats of a single experiment and the averaged results and conclusions used by farmers anywhere in agricultural Ontario as a guide for their own applications of scientific farming methods. Zavitz further solicited suggestions from Ag Union members about the kinds of unofficial experiments they were already running on their farms, and those they would like to see done in the future. The Ag Union and the OAC thus entered into a co-operative association where research and experiment complimented each other for the improvement of agriculture in Ontario.21

Soybeans were first offered for co-operative testing in the growing season of 1916. In the first few years, Early Brown, OAC No. 81 and selections of Habaro were compared for grain and hay yields. Only a very few innovative farmers chose soybeans from hundreds of possibilities listed on the application form. This was an extremely small sample size, even when the OAC location was included; nevertheless, Zavitz felt the results of even one or two “good” experiments enabled him to draw generally favourable conclusions about soybeans in Ontario, and reserved for them a permanent place in each summer’s trials. On the whole, the co-operative experiments with soybeans added value to the work of the Ag Union, and strengthened the collaboration between scientists and farmers. A long list of the advantages of experimental work in field husbandry submitted by farmers included training men to unite science with practice and lead others to do likewise, and helping farmers understand scientific principles they learned about in published material and at meetings.22 More specifically, experiments with soybeans revealed some fundamental information about this novel crop in its new environment on which all further research and experimental work was based.

21 Ag Union Annual Report, 1888, in OAC Annual Report, 1888, 143-146.  
22 Ag Union Annual Report, 1924, 23-25.
Arguably the most important conclusion was the fact that the summer weather in Ontario was often too wet for available soybean varieties to mature. It was also too cool, and the period of days to maturity was too short, and did not allow for the complete growth cycle of vegetative growth, flowering, and seed initiation and ripening to occur. This was reflected in recorded grain yields, which ranged (in research and experiments) from nothing to promising. After three dismal seasons, 1919 was warmer and drier, but 1920 was so wet that no experiments could be completed and no satisfactory reports were filed. This weather was not atypical; after almost ten years of co-operative experiments, Zavitz was only able to generalize, and state that soybeans were still of limited use in the province for either seed or fodder.\textsuperscript{23} Despite the enthusiasm of booster James T. Campbell, and the receipt of seed samples by farmers along Lake Ontario and further into eastern Ontario, it was soon apparent that perennial alfalfa and other clovers grew very well in eastern Ontario and produced abundant hay and seed crops, and soybeans did not.

In fact co-operative experiments kept soybeans alive in Ontario and moved them into Kent and Essex Counties, where they eventually thrived. In the southwest, production of both soybean hay and more importantly seed or grain were successful, due to the warm dry weather and long days. Not all farmers who raised soybeans as a grain or oilseed cash crop had the facilities to store some seed over a winter. Therefore when OAC No. 211 was released, and offered as the best available variety for seed and hay, several farmers in Kent County, near Chatham, ordered samples. In subsequent years, these men increased their seed for sale. Beginning in about 1925, preliminary field tests at the Dominion Experimental Station at Harrow (HRS) in Essex County also included OAC No. 211, as well as Early Brown and OAC No. 81, the three varieties tested in Ag Union co-operative experiments. Although the land planted to soybeans was “not exceptionally productive”, most likely because the good land was already

\textsuperscript{23} Ag Union Annual Report, 1925, 8-15.
devoted to research on proven crops like corn, grain and hay, yields were nonetheless “quite high”, an observation which led to the expansion of soybean research at HRS.24

An extraordinary level of co-operation within the scientific farming community existed in Ontario from 1890, when the relationship between the Ag Union and OAC was formalized, until 1938 when it was disbanded. The Ag Union connected scientists who worked at the College and alumni on farms throughout the province in a system that facilitated the introduction and continuation of soybeans in the province. It was estimated that over 133,000 farmers had participated in Ag Union experiments between 1886 and 1934. No farmer received any payment beyond the original free seed sample, and the harvest which was his to keep. Between 1920 and 1934, over 500 co-operative experiments ran every summer: not a significant number relative to the number of farms in the province, but the effect was compounded as neighbours visited the plots and reported to other neighbours, relatives and friends.25

This was the rural agricultural community at work. According to W.H. Porter, President of the Ag Union in 1925, farmer, editor of Farmer’s Advocate, and vocal supporter of scientific agriculture and its corollary, scientific farm forestry, the results of experiments at the College and Experimental Farms were useful in a general way, but “the farmer is obliged to make a test himself under his own special conditions to arrive at a definite conclusion and get the exact truth concerning his own troubles.”26 The Ag Union organized such tests and compiled and distributed the results and conclusions. General recommendations obtained from these results were available to farmers as publications and at extension meetings.

25 Ag Union Annual Report, 1934, 6.
26 Ag Union Annual Report, 1925, 4-5.
Scientific Agriculture and Soybeans at American Agricultural Experiment Stations

Agricultural historians Charles E. Rosenberg and Alan I. Marcus describe the development of scientific agriculture at American colleges and experiment stations in the late nineteenth and early twentieth centuries, at the same time as the Ag Union was gaining popularity and expanding the number of experiments it co-ordinated in any given summer, and the territory over which the participating farmers lived. Rosenberg describes the growth of science in the agricultural community as controversy and conflict among politicians, administrators, scientists, and farmers. Scientists who were effective at securing funding for applied research at experiment stations were hamstrung by farmers in their efforts to convert funds to meaningful results: successful, influential farmers who believed that state-supported research should generate fast results on crops of economic importance and tried to control the allocation and use of funds, and marginal farmers who rejected public funding for agricultural research, and often scientific agriculture as a whole. At these institutions, the opportunity for farmers to participate in experiments was not embedded in philosophies of innovation and improvement, notwithstanding the stations’ emphases on practical benefits, including economic returns. At OAC, farmers and scientists embraced the Ag Union, and got practical results through co-operation.27

In comparison to Rosenberg’s observed overt antagonism and competition for funding and focus on specific areas of production which pervaded the experiment stations and the agricultural community in general, Marcus describes a philosophical divergence of two groups of farmers who struggled to appropriate a meaningful niche in scientific agriculture, albeit in a slightly earlier period (1870-1890). He defines these groups as scientific and systematic farmers,

although their common goals were efficient farming and comfortable farm life. Ag Union members listed these same aspirations, which they believed participation in co-operative experiments helped them achieve: increased profits from adapting scientific methods to their own particular farms, and the addition of “dignity to farming and pleasure to farm life.” They were encouraged to add comments to their reports, in part because they were educated (Ag Union members were all OAC alumni), but also because they had practical expertise gained by working as farmers. Their comments about the advantages of co-operative experimental work to field husbandry fit the mandate of practical farming, initiated by William Brown and continued by Charles Zavitz.28

In the US, the principles for initiating agricultural research and executing experiments were deemed to be understood only by scientists: men with advanced academic training, who were employed at agricultural colleges and experiment stations. Farmers who were interested in scientific agriculture had little opportunity to collaborate with scientists, or add data to support fundamental research. Thus Marcus’s experiment stations and colleges separated scientists and farmers, rather than melding them as a co-operative unit. Experiment stations and colleges effectively separated science from production and economics at a very early stage of scientific agriculture in North America. Scientific agriculture at these sites included some co-operative work, mainly simple experiments performed on the campuses of collaborating institutions, with the ultimate ideal of discovering and confirming some universal law. Farm field trials were useful only for testing local environmental conditions, and fell somewhere in the realm of applied science.29

28 Ag Union Annual Report, 1924, 23-25.
The Ontario and American models of scientific agriculture differ in fundamental ways, although the objectives of scientists and participating farmers were the same in both countries: innovation and improvement of crop production in conjunction with efficient use of proven techniques, crops and varieties. In each objective, however, the authority of science was clearly recognized. The extent of voluntary participation in research and experiment varied between Ontario and various American jurisdictions, as did the extent to which scientists welcomed the involvement of farmers. Much of the success of Ontario’s Ag Union may be attributed to the dynamic and tenacious Charles Zavitz, who devoted his life to studying and improving Ontario crop agriculture.

In spite of their disparate acceptance of farmer participation in scientists’ activities, Ontario and American educators had a common interest in extending the results of research and experiment to the farm. In 1906, a “farmers’ advisor system” grew out of a friendly conversation between Seaman A. Knapp, American educator and advocate of practical agricultural education taught at state colleges, H.B. Frissell, principle of Hampton Institute in Virginia, and C.G. Creelman, president of OAC. Ontario’s system of District Representatives was quickly put in place, and by 1912 there were thirty such representatives all across the province, funded through the Ontario Department of Agriculture. They quickly became known as Agricultural Representatives (Ag Reps). In the US, “county agents” provided a comparable liaison between scientist and farmer. The federal Smith-Lever Extension Act, passed in May 1914, included allocation of funds to pay extension agents, publish reports and mail materials, and support some co-operative demonstration work.30

Thus the relationship between scientists and farmers in Ontario differed

substantially from that described by Rosenberg and Marcus, who find evidence that these two
groups did not work together and in some cases were actively antagonistic towards members of
the opposite group. Research and experiment were conducted by scientists, and the results were
delivered to the farming community by extension workers. This disjunction was based on
ideological grounds; “science pure” was necessary before “science applied” could function
properly and immediately but serendipitously transform “all insights gained into the laws of
nature” into tangible benefits. As a result of this unfulfilled (and unfulfillable) expectation,
agricultural science was a disappointment to farmers, who did not so much reject it as ignore it.
The disconnect was exacerbated by farmers’ inability to bond themselves into a homogeneous
body with congruent professional goals: Marcus’s scientific and systematic farmers. The
relationship between institutionalized science and scientists, and individual farmers, was uneasy

In Ontario, farmers could not ignore scientific agriculture. From the outset, the OAC was
mandated to provide experimental results, educational opportunities, and extension programs to
rural people. This virtually guaranteed that the farming and scientific communities would come
in constant contact, although it did not guarantee a collegial relationship. In fact several factors
promoted overall harmony. First of all, the Ag Union was initiated by alumni, who pressed for an
active professional and social network connecting peers and scientists before OAC scientists had
a chance to exclude them (and there is no evidence that such a movement ever existed). Contact
with OAC was encouraged: the annual meeting of the Ag Union in winter, summer visits by
whole families, and the \textit{OAC Review} all reinforced a strong connection between research and
production. While agriculture was moving inexorably toward specialization, the main management system continued to be mixed farming. Therefore, in addition to the Ag Union, farmers and scientists had many opportunities to engage with each other through membership in various producer groups and marketing associations, and at extension events. Without doubt, some farmers remained opposed to scientific farming and agricultural education, but the majority made efforts to learn either directly by studying at OAC, or indirectly. Extension programs facilitated the return of acquired knowledge to OAC. In contrast to Rosenberg’s and Marcus’s observations, the relationship between institutionalized science and scientists, and working farmers, was co-operative and friendly.

The introduction of soybeans to the United States took place within the experimental farm system at state colleges and universities, but did not include a system of co-operative farmer-run experiments similar to the Ag Union work at OAC. At the University of Illinois Experiment Station at Urbana, a long term rotation trial called the Morrow Plots had been established in 1876, even before the station itself opened in 1888. Much of the field work tested the effects of different fertilizers (manure, limestone and phosphates) on yields of corn, although soybeans were introduced to some of the rotations in 1912 and 1915. A summary of Morrow Plot results illustrates the relationship between agricultural science and farming as a business which Marcus highlighted:

[T]he practices in rotation and soil treatment which have been the most effective in increasing the crop-producing capacity of the soil have also been the most profitable financially. These latter practices not only have increased the yields but they have made possible a greater economy in production, an important factor in increasing farm profits.32

Systematic agriculture depended on science for research into best practices, which systematic farmers then turned to production and profit.

In Illinois, early studies indicated that soybeans could be valuable for pasture, hogging off and lambing off. Interest accelerated across the entire Corn Belt beginning in about 1918 when the oat crop was in difficulty, and farmers needed a cash grain substitute. Thereafter, acres for grain (as opposed to hay or other purposes) were always the largest proportion, and research and experiment at experiment stations reflected this trend. As soybean oil gradually made “a place for itself in American commerce”, and oilcake was already known to be a valuable source of protein in livestock rations, variety testing expanded. In 1924, the first year that the Crop Reporting Board, Agricultural Marketing Service, USDA, collected soybean data, Illinois had the largest acreage of any state. The next was Indiana, as soybeans moved into the Corn Belt. In 1926, soybeans were added to regular trials at the northern location in DeKalb, at the southern end of Lake Michigan, at a latitude similar to southwestern Ontario.33

**Soybeans in the Dominion Central Experimental Farm System**

Unlike the USDA experiment farm system, which was closely connected with state universities, the Canadian Dominion Department of Agriculture functioned independently of provincial departments of agriculture and colleges and universities. National politics and partisan strategising caused the Conservative government of J.A. Macdonald to create a Department of Agriculture in the 1870s in order to “woo the farmers’ vote away from the Liberals”, especially in rural Ontario, and to de-centralise Canadian politics. These motives spoke to Macdonald’s National Policy, which aimed to move the country towards becoming more than just the sum of its parts, in effect a transcontinental community. His Conservative party championed scientific

agriculture as a way to strengthen the agricultural industry in all regions of the country, without breaking the standard export commodity crop policy favoured by the national government into farming systems best suited to discrete regions.34

A model farm was established at Ottawa. Its original mandate was two-fold: train affluent gentlemen agriculturists as farmers, and turn a profit by charging steep tuition fees. Notwithstanding the serious problem of decreased fertility of long-settled land in central Canada, where Liberals were in the majority and the model farm was located, discussions on scientific farming were beginning repeatedly to refer to the new problems posed by the western environment, more specifically the controversy raised by conflicting reports by John Macoun and Henry Youle Hind over whether southern Saskatchewan and Alberta were climatically suitable for managed crop production. After an extensive tour of American institutions of agricultural research and experiment, William Saunders, the first Director and Cerealist, created and administered a centralized system wherein scientific research would take place at Ottawa, and testing of results, otherwise known as experiment, would be conducted by technical staff with practical knowledge at the satellite stations in Nappan, Nova Scotia; Brandon, Manitoba; Indian Head, North-West Territories; and Agassiz, British Columbia. Other stations followed, for example at Harrow in Essex County, southwestern Ontario, in 1909. William Brown, Superintendent of OAC, opposed Saunders’ plan in favour of direct funding to regional institutions which would allocate spending to research on local topics. His recommendation was based on a familiarity with mixed farming in Ontario, the understanding that farming depended on the environment which was notoriously diverse across Canada, and the belief that a central

bureaucracy or politicians and scientists could not do justice to all parts of the whole.\textsuperscript{35} Nevertheless, the centralized CEF system was adopted.

The Dominion Department of Agriculture engaged in research on soybeans as a forage or hay crop beginning in 1897. Like William Brown at OAC, Saunders also obtained seed from a commercial dealer, Peter Henderson of New York, in 1896 and again in 1898 because the previous year’s plants failed to set seed.\textsuperscript{36} There is no mention in reports from either the provincial or Dominion Departments of Agriculture about seed exchange between OAC and CEF, even though soybean research had been in progress at OAC for approximately four years. It is possible that William Saunders was motivated politically to ignore OAC, where researchers had leeway to design innovative experiments and include exotic crops to accommodate mixed farming and the steady move toward regional specialization. The CEF was a top down system, with William Saunders in charge, and it is also possible that he was so completely absorbed in planning for Canada that he was unaware of research elsewhere in Ontario than at Ottawa: at OAC in western Ontario. And yet he and Charles Zavitz, who was by now Professor of Field Husbandry in charge of crop research, were well acquainted through their common commitment to scientific agriculture and their common membership in various agricultural associations. What is clear is that Zavitz believed educated farmers could (and did) contribute valuable information to the corpus of Canadian agricultural research, whereas Saunders had no such respect for tillers of the soil.

When seeds from New York proved unsuitable for the Ottawa environment, Saunders ordered seed of very early-maturing plants from Japan. He then designed a single simple

experiment which ran at every Dominion station for about eight years, beginning in 1898. The objective of this experiment was the comparison of soybeans, also called soja beans, with horse beans (also known as faba beans, fava beans, or broad beans) and hairy vetch. Several years earlier James Robertson, Canada’s first Dairy Commissioner, had designed the “Robertson mixture” for winter feeding of dairy cattle; it contained “horse beans *Faba vulgaris*, variety *equine* ensiled with sunflowers *Helianthus annus*”.37 Horse beans were an annual forage legume, well-known for their tolerance to drought and frost. Both horse beans and sunflowers produced abundant vegetation, and their market value was expressed not by sales of silage, which was stored and consumed on the farm, but indirectly as quantity and quality of milk and manufactured milk products like cheese. Soybeans were seen as a possible forage alternative in areas where horse beans did not succeed. The very early-maturing Japanese variety was anticipated to produce a lot of vegetative growth and ideally some seed in Canada’s short seasons. Hairy vetch was added as an alternative forage legume.

After less than ten years of standard experiments at each satellite station in Canada, soybeans did not live up to expectations. They did not grow at Brandon in southern Manitoba; the 1901 crop was destroyed by an early June frost (although horse beans were uninjured), and soybeans disappeared from later reports submitted by the Superintendent. In December 1911 in an article on a seed fair at Gull Lake, the *Manitoba Free Press* reported that soy beans and cow peas “cannot be grown at their best much farther north than the parallel 40 degrees”, but that hay was possible “much farther to the north”. By this time, soybeans were known at the Manitoba Agricultural College at Winnipeg (at approximately 49°N); Manitoba Brown, also called Early Brown or sometimes simply Brown was added to variety tests at OAC by the mid-1920s. It

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37 *Dominion Annual Report*, 1893, 76.
appears that these two agricultural colleges enjoyed an interprovincial exchange of research data and materials.38

At Agassiz, in the Fraser River Valley at the same latitude as Winnipeg, the climate was suitable (although in some years the spring soil was too cold and wet for seeds to germinate), but soybeans could not compete with clover:

[Soja Beans] make a better growth on our warm sandy soil than the horse bean, and as they branch freely, and have a great deal of foliage, and have many pods, the cattle, horses, pigs and sheep are very fond of them, and on rich land fairly heavy crops can be raised, but clover can be grown so much more cheaply and more feed per acre can be got from clover, that it does not pay except under exceptional circumstances to raise Soja beans, especially as the seed seldom ripens sufficiently to be of use.39

Trials at Nappan, Nova Scotia, and Indian Head, North-West Territories, were equally unsuccessful but for different reasons. In 1904 at Nappan, both soja beans and horse beans were decimated by cutworms, but also “[T]he ‘Black Dolphin’ aphis destroyed the remaining plants of Horse Beans, and a frost September 1 killed the Soja Beans, making it impossible to obtain any reliable data from either of these plots.” A terse report from Indian Head contained all necessary information: “sown May 17 in rows 28 inches apart, in flower when killed by frost October 1, cut October 9”.40 Thus William Saunders terminated experiments on soybeans for forage at all stations by 1906.

No further expenditures of time, money or land would be made for at least fifteen years, at the new HRS in Essex County in southwestern Ontario, part of the Canadian Corn Belt. In 1923, a preliminary program of investigations of field corn and soybeans was inaugurated, concurrently with the first winter feeding of market steers, an experiment designed to expand the

38 Manitoba Free Press, December 30, 1911, 28.
39 Dominion Annual Report, 1904, 466.
40 Ibid., 334, 430.
livestock base of the southwest. As field corn, which grew exceptionally well in Kent and Essex Counties, was fed locally, and so contributed indirectly to farm income. Corn-eating hogs significantly expanded the regional and export economies, as did cash sales of seed corn to regions of the province which ensiled field corn as a winter feed. This was primarily across the milkshed of central and eastern Ontario and into Quebec (although silage corn was also grown as far north as Manitoulin Island).

As demand for oilseeds began to accelerate in the US, and soybeans in rotation with corn was an increasingly popular rotation in the American Corn Belt, scientists and farmers perceived an opportunity for southwestern Ontario farmers to enter the soybean market. The first step was improved seed production.

**An Emphasis on Seed**

The co-operative testing program facilitated by the Department of Field Husbandry at OAC expanded as more and more Ag Union members responded to notices published in rural newspapers such as the *Farmer’s Advocate* and the *Farmers’ Sun* about the selection of experiments for the upcoming summer (Figure 1-3).

Selections were on a first come, first served basis, and farmers were urged to send in their choices early. Seeds, instructions and a report to be filled in and returned, and some other supplies (such as commercial fertilizers in pre-weighed packages) were sent out from OAC, although in the fertilizer experiments, participating farmers were responsible for collecting wood ashes and manure and applying appropriate quantities. Between 1886 and 1917, a grand total of 88,604 separate tests in agriculture alone were made. Participating farmers were “particularly

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anxious to secure pure seed of the best varieties of farm crops as foundation material”, which they could increase for their own use. Even though labour was exceptionally scarce during World War I, both on farms and at the College, over 4,000 tests were prepared and conducted in each year from 1910 to 1916. Only seed obtained from OAC was acceptable for the controlled experiments, and the message was clear. Scientific crop agriculture depended on clean seed of a known, named variety.42

42 C.A. Zavitz, W.J. Squirrell, and A.W. Mason, *Results of Co-operative Experiments with Farm Crops, Sources of Seed and production of Food Materials* (Ontario Agricultural College, Guelph: Ontario Department of Agriculture, 1918), 2; *Ag Union Annual Report*, 1916, 5.
**HIGH GRADE SEEDS FOR EXPERIMENTAL WORK**

Annual Distribution for Experimental Union is About to be Made—Write Early for Samples To The O. A. C.

The members of the Ontario Agricultural and Experimental Union are pleased to state that for 1919 they are prepared to distribute into every Township of Ontario material of high quality for experiments with grains, fodder crops, roots, grasses, clovers and alfalfas, as follows:

**List of Experiments for 1919.**

<table>
<thead>
<tr>
<th>Number</th>
<th>Grain Crops</th>
<th>Plots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Testing two varieties of Oats</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Testing O. A. C. No. 21 Barley and Ember</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Testing two varieties of Winter Barley</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Testing two varieties of Spring Wheat</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Testing two varieties of Winter Rye</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Testing three varieties of Field Peas</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Testing two varieties of Spring Rye</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Testing seven varieties of Wheat and Dext Husking Corn</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>Testing three varieties of Maize</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Testing three varieties of sugar Mangels</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Testing three varieties of Swedish Turnips</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>Testing two varieties of Fall Turnips</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Testing two varieties of Carrots</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Testing the planting of Corn at six distances in the row</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>Testing three varieties of Millet</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>Testing two varieties of Sorghum</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>Testing Grass Peas and two varieties of Vetches</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>Testing Rapes, Kale and Field Cabbage</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>Testing three varieties of clover</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>Testing two varieties of Alfalfa</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>Testing four varieties of Grapes</td>
<td>4</td>
</tr>
<tr>
<td>22</td>
<td>Forage, Fodder, Silage and Hay Crops</td>
<td>2</td>
</tr>
<tr>
<td>23</td>
<td>Culinary Crops</td>
<td>3</td>
</tr>
<tr>
<td>24</td>
<td>Testing three varieties of Field Beans</td>
<td>3</td>
</tr>
<tr>
<td>25</td>
<td>Testing two varieties of Sweet Corn</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>Testing Fertilizers with Rape</td>
<td>5</td>
</tr>
<tr>
<td>27</td>
<td>Miscellaneous Experiments</td>
<td>2</td>
</tr>
<tr>
<td>28</td>
<td>Testing three grain mixtures for Grain production</td>
<td>3</td>
</tr>
<tr>
<td>29</td>
<td>Testing three grain mixtures for Fodder production</td>
<td>3</td>
</tr>
</tbody>
</table>

Any person in Ontario may choose any one of the experiments for 1919 and apply for the same. The material will be furnished in the order in which the applications are received, while the supply lasts. Each applicant should make a second choice, as the material for the experiment selected as first choice might be exhausted before his application is received. All material will be furnished free of charge to each applicant, and the produce will, of course, become the property of the person who conducts the experiment. Each person applying for an experiment should write his name and address very carefully, and should give the name of the County in which he lives.

C. A. ZAVITZ. 
Director.

Ontario Agricultural College, 
Guelph, March 18, 1919.

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Figure 1-3. Ontario Agricultural and Experimental Union Advertisement for experiments planned for summer, 1919. *Farmers’ Sun*, 1919, 4.
The trade in field crop seeds underwent a drastic change with the passage of the revised Canada Seeds Act in 1923. From 1904 to 1922, through a regulated system supervised by the CSGA, pedigreed seed of registered varieties of field crops was distributed to seed producers who increased stocks and sold bagged and tagged seed to farmers. The procedure was highly regulated, and designed to preserve genetic purity (varietal identity) for farmers who wished to purchase seed that was best adapted to their location. For example, although OAC No. 211 was the only soybean variety available for many years, it was still recommended as a variety that would grow well in western and southwestern Ontario.

The Canada Seeds Act of 1923 confirmed seed production as a specialty in Canada, and introduced a new regulation that seed merchants (including growers and retailers) adhere strictly to CSGA standards of mechanical purity and germination in order to sell pedigreed seed. Following the passage of the Act, only members of the CSGA (either individuals or companies) who complied with the Act could legally sell pedigreed seed. Growers were required to declare that the seed had been grown according to CSGA standards, which included recording the exact location of plots on the farm, the soil type and previous crop history of each plot, and maintaining a minimum distance from other fields where the same crop was grown. A cohort of thirty trained government inspectors from the Seed Division, Dominion Department of Agriculture, were empowered to grade, tag and seal pedigreed seed stored in approved containers. Trained technicians at five government seed laboratories were responsible for mechanical seed quality standards such as freedom from foreign material and seeds of other crops and weeds, as well as germination percentages. After 1922, the limitation on the number of generations that a crop could be increased and still be designated pedigreed seed was removed,
although the generation which the seed lot belonged to was noted on the tag when the bag was sealed. In effect, a grower who received Elite seed could increase the same stock ad infinitum and sell it with identity preserved, as long as he adhered to CSGA regulations.43

The Canada Seeds Act endorsed scientific agriculture by enforcing rigorous legislated standards. The special expertise and authority of seed producers (farmer members of the CSGA), seed inspectors and agricultural scientists were institutionalized. Even though each group had a different responsibility under the terms of the Act, they were permanently entrenched in scientific agriculture. Thus the Dominion Department of Agriculture and the OAC, both public institutions, and the CSGA, a private association of scientists and farmers, supported scientific agriculture and the statutory expression of one of its ideals, the Canada Seeds Act of 1923.

In 1922, in response to the impending adoption of the Canada Seeds Act of 1923, representatives of eleven seed houses and seed cleaning firms (including Col. Walter Bruce of John A. Bruce and Company) organized the Canadian Seed Trade Association (CSTA). The CSTA offered its services to the Minister of Agriculture as an advisory body to meet and confer on the new seed Bill, its regulations and any measures pertaining to the seed trade at any time.44 The Act made no provisions for increase or sales of field crop seed by other vendors such as seed companies, which served farmers, mainly by mail order, all over Canada, unless they adhered to its terms. Both wholesale and retail seed merchants had reason to be apprehensive about the new Act, which awarded the CSGA exclusive rights to establish genetic standards of field crops in Canada and to determine if a standing crop was eligible for pedigree designation. Seed houses did not lose the right to sell field crop seed, which until this time had been a profitable part of

their business. They could not legally sell varieties of field crop seed unless it passed inspection for varietal purity, cleanliness and germinability.

Few seed houses had the resources to comply with the new regulations, as well as carry out business as usual: storing a wide selection of seeds for the domestic market, publishing and distributing a catalogue, and filling orders on a timely schedule. By the early twentieth century, some of these catalogues were exemplars of technical and artistic design, with descriptive text, photographs, drawings, and covers in several colours, and some seed houses began to specialize in horticultural products. A number of smaller rural seed merchants handled local distribution of field crop seed without expensive advertising. Farmers themselves continued to sell seed, often by advertising in local newspapers; the Farmer’s Advocate and the Chatham Daily News both carried advertisements for soybean seed, as well as corn and clovers, in the early spring editions just in advance of planting.

Even though they did not receive the endorsement of scientific agriculture, other vendors besides CSGA growers participated in a steady market for non-pedigreed field crop seed. Despite the best efforts of the CSGA and extension programs arranged by scientists, many farmers were not persuaded to purchase pedigreed seed. Reasons for this are not clear, but farmers already owned the required seed (part of the harvest) and were loathe to spend scarce cash on something they deemed an unnecessary input. Even when contaminated stocks were not replanted, seeds passing through animals’ digestive systems kept weed populations permanently high and able to sustain themselves wherever manure was spread. Lost productivity resulting from planting unclean seed and feeding weedy grain continued to plague Ontario crop agriculture for decades;
when the Ontario Crop Improvement Association (OCIA) was formed in 1938, it made clean seed a top priority.45

The diversity of personnel who were actively involved in soybeans’ first 45 or so years, and the ways in which scientific agriculture evolved at OAC and on farms in Ontario and became part of field crop research and experiment, illustrates the fascinating path soybeans took from the boundaries of William Brown’s small garden to the release of the first registered variety in Canada! By 1925, a community of specialized groups, including seed merchants, scientists, farmers and farm families defined scientific crop agriculture in Ontario. These groups had worked, mostly co-operatively, to bring soybeans to the province.

At OAC, Charles Zavitz grasped soybeans’ potential at the very beginning of his own career, improved them through pure line breeding, and offered them to farmers as an experimental crop. A few innovative farmers boosted soybeans in spite of the cool, wet summer weather typical everywhere in the province except the southwest counties of Essex and Kent. A few more cautious types tried small experimental plots, with an eye to increasing seed for more extensive planting sometime in the future if the crop looked promising. By 1925, a new variety – OAC No. 211 – was registered and released for seed increase and sales to crop farmers.

The only group that was unsuccessful at establishing a place for itself in readiness for the next phase of soybean history was the seed merchant or seed house. Although John A. Bruce and Company and William Brown of OAC were first to import soybeans to Ontario and introduce them to scientific agriculture, the Canada Seeds Act of 1923 restricted sales of pedigreed field crop seed to growers who were members of the CSGA.

The spread of soybean seed was therefore reduced by the dearth of growers (not only CSGA members) in southern Ontario, as well as by the lack of other varieties more adapted to

45 Szego, “The Canadian Seed Trade Association”, 345-347.
marginal environments. They were unsuited to the Canadian climate everywhere but in southwestern Ontario, where they could not compete with corn, a crop that was already entrenched in crop rotations as a grain and forage staple. That is, until the 1920s when the European Corn Borer landed in Kent and Essex Counties in a shipment of broom corn. Add to this the bizarre weather, unseasonably wet, dry, hot, cold and windy, in the Dirty Thirties, when even farmers who applied scientific agriculture to farm management could not plan ahead. Nevertheless, soybeans’ success as an oilseed crop in the American Corn Belt, and their potential for production in Essex and Kent Counties, attracted the attention of scientists, farmers, politicians and processors. Through the second half of the 1920s to the late 1930s, all groups concentrated on learning more about growing soybeans as a viable commodity crop in Ontario.
Chapter 2. Learning about Soybeans, 1925 to the Mid 1930s: Discourse and Activity

During the period from 1925 to the mid-1930s, farmers and scientists discussed soybeans and learned from each other how they might fit into Ontario’s mixed farming economy. Farmers were unwilling to compromise this traditional and familiar system. Mixed farming buffered family life against the economic and environmental challenges of that decade, and until soybeans found a guaranteed niche for consumption on the farm or in the marketplace, they would be planted on small acreages for experimental or demonstration purposes only.

Even though scientists recommended this biological innovation, they understood little more than farmers about growing soybeans in the southern Ontario climate; the new sciences of genetics and plant breeding afforded scant help in a region that was preoccupied with growing corn, and research on soybeans proceeded slowly.

Nevertheless, agriculture in Ontario was moving inexorably toward regional specialization and the production of commodities for national and global markets, although still within a predominantly mixed farm system. Soybean acreages and industrial uses accelerated as the soybean commodity chain strengthened its position in North America.

Beginning in the second quarter of the twentieth century, a North American community of soybean growers, scientists, and processors coalesced in southwestern Ontario and the American Midwest. In the United States, economic interest in corn gave rise to research designed to support corn production, including the development of a breeding program for new soybean varieties in Illinois and other midwestern states. The University of Illinois at Urbana
gradually assumed leadership of soybean breeding and agronomy, important work which complemented its ongoing focus on improving corn, the state’s leading crop.

An Introduction to the North American Soybean Community: Physical and Cultural Environments

As early as 1922, American field crop specialist J.C. Hackleman enumerated some factors which contributed to the great increases already noted in soybean acreage (Figure 2-1). Not only did they improve the soil, they were useful on the farm as pasture, silage, hay or seed, and increasingly as a grain or oilseed: all produce with indirect or direct economic value. Soybeans in rotation with corn and wheat – all grains and all commodities for sale off the farm – became the most common crop production system in the Corn Belt. This occurred in large part due to a system of landholding and land management, including mechanization, which facilitated extensive acreages of a few crops adapted to the climate and soils of the Midwestern US.¹

In Canada, the soybean community was restricted almost exclusively to southwestern Ontario, also known as a Corn Belt because of its favourable climate for growing grain corn, an important field crop in Ontario as well. The system of land survey adopted by the Constitutional Act of 1791 fixed lot sizes at approximately 100 acres, most of which encompassed fields of more or less arable land interspersed with forest, waterway, rock or wetland. Microenvironments and microclimates existed within regions and even on a single farm.

As a consequence of the diverse environment, regional specialization was recommended by scientists at the Ontario Agricultural College (OAC); scientific farmers included families who blended many kinds of agricultural production for self-provisioning and sales. Unlike the system adopted by Midwestern American farmers, mixed farmers in southwestern Ontario combined livestock, field and often some horticultural crops in longer and more complicated rotations on
smaller fields. Ontario farm families therefore practiced a different kind of farm management than their Midwestern American counterparts.

Through the 1920s and 1930s, the farm family and the mixed farm were the basic social and productive units of Ontario agriculture. In his study of the United Farmers of Ontario, historian Kerry Badgley covers an earlier period of time (1914-1926), but some of his comments are germane to the social behavior of mixed farmers and farm families during the late 1920s and continuing through the 1930s. As a theoretical framework to his study, Badgley adopts some of libertarian philosopher George Woodcock’s ideas to explain that free individuals, including farmers, strive through their work to take a meaningful part in the unfolding of their lives.² This analysis is useful as rural historians endeavour to understand Ontario farm life (both productive, in the fields and barn, and affective, in the house, farmyard and garden) in the 1930s, and how soybeans fit into this structure.

On the whole, contemporary farmers believed themselves to be intelligent and capable of making knowledgeable decisions:

In the operation on one’s farm the yield of crops, the quality and production of live stock and the value of the goods marketed depend on the owner or operator himself. Here, at any rate, the individual farmer is supreme. He makes his own plans; he formulates his own policies, and he puts them into effect.³

They were informed by professional association with scientists (demonstrations, phone calls, visits to experimental farms), and with other farmers (at fairs, through memberships in producer groups and at many, many meetings). Farmers were confident that their lives had purpose, and in this they were supported and assisted by members of their families and their communities.

³ Farmer’s Advocate (hereafter cited as FA), March 3, 1932.
Through the challenges of the late 1920s and 1930s, a few individuals continued to plant soybeans as a part of their mixed farming management system. They were well-known and influential: creative “risk takers” at the leading edge of the innovation curve describing the trajectory of soybean discourse and activity. Charles Zavitz was one such risk taker, although public funds paid for his time, land and materials. Farmers who risked their own assets ensured that soybeans had a presence on Ontario farms.

Of paramount importance to the mixed farm was a balance of production and reproduction that distributed work and respite as evenly as possible over seven days and all four seasons on a schedule that integrated crop and livestock management with the needs of each family member. Rural historian Ruth Sandwell makes a strong case that the household is arguably the most important institution in rural society. The household consisted of individuals who co-operated and complemented each others’ strengths and weaknesses. Most of these were members of close-knit nuclear and extended families, and nowhere was this more crucial than on a mixed farm. In Ontario in the 1920s and 1930s, farm families faced shortages of hired labour as well as shortages of cash to pay wages, and unpaid family work was more important than ever. In 1930, in the province as a whole, fully 65 per cent of farm workers were family members, including women, children and elderly persons. Only six per cent were full-time paid employees (all men), and a few men were retained part time.4

In terms of investment in the farm, families invested time and energy when cash was limited. They farmed for cash flow; farms were revenue driven, not profit driven. This system (private ownership and decision-making, small fields, crop diversity in long rotations, and

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livestock) provided a setting for the farm community to learn more about growing and marketing soybeans, while avoiding risks attached to the early stages of innovation.

**Corn and the European Corn Borer: An Environmental Challenge**

The history of soybeans in Ontario can only be understood in the context of corn. Although corn was well-known to indigenous people who cultivated the land prior to the arrival of European farm makers in the late 1700s, it was a relatively recent innovation on Ontario farms. Economic historian Ian Drummond reports that 207,000 acres of corn (of all types) were planted in Ontario in 1880-81, according to the Ontario Bureau of Industries and Statistical Branch of the Department of Agriculture. This may be compared to wheat (approximately 3.7 million acres in the same year), a crop which has been closely analysed by economic and rural historians, and which declined in Ontario by the turn of the century.

The reason for wheat’s decline is generally believed to be twofold: competition from hard red spring wheat grown on the prairies beginning in the 1880s, and a concurrent expansion by Ontario farmers into mixed farming with regional specialization focused on livestock and feed crops. Export markets influenced this change. Animal products increased in importance, especially cheese from central and eastern Ontario, and feed of high nutritional value and palatability were essential. By 1889, “green fodder” was considered to be particularly important on mixed farms for improving the health of cattle and the quality of farm animal products, as well as the condition of the soil. Most legume and grass crops, grown and fed as hay or pasture, had extensive root systems which improved soil aeration and water penetration and reduced

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erosion. Organic matter in the form of dead and decaying roots and tops, and animal manure, was returned to the soil.

By the 1910s, the soils and climate of southwestern Ontario had enabled farmers, many of whom were experienced corn growers from midwestern American states like Wisconsin and Ohio, to allocate a considerable proportion of their acreages to corn. In 1923, Essex County farmers planted over 80,000 acres of husking corn (also called grain corn); this crop was harvested after the plant had stopped growing and senesced, and the ear and grain were dry and hard. The entire ear was stored in a crib or a bin, and later the cobs were shelled and discarded, while the kernels were fed to pigs or poultry. In the same year, almost 65,000 acres of husking corn were planted in Kent County; the combined acreage (approximately 145,000 acres) accounted for over half the total area planted to grain corn in the province. Some of the seed was sold and planted for silage in other counties where the season was too short for corn grain to mature. While corn was not a monoculture crop at this time, it was nonetheless part of farm rotations in virtually every township in Essex and Kent Counties. In southwestern Ontario, corn fields were numerous and close together.6 Although early work at OAC demonstrated that soybeans would grow best in southwestern Ontario, the success of corn kept farmers from accepting them as more than just a demonstration crop, even when the very existence of corn in Ontario was threatened by an insect pest, the European Corn Borer (Pyrausta nubilalis Hübn., also known as Ostrinia nubilalis).

The appearance of the Corn Borer in the late 1910s was a serious concern to North American agricultural scientists. On the one hand, contemporary knowledge of genetics, breeding and management tantalized them with promises of suitable corn varieties for all

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physical environments, and higher and more dependable yields. American plant breeders Edward M. East and Donald F. Jones were pioneers in corn hybrid research who worked with United States Department of Agriculture (USDA) scientists as well as private growers like Henry A. Wallace and Funk Brothers to discover the genetic mechanism of heterosis, also called hybrid vigour, in corn hybrids and apply it to commercial seed production. By 1921 Eugene Davenport, retiring Dean of the College of Agriculture, University of Illinois, identified genetics and physiology as indispensable tools in the study of crop production, which focused on improving quality and yield of corn grain in the Corn Belt.

At OAC, Charles Zavitz was familiar with the practice of single plant selection for the development of pure lines (an early application of Mendelian genetics). Plant breeders chose individual plants which displayed desirable characteristics in programs of continuous selection over many generations. All plants in a pure line, derived from a single plant and therefore of identical genetic makeup, would be genetically identical. Environmental stress – in the case of soybeans, this would be low temperature or short season – would impose additional selection pressure. By interpreting Mendel’s laws to mean that the mechanism of inheritance was through discreet units which coded for distinct physical features, breeders like Zavitz examined thousands of individual plants to find the most suitable. This philosophy of heredity was unlike that of biometricians like Francis Galton, Carl Pearson and R.A. Fisher, who studied populations.

Through his membership in the Canadian Seed Growers’ Association (CSGA) and his position at OAC, he was instrumental in introducing and validating this specialized technique, but physiology, or the study of plant metabolism, did not figure in his work. In Forty Years’ Experiments with Grain Crops, Zavitz summarizes his career at OAC; the discussion of hybridization and plant breeding illustrates his exclusive attention to the economic production of
food, “the most fundamental material problem of the world”. Zavitz made his soybean selections based on what he could see: plant performance and final yield. With respect to the science of plant breeding, he used the term hybridization as a general term for crossing, a standard contemporary technique for sexual reproduction and mixing traits, well-known since antiquity. He admitted that breeding work was a slow process. While hybridization in particular was demonstrably influential in improving the quality and quantity of crops, they were “impossible of full estimation”, possibly because complicated cellular and sub-cellular processes were so poorly understood and so difficult to connect to whole-plant results.  

When Zavitz retired in 1927, the new Canadian Society of Technical Agriculturists (CSTAg), founded in 1919, had founded Scientific Agriculture, a journal for articles dealing with original research, the results of experimental work, and other reports by “professional workers in agriculture holding academic degrees or their equivalent.” Included in the early volumes were papers on genetics, plant breeding, and crop physiology submitted by scientists working at public institutions across Canada.

On the other hand, the lowly Corn Borer destroyed crops and threatened livelihoods, and field crop science, including genetics, offered no immediate defense in this crisis. Professor Lawson Caesar, Provincial Entomologist, was empowered by the Ontario Corn Borer Act of 1927 to approve and enforce methods for controlling and eradicating the Corn Borer in Ontario. Clean-up of infected fields was the only known strategy for containing the Corn Borers by interrupting their reproductive cycle. By 1926, however, whole fields were ruined, with the worst

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8 The History and Development of the Canadian Society of Technical Agriculturists and of its Official Organ “Scientific Agriculture” covering a period of over three years October, 1919 – February, 1923. Together with a List of Members, Constitution and By-laws, Personnel of Committees, Editorial and Advertising Policies, Advertising rates, Major Activities, and such other Information as will Provide a Convenient Reference Medium. Published for the Use of Members, Prospective Members, Advertisers, and Others Interested in the Development of Professional Agriculture in Canada (Ottawa: Canadian Society of Technical Agriculturists, 1923), 5, 17.
damage occurring in the two counties that grew corn almost solely for husking, Essex and Kent. Provincial specialists monitored clean up operations and farmers scoured their cornfields for stray Corn Borers. Meanwhile, scientists in the Entomological Branch of the Dominion Department of Agriculture studied the ecology and life cycle of the Corn Borer, as well as any natural predators living in North America.9

The earliest reports of European Corn Borers in the United States appeared in the early 1900s; they arrived in a shipment of broom corn, possibly from Hungary or Italy. By 1920, clusters of Corn Borers had been identified near Boston, Massachusetts, and further west near Buffalo and Schenectady, New York. Although the European Corn Borer continued to spread in succeeding years, fears of widespread destruction through the Corn Belt never materialized. An added advantage to American corn growers was the inclusion of soybeans in their crop rotations by the 1920s; since Corn Borers did not infect soybean plants, and since soybeans had no known insect predators, a soybean field effectively broke the Corn Borer’s life cycle while providing a valuable crop. By the time the Corn Borer was recognized as a potential threat, soybeans were well established in the American Corn Belt; they were an unwitting but nonetheless useful part of the cleanup there.

The Corn Borer likely entered Canada, also from Europe, in broom corn delivered to a factory in St. Thomas. The insect was first identified in the late summer of 1920 in Elgin, Kent, Middlesex, Huron, and Oxford Counties. Whereas native parasites kept the Corn Borer in check in Europe, the insect had no known predators in North America. Unkempt patches of weeds at

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the edges of North American corn fields, as well as corn stubble left on the surface, sheltered adult moths as well as eggs and overwintering juveniles. By 1921, waves of moths had spread south to Essex, and north and east to Wellington, Perth and Huron Counties into the heart of the milkshed where corn silage was a staple stored feed and corn seed was largely imported from the southwest.

Provincial entomologist Caesar, headquartered at OAC to deal with the disaster, reported that the adults had a “wonderful instinct to spread out” when they arrived in a corn field. While the ecologist in Caesar noted with scientific interest this inherent tendency to fly in search of a place to lay eggs, the agriculturist in him was aghast as they spread out and multiplied unchecked. The pattern of spread through Ontario and American states was similar: a wave of infestation advanced to new corn lands every summer, while affected regions were re-infested if there were any host plants. The Great Lakes were not a barrier, since the waves of Corn Borers spread from field to field over land, advancing up to twenty to thirty miles in a season. It was possible that larvae crossed the border in both directions in shipments of seed corn contaminated with pieces of stubble, and possibly also in contaminated ears, especially fresh sweet corn. By 1925, Corn Borers had cut a swath of ruin through corn fields in Kent and Essex Counties. In Ontario, the epidemic had been getting steadily worse since 1921; the worst years of infestation were 1925 and 1926, when the International Corn Borer Organization sent a delegation of American and Canadian scientists and corn producers through Essex and Kent Counties following its annual meeting.10

The devastation frightened American entomologists into lobbying for government assistance. President Coolidge and the 69th Congress authorized ten million dollars for cleanup work in the spring of 1927 before corn planting time. The American campaign, a campaign of comprehensive mandatory control, was dubbed the Ten Million Dollar Clean-up. It was a definite success: Corn Borer populations were reduced or held to the same insect counts as at the beginning of the cleanup. Officials were most impressed by the co-operation which farmers extended to scientists, even as government authority was brought to bear on private property. American entomologists acted quickly to identify the essential problem – unhindered spread through private property – and to not only legislate cleanup, but to compensate it. Thus, farmers were given a positive incentive to destroy corn stubble. Furthermore, detailed surveys at the beginning and end of the season proved the efficacy of the cleanup campaign. This was essential, since without evidence that the campaign succeeded, farmers may have been disinclined to repeat all the extra work, even with compensation, and government may have refused to fund it.11

The contrast between official responses in Canada and the United States illustrates the crux of the Corn Borer problem in southwestern Ontario: damage got steadily worse for several years before officials took it seriously, and recognized that agronomic measures like burning or burying all corn stubble and cleaning up weeds, where moths might hide, especially along fencerows, were the only effective methods of control. By 1927, acres of corn planted in Essex and Kent Counties had dropped by approximately three quarters, from just over 145,000 acres

total to about 35,000. Much of this was unusable for either silage or grain. Because many fields were not harvested, and the plants were left to rot, Corn Borers continued to overwinter in stubble and spread.

In Canada the threat was only significant in Ontario (although Corn Borers were identified in isolated locations in Quebec by 1927), so there was little incentive for the Dominion Department of Agriculture to act aggressively. Not only was corn a crop of regional importance, it was not exported. It contributed only indirectly to the national economy, as feed for bacon hogs. The Department supported scientific research into rearing predator wasps at a small facility at St. Thomas; this phase of research was never successful in either Canada or the United States. Dominion corn breeding was transferred from Harrow in Essex County to Ottawa during the years of heaviest infestation; there the focus shifted to creating varieties adapted to eastern Ontario’s cooler climate while experiments on management of field corn continued at Harrow.12 Neither Canadians nor Americans suggested eradication as an option for control; indeed, in 1928 scientists at the University of Illinois Agricultural Experiment Station released an information circular titled Learning to Live with the European Corn Borer.

The Ontario Corn Borer Act (R.S.O. Chap. 312, 1927) was introduced to control the corn borer population in Ontario.13 Entomologist Caesar recommended several measures, all of which involved cutting the corn as close to the ground as possible, and disposing of cut plants by ensiling, shredding, feeding or burning. In the spring all remaining stubble in the field was to be ploughed under deeply using a wide bottomed plough, and all corn debris lying around the barn or corn crib was to be buried or burned. Failure to comply with these regulations would incur a penalty of between ten and fifty dollars for each offense. In addition to control measures, Caesar

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13 Caesar and Thompson, The European Corn Borer, 18-19.
also engaged in education and publicity by issuing bulletins and articles in local newspapers. He also released photographs of the corn borer at each stage of its life, and graphic photographs of ravaged corn plants.

In the four years following the introduction of the Act (1927 through 1930), cases of corn stalk infection noted and reported in Kent, Essex, Lambton, Middlesex, Elgin and Norfolk Counties dropped steadily but never disappeared. For example, in Kent County the rate of infestation was 22 per cent by 1930, a rather spectacular reduction from 79 per cent in 1926; most of this was due to the Act. Caesar was confident that by strictly enforcing the Act, insect populations would be reduced to the extent that damage was negligible. But inspectors were poorly trained and sometimes not diligent at their jobs; their rate of pay was arbitrary, to be determined by the county councils which employed them. Farmers were not compensated for cleaning their fields, or for lost crops. The success of the Act relied heavily on voluntary compliance and acceptance of extra work; Caesar admitted that his own duties (including his other work at OAC) precluded a thorough inspection of the whole province. Voluntarism and community spirit were well known in rural Ontario, but thorough cleanup took more time and energy than many farmers were willing or able to give.

Farmers gained a false sense of security that the worst of the epidemic was over when they observed fewer larvae and less damage in corn fields in their region; the extra work of cleaning fields and counting and reporting infected stalks paid a dividend in healthy plants, and many began to grow and ship grain corn again. As a matter of fact, the Act did not quarantine southwestern Ontario corn, but in any case, statistics collected in both countries clearly demonstrated that corn borers were still present, even if they were not always visible. This was a
particular problem in silage corn where damage often went completely unnoticed until over half of the plants were attacked.

Conditions for Corn Borer reproduction and migration varied. In the very hot, dry summer of 1930, most of the larvae in several of the drier counties perished, apparently due to a combination of heat and drought. In 1931 a bumper corn crop took extra time to harvest, and there was little time left in the fall to effectively clean up stubble. Unpredictable weather and fluctuations in the levels of infestation did nothing to help corn growers plan from year to year. Some scientists believed that late planting (in the last half of May) offered some defense, because moths laid their eggs in July when late-planted corn was not yet tall enough to attract them. But late planting was not recommended; in most regions, late planting limited the crop to silage, with no grain crop. In Essex and Kent Counties, farmers counted on grain corn for cash sales. Through the 1930s, an alternating cycle of rising and falling insect populations and damage established itself, and entomologists issued bulletins and press reports urging farmers to be diligent, even when there were few borers to be found.14

In southwestern Ontario, the corn borer challenged the whole agricultural community. Grain corn was the primary cash crop and other activities were tightly integrated into a rotation with corn. Scientists offered two ways to deal with the disaster. The first depended on use of a familiar practice: keep growing corn, and clean fields thoroughly of stubble following the harvest. The success of this strategy depended on compliance from every corn grower. The second required innovative thinking by everyone: a switch to other crops, either permanently or

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temporarily. Soybeans were one recommendation. As it turns out, scientific farmers chose both options.

**Continued Corn in Ontario**

Corn was a valuable soiling crop (fed green in summer). Flint corn was even considered for annual pastures, and although it was one of the most palatable crops tested, the total production of green material per acre was low in comparison to most legumes and some grasses tested. Ensiled corn excelled as a stored feed. It retained most of its nutritional value and cattle relished its tangy fermented flavor. In fact, soybeans for silage (alone or combined with corn in the silo) received cursory attention by OAC scientists in the 1910s. Drummond’s compiled data reflects an increasing turn to corn as a stored feed for ruminants, but husking corn was also sold as seed. By the early 1920s, husking corn was recommended by OAC scientists for mixed farms in southwestern Ontario, largely due to the long growing season and high temperatures, which combined to supply the corn heat units required for the crop to mature.\(^{15}\)

Southwestern Ontario farmers capitalized on the natural adaptability of open-pollinated corn to develop a provincial market for seed. Up to the 1930s, notwithstanding work on hybrids, open-pollinated corn was still widely grown in the American Corn Belt and southwestern Ontario. The free exchange of genetic material through random cross-pollination guaranteed that North American varieties would adapt to myriad environmental niches. For example, dairy farmers on Manitoulin Island, at Sault Ste. Marie and New Liskeard, as well as in central and eastern counties, purchased southwestern corn seed, mainly to grow silage. Vance Brothers of Tillsonburg, in Oxford County, advertised “Sweepstakes” seed especially for ensiling in

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“northern districts”; this variety boasted very high germination, early maturity, and dependable leafiness and cob production for high protein silage.\textsuperscript{16}

When the European Corn Borer struck, scientists on both sides of the border thought that corn would never be grown in Ontario again, but farmers depended on it. Seed corn for sale, grain corn for pigs and poultry and corn silage for dairy and cattle were the mainstays of agriculture through the province. As a result, the Corn Borer never disappeared.

The farmer who chose to continue growing corn made a decision based on the state of farm finances and potential markets for the crop. The value of corn land in the southwest was inflated by several factors beyond farmers’ control: its inherent fertility and the excellent regional climate for growing heat-loving annual crops like corn, tomatoes, sugar beets and soybeans, but also its proximity to rapidly developing towns and cities where farming, housing, industry and roads and railways competed for arable land. The tip of the southwestern Ontario peninsula was heavily populated. By the late 1920s, Chatham, the administrative and commercial centre of Kent County, was an expanding manufacturing centre. In Essex County, the border cities of Windsor, Walkerville and Ford City covered several square kilometers of former farmland with workplaces and residences.\textsuperscript{17}

Rural property values surged. In 1931, the value of farms in Essex County averaged $125.00 per acre, with land tax assessed at $2.59 per acre; in Kent County, farm land values averaged $88.00, with tax at $1.79 per acre. By way of comparison, in Wellington County in central Ontario, farm values averaged only $54.00 per acre, taxed at $0.94. In the province as a whole, farms were worth an average of $53.00 per acre, and the average tax per acre was only

\textsuperscript{16} FA, January 30, 1930.
$0.84. Farmers in Kent and Essex counties also carried higher than average debt loads, reflective of the fixed and variable costs associated with growing annual crops and raising livestock. Farm families depended on cash generated by the sale of commodity crops like sugar beets and tobacco, both grown under contract, and above all, seed corn, to maintain cash flow necessary for running a farm and raising a family. Even in the years when the Corn Borer was at its most destructive, there was still some husking corn to sell, and buyers for it. In 1927 in Kent County, average yield dropped to less than 60 bushels per acre, and income from corn fell correspondingly to about forty dollars per acre, but by the next year both yield and income jumped to pre-Borer levels. Average prices dropped again in 1929, but rose slightly by about 1934 and settled at a low but fluctuating average for the rest of the decade.18

Besides depending on grain corn for revenue, southwestern farmers were committed to corn through the regional mixed farming system of crops and livestock which was familiar and safe. Corn and small grains rotated with specialty crops like sugar beets, tobacco or field vegetables grown in small amounts. Perennial pastures and hay meadows were maintained for cattle and horses; hogs (which ate the corn) were housed, although sometimes they were allowed into a field to glean or hog off a crop. Dairying was a minor activity and supplied mainly local markets; a small amount of corn silage in Kent and Essex County was fed to dairy cattle. In Ontario in the 1930s, a recommended rotation was comprised of alternating annuals on a planned schedule: row crops (roots, corn), grains (wheat, oats, barley, mixed grains) and legumes (clovers, either as annuals or short-lived perennials). Row crops served to clean fields by permitting hoers to go between the rows and weed; in the southwest, there was little demand for

root crops because corn was so popular. If corn disappeared, the entire rotation system, where all crops had multiple purposes, became disorganized and required rethinking.

Corn production was so entrenched in southwestern Ontario (and indeed even more so in the American Corn Belt) that farmers found it impossible to give up. Since the first Agricultural Representatives (Ag Reps) were assigned to Kent and Essex Counties in about 1912, farmers requested information about corn almost to the exclusion of other crops. In Kent County, the annual Corn Fair was a popular fall event. In 1915, the local Corn Growers’ Association refused a request by the Ag Rep for money or management to open the show to other crop seeds. The proposed expansion went ahead with funding from the county and was so successful that organizers unanimously agreed to permanently include other crop seed competitions in future exhibitions, but Kent County farmers never wavered from their devotion to corn. In the annual reports of the various Ag Reps through the years to the 1940s, most meetings mentioned were on the subject of corn. The fall fair was referred to as the “corn and seed show” for many years.19

In spite of the regional focus on corn, mainly due to its cash value to farmers who had regular bills to pay, Kent and Essex Counties were in reality a region of mixed farming. Beginning in 1923, the newly formed Statistics Branch of the Ontario Department of Agriculture collected data on “farm crops” for each county and district on the province; these included fall and spring wheat, oats and barley, peas and beans, rye and buckwheat, flax and mixed grains, husking and silo corn, potatoes and turnips, mangels and sugar beets, alsike and sweet clover, alfalfa and hay and clover mixtures, and carrots.

The compiled data demonstrate that farmers in Essex and Kent Counties grew these crops, albeit sometimes in small quantities. For example, fewer than 500 acres of turnips and

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mangels were enumerated in most years, although pasture and hay crops and oats were sown in significant quantities. These crops, as well as corn, were typically fed to farm livestock. The low flax acreage (in 1924, one acre each in Essex and Kent) demonstrates what may have been a personal preference, possibly for home production of linen threads and textiles. In some years, no flax at all was planted. Furthermore, in spite of their importance to the southwest, the data of the Statistics Branch does not include either tobacco or field tomatoes grown for canning. Both crops added to farm receipts and the regional economy.20

Nevertheless, corn received the most attention, and farmers were concerned with corn husbandry. The decision of growers to persevere with corn despite the Corn Borer, and expert scientific advice to make some changes to reduce their reliance on corn, reveals the extent to which farmers kept their own counsel. Even though it had been an innovative crop only a few decades earlier, corn was entrenched in southwestern Ontario mixed farming.

**An Alternative to Continued Corn: Soybeans in Crop Rotations**

The second response to the challenge of the corn borer required innovative action: a switch to some other crop or crops which also grew well in the southwest. In the late 1920s and early 1930s, however, another challenge faced farmers: the disappearance of markets for export crops, which filtered down to individual farms and farm families who were unable to sell products or purchase inputs such as seed, fertilizer, and necessities for the home and family, or keep up with property taxes and loan payments. Added to the economic strife were abnormal weather patterns in summer and winter. Reports of cool, wet planting seasons, hot, dry growing seasons, and rainy harvest times were alarming. Farmers, who on the whole were not

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20 *Annual Reports of the Statistics Branch*. 1923-1940.
traditionally risk takers, adopted an even more cautiously conservative attitude toward innovative crops, including soybeans, and resorted instead to those that were familiar and reliable.

Since they were first introduced to North America, soybeans had been valued as a hay crop. William Brown at OAC grew them in his garden in 1881, and counted the numbers of seeds and pods while commenting on the size of the plants, an indicator of dry matter. By 1893, Charles Zavitz was in charge of experimental plots, and he referred to soybeans as one of five varieties of “fodder plants”, including other beans, received from the Kansas Experimental Station. From the earliest research and experiment programs, however, soybeans had to compete with alfalfa. Its nutritional value was roughly equivalent to alfalfa hay.

Soybeans had one fundamental disadvantage in comparison to alfalfa: because soybeans are an annual crop, one cut per summer was the best a farmer could plan for. Therefore, when rain in August ruined a crop of soybean hay, that loss left a deficit in planning for winter feeding that needed to be filled by something else. While numerous farmers submitted flattering testimonials about soybean hay, others hesitated until they knew more about it. On mixed farms, high-quality hay was essential to overwintering livestock, including horses, beef and dairy cattle. Farmers in many parts of the province were enthusiastic about soybean hay. For example, in Simcoe County in central Ontario, soybeans were reported to be “a splendid crop as everything we have fed it to are very fond of the feed”. In Lincoln County in western Ontario along Lake Ontario, cattle preferred soybean hay to mixed legumes and grasses. Interested farmers sought advice about planting, managing and harvesting a soybean hay crop, but the answers to their questions were vague and not particularly helpful, even when the information came from a scientist. For example, a soybean field was ready to cut for hay when pods were well developed and the beans in the pods had attained about one half their normal size. Furthermore, harvest was
recommended when about 95 percent of leaves had dried and fallen off, but a range of dates when this might occur was highly dependent on weather, which was itself erratic in the early 1930s. Planning and the timely performance of all the activities which were part of mixed farming integration were essential, particularly when markets and weather were themselves unpredictable.21

In comparison, alfalfa (also known as Lucerne) and alfalfa hay had numerous advantages over soybeans. Alfalfa was a perennial crop that offered two and sometimes three cuts in a summer. Alfalfa had been introduced to Ontario in the late 1880s, at about the same time as soybeans; alfalfa was a biological innovation that was embraced by farmers and added to research programs at both OAC and in the Dominion Central Experimental Farm (CEF) system. Continuous co-operative experiments with alfalfa were also conducted by the Ontario Agricultural and Experimental Union (the Ag Union) from about 1899. By the 1930s, alfalfa had spread through the milkshed in central and eastern Ontario. Two varieties were available: Grimm and Ontario Variegated. Each of these was winter hardy and quick to resume growing in spring, and could be counted on to produce digestible, palatable hay with a high protein content.22

Notwithstanding alfalfa’s hardiness, the winter of 1933-34 killed entire fields. Both western and eastern Ontario were particularly hard hit by extreme cold and little snow, and when it became evident in spring that thin and patchy stands might lead to a critical shortage of stored hay in the coming winter, soybeans were recommended as an emergency hay crop. Planting soybeans for hay as a last minute solution to alfalfa or red clover winter kill was popular in the


22 W.J. Squirrell, Hardy Alfalfa (Ontario Agricultural College, Guelph: Ontario Department of Agriculture, 1929).
American Midwest, but it is unclear if Ontario farmers actually planted soybeans as a last minute substitute for anything. When winter kill was common and springs were often too wet to follow a planting schedule, many farmers turned instead to roots like turnips and mangels as a stored feed. Roots had been popular in the early years of the century, but fell from favour when silos and corn increased in popularity, and alfalfa hay was easily grown. In the 1930s, some farmers returned to familiar roots, especially since the Department of Field Husbandry had released OAC No. 2 Yellow Leviathon Mangels and made one hundred pounds of stock seed available for distribution to farmers in 1928.23

Still the question remained for scientists and farmers who saw long term potential in soybeans: How to integrate soybeans into Ontario’s system of crop production, which depended mainly on export markets for dairy products and pork, as well as growing domestic markets for diverse agricultural commodities? The answer for most was to turn away from soybean hay, and accept soybeans, albeit cautiously, as a grain crop for the production of oil and its byproduct, high-protein oilcake or oilmeal.

In making this decision, they were following the lead of their American counterparts, Corn Belt farmers who had embraced soybeans as rotation partners with corn, and as oilseed cash crops in their own right, since the early 1920s. The pace of this shift was much slower in Ontario than in the US, but it was the factor that most significantly shaped the future of soybeans. Henceforth, scientists concentrated on grain yield in programs to develop regionally adapted varieties. Farmers began to look at soybeans primarily as a crop for the market: its value was derived from oil and protein contents. Not only did the grain have cash value, it was often

fed on the farm, mainly to hogs and poultry, as an alternative to purchasing feed. The short- and long-term advantages of soybeans were due exclusively to the grain.

In 1929, J.B. Edmondson of Clayton, Indiana, Secretary of the American Soybean Association (ASA), addressed the annual meeting of Ag Union members, including both farmers and scientists. The text of his talk was reprinted in the *Annual Report* of the Ag Union, and the *Farmer’s Advocate* reported on his visit, because he offered a possible solution for the “disturbing economic situation” existing at that time: crop surpluses for which there were no export markets and therefore no sales. Ontario mixed farmers (especially dairy farmers) accused federal politicians of paying too much attention to the plight of western Canadian wheat growers, and demanded the government intervene in securing markets for their produce. The situation also had serious social repercussions, and inspired farm youth in southwestern Ontario to form the New Canada Movement in the winter of 1933. The Movement’s logo, “Save Agriculture – Save Canada,” expressed clearly their conviction that farming and farmers were integral to the social, political, and economic affairs of the country. Although it was short-lived and failed to attract the support of farmers outside Ontario, the New Canada Movement had a powerful effect on the rural community in the province; from it sprang the Farm Radio Forum, Folk Schools and the Farm Credit Corporation.24

According to Edmondson, soybeans had many uses on the North American farm: feed (both hay and grain), soil amendment, and reseeding. He claimed there was an unlimited demand for soybeans in American crushing mills, most of which were situated in Corn Belt states close

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24 Ontario. Department of Agriculture. *Fifty-First Annual Report of the Agricultural and Experimental Union* (hereafter cited as *Ag Union Annual Report*), 1929, 34-39; “Utilization of Soybeans”, *FA*, January 2, 1930; letter from Giselle Ireland, RR2, Teeswater, N0G 2S0, no date, Ontario Farm Movements Collection, Archival and Special Collections, University of Guelph. For a valuable summary of the origins of the New Canada Movement as a precursor to rural adult education movements in Ontario, see Terry Crowley, *The New Canada Movement: Agrarian Youth revolt and Adult Education in the 1930’s* (Guelph: Department of Rural Extension Studies, University of Guelph, 1988).
to the Great Lakes and therefore relatively accessible by water to Ontario farmers. American growers were unable to fill this need, and soybean products – oil and oilcake – were in short supply and becoming even more scarce as demand expanded with growing populations of humans and animals. In fact, “there would be a good demand for soybeans in the years to come” and “there was no danger of surplus”.25

James T. Campbell had sung this same song a decade earlier, but Ontario farmers still hesitated. Edmondson urged them to get into soybeans immediately in order to inoculate their soil with the correct species of *Rhizobium* and grow profitable crops as soon as possible. The *Farmer’s Advocate* featured a photograph of “Soybean Investigators”, Professors Laughland and Squirrell of the Department of Field Husbandry, OAC, standing with Edmondson, knee deep in a field of OAC No. 211 and Manchu soybeans, two varieties in a summer field test.26 These predictions were exciting, but Ontario farmers did not respond to the promise of profit in the way that Edmondson hoped, and definitely not as ardently as American scientists, farmers and businessmen had embraced the crop.

In the early 1910s, a shortage of soybean oil had led to the development of a domestic crushing industry, centred in Illinois, close to soybean producers and well-served by railroads and Great Lakes shipping. Progress in this industry was led by Archer-Daniels-Midland (ADM), which diversified from its earliest commodities, flax and linseed oil, into soybeans and related products. ADM constructed its first dedicated soybean plant in 1929 in Illinois, although its linseed oil mill in Minneapolis crushed soybeans, albeit sporadically, at least until 1939.27

26 *FA*, January 2, 1930.
The ASA (of which J.B. Edmondson was Secretary and OAC President G. Creelman was president in 1929, when the ASA held its annual meeting at OAC) was founded in 1920 by farmers and extension workers to promote the crop and facilitate opportunities for profit. Since about 1925, soybeans were viewed in the United States as an “industrial raw material” due to their oil and protein content, and a research program was established at the University of Illinois in anticipation of “problems of fundamental importance to the whole industry including the farmer.” The program was guided by the following overarching plan: how to grow soybeans in specific agronomic conditions to produce grain with desired content of oil, protein, or both as industrial conditions demanded. By 1940, soybean acreage in Illinois had increased by 600 per cent from late-1920s acreages, to roughly three million acres; during the same time period, acres planted to corn remained relatively stable at about nine million acres. The industry, comprised of a handful of companies, crushed 64 million bushels in 1940.28

There was no such concerted movement to promote soybeans in Ontario; only a few growers planted them and on far fewer acres than the extensive crop production with limited rotations typical in the American Midwest. There were two fundamental reasons for this: the slow pace of breeding programs to develop and release adapted varieties and the lack of a firm market and favourable prices for Ontario soybeans. The situation represented a veritable catch-22 for the entire agricultural community. Identifying the relative importance of each factor is less useful than understanding that they were inexorably intertwined, and that plant breeders and soybean growers approached the problem in different ways according to their primary interest

and expertise. Agricultural scientists worked on developing adapted varieties, while farmers themselves became involved in marketing.

**Soybean Breeding at Public Institutions: Research, Experiment and Extension**

By the mid-1920s, plant breeding was a scientific specialty which demanded an expert knowledge of inheritance as well as familiarity with the structure of flowers and their reproductive organs. Science was wedded to commerce, “a truly Baconian vision of humanity’s relationship with nature,” according to journalist Noel Kingsbury. He explores this theme in his history of plant breeding and suggests that by the early twentieth century the science of plant breeding was used almost exclusively for the development of economically important crops. The discovery of Red Fife wheat by Mrs. Fife, and its subsequent improvement by Charles Saunders to Marquis, a hard red spring wheat with excellent bread-making qualities, solidified Canada’s reputation as the bread basket of the world. Marquis succeeded because it was an early maturing spring wheat which yielded exceptionally well in the prairie climate; although southern Ontario was traditionally a region where small grains, including wheat, were an important part of the mixed farming rotation cycle, Marquis was not adapted to that environment.²⁹

Kingsbury argues that American scientists used Mendel’s laws for both tangible and abstract aims: to develop “not just new crops and flowers but more crucially, abstractions and general principles, which could then be applied many times over.”³⁰ In the United States, however, scientists were unsuccessful at applying these laws to corn improvement. The development of hybrid corn in Illinois between 1890 and 1940 receives close scholarly attention from agricultural historian Deborah Fitzgerald, who documents the transformation of corn

³⁰ Ibid., 167-186.
genetics from mass selection through the study of pure lines and early hybrids using Mendel’s laws to the application of public corn research to commercial seed production and sales. Corn was “the most easily manipulated of farm crops”, male and female parts are readily distinguishable and separate, and exposed to the wind, which is responsible for most cross-pollination. Its physique made corn perfectly amenable to manual manipulation, where technicians either removed the male flowers before pollen was released, or moved pollen from a selected male to a target female, or both, but the physical expression of sexual recombination was much more complicated than contemporary understandings of genetics suggested. Nevertheless, the ongoing science of corn genetics at public institutions did not deter seed producers and retailers from creating a lucrative industry selling hybrid corn seed.

The structure of soybean flowers actually deterred breeders from attempting to use similar hybridizing techniques. Soybean flowers contain both male and female reproductive parts in a closed compartment which prevents pollen spread, and they grow in leaf axils close to the stem. Whereas corn was naturally open-pollinated, soybeans were almost exclusively self-pollinated, and the creation of genotypically and phenotypically stable pure lines was a matter of observation and selection. Even though corn and soybeans required the same climatic conditions, the breeding programs for each were completely different. Soybean hybridization using standard techniques for corn simply did not work.

The value of investment in soybeans by the provincial Department of Agriculture was estimated not in terms of dollars spent, but dollars added to the rural economy. Charles Zavitz calculated that co-operative experiments paid for themselves in good will between farmers and scientists, as well as the increased interest in scientific agriculture in rural Ontario. The greatest

32 Zavitz, *Forty Years*, 8.
return to this investment accrued to the province, which provided support for research, experiment, education and extension in the form of land, buildings, equipment and draft animals, and paid the salaries and expenses of scientists who kept soybean experiment programs going by piggy-backing them onto other experiments with corn, forage crops, and farm management systems. In exchange for this support, annual co-operative experiments and demonstration plots returned a wealth of useful information at no direct cost to OAC except mailing seed to participants, and this was partly covered by the fees for membership in the Ag Union. Scientific farmers subsidized agricultural research in general, and soybean research in particular, through their voluntarism.

After a decade of intense selection, OAC No. 211 was released in 1923, and registered by the Canadian Seed Growers’ Association in 1925. It was actually the product of over forty years of diligent co-operative work by scientists and farmers, but more research was required to either improve this variety or develop new ones that were specifically adapted to Ontario’s myriad climatic and geographic niches. OAC No. 211 was readily damaged by wet and cool weather, especially in midsummer at flowering and seed set, and later at harvest. Charles Zavitz officially retired in 1925, and although his colleagues at OAC continued to promote soybeans, the research program remained small through the late 1920s and 1930s. In 1938, researchers released Goldsoy, an early-maturing selection of OAC No. 211 with improved grain yield; its lower hay yield was a relatively insignificant disadvantage. Goldsoy was the last new soybean variety to come out of OAC for several decades.33

In order to promote soybeans for grain and hay, the Department of Field Husbandry co-ordinated meetings and demonstration plots across the province, published a question and answer

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pamphlet, and mounted and staffed a three-day soybean exhibit at the Western Fair at London. All were popular and well-attended. During these years, co-operative members of the Ag Union were actively testing crops, and interest in growing soybeans picked up in 1931 due in large part to exceptional yields on test plots in 1931. In 1932, 12 farmers requested soybean seed through the Department of Field Husbandry for co-operative testing, and numbers of applications for soybean seed increased annually to the late 1930s, but the crop was still an innovation and in both absolute and relative terms the number of interested farmers was very small.\(^{34}\)

Speaking at the World’s Grain Exhibition and Conference in Regina in 1933, W.J. Squirrell, Professor of Agronomy at OAC, reported that approximately 25,000 acres had been planted in western and southwestern Ontario during the previous four years.\(^{35}\) This amounts to 6,250 acres per year on average: generous by anecdotal reports (since soybean acreage was not recorded by either the Statistics Branch of the Ontario Department of Agriculture during the 1930s, or the Canada Census until 1941) and minuscule in comparison to American data.

The Ontario Department of Agriculture expanded its experiment system, and established satellite institutions, with OAC at the hub, which focused on regional farm management systems. In 1922, the Western Ontario Experimental Farm (WOEF) at Ridgetown in Kent County was created to conduct field experiments on burley tobacco, white beans, potatoes and sugar beets, and later commercial vegetable crops and flowers, and swine. The first plot tours were planned for the summer of 1925 to demonstrate methods of growing these specialty crops as alternatives to corn. Soybeans were subsequently introduced at Ridgetown with field studies of management

\(^{34}\)Ag Union Annual Report, 1931. Toronto, 1932, 14; Ag Union Annual Report, 1932, 12; Ag Union Annual Report, 1933, 10.

criteria including planting densities and rotations, after work at OAC demonstrated that soybeans might be a viable alternative to corn.36

The Central Experimental Farm system, headquartered at Ottawa, also resumed soybean breeding in the mid-1920s, at two locations: Ottawa and its satellite station at Harrow (HRS) in Essex County. Earlier soybean research, supervised by William Saunders from 1906 to 1911, had ended with the generalized conclusion that soybeans were unsuited to Canadian conditions, and therefore had no economic potential. In the meantime, however, a new cohort of plant breeders recognized their indirect value on the farm, although their cash value was conspicuously discounted:

Present production of the soybean in Canada is chiefly for seed, which, being extremely rich in protein and oil has a high commercial value. The industrial uses for which it can be utilized are numerous. The seed also has considerable value on the farm for live stock feeding and, since the soybean plant itself possesses a high nutritive value for fodder, it is quite possible that as production increases the crop may find its greatest use on the farm, rather than in industry.37

Their suitability for growing at HRS was noted. This feature, combined with the Corn Borer epidemic, inspired early studies of field management: “Being a cultivated crop soybeans might be used to some extent as a substitute for the corn crop in the corn borer infested area. By growing the proper varieties the crop will be harvested just previous to the time for sowing fall wheat which may be sown in the soybean stubble with the minimum of soil preparation.”38

An introductory breeding program began in 1930 with crossing outstanding varieties. Scientists at HRS obtained seed from diverse sources, including China and Korea, OAC, various USDA experiment stations and a local grower, but the “small floral parts and the proximity of

36 “Ridgetown College: This Date in History”, Ridgetown College Library, 2; “Ridgetown School to become Agricultural College”, London Morning Free Press, Saturday April 25, 1936.
37 G.P. McRostie, R.I. Hamilton, F. Dimmock, and S.E. Clark, Soybeans in Canada (Ottawa: Department of Agriculture. Forage Crop Division, Central Experimental Farm, 1928), 7-8; Dimmock and Kirk, Soybeans, 5.
38 McRostie et al, Soybeans in Canada, 4.
the flowers to the ground made this work quite difficult to accomplish with any degree of certainty.” HRS released AK (Harrow) in 1933. This was a selection from AK or “All Kinds”, a population derived from repeated crosses and selections from a Chinese sample imported to North America by the Lucas Paint Company, New Jersey, in 1912. An entry named AK was also on the list of varieties tested during several summers at Illinois. AK (Harrow) was specifically adapted to the extreme southwest portion of the province, where it was a prolific producer of both grain and hay. No more new varieties were released from Harrow for many years.39

In 1939, scientists at CEF Ottawa released Mandarin (Ottawa), Kabott and Pagoda. Mandarin (Ottawa) was a selection of the variety Mandarin, introduced to North America from Manchuria in 1911. Kabott was a selection from a mixed seed lot from a different Manchurian strain. Pagoda was offspring of Mandarin crossed with Manitoba Brown, both of which had been part of OAC research trials for many years. Most of the seed used in CEF breeding programs was obtained from OAC. Mandarin and Manitoba Brown both originated in cooler, shorter season regions, where they grew well and set seed; their progeny, Pagoda, was earlier and more tolerant to low temperatures than both its parents.40 Nevertheless, even though they were earlier to mature, the new varieties were often killed by frost before the grain was ripe. Farmers watched the crop with interest. The few who planted them took a chance that, between agreeable weather and their own able management, they would harvest a bountiful crop.

Soybeans on the Mixed Farm in Southwestern Ontario

Field crop experts recommended soybeans for different kinds of produce – some marketable, some not. The vegetative plant had several uses: ploughed down as green manure, cut green and hauled to livestock as a soiling crop, stored as ensilage or hay, and hogged off to supplement the corn ration when bad weather interfered with harvesting. The grain was equally versatile. Its feed value in poultry and hog rations was well understood, as was the need to monitor amounts fed to hogs, and to blend high-protein soybeans with high-carbohydrate corn to avoid soft and unsalable pork. A few farmers specialized in seed production. When threshed, soybean straw made tolerable bedding.41 Despite what scientists thought, however, farmers themselves were mainly interested in soybeans as a feed crop in rotation with other field crops.

A soybean crop also offered intangible benefits with no immediate cash value but which strengthened the existing mixed farming system. One of these intangibles was soybeans’ capacity to be integrated into the annual work schedule which underpinned each farm family. They were especially flexible in rotations with corn and small grains, and amenable to earlier or later planting with standard implements. Steady year-round work growing crops and tending livestock provided employment, room and board for family members who might otherwise be lost to the Depression. D.L. McCreary exaggerated only slightly when he stated plainly that farmers survived because the complement of plant and animal products raised on mixed farms was so diverse that no one starved: “We have all learned some lessons these last two or three years and we have learned for one thing how to get along without any money.”42 A few acres of soybeans augmented that diversity by adding a feed option or a specialty cash crop. And finally mixed farming as an integral management system maintained soil fertility and farm productivity through crop rotation which kept weeds, insects and diseases under control, and by allocating

41 McRostie et al, 7-8; OAC Annual Report, 1932, 69.
42 “Five Cash Crops,” FA, July 6, 1933.
land to permanent pastures and woodlots. Soybeans were accepted because they fit nicely on traditional mixed farms: the advantages of the crop reinforced the advantages of the system, and vice versa.

Robert Knister of Northwood, near Chatham, experimented with soybean seed obtained from OAC even before OAC No. 211 was registered. By virtue of his membership in the Canadian Seed Growers Association (CSGA), he was legally permitted to sell his seed in bags tagged with an official inspection number which guaranteed varietal purity and cleanliness from foreign material, and to charge a premium price. Knister was present when J.B. Edmondson addressed the annual meeting of the Ag Union in 1929; in a question and answer session following the talk, he explained that he had planted as many as thirty acres in a single year, with yields ranging from fifteen to thirty-five bushels to the acre. He sold most of his seed, likely saving some for his own use, although he harvested part as hay to feed his own cattle.43

Other seed producers in the southwest capitalized on their expertise and became world-renowned at growing champion soybeans. In 1932 and again in 1933, Gordon Finlay of Finlay Bros., neighbour to Robert Knister in Northwood, took the grand prize for soybeans at the Chicago International Livestock Exhibition and Grain Show. This exhibition and competition was held annually in December, when harvest, threshing and other related activities were complete. In 1934 and 1935, W. Davison of Blenheim was best overall grower, thereby securing Kent county’s reputation as a place where excellent grain soybeans could be counted on to grow.44

Each of these farmers started with bushel lots of OAC No. 211 Elite Stock seed shipped from OAC. Knister, Finlay and Davison built up competitive businesses selling registered soybeans and other seeds to local farmers through the 1930s. By early spring, 1937, Finlay added a line to his spring advertisements in the Farmer’s Advocate advising prospective customers that he was also receiving orders from Morocco, New Zealand, Spain and Portugal. The generic soybeans that had come to Canada from western Europe in the 1880s were now travelling back to that region and to other parts of the world as a highly improved genetically pure variety.45

Gordon Finlay’s detailed description of soybean culture illustrates the intensive nature of soybean growth, but they fit satisfactorily into a Kent County rotation: they responded with “phenomenal growth” after each of numerous passes with a light spring-toothed harrow during the growing season, they were cut and stooked the same as other cereals, using the same equipment, and the early-September harvest did not interfere with other harvesting on the farm.46

In Chatham Township, Kent County, D.L. “Good Roads Dave” McCready was a successful mixed farmer and community leader who advocated planting a wide variety of cash, feed and food crops as a hedge against market instability and to conserve soil fertility during the early 1930s. In 1933, he planted 55 acres of crops for sale, including three acres of soybeans for delivery to the new Soya Bean Oil and Meal Co-operative (SBOMC) crushing mill in Chatham. His other cash crops required a steady supply of family and hired labour: fall wheat, sugar beets under contract for delivery to the Wallaceburg refinery, tobacco (also under contract), and potatoes. Corn was planted after May 15, and soybeans followed. Potatoes and beets were hoed and hilled. All spring grain crops and corn were harvested in late August and early September, when weather was dry and help was available. Since the equipment needed for growing soybeans

45 Advertisement for OAC government standard No. 1 soybean seed for sale at $4.00 per bushel, FOB Chatham, sacks free, FA, March 6, 1930.
was the same as for other grains, they were planted, cut and threshed around the other crops. The family also kept livestock, including laying chickens which “practically kept the house”. “Good Roads Dave” was well-known in the community. He lobbied for improved roads, a community corn dryer, and better terms on sugar beet contracts on behalf of local producers. He was also a charter member and served on the governing board of the SBOMC.47

In contrast to McCreary, Sam Smythe and son Harold cultivated 20 acres of soybeans: some for hay but most for grain. Smythe advertised some for sale as seed in spring (and planted his own seed stock), but most of the crop was ground on the farm and fed as a protein supplement, mixed with home-grown oats and barley, to a herd of 37 Jersey cattle whose milk they sold to a local dairy. These cows were turned onto permanent pasture in spring. In the past they had also fed ground soybeans to hogs. These integrated mixed farming practices allowed the Smythes to offset the low selling price of milk.48 The focus of farm management was self-provisioning and cash flow.

Soybeans played a small but important role in each of the Knister, Finlay, Davison and McCreary farm operations. During the Depression, when money was scarce, each family diversified, selling surplus crops to keep revenue coming into the business and the household. Money made from selling soybeans added to the general pool of farm income, but some farmers had eyes on larger markets. They recalled G.M. Edmondson, who encouraged Ontario farmers in 1929 to grow soybeans for the American market. In 1932, when prices were still high in the United States, a few Kent County growers formed the SBOMC to market their own grain soybeans.

47 “Five Cash Crops,” FA, July 6, 1933; Victor Lauriston, _Romantic Kent. The Story of a County 1626-1952_ (Victor Lauriston, 1952), 707, where Good Roads Dave McCreary is mentioned as living “on the Sydenham Road”.
48 FA, August 15, 1931.
The Soya Bean Oil and Meal Cooperative, Chatham, 1932-1935

Throughout the 1930s the marketing of farm produce was a topic which generated endless conversation in rural communities. The case of the short-lived SBOMC at Chatham, which operated between 1932 and 1935, illustrates some of the myriad issues impinging on commodity marketing in southern Ontario. In the first place, while more than 700 soybean growers (a generous estimate) purchased memberships, others did not, and many pledges were not honoured: support for co-operative marketing was divided even in this small group. For example Dave McCreary, a co-op executive member, grew his sugar beets under contract to a refinery (the Dominion Sugar Company Ltd.), and his household petty cash was earned from local sales of eggs. The McCreary farm family was therefore co-operative and capitalist as the situation demanded. Such a risk-averse approach to decision making was typical of Ontario farmers, and applied to economics as well as crop selection.

Secondly, there was at best a very weak domestic market for soybeans, although the demand for soybean oil was strong. The Ontario crop was too small to influence prices set by American purchasers, in this case Archer-Daniels-Midland (ADM). Indeed, Ontario farmers in general were constrained by export markets, especially for cheese, pork, some beef and apples, and a few specialty commodities. One of the most strident complaints advanced by dairy farmers was the lack of access to traditional imperial markets following World War I. Counterarguments that Ontario producers as a rule should improve the quality of their products and standardize them to conform to consumer preferences abroad were not taken seriously. The most egregious example of this was farmers’ refusal, almost across the board, to purchase certified seed, or even to clean their own seed prior to planting. The resulting penalty accrued to investments of time
and input costs by reducing the yield and selling price and spoiling the demand for Ontario produce.

Finally, the perceived inequality of support from their Dominion government compared to assistance granted to prairie grain producers embittered Ontario farmers. The re-creation of the Canadian Wheat Board in 1935 for the orderly marketing of prairie wheat initiated discussions about marketing boards as well as controlled prices for Ontario commodities. By 1938, the Farmer’s Advocate editorialized that the Dominion government had put marketing problems “back on the farmer’s doorstep”. Far from providing assistance, the Dominion government had adopted a policy of “drift and delay”. Dean Shaw, Director of Marketing Service in the Dominion Department of Agriculture, “related effective marketing to efficient production based on the adaptability of soil, climate and vegetation to various lines of production” and rejected demands for government intervention.49

In effect, Ontario farmers were expected to define and regulate their own marketing problems, actions they had been taking for years with mixed success. In Essex and Kent Counties, various marketing board initiatives affected rural communities, including soybean growers. Two commodities in particular – field beans and tobacco – were affected by supply management and price controls. The field bean market had traditionally been acrimonious: “dealers vied with each other in cutting prices and undermining any certainty or stability the market might have”. The creation of a Western Ontario Bean Marketing Scheme in the mid-1930s stabilized prices but did not resolve ongoing issues of continued price undercutting by

some dealers, grower concerns about the mandatory 8-cent per bushel levy, and the threat by a small but powerful consortium of elevator owners to withdraw from the Scheme.50

Early tobacco marketing was characterized by co-operation, including the formation of the Kingsville Co-operative in Essex County, but it was also dogged by the inability of bright and burley tobacco producers to agree on sales tactics. When field bean production moved north to Huron County, and tobacco east to Elgin, Norfolk, Oxford and Brant Counties, land became available in Essex and Kent County where farmers already had a wealth of experience about marketing, and growing knowledge of soybeans.

Much of the confusion and controversy about commodity pricing and marketing in Ontario was a response to changes in legislation in various jurisdictions in Canada. In 1934, Parliament enacted the Natural Products Marketing Act, which provided for the establishment of local boards with considerable independent powers of regulation to control production and establish prices of local commodities. In 1937, the Act was revoked by the Privy Council, United Kingdom, on the grounds that it infringed on provincial jurisdiction. Shortly thereafter, Ontario enacted its own Farm Products Control Act; marketing plans were officially sanctioned by the provincial government. These evolved as negotiating agencies, composed of members of the producing, purchasing and processing community for the respective commodity. The Farm Products Control Act was amended in 1946 to the Farm Products Marketing Act.51 This organizational structure responded to at least one of the arguments advanced by producers during

the Depression: that governments were not working in the interests of farmers to negotiate prices which represented fair returns for labour and fixed and variable expenses. It reflected the long-standing philosophy that farmers and associated groups (buyers and processors) understood supply and demand conditions better than politicians.

In spite of controversies over commodity marketing in every corner of southern Ontario, the enthusiasm for soybeans which J.B. Edmondson communicated to the groups of farmers who heard him talk and accompanied him on visits to soybean fields was contagious. In May 1932, in spite of the depressed economic conditions experienced by farmers everywhere in Ontario, a group of farmers in Kent County viewed the market for grain soybeans with sufficient optimism to form the SBOMC. The market would be south of the border, a reflection of the new trade relationship between Canada and the United States after World War I.

This was the only co-operative crushing venture in Ontario, and the only one that processed soybeans exclusively. Bidwell Oil Mills, Ltd., crushed a variety of different oilseeds, including soybeans, at Milton, Ontario, from the late 1920s until it closed in 1932. Dominion Linseed Oil Company of Baden added soybeans to its main activity, crushing flax seed and selling linseed oil and oilmeal since at least 1871, when John and James Livingston built three fibre flax mills in Listowel, Baden and Wellesley, in western Ontario. By the early twentieth century, the mill at Baden was Canada’s largest linseed oil mill, but competition for linseed oil production from paint manufacturers pressured the company to add to their repertoire of processing and manufacturing technologies. Soya Mills, Limited, of Stratford opened in 1935; it is not clear how long this mill continued to operate.

Just as in numerous American mills, the move from oilseeds like cottonseed and flax to soybeans occurred when equipment was sporadically idle, and small loads of soybeans were
available to fill gaps in production. Historian Joshua D. MacFayden argues that the paint and linseed oil industry was fiercely competitive, and costs of exporting linseed meal and importing seed were high. The Baden mill was a going concern with an established reputation, and exploited its many business connections in Canada and other countries to branch into soybean crushing. Similar vertical and horizontal expansions occurred in the US, where flax mills diversified when a lucrative market for soybean oil developed.

Ontario farmers were familiar with Canadian trade policy and commodity crop process for domestic and export markets. In Kent County, for example, the Chatham Daily News reported regularly on tobacco, bacon, onions, sugar beets and other agricultural products. The ongoing struggles of field bean growers to compete with lower prices of Michigan beans in markets at Toronto and Montreal, and their unsuccessful efforts to form the co-operative Ontario Bean Exchange, were chronicled at length. The organizing committee of the SBOMC was formed by the Chatham Board of Trade, and meetings were held in the Board’s agricultural offices. Committee members included the city manager, the mayor and a city alderman, and several others, all business experts who might guide the SBOMC to certain success.

It is not difficult to imagine the excited brainstorming and careful planning that occurred in the months prior to the opening of the SBOMC. In actual fact Chatham, which was the business and administrative hub of Kent County, had a diversified industrial-agricultural economy in the early 1930s, much of based on processing the products of local mixed farms. In late summer and fall, Libby’s canned tomatoes and the Dominion and Canada Sugar Company

54 Chatham Daily News May 28, 1932.
handled tons of beets; each factory employed hundreds of workers, although on a seasonal basis. A group of local dairymen formed Kent Dairy Limited to serve the region.55

New manufacturing concerns proliferated throughout the county. The Wilson Broom Factory of Ridgetown planned to use locally-grown broom corn beginning in the summer of 1933, instead of stocks imported from the American south. The Sands Manufacturing Company commenced fabrication of water heaters in mid-1932, and the Chicago Rivet and Machine Company of Canada set up shop in early 1934. The SBOMC occupied a former mill at the corner of Adelaide and Colborne Streets, not too far from the Thames River. Chatham was one of few rural communities in Ontario which were recovering from the Depression, and where average incomes were stable and growing.56

Public officials at all three levels of government supported the SBOMC with financial assistance. The Chatham City Council agreed to pay the account of the Chatham Board of Trade to a maximum of $458.32, clearing the account which the Board had incurred during negotiations with prospective members and ADM. The provincial government added $1500.00, to be applied by the Board for “the study and establishment of the Soya Bean industry in Canada”, an open-ended project with apparently no firm agenda. Thanks were extended to the premier, Hon. G.S. Henry, for the receipt of funds on completion of negotiations at the end of September, 1932. The province was not forthcoming with financial assistance before the mill promotion was complete, but waited until the deal was signed with members and ADM before


contributing; in this regard, the provincial government was not unlike many Kent County farmers who also waited to see how soybeans were accepted and processed and payment disbursed before purchasing a membership in the co-op.\textsuperscript{57}

The Board and the SBOMC received a major concession from the Dominion government: the processing machinery purchased from Kansas was admitted into the country duty free and exempt from all taxes, for a total saving of more than $8000.00. The exemption was granted after collaborative research about soybeans’ potential in southwestern Ontario was undertaken by SBOMC directors and the member for Windsor East, Dr. Morand, and duly reported to the Minister of National Revenues, E.B. Ryckman.\textsuperscript{58}

On May 28, 1932, approximately one month after the crop was in the ground, the \textit{Chatham Daily News} carried a bold headline: “Soya bean cooperative gets charter”. Growers who purchased a share in the co-op, valued at fifty dollars, immediately acquired a guaranteed buyer for all the soybeans they might harvest in the fall. The number of members was over-estimated at between seven and eight hundred. At its first meeting with the Chatham Board of Trade, the SBMOC submitted a formal contract to growers. In August, the SBMOC announced that a contract for management of the mill, purchase of the entire soybean crop of each member (except what would be held back for seeding the following year) and marketing of all products had been signed with Archer-Daniels-Midland of Canada, Limited, a branch of Archer-Daniels-Midland Company (the Minnesota-based dealer in agricultural commodities and innovator in industrial processing with an extensive network of oilseed-crushing plants in the United States.) Both the SBMOC and ADM entered into the purchasing agreement with the expectation of

\textsuperscript{57} “Promotion of Soya Bean industry is now completed,” \textit{Chatham Daily News}, September 20, 1932.
claiming for themselves a portion of the profitable North American market for soybean oil and other products.\textsuperscript{59}

The formation of the SBOMC followed a few really exciting years for soybeans in Ontario, when small demonstration plots throughout the province, accompanied by enthusiastic publicity from OAC, allowed farmers in southwestern Ontario to carefully watch their progress. In the summer of 1931, the Department of Field Husbandry delegated forty-one farmers to grow two-acre demonstration plots on parts of their farms that were easily accessible to visiting extension workers as well as passersby. Every county in western Ontario had at least one such plot, while eight plots were scattered through eastern Ontario. These were in addition to nine co-operative experimental plots co-ordinated by the Ag Union, which noted more interest in soybeans than in any previous year. Average grain yields were good: twenty-three bushels per acre of grain by the end of August on those demonstration plots that had already been threshed. The co-operative fields were even better: twenty-seven bushels per acre, after two years of dreadful performance. In 1929 and 1930, average yields on co-operative plots had been slightly less than fourteen and slightly more than eight bushels per acre respectively.\textsuperscript{60}

It seemed possible that a successful protocol for growing grain soybeans was coming together as a result of the research and experiments conducted at OAC and transferred to working farms for small scale production. Optimum planting dates had been tentatively identified for different regions. Planting and harvesting technologies were straightforward, and mostly adapted small grains drills, binders and threshing machines which many farmers already owned or contracted. Storage was still an unresolved issue; because their high oil content caused soybeans to heat, bulking in a grain bin was ruled out. Recommended storage procedure –


\textsuperscript{60} \textit{OAC Report}, 1931, 137; \textit{Ag Union Annual Report}, 1931, 14.
bagging them, stacking the bags in a barn and rotating them periodically for air circulation to prevent spontaneous combustion – was an inefficient use of precious labour and space. If they were to plant large acreages of soybeans, farmers needed a confirmed buyer capable of accepting large quantities and storing them for a time if necessary. ADM promised that.

The Chatham mill was a going concern from 1932 through 1934. The first carload of oil was shipped to Toronto in late fall, 1932. The managing company also found buyers for the oilmeal of the first crush: Ralston Purina Company of Woodstock, and an unidentified Toronto broker who purchased two tons to ship as samples to the West Indies in hope of making a fortune with follow-up orders. At the end of this first year, the plant was free of all financial obligations and capital and surplus were valued at $46,000 total. In the spring of 1933, 772 growers pledged over 10,000 acres of soybeans (four times the previous year’s acreage), and in October, an advance price of fifty cents per bushel (an increase of four cents per bushel over the first year) was promised to growers on delivery. ADM expressed the tentative hope that the plant might take delivery of enough soybeans to run continuously, thereby keeping operating costs as low as possible. But the summer of 1933 was abnormally dry, and owing to this drought growers delivered only half the expected tonnage. Nevertheless, the plant turned a nice profit in the six-month period ending February 28, 1934, although the manufactured product had not been sold in sufficient quantities to allow payment of the promised dividend on the 1933 crop. The plant manager urged growers to increase the allocation of crop land to soybeans; the mill’s annual potential was 325,000 bushels, but the 1933 crush was only 23,000 bushels. At the end of September 1934, ADM continued to appeal for more acreage for 1935.61

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In November 1934, without warning, the manager of SBOMC disappeared with “4800 bushels of soybeans valued at about $5000 and also 40 tons of meal valued at $1400”. ADM claimed complete protection from loss by the manager’s bond.\(^62\) By the fall of 1935, the mill had closed.

A close look at some numbers corroborates the company’s claim that the mill was under-supplied, and provides evidence that farmers in Ontario were still learning about soybeans and were unwilling or unable to deliver enough to bring the mill up to capacity. Although 772 growers pledged all the soybeans they could grow when they purchased shares early in the spring of 1933, only about 525 acres were actually planted due to dry weather in that spring and early summer. How many acres did any individual shareholder plant? There was no required quota, but Dave McCreary, one of the Directors of the SBMOC, only planted three acres. Gordon and Betty Coutts, long time Kent County farmers, reminisced in 1999 about their first attempt at growing soybeans in the early 1930s. They originally planned to deliver their five-acre harvest to the mill, but instead they fed the crop to their own livestock in lieu of purchasing a protein supplement.\(^63\)

Indeed, the decision to hang onto harvested soybeans was economic: just prior to the opening of the mill, the North American price of soybean oil dropped and stayed low. As a consequence of this unforeseen slump, ADM offered only fifty cents per bushel plus a bonus to be stipulated when the crush was all sold and net profits calculated. Ontario farmers could not

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grow soybeans under these financial constraints, but terms offered by other mills were just as unattractive.64

Besides the SBOMC, other crushing facilities purchased soybeans at higher prices than those offered by ADM. For example, Bidwell Vegetable Oils Limited of Milton offered seventy-five cents per bushel in May 1932. Dominion Soya Industries opened in 1935 in Montreal to produce oil, meal and flour; their price varied from eighty cents to $1.10 per bushel. Soya Mills Limited of Stratford also opened in 1935, just as the SBOMC was struggling unsuccessfully to stay in business, and purchased 30,000 bushels from Ontario growers at ninety-five cents per bushel; despite up-to-date equipment shipped from England, the by-product oilmeal was too high in oil and was unacceptable as a feed. And finally, Dominion Linseed Oil Company of Baden paid ninety cents per bushel. All prices quoted excluded shipping, which was to be paid by the grower and varied with distance from the mill. Since most growers lived in Kent and Essex Counties, transportation costs ate up significant portions of the net profit. As a consequence of the short supply of local soybeans, Dominion Soya and Dominion Linseed Oil both imported large quantities from the United States.65

Furthermore, prices offered by these mills did not include a bonus like that promised by ADM. In late September, 1934, the company paid growers an additional ten cents per bushel on soybeans delivered in the fall of 1933 (one year previous), bringing the final price to sixty cents.66 ADM and the SBOMC were also contracted to accept all soybeans delivered to the Chatham mill by growers who had purchased a share in the co-operative, another benefit not offered by other mills, some of whose soybean-crushing activities were a small part of their

64 Proceedings of the Second Conference on Soybeans, 2.
66 “Soybean co-operative to give bonus to growers”, Chatham Daily News, September 28, 1934.
regular operations. A farmer who was determined to grow soybeans as a commodity crop could count on ADM to purchase the crop at harvest; this type of risk aversion appealed to a few, although not enough to keep the mill anywhere near capacity.

In the face of low prices, soybean farmers chose to pledge acres (with no obligation to deliver) and either plant something else or hold onto harvested soybeans for their own use; in both cases neither farmland nor crop went idle. Many factors came together to thwart their plans for a cash crop: a North American market dominated by American interests in which they were but small players who could not hope to influence prices; the natural unpredictability of the weather; and their own innate cautious conservatism which induced them to choose familiarity over risk. When they were hard pressed to even recover costs, growers found alternate uses for their harvest: a sensible decision, made in the face of “… constant inundation of their vision of society as it should be by the world as it was.”

**The National Research Council and Three Conferences on Soybeans, 1936: Bridging the Transformation from Fodder to Oilseed**

Between April 29 and June 30, 1936, the National Research Council (NRC) of Canada convened three conferences on soybeans at Ottawa. These meetings, where politicians and scientists strategized about Canadian crop research and production in a challenging global economy, occurred just when soybeans were transforming from a hay and fodder crop to an oilseed with cash value as a commodity crop.

Federal politicians and NRC scientists were aware of the enthusiasm for soybeans in southwestern Ontario. Much of their interest resulted, however, from their concern about western

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Canada. The late 1920s and 1930s were particularly challenging for prairie wheat producers, due to the same soft export markets for agricultural commodities that Ontario farmers faced, as well as drought and soil erosion. The Minister of Finance, Charles Avery Dunning, who was a businessman, former premier of Saskatchewan and former General Manager of the Saskatchewan Co-operative Elevator Company, directed scientists to “consider possibilities for development and the requirements for research in relation to cultivation, to development of new species and to utilization” of substitute crops for western Canadian wheat.68

The objectives of these meetings were the identification of the science needed to develop soybeans as a marketable crop grown on the prairies, as well as a cursory survey of industries which processed soybeans in Canada. The focus was solely on the grain, since oil was in great demand for edible and industrial purposes, and high-protein oilmeal was utilized in feed and food manufacture. Indeed, most of the participants were chemists with laboratory expertise but only vague familiarity with the realities of crop production.

At the first conference, Dr. R. Newton, an eminent chemist who was by 1943 President and Director of Research of the University of Alberta, reported realistically, albeit pessimistically, that they might be grown economically only in the irrigated regions of southern Alberta; districts that were most suitable for soybeans were those where the best wheat was grown. At the second conference, the monthly letter of the Royal Bank of Canada, containing general information about soybeans, and some positive data about the large cash returns to American growers who “sowed 5 million acres” in 1935, was reproduced as an Appendix. Southern Ontario was identified as the only place in Canada suited to “the industrial growth of soybeans”, or on a sufficiently large scale to satisfy the needs of industry. The third conference

presented a series of reports: on the scientific literature, on milling and baking and other possible industrial uses for oil and oilmeal. A general discussion concluded the series with tentative ideas for further study, including the suggestion that the NRC might be of help to the Department of Agriculture with development work – “cytological studies were mentioned” – but all agreed that the agricultural scientists were capable of assuming responsibility for the problem of developing new varieties. In fact, federal scientists had resumed work on soybean breeding in the late 1920s at HRS, and at Ottawa in the early 1930s.69

By interpreting soybeans as they existed in the 1930s as a solution to a western Canadian problem, conference organizers failed to recognize the reality of soybean research and production, and therefore the conferences ended inconclusively. Politicians and NRC scientists, represented chiefly by chemists, accurately identified a national economic need: foreign trade and a balanced economy. To 1939, NRC scientists actively engaged in research on hard red spring wheat under the umbrella of the Division of Biology and Agriculture, where the “maintenance of the high quality of Canadian wheat is essential even in war-time, as irreparable damage could be done to our export trade by shipping inferior grain.” As a war economy depended on many commodities, including fats and oils, the search narrowed from a generic substitute for wheat to rapeseed, an oilseed which was already growing on the prairies. The NRC Grain Research Committee collaborated with the Chemistry Department, University of Saskatchewan, to evaluate new varieties of oilseeds including flax, sunflowers, rape and some

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other crops for southern Saskatchewan farms. Analysis of soybean oil was already underway at CEF laboratories in Ottawa.\textsuperscript{70}

The future of soybeans was therefore set by the demands of war. Oil was the most economically important product of a processing industry which was already active in the US, but demand for oilmeal remained strong as well. The creation of Victory Mills by a consortium of private business interests signaled a strong and steady international market for Canadian oilseed soybeans which appealed to southwestern Ontario farmers because it was close and accessible. After the challenges experienced by farmers in the late 1920s and 1930s, they were ready to take charge of commodity production and competitive pricing. And while soybean breeding was a slow task, scientists persisted in their efforts to develop, through selection but also deliberate crossing of selected parent lines, varieties which were adapted to southwestern Ontario and eastern Ontario.

The work of developing soybean production and the processing of soybean oil and its by-product oilmeal was left to farmers and businessmen. Industrial chemistry, known as chemurgy, was applied to crop agriculture and grain soybeans found a niche as an oilseed crop in Ontario.

\textsuperscript{70} R. Newton, “Research Activities in the 1930s ended (From the 23\textsuperscript{rd} Annual Report of the N.R.C., 1939-40),” quoted in N.T. Gridgeman, \textit{Biological Sciences at the National Research Council of Canada} (Waterloo: Wilfrid Laurier University Press, 1979), 94-96; Gridgeman, \textit{Biological Sciences}, 3-34, 68-78.
Chapter 3. Innovation and Application Come Together, Mid 1930s to Early 1950s: Production and Processing and the Influence of World War II

By the mid-1930s, soybeans began to enter the mainstream of agricultural science, production and processing in Ontario. The main impetus for this move was World War II and its aftermath; prior to this, interests in chemurgy laid the groundwork for the research, production and processing that would need to occur before critical needs for edible fats and oils could be satisfied.

The critical need for edible fats and oils, as well as industrial oils, did not result in accelerated soybean breeding programs at either provincial or Dominion research stations. The few available varieties were still not productive enough to interest farmers in southwestern Ontario until later in the War, when government programs encouraged them to increase soybean acreages with the promise of guaranteed minimum payments per bushel. Private interests also took an interest in purchasing soybeans for manufacturing. The agricultural community thus expanded and diversified into several groups with disparate interests. Specialists continued to breed for regional adaptation and yields, and broaden the scope of crop science to studies of plant and cell metabolism; farmers emphasized production in traditional mixed farming, with even more emphasis on regional specialization; and processors and manufacturers, interests that were increasingly removed from the fields of rural Ontario, focused on converting primary products to consumer goods and selling them.

Chemurgy, an early form of industrial chemistry, was an active movement attracting Canadian scientists and entrepreneurs. It was acclaimed as a solution to the farm problem: industry would convert surpluses and by-products from all kinds of crops into useful goods, profits from which would accrue at least partly to farmers themselves. Chemurgy was supported
in principle by government policy and actively by professional chemists and agricultural
scientists. Businessman E.P. Taylor constructed Victory Mills on the Toronto waterfront in 1946
to encourage supplies of Ontario soybeans, and take advantage of post-war demand for edible
oils.

By the late 1930s, industrial agriculture was increasingly common as a management
system in the United States. In Ontario, mixed farming continued, with a move by many farmers
towards the production of commodity crops such as soybeans and away from livestock, as
regional specialization became more pronounced. To address new issues arising from this
innovative system, farmers organized two new associations. The first group, the Ontario Crop
Improvement Association (OCIA) filled the gap left when the co-operative Ontario Agricultural
and Experimental Union (the Ag Union) was phased out; it was mandated to preserve and
maintain access to the results of scientific research for application to farming practices. Thus
farmers moved towards the application of agricultural science: the management of farm
resources, especially soil and surface and ground water, using technology and purchased inputs.
The second group had a vested interest in soybeans. In 1949, growers in southwestern Ontario
formed the Ontario Soya-Bean Marketing Board (OSBMB). The OSBMB was empowered to
negotiate prices for all soybeans sold in Ontario to purchasers in Canada, the United States and
Europe.

Thus, by about 1950, soybeans were seen to have value in a global market. Wartime
orders for oil products and post-war consumer preferences for high-quality protein foods like
meat placed them in growing demand. As prices rose, acreages began to climb, although the
numbers of farms with soybeans increased slowly. Scientists turned their attention to myriad
problems, the most pressing of which was the development of varieties adapted to the different soils and climates in southwestern and eastern Ontario.

**Chemurgy: Industrial Chemistry and Innovation in Processing Agricultural Products**

Chemurgy is a discipline which has largely been replaced by industrial chemistry, chemical engineering and food chemistry; it means the industrial use of agricultural products and by-products in the manufacture of materials and finished goods, both edible and industrial or inedible. Chemurgy evolved from domestic, artisanal and proto-industrial processing of agricultural products and by-products when these traditional activities were moved to factories, workplaces equipped with specialized equipment, often located at a significant distance from the farm itself.

Factory cheese-making in Ontario is an example of late nineteenth-century chemurgy, where large batches of a milk by-product (curds) were transformed into a standardized good which quickly garnered a strong commercial export market, especially in Britain. This product was Canadian cheddar cheese, produced mainly in the milkshed of Ontario. The quality of the cheese was attributed to cheese-making expertise and skilled dairying including animal husbandry and the production and storage of high-quality corn silage and alfalfa hay.¹ Chemurgy was subsequently applied to other agricultural products. Arguably the most famous artefact of soybean chemurgy is Henry Ford’s soybean car, constructed in part out of a durable resin of fibre extracted from soybeans grown on Ford’s farm near Dearborn, Michigan.

In 1929, in response to the exciting potential for production and profit, a group of privately-owned American seed producers and processing companies, including Archer-Daniels-

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Midland (ADM), organized the National Soybean Processors’ Association (NSPA). Most of these companies were headquartered in Illinois, and operated mills throughout the Midwest. During the 1930s, chemurgists at ADM developed edible soy protein, and found a way to extract lecithin, an edible emulsifier, from soybean oil.

By 1939, a crushing industry was expanding further north into Minnesota, where ADM was already processing soybeans, albeit sporadically, at its linseed oil plant in Minneapolis. Like ADM, which had partnered with the Soya Bean Oil and Meal Co-operative (SBOMC) in Chatham, some of these companies did business in Canada. A.E. Staley Manufacturing Co., of Decatur, Illinois, another founding member of the NSPA, distributed its soybean oil meal through J.H. Stafford Industries, Ltd., of Toronto, and Cooperative Fédérée de Québec, of Montreal. American companies which manufactured soy products also employed chemists and chemurgists to develop new products. For example, Glidden soy products, developed by scientists in its Soya Division, were found not only in its range of paints, varnishes, lacquers and enamels, but also in dog food, brewing, cosmetics, and other related products manufactured by its various subsidiaries and by other industries. Glidden was based in Cleveland, Ohio, with factories in eight American cities and Toronto. Vertical integration of related industries, all owned by the same parent company, optimized efficiency as companies spread costs over several operations and retained profits from a variety of manufacturing enterprises.²

In Canada, research on soybean chemurgy was undertaken by scientists at the Central Experimental Farm (CEF), Dominion Department of Agriculture. Beginning in 1929, CEF had

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initiated analyses of protein and oil contents of soybean seed at its Ottawa Division of Chemistry laboratory. Most striking was the revelation that oil and protein contents varied inversely. Analysts demonstrated that both AK and Mandarin were excellent producers of oil when grown at Harrow (even though Mandarin was a shorter-season variety). Breeders subsequently used these results to plan crosses between male and female parents of favourable lines, with the goal of developing varieties for feed (protein) or oil, beginning in about 1938. Although only two seasons’ data were available, they nonetheless had some bearing on the decision of Harrow Research Station (HRS) plant breeders to plan further work with these two varieties. From the 1930s to the 1990s, the average oil content of soybean seed (grams per kilogram) continued to increase at a fairly constant rate, while seed protein decreased at a similarly constant rate.³

Dominion soybean breeders, guided by the analytical results of their chemist colleagues, combined regional adaptation, increased yields and increased oilseed content to satisfy the needs of the processing industry.

Canadian companies crushed soybeans and produced oil and oilmeal for sale, but with disappointing results. Bidwell Oil Mills, Ltd., crushed a variety of oilseeds, including soybeans, at its facility in Milton. This business suffered a similar fate to the SBOMC-ADM collaboration. The surge of soybeans in North America, and the spillover of this enthusiasm into southern Ontario, prompted Bidwell’s owners to open and advertise for soybeans in at least one rural newspaper, the Farmer’s Advocate. In August, 1932, the Toronto Daily Star advertised a call for claims against the company which was shutting down after only a few years in business.⁴

⁴ Farmer’s Advocate (hereafter cited as FA), May 12, 1932; Toronto Daily Star, Aug 19, 1932.
Soya Mills Limited of Stratford opened in 1935, just as the SBOMC was struggling unsuccessfully to stay in business, and actually purchased about 30,000 bushels of Ontario soybeans at 95 cents per bushel (delivered). Despite supposedly up-to-date equipment brought from England, this mill was unable to extract oil below ten to eleven per cent, and the oily meal was therefore unacceptable for feeding livestock. Yet another Ontario company, Dominion Linseed Oil Company of Baden, introduced a line of soybean oil and oilmeal in about 1932. One of its primary soy products, a full fat flour ground from whole beans which it hoped to introduce to Canadian bakers, was allegedly vetoed by millers of wheat flour who “controlled the baking industry”.5 Soy flour had in fact found a small niche market in North America as a dietetic food.6

Some Canadian companies also created innovative products and modified and improved existing ones to expand the vertical integration of their product lines in diverse industries. For example, Dominion Soya Industries (DSI, sometimes referred to as Dominion Soya Products Limited), crushed soybeans at its Montreal plant and extracted both oil and oilmeal. DSI sold soybean oil to paint manufacturers and meat packers (processors at either end of the manufacturing spectrum which comprised soybean products: industrial or inedible, and food and feed or edible). Soybean oil had distinct advantages in paints and finishes due to its drying properties, defined in chemical terms by its Iodine Number. When it was blended with other oils (especially linseed oil) its drying properties improved the uniformity and hardness of the finish. It did not yellow on exposure to air, and was therefore extremely valuable in white paints, especially the synthetic enamels used on new and popular household appliances like refrigerators and ranges, as well as cars. It was used in grinding pastes because it did not skim over. Meat

packers, including Canada Packers, added soybean oil to shortening and cooking oil, where it reduced spitting.

Soybean oilmeal and flour were considered to be by-products of oil extraction. The largest market for soybean meal was cattle feed; feed suppliers like Ralston Purina of Woodstock purchased meal from SBOMC in Chatham when it was in business and mixed it or sold it to area farmers. Soybean flour, ground to a powdery consistency from oilmeal, had a low oil content, in contrast to the full fat flour (from ground whole soybeans) the Dominion Linseed Oil Company was trying to market. DSI did not conduct in-house research on its flour, but offered to supply samples to any chemurgists interested in developing new products. Canada Packers used the flour as a binder in its sausages. McGill University food scientist Dr. Eugene Rabinowitch added soybean flour to cheaper “hot dog” sausages to improve their food value, and took considerable quantities of soybean oil and flour on a research trip to northern Canada “for use of the Eskimo” in food preparation. Despite the favourable science and technology, the Department of Pensions and National Health vetoed the addition of soybean flour to meat products. Concern for consumers of sausages was at the heart of this decision: politicians feared soybean flour would be used as a meat substitute rather than just a binder, as its comparative food value to meat protein was poorly understood.7

Extraction technology was still imperfect at this time; indeed both oil and oilmeal were known to be tainted with the flavour and odour of gasoline used in some solvent extractors. ADM scientists and engineers had developed a “New Process Soybean Oil Meal” with a higher protein and a lower fat content which was the by-product of its own patented Hildebrandt solvent extraction process. Other extraction methods were also commonly used. The expeller press was

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the most widely adopted technology. The high temperatures used during this process destroyed the toxic component in raw soybeans which inhibited animal digestion and also made them unpalatable. To remove this undesirable factor, farmers who fed their own soybeans were advised to roast them first.\(^8\)

In addition to food and feed, soybean flour had industrial potential. By virtue of its finely powdered structure, it was used as a sizing for both fabric and paper. The Dominion Textile Co. tried soybean flour for finishing cotton yardage, but with unsatisfactory results. Dr. J.B. Phillips of McGill University tested many formulations of soybean flour preparations for coating paper; his results were uniformly satisfactory but no paper manufacturers were willing to apply his technology on a commercial scale. Sherwin-Williams experimented with soybean flour in water-based paints, to augment its extensive product line of oil-based finishes. The flour would not go into solution easily, and the solutions “stank.” Two companies which manufactured adhesives, Hercules Glue and Bulldog Grip Cement, reported that soybean flour vastly enhanced the waterproofing capability of glue used in the plywood industry; binding glue that would keep plywood veneers from separating on exposure to wet conditions was a decided advantage in building construction.\(^9\)

While one or two of these projects held promise, especially coatings for paper, they remained largely undeveloped, and the soybean-based products that did make it to market were specialized and satisfied niche demands only. Federal politicians, with a focus on western Canada and wheat, missed the opportunities for stimulating agriculture and generating revenue in rural Ontario. Scientists were constrained by funding directives from the Department of


Agriculture and the National Research Council (NRC); at the close of the Third Soybean Conference at Ottawa in 1936, the chemists (who made up almost the entire roster of attendees) directed soybean work back to field crop scientists (represented by F. Dimmock, soybean expert), who continued to select for regional adaptation. Meanwhile, American processors were actively promoting soybean products.

In 1934, the United States Farm Chemurgic Council (USFCC) was founded and headquartered in Dearborn, Michigan, close to Henry Ford’s automobile factories. The USFCC encouraged existing flaxseed and cottonseed crushing plants to adapt to soybeans. Ford built his famous soybean car before World War II curtailed all research that was frivolous and extraneous to the production of war supplies. In 1936, to complement its field work, the University of Illinois set up a laboratory for the study of industrial utilization of soybeans and soybean products; this was a collaborative project with the United States Bureau of Chemistry and Soils and Bureau of Plant Industry. The corporate slogan adopted earlier by ADM perfectly articulated a vision for the future of industrial chemistry: “Creating New Values from America’s Harvest.” Utilization of total soybean stocks changed dramatically between the mid-1930s and the early 1950s (see Chapter 2, Figure 2-3. Acres of soybeans grown for beans (grain and seed), United States.)

Until 1934, most of the American crop was consumed on a farm as feed and seed. From 1935 on, seed production continued to be an important specialty, livestock feed including hay dropped to a low but steady level, and oilseed production accelerated. Processing for oil and meal consumed increasingly more of available stocks, until by 1950 more than 83 per cent of total American supply was delivered to an extracting mill somewhere in the Corn Belt region. By

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1940, the industry was crushing 64 million bushels of soybeans annually; by 1950, actual crush had increased to 222 million bushels from American growers, which was less than available capacity. In 1930, in order to protect its burgeoning industry, the US had imposed a duty on imports of soybeans, oil and meal. This tax affected mainly large Asian and European shippers who had supplied American processors for years. In 1951, the tariff was adjusted slightly to reduce the rates on oil and oilmeal as the US became a net exporter of soybeans. America’s chief markets were Western Europe, Japan and Canada.\textsuperscript{11}

In Canada, soybean chemurgy was very slow to develop, largely because there was no co-ordinated communication between groups which had by this time demonstrated an interest in the crop – politicians, processors, scientists and farmers – which might identify a common interest and a market, and promote the development of more suitable varieties and increased acreages in southwestern and southern Ontario. The widely divergent attitudes of two individuals – American grower J.B. Edmondson and Canadian NRC chemist C.Y. Hopkins – highlight a crucial difference in soybean boosterism between the US and Canada. Edmondson predicted a strong future for soybean markets in 1929 when he visited the Ontario Agricultural College (OAC). American farmers and corporations – private interests – drove innovation in soybean research, production and processing, beginning in the late 1920s; the Proceedings of the American Soybean Association (ASA) annual meetings, for example in 1936, are full of advertisements for equipment and soybean products such as paint and solicitations from processors for delivery of harvested soybeans. The motto of the NSPA, with offices in the Board of Trade Building, Chicago, is telling: “You Grow the Beans … and We’ll Find the Market.”

The bulk of the publication is devoted to research reports from corporations, as well as

government bureaux. Public and private institutions encouraged farmers to grow and sell soybeans.\textsuperscript{12}

The glumness of NRC chemist Hopkins, representing the Canadian government, contrasts sharply with Americans’ ebullient celebration of a new commercial opportunity. Hopkins reported a general lack of enthusiasm about soybeans at the Dearborn Conference of Agriculture, Industry and Science in 1936, and attributed this to a saturated market, where production and processing in the US were well-established and approaching an upper limit, and the margin of profit to the processor was very limited.\textsuperscript{13} He was pessimistic about the market potential of soybeans in North America in general. In hindsight, one wonders where he got this impression, because it contradicts all information published by American interests.

In Canada, NRC scientists, mainly chemists, had to all intents and purposes abandoned the idea of developing soybeans as an oilseed crop following the three 1936 Conferences at Ottawa, but in 1938, the National Chemurgic Committee (NCC) of the Canadian Chamber of Commerce (CCC) was organized, “dedicated to the creation of new sources of wealth and opportunity”. The NCC commissioned the Canadian Society of Technical Agriculturists (CSTAg) to conduct a survey on Canadian research into the utilization of farm products in industry. This report was inspired by the need to find new and expanded markets for farm products. The CSTAg struck local committees and circulated a standard questionnaire covering research in progress and suggestions for new investigations for edible and inedible products of any crops familiar to farmers and processors in that area. The contribution which applied “chemurgy” could make, as opposed to “chemistry,” which had failed after several decades to solve the problem of surplus farm products by scientific research, was stressed. Soybeans were

\textsuperscript{12} Proc. ASA, 1936, 36.
only one of numerous crops studied, and were subsumed under the headings of vegetable fats and oils and oil-seed meal. Soybeans were not one of current or suggested crops for development described in the *Report*.\(^\text{14}\)

In 1940, shortly after the start of World War II, a shortage of vegetable oils prompted the opening of a modest oilseeds laboratory at the University of Saskatchewan. The NRC reorganized its search for an oilseed crop for western Canada, and endorsed rapeseed (*Brassica napus*) instead of soybeans. Rapeseed oil was extremely valuable as a lubricant for steam locomotives and marine engines. During the war, C.D. Howe, Minister of Munitions and Supply, “practically ordered the cultivation of the crop on western farmlands” when the usual supplies from Asia and Europe were cut off. According to N.T. Gridgeman, biochemist and NRC biomathematician and historian, the longer-term motivation for the project was diversification in prairie agriculture, as the “old reliance on grain could not be perpetuated.” This theme was carried over from the earlier NRC conferences on soybeans.\(^\text{15}\)

After the war, as the reciprocating steam engine disappeared, the cultivation of rapeseed declined with it, but the uses of rapeseed oil in edible products revitalized interest in the crop, and “with careful refining, bleaching, hydrogenation, and deodorizing, rapeseed oil could be substituted for soybean oil in edible products without loss of quality.”\(^\text{16}\)

**Soybeans and World War II: Production, Politics and Processing Come Together**

Southern Ontario farmers continued to raise livestock and feed and food crops. The *Farmer’s Advocate* expressed editorial approval of chemurgy, articulating farmers’ demands that

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\(^{14}\) *Canadian Research on the Utilization of Farm Products in Industry*, 16-34.

\(^{15}\) N.T. Gridgeman, *Biological Sciences at the National Research Council of Canada: The Early Years to 1952* (Waterloo: Wilfrid Laurier Press, 1979), 68-70.

\(^{16}\) Ibid.
agricultural science initiate a search for manufacturing and processing technologies to use crops, crop surpluses and by-products to expand markets and guarantee a more dependable return on their investments in time, expertise in scientific techniques, and management:

Science and research should now be employed in the direction of utilization, just as in the past all technical knowledge was enlisted in the effort to grow bigger and better crops. The trend also calls for a revision or gradual modification of the teaching courses in agricultural colleges and schools. Farm management, finance, good municipal government and efficient marketing, are all of prime importance, and should no longer take second place to the application of science to the art of production.¹⁷

Research and experiment were meaningless unless farmers could make a decent living. By the late 1930s, “the farm problem”¹⁸ had become acute enough to prompt officials of the NRC to commission the report on Canadian Research on the Utilization of Farm Products in Industry. The objectives of the report, released in 1940, were twofold: to compile a comprehensive list of all chemurgic research in Canada, and to document how and to what extent this research was being integrated into industry and manufacturing. The report had been commissioned before the war, as business and science collaborated to determine how the farm problem could be solved by expanding markets for farm produce to processed and manufactured goods, in addition to traditional markets for foods and feeds.¹⁹

A more comprehensive scientific agriculture, including accounting and finance, planning and marketing, and resource management, all applied to crop production, would be part of a movement to “transform farming from an occupation that is little more than an uncertain gamble

¹⁸ The “farm problem” is a term which appears in many sources. While it is not clearly defined in Canadian Research on the Utilization of Farm Products in Industry, it is interpreted there as an economic issue: dealing with seasonal and annual surpluses and finding markets for agricultural products. Canadian Research on the Utilization of Farm Products in Industry, 4.
¹⁹ Ibid., 8-34.
to a business with some foundation and some future to it” that began in the dirty thirties and climaxed during World War II and its aftermath.\(^{20}\)

In Ontario, the failure of corn producers in the southwest to grow white dent corn, especially Wisconsin No. 7 to supply American manufacturers of starch and breakfast cereal, was a situation that baffled the authors of the report. A shipping infrastructure that relied wholly on a railroad network that did not adequately serve all regions of rural Ontario and lacked storage depots at Great Lake ports received some of the blame for the problem; the report did not address this issue beyond bringing it to the attention of the politicians and businessmen who might read it. Farmers were also faulted for not taking advantage of a lucrative market by holding back poor-quality corn on the farm for feeding due to the low market price, and high-quality corn in case the price should rise further.

This situation was also typical among soybean growers. Chatham farmers, including SBOMC members, had failed to plant or deliver soybeans in any significant quantity, and often held back what they harvested to feed and plant on the farm. Robert Knister, who probably knew soybeans as well as any farmer in North America, sold his entire crop for seed and high-quality feed. Soybean deliveries to regional mills also suffered from deficient transportation; “Good Roads” Dave McCreary got his nickname from his lobbying efforts to expand and improve rural roads in Kent County.

The report did not address issues of farm production or farm economics. Nonetheless, it was an official political start at integrating production and processing. Soybeans were included for discussion in the report not because there was a surplus but because Canadian manufacturers of fats and oils imported most of their supply from the United States. This included oilseeds and

seed oils and meals (already extracted) from numerous crops. Of all the vegetable oils used by Canadian manufacturers, only flax, soybeans and rapeseed were adapted to Canada’s climate. Due to these environmental constraints (mainly the length of the growing season), linseed oil was the only one which soybean oil could potentially replace, at least in some provinces, but soybeans suffered from a higher cost of production and a lower selling price than flax. Furthermore, higher flax prices during the war induced farmers to plant nearly three million acres in western Canada, which further increased the supply of flax and depressed the demand for soybeans.\footnote{Ibid., 18.}

To support prices of farm products other than wheat, Parliament passed the Agricultural Prices Support Act in 1944. The Act authorized the Agricultural Supplies Board (ASB) to prescribe prices that ensured “adequate and stable returns for agriculture” and secured a “fair relationship between the returns from agriculture and those from other occupations”. The Act was amended in 1950 to make its operation continuous.\footnote{Ibid., 216; Sheila I. Stewart, “Statutes, Orders, and Official Statements Relating to Canadian War-Time Economic Controls,” \textit{Canadian Journal of Economics and Political Science/Revue canadienne d'Economique et de Science politique} 13, no. 1 (February 1947):100-101.}

Through the war and its immediate aftermath, soybeans received close attention from the ASB. The price of soybeans relative to other cultivated crops such as corn, white beans and sugar beets was an important factor in relation to production in southwestern Ontario. In response to soybeans’ competitive disadvantage in terms of net returns per acre, and therefore to encourage more planting, the ASB set a minimum price for the 1942 crop of $1.96 per bushel, basis No. 2 Yellow, delivered at Toronto or Vancouver; that price was set early in the year to guide farmers’ planting decisions. As of 1943 the minimum price was raised to $2.15 and continued at that level until 1946 and 1947. Increased soybean acreages indicated that farmers did indeed respond to the
economic incentive. Between 1935 and 1939 slightly less than 10,000 acres were planted annually in Ontario, but from 1943 to 1947 the average annual acreage increased to 46,800.\textsuperscript{23}

The phenomenal increase in acreage was also stimulated by efforts of the Commodity Prices Stabilization Corporation (CPSC), in association with the Oils and Fats Administration (OFA), to alleviate a severe shortage of animal and vegetable protein feeds. Some of this shortage was offset by a subsidy of $3.00 per ton paid to Canadian processors of alfalfa meal in early 1943. Vegetable proteins became somewhat more plentiful with the increased oil seed crushing capacity in Canada, and an arrangement with American crushers made approximately 2,000 tons of soybean meal available monthly. The early part of 1944 brought increased slaughtering of livestock, which eased demand for feed and supplements, even as an excellent fishing season off the British Columbia coast amplified the supply of fish meal. While subsidies on imported oilseeds were eventually terminated when Canadian requirements were met, the scarcity of protein supplements for feed formulations continued. To reduce some of the burden of purchasing supplements, the Canadian government retained price controls on feed ingredients after similar controls had been removed in the United States. This enabled Canadian livestock producers to obtain these scarce materials at prices which represented “subsidies to feeders”. For example, soybean meal was $52.00 FOB Toronto from 1943 to July 1947 while American prices were almost double that, at $97.00 in July 1946.\textsuperscript{24}

The short- and long-term effects of wartime price controls and incentives for farmers to plant soybeans were substantial and far-reaching. Suddenly, which is to say after decades of cautious discourse about soybean production and marketing, crop farmers had guaranteed buyers for all the soybeans they could harvest at prices that were favourable and fixed for the

\textsuperscript{23} Auld, \textit{Canadian Agriculture and World War II}, 52-58.

\textsuperscript{24} Ibid., 94-96. FOB, or “free or freight on board”, signifies that goods were to be delivered to the buyer without extra charges for transport to the point of purchase.
foreseeable future. Except for small areas in Manitoba from 1943 to 1945 and British Columbia in 1943 (approximately 1000 acres in total in each province), Canadian soybeans were grown wholly in southwestern and western Ontario where farmers enjoyed exclusive access to a growing market. By 1950, Essex and Kent Counties together accounted for slightly less than eighty per cent of acres planted to soybeans in the province; the remaining acres were almost all in Elgin, Lambton and Middlesex Counties, with small but significant areas in Norfolk and Huron Counties.

Furthermore, soybeans proved to be a competitive alternate commodity crop to grain corn. The complementary relationship between corn and soybeans in the American Midwest had been understood and exploited for decades; southwestern Ontario corn producers now began to incorporate soybeans into planned rotations. And while the main impetus for growing soybeans had been wartime needs, expanded planting was just in time to satisfy post-war demands for accelerated production of feeds and foods. Benefits from wartime incentives also accrued to livestock farmers: not only were protein supplements (including soybean oilmeal) priced attractively to “feeders”, but it was also possible for prairie farmers to receive an Advance Equalization Payment by selling their grain to a feed mixing station and buying a mixed feed already prepared. Many of these mixed rations included soybeans, even though the prairie farmers themselves were not soybean growers. The western Canadian livestock industry improved. As an indirect result, the value of soybeans as a protein supplement received considerable attention. Initially this was as oilmeal, but eventually whole grain feed supplements came to the attention of crop producers, including mixed farmers in Ontario.25

The End of the Ag Union and Inauguration of the Ontario Crop Improvement Association: Farmers Organize

Beginning in 1937, the Ag Union was quietly phased out, in a combined initiative by the provincial Department of Agriculture and the Department of Field Husbandry at OAC to compartmentalize agriculture into specialties: scientific research and experiment, marketing, and farm management and production. In its place, the OCIA was formalized from existing County Crop Improvement Associations (CCIAs) as a vehicle for farmers to keep abreast of results of scientific research carried out at OAC and regional experiment farms in various parts of the province. Prominent farmers, agricultural scientists and politicians initiated the change, which educated farmers (the same population which had been the backbone of co-operative experiments administered by OAC through the Ag Union) accepted without apparent protest. The two organizations overlapped for a few years: the Ag Union continued to hold meetings and release an Annual Report until at least the early 1940s, and the OCIA met and published their own Annual Reports beginning in 1937, even before the organization was official.

The new organizational structure of scientific agriculture had early roots in government restructuring in 1924, when a provincial Standing Committee on Crop Improvement was formed. Its membership consisted of representatives from each department of each research institution and college in Ontario, as well as scientists from the provincial and Dominion Departments of Agriculture. The Standing Committee advocated the formation of CCIAs, “for better organization and development of field days, farm meetings, demonstrations”, and other professional development activities. County Agricultural Representatives (Ag Reps), who were also members of the Standing Committee, would communicate useful information from Committee headquarters in Toronto to rural Ontario. In early 1931, a subcommittee of the new
Standing Field Crop Committee recommended that the Ontario Field Crop and Seed Growers’ Association (OFCSGA), the Ag Union, and the CCIAs be amalgamated into a single group: the OCIA, which would represent all farmers in Ontario.26

As early as 1932, “reduced government income and forced reductions in expenditures” compelled the Superintendent of Agricultural Societies, J. Lockie Wilson, to cancel the combined field crop and clean seed competitions held every year, as well as the competitions conducted by the Ontario Vegetable Growers’ Association. This came at a time when the Canadian Seed Growers’ Association (CSGA), and production experts at OAC, were pressing farmers to plant clean seed, tested for germination.27 In the spring of 1936, the OFCSGA took the matter of clean seed into its own hands. The group adopted a regional zoning system, and planned additional seed fairs for the spring to promote the value of clean seed.28

Individual farmers continued to support fairs and exhibitions, where produce was displayed and excellence in farm management and production was rewarded with the esteem of peers and often material prizes as well. The Ontario Corn Show at Chatham in late February, 1934, “drew a superior exhibit” of corn, cereals, grass seeds and other crops. J.H. Lampman of Ridgetown won the open class for soybeans. Many commercial exhibitors were featured at the show, including several fertilizer manufacturers. In an advertisement in the Farmer’s Advocate, Monarch Feeds itemized the ingredients in its baby chick ration (available through its booth at the show.) One ingredient was soybean meal, added in accordance with OAC recommendations. The Ottawa Valley Seed Show, held in Cornwall in early April, 1938, featured several open classes with many entries. Kent County farmer G. Gordon Finlay took first prize in the open

27 FA, March 17, 1932; February 15, 1934; March 15, 1934.
28 Ibid., February 13, 1936.
class for soybeans; there were no entries in the local class. Finlay’s trip to Cornwall was likely planned to promote his seed production, sales and export business. In 1939, he offered “Early Mandarin (registered) Soyabeans” on the “Ads” page of the Farmer’s Advocate; this variety had recently been released from the Central Experimental Farm (CEF) at Ottawa and would have been especially suitable for any eastern Ontario growers who recalled his win at Cornwall the previous year.29

While economic exigency forced the provincial government to reduce financial support for agricultural programs and find ways to transfer responsibility for many initiatives to farmers themselves, all groups – politicians, scientists and educated farmers – believed that the transfer of information derived from scientific research and experiment was crucial if Ontario agriculture was to be competitive in local, regional and international markets.

Dr. G.I. Christie was President of OAC during these challenging years (from 1928 to 1947). In 1937, he admitted that the Ag Union had been in danger of cancellation in the late 1920s, but because so many valuable crop varieties had been released due to the results of cooperative experiments, he decided to save the organization.30 Professor Squirrell, long-time Secretary and Treasurer, who assisted and then replaced Charles Zavitz in the Department of Field Husbandry, provided administrative continuity and philosophical and material support for the Ag Union until the summer of 1936, when he was killed in an automobile accident. Whereas Squirrell held a BSA and had spent his entire career at OAC, his successor, Dr. G.P. McRostie, had a PhD from Cornell University and job experience as Head of the Field Husbandry Departments at both Macdonald College at Montreal and the University of Manitoba and as Dominion Agrostologist.

29 Ibid., March 1, 1934; April 14, 1938; April 13, 1939.
The new Professor of Field Husbandry used his authority and control of OAC resources to reroute research and experiment on a course of careful experimental design and rigorous replication. At the annual meeting of the Ag Union in 1937, he suggested that more accurate experimental information could be obtained if tests were conducted in duplicate or even triplicate, a dedication of time and space that would be very difficult, if not impossible, for many co-operative members to pledge. He sub-divided the province into areas with reasonably similar growth conditions to facilitate recommendations for regionally adapted varieties; this was an important consideration for all crops, including soybeans. Previously, one-off trials on farms spread randomly throughout the province were typical of Ag Union experiments. The following year, McRostie outlined the new experimental regime he had put in place at OAC: continuation of the usual small observational plots employed by the Ag Union, which had “in the past been productive of much information concerning the suitability of varieties for widely scattered districts”, and three new designs, each of which stressed replication and accuracy. As Professor of Field Husbandry at OAC, McRostie set a new course for research and experiment in the department that was based on the separation of science and production.

McRostie retained the position of Secretary-Treasurer of the Ag Union, but he transferred his professional support to the OCIA. Its first annual meeting was held in Toronto in 1939, whereas Ag Union annual meetings had always been held at Guelph. McRostie was appointed to a Project Approval Committee for allocating funding support from the Department of Agriculture to county branches for projects and prize monies. OCIA members were discouraged from engaging in independent experiments on their farms by a formal resolution “that all “fact finding experiments” shall be undertaken by Agricultural Research Institutions and that Crop Improvement Associations confine their projects to demonstrations based on the findings of

these institutions.”32 This proposal was introduced by Alex Stewart and supported by the membership. The primary activity of the OCIA and county branches became the promotion of clean seed at seed fairs and displays, where members displayed and sold grain, clover and grass seed and seed potatoes. The main source of income for the OCIA, aside from an annual government grant (from $200 to $300 in the first few years) was membership dues and banquet receipts.

Like the Ag Union (which had also been subsidized by the provincial Department of Agriculture to cover the costs of field experiments), the OCIA was an organization for farmers interested in improving. Unlike the Ag Union, the OCIA was open to all farmers, not just OAC alumni. By 1939, when the Ag Union celebrated its 60th anniversary, it boasted a membership which was aging; many were retired and unable to participate actively in co-operative experiments or even to travel to the annual meeting.33 Short Courses were very popular with both farmers and OAC faculty, including Christie and McRostie. They introduced scientific agriculture to farmers who would not otherwise attend OAC. Several hundred persons attended the Ag Union banquet in 1939, but this included farmers enrolled in Short Courses running on campus over the Christmas break. These students were encouraged to join the OCIA, as were all regular students. The OCIA was a popular alternative to the Ag Union, whose membership diminished among young and active farmers.

The constitution of the new OCIA was set out in November 1938. The Ag Union published an Annual Report in 1940; that year, 110 replicated rod row tests were conducted with


oats and barley in 17 counties and five administrative districts in all regions of the province. These included seven tests with nine varieties of soybeans. All were “conducted largely through the County Crop Improvement Associations and the local Agricultural Representatives.” By 1942, 48 branches of the OCIA had been organized in all parts of the province. By 1942, Ag Union annual reports ceased and the organization itself finally disappeared.

Alex M. Stewart was the last President of both the Ag Union and the OFCSGA and he served as the first President of the OCIA. Under his leadership, the primary purpose of the organization was clear: to facilitate the wider adoption of crop varieties suitable to Ontario’s soils and climates by maintaining close ties with OAC and other research and experiment stations, without any involvement in research and experiment, politics or marketing. OCIA meetings featured topics of general interest, with guest speakers followed by open discussion. For example, farmer William Wallace of Woodlsee, Essex County, addressed the 1943 meeting on the subject of “The Soybean, The Modern Miracle Crop.”

A decade later, in 1952, Wallace was a recognized leader in corn and soybean production and the incoming president of the new Ontario Soil and Crop Improvement Association (OSCIA), which replaced the OCIA by officially recognizing the close relationship between soils and crops. He summarized the working philosophy of the association:

We not only bring the science lab and the test plot to the back concession, we try to bring the back concession economy and practice, into research work. While listening to science and theory we are not forgetting to listen to the men who listen to the grass grow.

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36 Ibid., 38. William Wallace is an inductee into the Ontario Agricultural Hall of Fame, 1986; he was sponsored by the Essex County Soil and Crop Improvement Association, for his “strong leadership during the rapid changes in corn and soybean production” during the 1940s and 1950s. Ontario Agricultural Hall of Fame, http://www.oahf.on.ca/Wallacewil.html (accessed July 2, 2013).
The management of rural and farm natural resources was implicit, and with the formation of the OCIA this practical part of farming became intimately connected with scientific agriculture. When Alex M. Stewart likened farms to factories, he acknowledged the existence of specialized mixed agriculture in Ontario, where it also had features in common with conservation as resource management. Each movement valued physical resources such as arable soil, sufficient annual precipitation stored as ground water, favourable temperatures, rural wildlife and forest cover, as well as human resources such as rural communities and farm families who still owned and operated the majority of Ontario farms. The OCIA and OSCIA successfully forged a useful and meaningful connection between research, management and production, the relationship on which agriculture was based. As Ontario agriculture became increasingly specialized, and farmers worked to streamline the use of inputs and eliminate duplication and waste, it became an efficient system for utilizing natural resources and manufactured inputs to satisfy the needs of a growing North American post-war population for consumable goods.

This was the beginning of what may seem to be a paradox: after forty years, individual farmers were excluded from participating in co-operative experiments. In fact, new farmer organizations such as the OCIA and commodity marketing groups interacted with scientists and politicians, but separately, as professional groups with special interests and areas of expertise in scientific agriculture. Scientists interpreted theory to investigate general regional problems, while farmers applied scientific principles derived from research and experiment to manage unique farm resources and cultivate crops and livestock in environmentally diverse regions of agricultural Ontario.

As a lobby group, the OCIA found power in numbers; among the objectives listed in the constitution were the promotion of clean seed, sponsorship of competitions, seed fairs, seed
exchanges and seed sales, and exchange and purchase of seed among members. The vehicle for these activities was educational work throughout the province, in co-operation with the federal and provincial Departments of Agriculture. Far from impeding the progress of scientific agriculture, the separation of research and experiment from management and production improved the efficiency of farmers and scientists and introduced a new kind of partnership facilitating individualized farm management and industrializing agriculture.

Ontario farmers, specialists in certain commodities but still constrained by regional and local environmental conditions, needed guidelines, not hard and fast rules, and this is exactly what scientists were able to deliver. Statistical analyses of the kind favoured by McRostie and others gave results that were specific to an area, but were still broad enough to miss deviations from the calculated norm. Provincial Ag Reps, employed in every county and district, acted as extension agents and expert advisors; they were in regular and close contact with both scientists and farmers. Farmers obtained information through various media – published bulletins and reports, speeches and meetings, and increasingly through radio programs like the Farm Radio Forum, broadcast weekly beginning in 1939. They also relied on community leaders for advice: creative thinkers such as Alex M. Stewart, at the leading edge of theoretical innovation curves.

In 1935, when negotiations to terminate the Ag Union and the OFCSGA and form the OCIA were in full swing, Ag Union President Douglas Hart of Woodstock summarized this philosophy of individual farmers and farm families functioning as part of a rural community:

No matter how sound these experimental results [from OAC and other experts] may be, unless we can work them out on our farms with the money and labor available and in face of the weather and all the pests we have to fight, they are not satisfactory for us. … Later these have to be tested on your farm and mine.37

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37 Ag Union Annual Report, 1935, 7.
The true legacy of the Union was arguably and the institutionalization of applied scientific agriculture in a community of scientific farmers. Its members shared a collective sense that farming contributed to Ontario’s economic and social well-being, and that they were agents of this process.

In Essex and Kent Counties, farmers slowly turned to growing more soybeans in response to the market created by a new storage and crushing enterprise, Victory Mills, whose corporate owners, E.P. Taylor and Canadian Breweries Ltd., recognized there were profits to be made by satisfying a critical domestic shortage of vegetable oil. The project connected the agricultural and industrial worlds, two economies that “are so intertwined and inseparably bound together that one must think of them jointly if there is to be any sound thinking about either one or the other.” Specialized mixed farming and the production of commodity crops became part of a new concept, agribusiness.

**WW II Problems and Solutions: Victory Mills**

The spheres of agricultural science and secondary industries such as manufacturing and processing were changing and overlapping in unprecedented ways by the years leading up to World War II; Figure 3-1 illustrates graphically that the ASA served both producers (“Agriculture”) and processors (“Industry”). Mutually beneficial relationships based on private funding earmarked for specific work at a public research institution began to develop between companies and scientists as a normative method of innovation. The fruits of the research were to be – ideally – profits in the case of the company, and new and renewed sources of funding in the case of the scientist.

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The historical changes in food supply and demand, and the modern financialization of food described by economist Jennifer Clapp and political scientists Doris Fuchs, Richard Meyer-Eppler and Ulrich Hamenstädt offer explanations for the ongoing dynamic of food research, production, processing, distribution, storage, advertising, wholesale and retail sales. A fuller historical analysis of early post-World War II collaborations among science, industry, business and farming interests indicates that the commodification of food, and the vertical integration of food production systems, intensified just as soybeans began to take off as an oilseed crop in agricultural southern Ontario.

Food trade is at the cutting edge of economic studies of food; in a recent meta-analysis of studies published since the early 2000s, Fuchs, Meyer-Eppler and Hamenstädt highlight the complexity of the system, and suggest avenues for fruitful future research. Contemporary Canadian economist Clapp studies food systems, including global food security and sustainability, in the late twentieth and early twenty-first centuries. One of her scholarly interests is the “financialization of food”: the formation of intricate, intense linkages among finance, non-food commodities and food, where compatible products are bundled and traded in global markets. Clapp introduces her argument by affirming that the link between food and finance has been in existence for centuries, through agricultural futures markets and the value of key trading currencies, although they were commonly studied as factors influencing food availability, not prices. This trend intensified following World War II, with the US as the main proponent of globalized food trade. Clapp argues that fluctuations in food prices, particularly since the 1990s, have become more strongly linked to investor behavior than to supply and demand imbalances, and have played a significant role in recent episodes of food price volatility. She discusses late twentieth and early twenty-first century trading patterns for grains and oilseeds, including
soybeans, as a vertically-integrated transnational business enterprise dominated by four American firms, including ADM. Farmers have a relatively minor role in this structure.  

Figure 3-1. Agriculture and Industry. American Soybean Association, 1940 Proceedings, Dearborn, Michigan, front cover.
In the early 1950s, the concept of “agribusiness” was introduced to “business, agriculture, and academic life” through a new Program in Agriculture and Business at the Graduate School of Business Administration, Harvard University. Dean Donald K. David described its objectives:

It is hoped that by undertaking studies in the basic technical, economic, and human aspects of the relationships between [manufacturing and agriculture], it will be possible to influence a greater degree of coordination, to the end that agriculture and its related supplying, processing, and distributing industries will more effectively serve the needs of a fast-growing population.\(^{40}\)

Farmers were an integral part of this system, especially as they endeavoured to balance natural resource conservation with optimal yields while searching for the most attractive markets for their produce.

Victory Mills Soya Bean Plant, comprising a series of waterfront elevators for storage of soybeans delivered by rail, and a crushing and solvent extraction mill linked to the Great Lakes and St. Lawrence River transportation network, was constructed in 1942 and 1943 on Lake Ontario in Toronto to take advantage of wartime demand for fats and oils and high-protein feed by processing Canadian soybeans.

Victory Mills succeeded because agribusiness – a network of private entrepreneurs, including investors, manufacturers and farmers – embraced soybeans, with their potential for providing a secure and comfortable income and even profit. During World War II, E.P. Taylor, Canadian entrepreneur, race horse owner and breeder, and farm owner, worked as a “dollar-a-year man” as C.D. Howe’s deputy on the Combined Production and Resources Board and as Co-Chairman of the Joint War Aid Committee. Taylor was familiar with soybeans; in 1938, his company, Canadian Breweries Ltd., had invested in Sunsoy Products Limited, a small Toronto manufacturer of full fat soy flour and other products. Through his work during the war, he became familiar with the shortage of edible oils. Canadian Breweries, Ltd., constructed and

\(^{40}\) Donald K. David, quoted in Davis and Goldberg, *A Concept of Agribusiness*, vii.
operated Victory Mills, with some involvement from Toronto Elevators, also situated on the waterfront, as a business proposition to develop, manufacture and sell soybean oil and other products. Victory Mills encompassed storage elevators, a processing mill, and a research facility. Raw soybeans arrived by rail; soybean oil and meal left by rail and ship.41

To paraphrase the memorable line in W.P. Kinsella’s tale of baseball and the American dream, “if we build it, they will grow and ship soybeans”; that was the underlying operating plan of Victory Mills’ Board of Directors, presided over by Taylor. The Board anticipated a good economic future for soybean oil with profits to match, and planned to be ready for a post-war soybean boom in Ontario.

The Dominion Linseed Oil Company of Baden had operated successfully as an oil seed crusher for a century, even though it was headquartered in land-locked Waterloo County in western Ontario. Much of its market was local: purchase of oilseeds from regional farmers, and sales of oilmeal to feed companies and livestock farmers. By the late 1940s, as E.P. Taylor and his colleagues interpreted business, this kind of localized strategy was not feasible if returns on investment were to be maximized. Sure enough, by the 1950s only three soybean mills existed in Ontario: Canadian Vegetable Oil Processing Limited at Hamilton, Toronto Elevators/Maple Leaf at Toronto, and Victory Mills, in its own words “the largest Soybean processing plant in Canada, offering farmers a profitable market for their soybeans.”42

Victory Mills succeeded due to the changing global structure of commodity production, processing and trading. Company owners and investors were entrepreneurs, not farmers, unlike the co-operative SBOMC in Chatham in the early 1930s, where growers tried to be both; their

42 Victory Mills, Farming with Soybeans (Toronto: Victory Mills, no date), back cover.
reasons for going into the business of processing soybeans exclusively were made clear in a descriptive pamphlet, *New Soybean Guide*, the subtitle of which was “… new varieties and new methods assure higher yields, greater **PROFITS**” [bold capitals in the original]:

Canada can no longer freely import her fats and oils requirement, and it is necessary for us to promote production, both from a point of relieving our immediate shortage and to better our position in the future, so as to avoid being dependent on imports of these essential commodities which are produced in the far-flung corners of the globe. It is recognized today that it is an economic and strategic necessary for Canada to be more self-sufficient in respect of these vital edible and industrial fats and oils.43

Unlike the industrial farming described by FitzSimmons and Fitzgerald, however, Victory Mills did not own or manage soybean farms.

Victory Mills promoted soybeans (albeit for private gain) much more vigourously than either provincial or federal governments. Taylor chose not to exploit rapeseed, growing in Saskatchewan, even though the NRC had dedicated substantial public funding to research and development of rapeseed. Granted, rapeseed was a relatively new biological innovation, not well known to chemists or field crop scientists, but even when soybeans were at a similar early stage in Ontario, the Dominion Department of Agriculture virtually ignored them. The federal government continued to demonstrate an intense interest in western Canadian wheat, and commodity crops to complement or replace it. Soybean breeding continued at a slow pace. After the war, NRC scientists determined that “with careful refining, bleaching, hydrogenation, and deodorizing, rapeseed oil could be substituted for soybean oil in edible products without loss of quality.”44

To promote soybean production on southwestern Ontario farms, Victory Mills established an Agronomy Department, and constructed a Research Institute to be staffed by

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44 Gridgeman, *Biological Sciences at the National Research Council of Canada*, 68-60.
“leading Canadian scientists who will devote their abilities to extending the use of Soybean products”. The company hired agronomist Ivan Roberts, an OAC alumnus, and published the comprehensive *New Soybean Guide* and *Farming with Soybeans*. These booklets were modeled closely on the bulletins and circulars authored by OAC scientists and released by the Ontario Department of Agriculture for many years. Like OAC publications, Victory Mills booklets contained recommendations for field practices (but no science), and helpful illustrations. A map of southern Ontario climatic zones accompanied a list of varieties most commonly grown in Canada. For each variety, some distinguishing physical features (especially seed and hilum colour), days to maturity and average yields in bushels per acre enabled a farmer to “choose a variety that meets as nearly as possible his farm conditions.” Farmers were familiar with the booklets’ format; the booklets were trustworthy.45

Although Victory Mills was advertising a service (free agronomic advice followed by the purchase of harvested grain), the pamphlet *New Soybean Guide* also bears some striking resemblances to seed catalogues distributed by the John A. Bruce Company in the late 1800s, when they were still in the business of selling field crop seed. Both companies featured testimonials from satisfied farmers. Bruce Company seed satisfied farmers across the country; in the 1890 edition, for example, there were laudatory letters about oats from Calgary, Northwest Territories; Carman, Manitoba; Newburg, New Brunswick; and several Ontario counties. In *New Soybean Guide*, growers from Kent, Elgin, Essex and Middlesex Counties described their successes with soybeans, and their satisfaction with soybeans as a cash crop which also benefitted the soil.46

45 *New Soybean Guide*, 4-5.
Both companies also used scientific agriculture in their publications to improve their business prospects. The Bruce Company referred to Prof. Brown, of the Ontario School of Agriculture, to promote agricultural grass seeds for sowing permanent pastures. Victory Mills reproduced data derived from research and experiment, including recommendations for two-year, three-year and four-year rotations, as well as the lists of recommended varieties. *Farming with Soybeans*, undated but probably released in the early 1950s, re-formatted information from many government documents to create an up-to-date handbook.

Victory Mills also funded research at OAC. Beginning in about 1945 until about the mid-1950s, Toronto Elevators and Victory Mills jointly sponsored a breeding project which tested new soybean varieties in the Department of Field Husbandry. In the same time period, Canadian Breweries, Ltd., Research Institute co-operated with the Department of Animal Husbandry in a study of soybean meal as a protein supplement in chick starter diets. Soybean meal continued to be regarded as a by-product of oil extraction; it was heavy, bulky and cumbersome to transport, and its nutritional value was compromised unless it was heated. In both cases, scientific research, directed to answering specific questions, had potential to increase companies’ profits from soybean products.

World War II had validated the relationship between public research and private manufacturing interests, but private companies also began to fund innovative projects based on management of the crop in the field, prior to harvest and processing. For example, in 1946 Sherwin-Williams (manufacturers of water- and oil-based paints and other finishes) awarded a $500 fellowship to a summer student working on a new herbicide, 2,4-dichlorophenoxyacetic acid (2,4-D) in conjunction with the Departments of Botany and Field Husbandry. This
preliminary work led to a series of annual studies on the responses of various field crops, including soybeans and flax, to 2,4-D sprays.47

The business of agriculture was not new. Efficient production, marketing and processing were hallmarks of regionally specialized mixed farming, chemurgy, and the OSBMB. Agribusiness, however, attached new themes and practices to the network of farmers, scientists, processors, politicians, and suppliers of seed, equipment, and other suppliers of capital and inputs which previously existed. Like E.P. Taylor, many agribusinessmen were not farmers; they were disconnected in time and place from the physical and cultural rural environment on which their profits depended. Unlike farmers and others with direct business, professional and social connections to the rural community, they did not reinvest profits in the places where soybeans grew or return cultural or physical environmental benefits to the countryside. They built facilities for adding value to primary commodities in urban centres, often in other countries. They maximized profits to satisfy shareholders, not landowners. These are crucial attributes of agribusiness which were exacerbated as consumer demand for manufactured goods, many of which were derived from corn and soybeans, expanded.

The Ontario Soya-Bean Growers’ Marketing Board and the Ontario Soybean Committee: Farmers and Scientists Organize

When government restructuring in the Ontario Department of Agriculture resulted in the formation of the Standing Committee on Crop Improvement, its various subcommittees consisted of politicians and scientists, with a few farmers invited as consultants. Fiscal austerity in the early 1930s had reduced programs in which individual farmers had traditionally participated: competitions, demonstrations and exhibitions. Furthermore, increasing emphasis on

specialization in agricultural science, and a move to more rigorous control of experimental conditions, experimental design and analysis using the relatively new statistics and analytical techniques, excluded farmers. In fact, when the OCIA was formed in 1938, members were firmly advised not to run any experiments on their farms, but to “engage in purely demonstration work with proven varieties, methods and practices, which would illustrate in the community what has been ascertained as a result of experimental work conducted by Agricultural Research Institutions.” Farmers agreed to abide by this recommendation, and the OCIA became one of many rural interest associations and commodity groups.

Associations of crop producers had existed in Ontario for decades. Commodity groups, variously called marketing boards, marketing schemes, supply management groups, cooperatives and other titles, were relatively common in Ontario in the 1930s. Economist Ian M. Drummond argues that self-government symbolized democracy to the producers themselves, with every member sharing equally in risks and revenue, even as growers were compelled to join and comply with a set of regulations stipulated by the provincial government. In agricultural Ontario, many farmers were eager to form boards for the orderly marketing of all manner of commodities: beans, tobacco, milk, butter and eggs were all controlled to some extent by legislation.

Dissension and confusion churned among producers, however. The Western Ontario Bean Marketing Scheme is a case in point. In August, 1935, members went on record as being unanimously in favour of selling beans under the Natural Products Marketing Act, which had in fact been revoked in 1934. Without some form of ordered marketing, producers feared the price

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48 Martin, A History of the Ontario Soil and Crop Improvement Association, 11-12.
of beans would gradually sink to the value of livestock feed. Barely one month later, the four largest bean dealers threatened to withdraw from the agreement amid charges of price-cutting. The dispute was reported in detail in the *Farmer’s Advocate* over a period of months. Producers of other commodities were equally divided about legal marketing protocols; to curtail activities such as alleged bootlegging of butter and illegal trading in potatoes, and enforce a democratic process in commodity sales, the Ontario government enacted the Farm Products Control Act in 1937. According to this Act, marketing boards became sales monopolies, empowered to negotiate prices with buyers on behalf of all members. It was up to producers to form a marketing board sanctioned by the provincial government, whereupon all producers of that commodity were obliged to join. Ontario farmers in general were thus familiar with the structure and function, as well as the advantages and disadvantages, of organized commodity marketing.

During the 1930s and early war years, Ontario soybean acreage hovered annually around 10,000 acres, but with government assurance of a guaranteed ceiling price for soybeans ($1.96 per bushel, basis Toronto; $1.86 net at the shipping point) farmers planted 40,000 acres in 1942. In 1943, they planted over 50,000 acres, and expansion continued after the war and through the 1940s and 1950s, mostly as small acreages in mixed farm rotations. The Victory Mills Board of Directors was correct in its prediction that soybean acreage would take off, although it is unclear if these businessmen understood anything about soybean farming *in situ*. Only a small percentage was actually shipped and crushed for oil. Farmers continued to feed them on the farm, and Victory Mills continued to import soybeans from the American Midwest.

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In light of the expanding market for soybeans, growers initially formed the Ontario Soybean Growers’ Association (OSGA) in 1946. Producers from Essex, Kent, Elgin, Lambton and Middlesex Counties were involved; the group was financed by voluntary membership fees and donations from local elevator operators. The fledgling organization was the first Canadian trade organization for soybean growers who together produced more than one million bushels on 60,000 acres. Their average yield – roughly nineteen bushels per acre – compared favourably with average American yields. By this time, Victory Mills was fully operational, and a price ceiling was fixed at $2.15 per bushel. The OSGA immediately sent a delegation to Ottawa to persuade the government to raise the ceiling price to $2.40, a figure more in line with the ceiling on corn. (The ceiling was abolished in September 1947.) OSGA members also initiated proceedings to form an Ontario Soya-Bean Growers’ Marketing Scheme (OSGMB) under the new Farm Products Marketing Act, which replaced the Farm Products Control Act in 1946. Committed growers met with OSGA leaders and processors to determine pricing, grading and handling charges, as well as license fees charged to growers per bushel sold through the association.52

In 1949, the OSGMB was created. Its official marketing plan, which did not change significantly between 1949 and 1970, limited the right to grow soybeans and the right to deal in soybeans (either as a dealer or a processor) to licensed individuals only. The OSGMB was authorized to “stimulate, increase and improve the marketing of soya-beans” according to the provisions of the Ontario Soya-Bean Growers’ Marketing Plan, and in co-operation with any other soybean marketing groups in Canada, by establishing grading standards and basis prices,

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co-ordinating timely marketing to avoid gluts, and setting maximum rates for storage and handling. The local board (so designated under the authority of the overarching Farm Products Marketing Board) was comprised of members from five districts: Elgin, Kent, Lambton, Middlesex and Essex (except Pelee Island) Counties, and Pelee Island. Within each district, producers were required to form a District Soya-Bean Growers’ Committee. Furthermore, a negotiating Agency for Soya-Beans of twelve members was reorganized annually: six to be appointed by the local board of producers, three by the dealers and three by the processors.

In the first year, a mandatory payment of one-half cent per bushel or fraction thereof was levied on producers, payable to the local board. In 1950, the fee increased to one cent per bushel, where it remained until 1959. These fees were collected and used at the discretion of the local board to pay expenses incurred while negotiating contracts and arbitrating disagreements in matters of buying and selling Ontario soybeans. This style of marketing plan contrasted sharply with the compulsory co-operative approach adopted by some other Canadian marketing boards, and was “more akin in spirit to labour negotiations” than to the imposed price structure which had been in place during the war. Nonetheless, the local board was empowered to compel all soybean growers in Ontario to register and pay a license fee to the board. Dealers and processors were required to furnish annual statements of the amounts of soybeans acquired and processed. Thus could the board keep track of provincial acreage, yield, growing conditions, fixed and operating costs.53

The OSGMB succeeded because farmers had longstanding experience not only with marketing; they had also witnessed first-hand the progress of soybeans in southwestern Ontario.

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Many growers knew soybeans intimately. R.H. Peck of River Canard, south of Windsor, deep in Essex County, was proud to declare he had grown soybeans for twenty-two of his thirty-three years. He raised his first crop for a school fair in 1925. In the mid-1930s, he grew and sold certified seed. He was a charter member of the OSGMB, a Director of District 2 (Essex) from 1950 to 1954, and Chairman in 1952. He was also a Director of the American Soybean Association (ASA) from 1947 to 1953, only the second Canadian to hold this prestigious position. The first was OAC President George I. Christie, who was also President of the ASA in 1929, the year the annual convention was held at OAC.54

Soybeans and soybean growers thus formed a small but growing community in agricultural Ontario, concentrated in the southwest. While soybeans continued to be part of a mixed farming regime of crops and livestock, globalization demanded Ontario farmers maximize efficient management and production. In the US, industrial agriculture and the extensive production of corn, soybeans and grain in the American Corn Belt, were well established. In Ontario, although farmers increased their use of purchased inputs, mixed farming on smaller acreages persisted.

**Industrial Agriculture and a Model for Southwestern Ontario**

Economic geographer Margaret FitzSimmons and historian of science Deborah Fitzgerald place the origins of modern American industrial agriculture in the 1920s and 1930s. It was most often farming on a large scale, applying economies of scale to inputs like labour, land and time to reduce costs and increase profits to landowners. In the US, industrial agriculture was closely allied with manufacturing through a shared philosophy: that humans could streamline and control production and output by knowing the value of inputs and using them accordingly for

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maximum yields. Industrial farms were characterized by enormous acreages, exceptionally high yields per acre, or both. Labourers were contracted to perform repetitive, assembly-line work, and the persons who actually worked the soil did not own it.

From the discussions of FitzSimmons and Fitzgerald, American industrial agriculture emerges as a flexible framework of crop and livestock production, responsive to global supply and demand, within which educated specialists from many disciplines share experimental knowledge and practical applications of commodity production for profit. FitzSimmons models her theory on the diversification of sugar-producing smallholdings in the Salinas Valley, California, into head lettuce, artichokes and other fresh vegetables as refrigerated rail transport made shipments to eastern urban markets not only feasible but profitable from the early twentieth century to the late 1970s. She is careful to note the features that differentiate farming from the “simple competition among homogeneous firms” which characterizes the secondary, or manufacturing, sector: chemistry and biology restricted labour productivity and production time, as farmers who dealt with living systems (as opposed to machinery and technology in factories) could not accelerate or standardize either their management systems or the productivity of their fields. Farming’s inescapable dependence on “land” was as critical in the Salinas Valley as in southern Ontario; area and location, in reference to “rent” as well as fertility and climate, defined the rate of “industrialization”. FitzSimmons argues that markets (accessibility to inputs and finance capital, as well as to consumers) most accurately defined industrial agriculture. Moreover, vertical integration reinforced the ability of industrial producers to be profitable, although “the social and spatial organization of agriculture … is elaborately developed as a consequence of intricate historical forces and contingencies.” Between 1945 and 1976, crop
production in the Salinas Valley became concentrated in distinct regional pockets, and sugar beets and dry beans essentially disappeared in favour of high-value perishable produce.\textsuperscript{55}

Fitzgerald focuses her discussion of industrial farming on mammoth farms, some as large as 100,000 acres, in the American Midwest using several case studies. The sheer size and expanse of these establishments necessitated standardized management in order for profit to be realised. Specialized personnel kept each system running efficiently. On the Poso Land and Products Company, bookkeepers and accountants prepared balance sheets which showed at a glance what parts of the enterprise were efficient and what parts needed attention. On this farm, the general manager was an agricultural engineer; on the California Packing Company farm, a “foreman” managed a parcel of peach orchards and all the workers posted there. A universal feature of Fitzgerald’s mammoth farms was that there were no “farmers,” who she defines as “yeomen wedded to the land, yeomen whose way of life was as important to maintain as production goals were.” She argues that the management of these farms was too complex for farmers, who were demoted to field hands. Her work implies that a physical and psychological separation took place between humans and the environment where food was grown, and on these large farms, at least, an industrial psychology emerged.\textsuperscript{56} Physics and mathematics, engineering and technology superceded the softer sciences of chemistry and especially biology, where generalities were accepted as normal and adapted varieties were the most important category in field crop agriculture.

In Ontario, agriculture was tempered by the same conditions that Fitzsimmons cites: land as it was related to location and area under cultivation. As a consequence of the environmental


\textsuperscript{56} Deborah Fitzgerald, \textit{Every Farm a Factory: The Industrial Ideal in American Agriculture} (New Haven and London: Yale University Press, 2003), 106-128.
diversity which characterized southern Ontario, small to medium-sized farms, owned, managed and operated by individuals (farmers and farm families), existed until well into the twentieth century, and the production and management systems which families employed were determined by these very locational factors. While corn and soybeans became important rotation partners and commodity crops, a management system comprising some combination of field crops and livestock was retained. Most importantly, farm families owned the land they worked, and farms were consistently of a size that could be operated by an extended family. While agriculture in Ontario shared some of the features of industrial agriculture, especially regional specialization, the production of commodity crops for off-farm sales, and increasing dependence on purchased inputs, mixed farming persisted as a system of management throughout the agricultural regions of the province.

According to the 1941 Census, farmers in almost all counties in Ontario reported income from each of the following categories: wheat; other grains and hay; potatoes, roots, tobacco and fibre flax; vegetables, fruits and nursery products; dairy products; poultry and eggs; cattle; swine; other animals and wool; and honey and forest products. (The only exception was wheat in Russell County.) In addition to off-farm sales, farm families in all counties consumed their own produce. The majority of farm labour was performed by male members of the family, supplemented by female family members and hired hands. The most common size of farm was between 51 and 299 acres.\(^{57}\)

In southwestern Ontario as World War II ended, crop agriculture began to transition from mixed farming with regional specializations to the intensive production of a few crops on a single farm, often without any significant livestock as part of the farm operation. An important aspect of industrial farming was its dependence on purchased inputs, including fertilizers in lieu

\(^{57}\) Census of Canada, 1941, 868-875, 888-899, 992-1018.
of manure, machinery, implements and fuel. Of particular significance to corn producers was the development of the insecticide DDT for control of the Corn Borer, which was still systemic in the southwest; this too had to be purchased. While industrialized mixed agriculture existed in Ontario, it developed very differently than the models FitzSimmons and Fitzgerald describe for parts of the US.

Industrial farming required the kind of steady cash flow that mixed farming, especially in the dirty thirties, managed without. Most of the shift to industrial farming was beyond the control of the individual mixed farmer and farm family. Most of it entailed the losses to other regions of crops grown under lucrative contracts, as mixed farmers there also specialized in commodity crops that were adapted to their own environments. For example, in Kent County all but two sugar beet processing plants had closed by 1951, and beet acreage declined steadily until the last plant, located in Chatham, finally closed in 1967. Tobacco production moved east to the sandy soils of Norfolk and Oxford Counties. Field beans moved up Ontario’s west coast to Lambton and Huron Counties. Grain and seed corn, soybeans and small grains became the premier field crops in Kent and Essex Counties.

Where did soybeans fit in industrializing mixed agriculture as it emerged in Ontario? In 1941, they were enumerated “with beans”, that is field beans for canning or drying. As the distinct differences between field beans and soybeans were understood, and they became more popular on farms across the province, they earned their own category as a field or grain crop. In 1941, they had also been footnoted as “other tame hay”, along with millet, crested wheat grass, western rye grass, alsike, red clover, and other annual and perennial legumes and grasses. By
1951, soybeans were enumerated as a field crop only, and data was collected for each county in the province.\textsuperscript{58}

Data from 1951 and 1961 census years demonstrate several trends when individual counties are selected for comparison. In Tables 3-1a and 3-1b, Essex and Kent Counties are compared with Wellington and Carleton Counties. Essex and Kent Counties are the southernmost counties in western Ontario; HRS was established in Essex County in 1909. Wellington County is located in western Ontario. OAC, where soybeans were first introduced to Ontario and where the earliest selections and varietal tests were made, is in Wellington County. Carleton County is in eastern Ontario, and is home to the Central Experimental Farm (CEF) at Ottawa. These three regions became important centres of soybean breeding for regionally adapted varieties by the 1950s and 1960s.

<table>
<thead>
<tr>
<th></th>
<th>Total acres in soybeans</th>
<th>Number of farms reporting soybeans</th>
<th>Average acres planted to soybeans per farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Province</td>
<td>154,973</td>
<td>6778</td>
<td>22.9</td>
</tr>
<tr>
<td>Essex County</td>
<td>60,320 (about 39% of provincial total)</td>
<td>2279 (about 34% of provincial total)</td>
<td>27.9</td>
</tr>
<tr>
<td>Kent County</td>
<td>62,785 (about 41% of provincial total)</td>
<td>2252 (about 33% of provincial total)</td>
<td>26.5</td>
</tr>
<tr>
<td>Wellington County</td>
<td>99</td>
<td>16</td>
<td>6.2</td>
</tr>
<tr>
<td>Carleton County</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 3-1a. Soybeans in 1951. Percentages and average acres planted to soybeans per farm were calculated by the author. \textit{Census, 1951}, 17-1 – 17-8.

\textsuperscript{58} Ibid., 924-931.
Table 3-1b. Soybeans in 1961. Percentages and average acres planted to soybeans per farm were calculated by the author. *Census, 1961*, 16-1 – 16-8.

A striking statistic is the average acreage planted to soybeans per farm in each region. Wellington and Carleton County growers were still experimenting with very small acreages, some of which may have been demonstration acreages in co-operation with the OCIA and the Department of Field Husbandry. Essex and Kent County growers had committed entire fields to soybeans. In 1951, Essex and Kent Counties together accounted for about eighty per cent of the provincial total. By 1961, this had dropped to about seventy per cent, as soybeans began to expand through southern Ontario into Lambton, Elgin and Middlesex Counties, where most of the remaining acres were planted.

Likewise, only a handful of farmers in either Wellington or Carleton Counties tried soybeans, and only five or six per cent of all farmers in the province reported growing soybeans in 1951 and 1961 respectively. It was a completely different story in Essex and Kent Counties, however. By 1951, 43 per cent of all Essex County farmers and 42 per cent of all Kent County farmers grew soybeans. By 1961, a slightly greater percentage of Essex County farmers were soybean growers (46 per cent), but in ten years, fifty-four per cent of farmers in Kent County had embraced the crop. Tables 3-1a and 3-1b show that average acreages planted to soybeans per...
farm increased substantially in Kent County (from 26.5 to 32.9). Even in the southwest, microenvironments demanded specifically-adapted varieties, which were becoming widely available for farms outside the extreme southwest.

Table 3-2 describes the corn/soybean situation in Essex and Kent Counties in 1950 using data from the 1951 Census. “Soybeans for threshing” is a clear indication that grain and seed were the commodities of interest; soybean hay had virtually disappeared from Ontario farms. Likewise, grain and seed corn predominated in Essex and Kent, but since the advent of hybrid corn in Ontario in the later 1930s, farmers in the milkshed and further north were also able to grow their own grain corn for feeding swine and poultry, and purchase hybrid seed to plant for silage for ruminant livestock. Thus southwestern Ontario farmers, who had enjoyed a virtual monopoly on seed and feed corn production prior to World War II, turned to soybeans to replace some of this lost market.

In 1948, soybean acreage doubled to 94,000 (from an annual average of 46,800 between 1943 and 1947). In 1949, acreage increased approximately ten per cent, and in 1950 increased again by more than twenty-five per cent. Government action fixed the price per bushel paid to growers, but farm accounting was a detailed record of expenses for individual crops, and immediately available to the farmer. These expenses included inputs and equipment. They might record day-to-day expenditures of farmer time attributed to each crop. They also indicated indirect expenses such as deterioration and depreciation of fixed assets such as the soil. Each entry on a balance sheet was a crucial measure of farming efficiency, at a time when commodity crops comprised a growing share of farm production and income, and purchases for farm operations absorbed an increasing percentage of cash expenditures.

The data in the second half of Table 3-2 is useful for understanding the connection between industrial agriculture and the rapid acceleration in soybean planting in Ontario by the post-war period. To a farmer, the entry “$ per acre” earned from growing either corn or soybeans was arguably the most critical, but this value also depended on hidden costs and benefits. In the case of corn, “$ per acre” was greater in Kent County (about $75) than in Essex County (about $66), which was in fact below the provincial average (about $72).

The lower value for Essex County reflects reduced productivity due to soil damage. Indeed, by the early 1940s Essex County farmers observed the state of their soil with concern: compacted and poorly drained, with virtually no organic matter after years of continuous corn and small grains. As a result of their inquiries, soil specialists at OAC undertook the Essex County Soil Improvement Studies. This project recommended (among other actions) the modification of rotations by including legumes, hay or pasture to improve soil structure and permeability. Soybeans had the double advantage of being a legume (which fixed atmospheric nitrogen) and a commodity crop (like corn). The “$ per acre” for soybeans was lower than for corn, but nonetheless includes indirect savings such as the reduction in purchased nitrogen fertilizer or in farmer time and use of machinery with fewer passes over the field, which balanced the lower value income.60

<table>
<thead>
<tr>
<th>Soybeans for threshing</th>
<th>Provincial total</th>
<th>Essex County</th>
<th>Kent County</th>
</tr>
</thead>
<tbody>
<tr>
<td>acres</td>
<td>154,973</td>
<td>62,785</td>
<td>60,320</td>
</tr>
<tr>
<td># farms reporting</td>
<td>6,778</td>
<td>2,252</td>
<td>588</td>
</tr>
<tr>
<td>acres per farm *</td>
<td>23</td>
<td>28</td>
<td>103</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corn shelled or for grain</th>
<th>acres</th>
<th>Provincial total</th>
<th>Essex County</th>
<th>Kent County</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>289,263</td>
<td>64,230</td>
<td>98,796</td>
<td></td>
</tr>
</tbody>
</table>


Did farmers in southwestern Ontario take all these factors into consideration? They did indeed. In 1937, in his presidential speech to the Ontario Agricultural and Experimental Union (the Ag Union), livestock farmer and seed producer Alex M. Stewart of Middlesex County compared a farm to a factory: each was a production unit. Farming (like manufacturing) depended on knowledge, equipment and technology to produce a marketable good. The urgency of his message was a result of lost productivity, exacerbated by the economic difficulties which farmers experienced through the 1930s, when the situation reached a crisis in many rural areas. It was also a consequence of chronic long-term soil, water, and farm forest and woodlot mismanagement. According to Stewart, the rejuvenation of worn out soils was a problem that would take a long time to remedy, but was crucial to efficient, profitable farming. This message...
– conservation of natural resources – had special meaning for farmers and farm families who
made a living by managing soil and water.⁶¹

Nor did the size of farms have anything to do with industrializing agriculture in Ontario;
“medium-sized” farms prevailed, although very small farms continued to disappear and large
ones slowly increased in number.⁶² The system of land tenure tempered the spread of
industrialization. Ontario farms were of a size which was manageable by an extended family,
with some hired labour at certain times of the year when it was available and affordable. Crops
were rotated, and work spread over the year (including the care of livestock, summer field work,
and winter maintenance and repair of machinery and other capital assets). In particular, crop
rotation improved the soil (structure as well as nutritive value) and controlled pests, and
therefore reduced the need for purchased chemicals.

While Ontario farmers used materials and techniques that were certainly part of
industrialization, on the whole the model of industrial agricultural that existed to the 1950s was
tailored to Ontario environmental conditions. It continued a traditional system – mixed farming –
that had existed for over a century. Mixed farming had not stagnated, however: scientific
agriculture and access to markets for standardized goods had introduced changes to crop
production. By the 1950s, scientific research and management using the results derived from
scientific management began to diverge as two distinct areas of agricultural expertise.

Research and Management Diverge

⁶¹ Alex M. Stewart, “A Grower’s Views of Registered Seed Grain. The Producer should keep to the high side of the
Agricultural and Experimental Union (hereafter cited as Ag Union Annual Report), 1937, 8.
⁶² Census of Canada, 1931, 392-399; Census of Canada, 1941, 868-875; Census of Canada, 1961, 1-1.
The formation of the OSGMB symbolized the confidence of producers in southwestern Ontario in the potential of this cash crop: they believed the quality and quantity of their soybeans would compete favourably with American soybeans in the foreseeable future. The formation of the OSGMB confirmed the onset of commodity production in southwestern Ontario; while off-farm sale of field crops had always been a familiar practice, extensive fields of soybeans were now grown exclusively for marketing at the best possible negotiated price.

By 1949 scientists had also organized to set up the Ontario Soybean Committee (OSC), dedicated to the co-ordination of research among the various experimental stations for the improvement of varieties specially adapted to Ontario. The OSC evolved as a professional organization to collect and share scientific results among soybean researchers, and disseminate information to growers.63

The focus of breeders was the development of maturity groups (MGs) of varieties adapted to specific climatic regions, including southwestern Ontario but eventually spreading east through central Ontario as far as the Quebec border, and in this effort they collaborated with pathologists to select for disease resistance as well. Agricultural scientists specialized more and more in other sub-disciplines as well, such as cell, plant and crop physiology, plant biochemistry, soil physics and chemistry, and agronomy. The inaugural meeting of the Canadian Society of Plant Physiologists/La Société Canadienne de Physiologie Végétale was held at Toronto in November, 1950, “to serve as a central organization for the promotion and correlation of fundamental and applied research, and to act as a central consulting body to advise research organizations in Canada on problems and research projects in this field.” One of the charter

63 “Organize Ontario Soybean Committee”, Soybean Digest (February 1948), 16. See also Soybean Blue Book (1952), 10, 12.
members was C.M Switzer, OAC alumnus (1951) and faculty member, Department of Botany, OAC, from 1955 to 1971.64

The formation of the OCIA, OSGMB and OSC was indicative of a trend in Ontario agriculture: the separation of farmers and scientists into two distinct and mutually supportive groups. Scientists and farmers had different skills and areas of expertise which no longer overlapped as they had, for example, in the days when the Ag Union and the Department of Field Husbandry co-operated in the collection of field data. In those days, scientists planned experiments and dealt with individual farmers, whose active participation was solicited through advertisements in the farm press, and whose data (both quantitative and anecdotal) was welcomed.

The next phase of soybean production in Ontario began in the early 1950s, with the development of a high-yielding variety at Harrow Research Station, called Harosoy. The release of Harosoy in 1952 by plant breeders at HRS in Essex County, southwestern Ontario, was the biological innovation that finally gave Ontario soybeans the impetus they needed to become a competitive crop for North American acreages. Following Harosoy, they could no longer be relegated to the status of marginal or alternative crop. Harosoy was a ground-breaking cultivar (cultivated variety), consistently yielding 33 bushels per acre in southwestern Ontario and the American Corn Belt: 65 per cent more than any of its original Harrow-adapted parents. Harosoy’s pedigree included AK (Harrow), Harman and Harley, all developed at HRS between 1933 and 1948. In 1951, Harosoy won the World’s Championship Seed Sample at the Royal

Winter Fair in Toronto, and in 1953 the same cultivar won the Grand Championship Award at the Chicago Grain Exhibition; both were prestigious agricultural fairs, attended by international competitors and observers. By 1959, Harosoy occupied 75 per cent of Canadian and 15 per cent of American soybean acreage.65

Throughout the transition from minor regional crop to a commodity with increased maturity groups and expanded regional adaptation, the relationship between scientists at publicly funded institutions and farmers in southern Ontario remained one of mutual support, even as agricultural science and scientific farming separated into two distinct professional disciplines.


From 1881 through the early 1950s, the ongoing history of soybeans has provided a case study of the evolution of field crop agriculture in southwestern Ontario. At the heart of this process was the development of a mutually supportive relationship between scientists employed at public institutions and farmers and farm families managing their own lands as a means of earning a living. In the early years, the Ontario Agricultural and Experimental Union (the Ag Union) was the vehicle through which alumni and faculty of the Ontario Agricultural College (OAC) could communicate. Charles Zavitz was adamant that he neither “originated” nor controlled the Ag Union, which was in fact run by committees of scientists and farmers, but he served as its Secretary from 1884 until his retirement in 1927, and President and Honorary President for many years. Zavitz actively promoted co-operation between OAC and individual farmer members.¹

As mixed farming became more regionally specialized, the professional goals of scientists and farmers continued to be very similar: reliance on applied science for flexibility in making decisions and reducing risk. According to Dr. E.S. Archibald of the Central Experimental Farm (CEF), Ottawa, “The farmer who designs and faithfully follows a well balanced, properly adjusted program for all round improvement – a program sufficiently fluid that he can meet unforeseen contingencies; the expert farmer, the expert livestock man and the good business man will be the one who comes out all right in the long run.”² His remarks referred to the Depression years, but they are equally appropriate when describing farming,

² Ag Union Annual Report, 1930, 99.
especially scientists’ and farmers’ work with soybeans at any time since they were first introduced to Ontario.

In 1938, the Ag Union came to a quiet end, in response to economic challenges in the early 1930s, but also because of the increasing emphasis on specialization in science in general, and moves to adopt more rigorous control of experimental conditions, experimental design, and analysis of results using relatively new statistical methods. Individual farmers organized themselves into interest groups and commodity marketing groups. Although Ontario continued to be a region of mixed farms, industrial farming, where commodity crops like corn and soybeans, grown specifically for cash sale on farms of increasing size, began to show up on the rural landscape, albeit to a limited extent (in both absolute and relative numbers).

From the late 1930s through the post-war period, scientists and farmers segregated themselves into two groups of specialized professionals. Farmers became managers who identified practical problems and turned to scientists for specific help. They applied results derived from scientific research to refine the management of farm resources and inputs, mainly purchased by this time. This relationship continued through the 1950s, 1960s and 1970s, as specialized scientists at government research stations, experiment farms and colleges developed new soybean varieties for southwestern, central and eastern Ontario, as well as field and soil management techniques which farmers applied to optimize yields.

As soybeans became a highly successful commodity crop for numerous farming regions, they attracted private business interests. Seed houses hired scientists, who used varieties released from public institutions to create new varieties, for sale, for private profit. The first of these varieties was released in 1983. A century of research, experiment and extension, when mixed
farming provided an established structure for the introduction and improvement of soybeans in Ontario at public institutions, came to an end.

**Science Applied to Production**

In the early 1950s, crop agriculture in southern Ontario underwent a profound change in philosophy and application among both scientists and farmers. Scientific research was institutionalized at colleges and research stations, while farmers applied the results of research and experiment to improve production. Pathologists, soil scientists, plant physiologists and weed scientists were all active in this new paradigm of scientific agriculture. New varieties had been years in the making; one could say almost 75 years, since all prior research and experiment by scientists and farmers laid the groundwork for their release. Their continuing goal was the management and manipulation of biological and environmental resources for sustained productivity.
Figure 4-1 is adapted from work by livestock specialists James White, James Dalrymple, and David Hume. While the graph plots hectares of soybeans planted in Ontario since 1945, the information is broadly similar for soybean yields (tonnes per hectare) and total production (million tonnes) over the same time period. There are two significant years noted on the graph when soybean hectares increased.

The first year, 1950, indicates a subtle but important change in the inclusion of soybeans in rotations in southwestern Ontario only. Soybeans became a significant crop in the 1940s, as World War II stimulated a need for oilseeds. By the early 1950s, hectares planted had increased from a few thousand to approximately 155,000 acres (see also Chapter 3, Table 3-1a. Soybeans
in 1951). By 1961, this had increased by about one-third more, to almost 212,000 acres. This occurred almost entirely in southwestern Ontario, and was due to the co-operative development of two new varieties by breeders at Harrow Research Station (HRS) and the United States Regional Soybean Laboratory at Urbana, Illinois. These were Harosoy and Harosoy 63.

In 1952, the soybean variety Harosoy was released by scientists at HRS in Essex County, southwestern Ontario. Harosoy had been developed for southwestern Ontario, using conventional crossing methods, and proved to be suitable for growing in the American Corn Belt as well. Prior to the release of Harosoy, the main bottleneck to wider adoption of soybeans had been the lack of varieties adapted to different environmental niches in the American and Canadian Corn Belts. Harosoy marked a turning point for soybean production in Ontario: planted hectarages began to climb, as soybeans became a crop of major economic importance.

The second change in the slope of the graph, at about 1970, is much more unmistakable. Beginning in the 1970s, fields of soybeans spread across the province, and soybean hectarage steadily increased more than six-fold by 2000 (Figure 4-1). This can be attributed to the release of Maple Arrow and its progeny, a series of varieties developed at CEF Ottawa and adapted to the short seasons and low temperatures characteristic of eastern Ontario. Ottawa breeders had experimented with soybeans for many years, both as grain and forage, using the same standard varieties as most other programs in Canada and the northern states. Breeders took a shotgun approach: cross anything that showed promise, and hope for the best. For example, in 1948, seed of their best varieties was obtained from researchers at Wisconsin, Guelph, Indiana, Harrow and Illinois, and crossed with the best Ottawa selections. It was only when very early maturing plants from Sweden were crossed with North American selections that scientists at Ottawa were able to identify single plants which matured in short seasons and develop new varieties from pure line

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3 1 acre = 0.404686 hectare. 1 hectare = 2.47105 acres.
selections. Similarly, introductions from Japan contributed genes for high protein and protection
against mid-summer chilling damage.4

In the post-war period, the federal Department of Agriculture began to acknowledge the
climatic, geographic and geological diversity that was the key feature of Canadian agriculture;
this was an important philosophical departure from the central planning that characterized earlier
years. The Department increased its commitment to soybean research and experiment at HRS
and the CEF at Ottawa, demonstrating a willingness to investigate innovative or niche crops at
regional stations. Soybean research at OAC was also rejuvenated. Soybean breeders in the
provincial and federal Departments of Agriculture addressed the most pressing practical
problems which dogged soybean farmers: adaptation to the diverse environmental conditions in
southern Ontario, including climate and soil. Post-war agricultural science was therefore the
application of exciting theoretical work which had taken place prior to and during the war to
managing field crop environments and increasing the production of food and feed for a growing
population.

When Charles Zavitz retired in 1927, an era when experience was valued and graduate
studies were available to very few individuals came to an end at many agricultural institutions in
Canada. The creation of the Canadian Society of Technical Agriculturists (CSTAg) by a group of
Macdonald College alumni in 1921 was a benchmark for this shift: the constitution of the
CSTAg decreed that all regular members must be a graduate of a college or university of
recognized standing, or a non-graduate, engaged in “agricultural research, administration,

4 F. Dimmock, Soybeans (Dominion of Canada. Department of Agriculture. Division of Forage Plants –
Experimental Farms Service: Ottawa, 1948), 11; James White, James Dalrymple, and David Hume, The Livestock
Industry in Ontario, 1900-2000: A Century of Achievement (Brampton: InfoResults Limited, 2007), 2-30; X.
Delannay, D.M. Rodgers, and R.G. Palmer, “Relative Genetic Contributions among Ancestral Lines to North
and D.R. Knott (Saskatoon: University of Saskatchewan Press, 1995), 158.
education, extension work, publicity or experimental problems”. Associate membership was reserved primarily for undergraduates. In 1925, a new category for senior students pursuing a degree course at an agricultural college of recognized standing, designated as Student Members, was created. Honorary members (the final category) were ineligible for regular membership, but had “rendered the profession valuable or [given] special service.” In a nutshell, the CSTAg was a professional association exclusive to educated agricultural scientists.5 The CSTAg was succeeded by the Agricultural Institute of Canada (AIC) in 1945. Scientific Agriculture was continued by the Canadian Journal of Agricultural Science, which subsequently split into three journals: the Canadian Journal of Plant Science, Canadian Journal of Animal Science, and Canadian Journal of Soil Science in the 1950s.

Agricultural scientists drew from research and experiments in biology, chemistry and physics, as well as related disciplines like economics and statistics. In particular, groundbreaking work in molecular biology and biochemistry (pioneered by Linus Pauling) demonstrated that the network of metabolic systems, physiological processes and physical characteristics were inherited, and coded for by an unknown macromolecule. The structure and mode of action of deoxyribonucleic acid (DNA) were eventually published in 1953, but by this time, molecular biology and biochemistry were tools of the trade for plant breeders, plant physiologists and others who worked in laboratories, growth rooms and growth cabinets. Moreover, this work could be done at any time of day, in any season. These new spaces and times were far removed from field conditions, and presented a dilemma for farmers and

5 The History and Development of the Canadian Society of Technical Agriculturists and of its Official Organ Scientific Agriculture covering a period of over three years October 1919 – February 1923. Edited and arranged by the General Secretary of the Society (Ottawa: Canadian Society of Technical Agriculturists, 1923), 56-57; 1927 List of Members (Ottawa: Canadian Society of Technical Agriculturists, 1927), 64.
scientists: how to keep environmental problems of crop production at the forefront of a research agenda, when growing conditions were so different indoors?

**Specialized Crop Sciences: Breeding, Pathology, Soil Science and Physiology**

From early techniques – identification of desirable plants, and repeated selection of pure lines, culminating in a new variety – to the creation of an even newer variety by crossing plants with specific characteristics – plant breeding and genetics were integral to soybean improvement. The high-yielding variety Harosoy, released by plant breeders at HRS in Essex County, was the biological innovation which firmly established southwestern Ontario as a region where soybean production could be dependable and profitable.

Harosoy was a ground-breaking cultivar (cultivated variety), consistently yielding 33 bushels per acre in southwestern Ontario and the American Corn Belt: 65 per cent more than any of its original Harrow-adapted parents. Harosoy’s pedigree included AK (Harrow), Harman and Harley, all developed at HRS between 1933 and 1948. By 1959, Harosoy occupied 75 per cent of Canadian and 15 per cent of American soybean acreage.6

Despite its exceptional yields, Harosoy was highly susceptible to stem rot and root rot, diseases caused by endemic soil-borne microorganisms. Brown stem rot was first noted in Ontario in September 1947. By the mid-1950s, Phytophthera root rot disease, caused by the fungus *Phytophthera megasperma* var. *sojae*, was identified in soils where soybeans were growing. Phytophthera root rot had the potential to wipe out a field of soybeans (especially when it infected a crop early in the season). In fact all varieties developed at HRS displayed

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susceptibility to these fungal diseases. Developing resistant varieties became one of the main objectives of the HRS program which expanded to include plant pathologists. Harosoy’s back cross progeny, Harosoy 63, was both high-yielding and *Phytophthera*-resistant. Harosoy 63 was developed at the United States Regional Soybean Laboratory at Urbana, Illinois, in co-operation with Ontario researchers, and increased at HRS in the early 1960s for release to Ontario seed dealers and farmers as a substitute for Harosoy. By 1966, 26 per cent of the total US crop of 25 million acres was either Harosoy or Harosoy 63, including 42 per cent of the crop in Illinois, 48 per cent in Indiana, 46 per cent in Ohio, and 58 per cent in Michigan.\(^7\)

The economic implications of *Phytophthera* root rot disease were not lost on scientists, and the discovery of stem and root rots in southwestern Ontario soils may be compared to the discovery of the European Corn Borer in Essex and Kent Counties in the early 1920s. In both cases, the pest was new to the region, although its potential for damaging a crop was well-known. The Corn Borer had advanced through agricultural southern Ontario unimpeded until fields of ruined corn were impossible to ignore. Canadian entomologists were slow to realize the threat, and the steps they took to combat the Borer were relatively ineffective. In particular, regulations for clean-up were not enacted until the Corn Borer Act of 1927, when the infestation was completely out of control and the Corn Borer had spread as far north and east as Manitoulin Island and southern Quebec.

For their part, farmers believed in corn as the premier grain and silage feed crop for Ontario, and continued to plant corn year after year. They preferred to deal with the Borer on a contingency basis, rather than stop growing corn for any length of time. For this reason, Corn

Borers continued to be a serious threat well into the 1950s. Even the new pesticides, including DDT, could not eradicate the Borer.\(^7\)

Agricultural scientists seem to have learned a lesson from the Borer experience: when stem and root rots threatened soybean production in southwestern Ontario, a program was immediately put in place to investigate the diseases. Since 1942, the Canada Department of Agriculture had been structured as four main “services”: science, experimental farm, production, and marketing. The science service encompassed animal and plant pathology, as well as bacteriology and dairy research, chemistry, entomology, and plant production: all investigations of fundamental biological processes. Hence, pathologists initially took up the root rot problem at HRS as a study of the ecology and physiology of *Phytophthora megasperma*.\(^9\) Plant breeders responded by developing varieties with improved disease resistance as well as yield potential; after the successful Harosoy, they released a total of nine more varieties by 1975.\(^10\)

Although soybeans were not a new crop to Ottawa researchers, serious breeding work had languished until the early 1930s, when small studies began again. For several years, until the early 1960s, the primary focus of soybean breeding at Ottawa was the incorporation of resistance to the same Phytophthora root and stalk rots as in southwestern Ontario, as well as the selection of varieties adapted to the Ottawa environment. In crosses for resistant short season varieties at Ottawa, breeders noted that yield and oil content were positively correlated, and that by selecting for increased yields (still the second most important criterion for a new variety anywhere in Ontario, following regional adaptation), they also automatically selected for increased oil and decreased protein. This inverse relationship was well known. Wartime demand for oilseeds, and the decision of National Research Council (NRC) officials to make rapeseed (*Brassica napus* L.)

\(^7\) *Canada Dept of Ag Annual Report*, 1955, 99; *Canada Dept of Ag Annual Report*, 1957, 98.
\(^9\) *Canada Dept of Ag Annual Report*, 1942, 8.
\(^10\) *Canada Dept of Ag Annual Report*, 1954, 28.
the foremost oilseed crop for Canadian farmers, and Saskatchewan the centre of Canadian oilseed research, had retarded the progress of soybeans. Nevertheless, by the 1950s edible oils were in demand in Canada; the golden yellow colour of soybean oil made a bread spread that was palatable, nutritious, economical, and so close in appearance to butter that Ontario dairy farmers lobbied vigourously for strict regulations regarding the marketing of margarine. Merit, released in 1959, performed well in eastern Ontario and in some northern states, including Minnesota. Merit was early-maturing, high-yielding, resistant to seed-coat mottling and Phytophthora root rot, and high in oil content.11

Short season cultivars owed much of their success to the incorporation of Swedish germplasm into Harosoy 63 and the subsequent development at Ottawa of Maple Arrow, the first cultivar developed specifically for cold tolerance. Swedish and Japanese lines used as breeding stock were unsuitable for commercial production, but they were tolerant to low temperatures as well as sudden mid-season temperature drops. Any temperature below 10 degrees Celsius caused soybeans to abort their flowers, resulting in significantly reduced seed yields; this was a critical factor for eastern Ontario, where overnight temperatures routinely fell to critical levels. Ten years of intensive selection resulted in the release in 1976 of Maple Arrow, a high-oil, low-protein cultivar which took approximately 117 days to mature. A series of “Maple” varieties followed: Presto, Amber, Ridge, Isle and others, all of which contained the original Swedish genes for earliness and cold tolerance. In a concurrent program, scientists at Ottawa also worked at developing an early-maturing, high-protein strain, for comparison with the standard high-oil low-protein varieties used in livestock feeding trials.12

The development of successful varieties at CEF Ottawa, a location with a regime of climatic conditions far different than China (the ancient origin of soybeans) or Guelph (where they were first grown in Ontario) was due in large part to co-operative investigations by crop physiologists and agronomists. These scientists examined metabolic responses to adverse environmental conditions such as short seasons and cool summer temperatures; they studied whole plants but also isolated systems under laboratory conditions. The results of their studies allowed breeders to understand the physiological and phenotypic expressions of genetic changes; breeding and physiology became closely linked specialties.

At CEF Ottawa, increased yields were associated with a suite of connected metabolic functions, all of which contributed to an increased “harvest index,” a term that defined the proportion of the plant which was harvested and used. In postwar Ontario, soybean hay had virtually disappeared in favour of forage legumes like alfalfa, clovers and birdsfoot trefoil (*Lotus corniculatus* L.), a recent introduction valuable for its tolerance to environmental stresses and its ability to become established and grow in poor soils. Therefore the harvest index for soybeans took into account the grain exclusively. The newer soybean varieties were shorter, the proportion of plant that was seed had increased (more seeds per plant) and the harvest index was therefore higher. As a result of the more complete understanding of valuable agronomic characteristics and their relationship to physiology, breeders also selected for favourable plant architectures and dense crop canopies to maximize light interception and carbon fixation. With these changes, plant densities could be increased even more with corresponding increases in yields per acre.13

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At OAC, a “definite program of planned hybridization” was reinstituted in 1950 after years of nominal attention to soybeans. The growing economic importance of the soybean crop in central Ontario justified this substantial expansion in soybean breeding, and the research took several directions, all of which incorporated some practical end use for soybeans, either on the farm or in processing. This research agenda speaks to the communication existing between scientists at OAC and Ontario farmers. Variety testing continued at the Guelph campus, and at several Colleges of Agricultural Technology (CATs), especially Ridgetown. Demonstration plots were also situated at farms throughout the south and southwest, still administered and managed by OAC staff. In 1956, a committee of Provincial and Federal Experiment Station personnel and the Ontario Research Foundation was established to divide Ontario into crop regions and prepare a list of recommended crops and cultivars for each region. In January 1957, the Ontario Committee on Field Crop Recommendations published *Field Crop Recommendations for Ontario 1957*, OAC Circular 296. Although soybeans were not yet featured in this circular, the Ontario Field Crop Protection Committee had already released *Control of Soybean Insects and Diseases*, OAC Circular 275 in April, 1956. A comparable circular was published for many other field crops.¹⁴

In 1964, the Department of Field Husbandry became the Department of Crop Science, with a mandate to develop a fuller understanding of the factors conditioning yield and quality in crop plants. To this end, a new crop physiology laboratory allowed scientists to expand the part of the program dealing with the redesign of cereal, corn and soybean plants – all commodities

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integral to regionally specialized mixed farming in Ontario – to make them more efficient at photosynthesis.\textsuperscript{15}

The soybean research network based at OAC extended further to include strong connections with industry. Victory Mills continued to subsidize variety testing in co-operation with the Department of Field Husbandry. When Victory Mills was sold to the American Proctor and Gamble Company in 1954, however, funding to OAC was no longer summarized in the \textit{Annual Report}. The Ontario soybean crop, while an important commodity to the province’s mixed farmers, was very small relative to the American crop, and until companies were assured that their research dollars would earn a significant return on investment in Canada through increased acres planted, yields per acre, or both, they did not fund programs at Canadian institutions. In any case, the United States Regional Soybean Laboratory at Urbana was the centre of soybean research in North America.

A second connection with industry produced a new kind of collaboration: research on herbicides, which dovetailed with the kind of studies on metabolic processes and growth regulation that interested physiologists. American weed scientist F.L. Timmons places the beginning of the “chemical era” of selective weed control in crops at about 1941, in the middle of World War II, with the creation of the phenoxyacetic herbicides. The first and most well-known of these is 2,4-dichlorophenoxyacetic acid (2,4-D), a growth regulating compound which kills susceptible broad-leaf weeds by stimulating them to grow out of control until they die.\textsuperscript{16}

At OAC, summer field tests with various preparations of 2,4-D were carried out as early as 1945, when Dupont and Dow, both chemical companies based in the United States, sponsored


preliminary experiments with the Department of Botany. During the same summer, Sherwin-Williams awarded a fellowship for a summer student to be hired jointly by the Departments of Botany and Field Husbandry. Following a second summer of experiments, scientists in the Department of Field Husbandry had gathered enough data to recommend further studies to determine the optimum times and rates of spray applications for “profitable use” of the herbicide. The weeds tested were a range of grasses and broad-leaved crops, including soybeans. With no prior knowledge of herbicide action on crops commonly grown in Ontario, scientists began with preliminary work: apply the chemical, observe and record the results, and refine the experiment for replication the following summer.17

This is in fact the same approach used in co-operative experiments administered through the Ag Union for forty years, but with crucial differences that reflect the extent to which science had become specialized. The experimental treatment (application of 2,4-D) was directed at a specific metabolic process in targeted plants, now that physiology and biochemistry were important sub-disciplines of field husbandry. Knowledge of the mode of herbicide action required years of advanced academic study. By the post-war period, many agricultural scientists had either an MSc or a PhD in their area of expertise. The work was not undertaken by farmers.

At about the same time as this early herbicide work was proceeding, more conventional field work demonstrated that weed control in a field of growing soybeans could be achieved by one or two cross cultivations with a drag harrow, a finger weeder or a rotary hoe early in the season, followed by regular inter-row cultivation, with no evidence of permanent damage to the crop.18 Many farmers still used horsepower for pulling these implements, and applied horse manure (as well as manure from other livestock) to fields as fertilizer and organic matter. As

18 OAC Annual Report, 1948, 40.
long as there were animals on a farm, oats, hay and pasture were essential to management, and the farmer retained a traditional system of mixed farming.

The implications of this simultaneity are profound. Through the 1940s and 1950s, farms in Ontario reported a mixture of field crops, perennial hay and pasture, and livestock. Census returns reflect this reality. In 1941, a comparison of gross farm revenues and farm expenses reveals that while each county in the province had a particular specialty, aggregated farms reported a variety of crops and livestock sold, and a list of purchases which corresponded to the needs of a mixed farm.

Essex County produced all the field crops and all the livestock and livestock products enumerated, due to the temperate year-round climate and the generally fertile and well-drained soils. Of all expenses reported, labour was by far the highest, evidence of the intensive nature of Essex County mixed farming: potatoes, roots, tobacco, fibre flax, vegetables, fruits, nursery products and dairy products all required more hands-on attention than hay, grains and animals raised for sale or slaughter. Kent County farmers reported similar activity, although other grains and hay, and potatoes, roots, tobacco and fibre flax predominated as revenue-generating crops, and cattle and swine were the primary livestock raised. In Carleton County, eastern Ontario, dairy products were the greatest source of farm income; few crops were sold since farmers devoted fields to pasture and stored feed. In Carleton County, purchased feed (supplements and possibly emergency supplies) and labour (year-round milking) represented the largest expenses. In 1941, Carleton County farmers grew no tobacco. All counties reported horses.19

The Censuses of 1951, 1961 and 1971 confirm the continuing adoption of regionally specialized mixed farming. Essex County farmers continued to take advantage of their

environmental advantages, and reported most enumerated crops. In 1951, approximately 2,250 farmers planted almost 63,000 acres of soybeans; this was almost exactly the same as the acres planted to grain corn, suggesting some kind of planned rotation. Kent County farmers also grew most crops, although more corn (mostly grain) than soybeans. In both counties, small grains and oats occupied the greatest acreages, and Kent County was still an important producer of sugar beets. Carleton County reported approximately half of its field crops as hay, with the remaining almost entirely as other feed crops (grains, some grain and silage corn). Three farms in Carleton County produced nine acres of soybeans. By 1961, very small acreages of rapeseed were reported in Kenora, Rainy River and Thunder Bay.20

Just as crop production for sale or use on the farm had always been a part of a mixed farm in southwestern Ontario, livestock remained on farms where most field crops were grown for sale. The very inclusion of hay in rotations under study by scientists at the Department of Field Husbandry, OAC, is evidence that livestock continued to be a significant part of the operation in the southwest, where soybeans were recommended as a commodity crop for sale to processors like Victory Mills. Farmers with abundant arable land found that raising a suite of compatible commodity crops in a regular rotation was a dependable way to make a living, but it was desirable to retain some land for feed production, or finish animals before winter before stored feed was required. Animal manure was returned to fields as fertilizer and organic matter. Thus farmers maintained a flexible annual work schedule and the ability to respond to markets, and continued to exploit the natural climate and soils of agricultural Ontario.21

Farm Management and Commodity Crops: The Continuing Relationship between Soybeans and Corn

Nevertheless, crop agriculture was at a crossroads in Ontario. As soybeans were rapidly entering the lexicon of crop scientists and crop farmers, corn continued to be the premier field crop in Ontario. In their comprehensive study of the livestock industry in Ontario from 1900 to 2000, crop scientists James White, James Dalrymple and David Hume celebrate a “century of achievement,” when new technologies and management practices “changed the rural community structure, the area of land farmed, number of farms, financing, the size of farm families and discretionary incomes of farmers and urbanites.” Improvements in field crop production were fundamental to this series of changes.22

Due to a major extension effort by OAC scientists, especially George Jones who preached “the gospel of corn” at countless farm meetings, grain corn was adopted almost exclusively as a feed for hogs, cattle and poultry. The appeal of corn can be attributed to several innovations: new corn hybrids, with dramatic yield increases; synthetic fertilizers, insecticides and seed protectants; improved equipment for tillage, planting, harvesting and drying; extensive soil drainage systems; and better crop rotations.23 Each of these innovations resulted from science applied to practical agricultural problems.

Thus the history of soybeans continued to be closely intertwined with that of corn. Despite the move to rotating crops, a plan that reduced the area planted to corn by about two-thirds in every year, total hectares planted to grain corn accelerated from about 1940: slowly at first, but very rapidly between 1960 and 1980 when research at OAC was intensive. This

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23 Ibid., 2-24 – 2-30.
coincided with the beginning of soybeans in Ontario. In fact in the early 1940s, soybean area was approximately equal to grain corn area, and they began to accelerate in tandem.\textsuperscript{24}

The information about soybeans which was disseminated to farmers was designed to be applied directly to farm work. This was a response to interactions with farmers, expressed at trade shows, extension meetings and other venues. Farmers did not need to know about plant physiology and designer plants to grow a good crop (or at least scientists believed this to be true). For example, the data presented in \textit{Soybeans as a cash crop in Ontario}, published in 1954, began with a comparative table of production, price and gross returns per acre for Essex and Kent Counties. The crops compared were grain corn, soybeans, fall wheat and oats. The report stated clearly that the favourable rates of return from soybeans made it worthwhile for farmers to consider expanding a rotation to include them. Between 1946 and 1950, soybeans paid an average of $52.92 per acre, compared to corn at $63.87, fall wheat at $49.18 and oats at $30.37. The choice was still the farmer’s, but should he decide to consider soybeans, more useful data was presented in concise information bites: methods and rates of seeding, weed control, harvesting, storage and marketing. Finally, a list of varieties recommended for growing in each climatic zone and a zone map of southern Ontario were included.\textsuperscript{25}

While soybeans would never replace fall wheat or oats in long-term rotations, they were planted in place of some grain corn because both were reliable commodity crops whereas most small grains were fed on the farm. Corn was the king of field crops; soybeans complemented corn in many ways, and therein was the secret of their success. While the recommended seeding date was the same for both crops, corn was less flexible when spring weather was wet or cold. Soybean planting could wait a week or two until the soil warmed up, but corn could not; delayed

\textsuperscript{24} Ibid., 2-25, 2-29.
\textsuperscript{25} \textit{Soybeans as a cash crop in Ontario}, 5-7.
soybean planting called for a little higher rate of seeding, and if possible an earlier-maturing variety. The same equipment was used for both row crops. The corn planter worked for soybeans (although not as well as the grain drill). Before herbicides were available, both crops required cultivation during the growing season for weed control, using the same implements but adjusted for row widths. Fertilizer requirements for corn were much greater than for soybeans, especially nitrogen, although soybeans benefited from applications of phosphorus and potassium a week or two prior to planting. Soybeans also made use of residual fertilizer left in the soil after a corn crop. The soybean crop was generally harvested first, followed by grain corn.26

Soybeans moved slowly and steadily into Ontario rotations as a partner to corn, not as an alternate choice. Varieties of each were available for every climatic zone. The two crops were so valuable as complementary commodity crops that “Corn and Soybean” research programs became the norm at experiment farms and stations.

Once Harosoy and Maple Arrow and their progeny were available, corn and soybeans became almost inseparable, just as they had been in the American Corn Belt since the mid-1920s; they might as well have been dubbed the Siamese twins of Ontario crop agriculture. But in fact, soybeans were a useful addition to corn rotations which suffered from two specific management problems: soil compaction and weed control. The fibrous root of the soybean plant, although it was not as extensively branched as a cereal root, nonetheless improved soil aeration. Atmospheric nitrogen fixed in root nodules was available to the current crop, and residual nitrogen was left for the next crop in the rotation, thus reducing fertilizer costs. And fewer passes with a tractor or a horse for fertilizer or herbicide application meant less soil compaction.

In Essex County, the heavy clay soils were in poor physical condition after years of intensive cultivation. The most common rotations combined a high proportion of soil-depleting crops, such as corn and grain, relative to soil-conserving crops, such as legumes, hay or pasture. Over decades of cropping in the southwest in general, soil had been compressed by repeated passes with heavy equipment. The worst effects of this were impeded drainage and waterlogging, which delayed spring planting because the soil was too wet to work and too cold to support germination and early seedling growth.27

Many problem farms also reported the regular disposal of crop residues, such as cornstalks or straw, by burning. As a result of these observations, soil specialists at OAC developed a soil improvement program which included ploughing under rather than burning crop residues, modified and reduced tillage operations, and the adjustment of traditional crop rotations. This research and extension program, called Essex County Soil Improvement Studies, continued for several years in the Departments of Chemistry and Soil Science, and its conclusions were applicable to soil management anywhere else as well. The work emphasized the importance of “direct contact advisory service” in getting the program into action on the farm. In other words, individualized consultation between the farmer and the Agricultural Representative (the Ag Rep), who delivered the results of scientists’ assessment, increased its efficacy. Farmers were eager to visit test plots at the OAC campus and small regional demonstration plots donated by interested farmers; often the local branch of the Ontario Crop Improvement Association (OCIA) sponsored such excursions. Where an annual crop was called for, soybeans were an astute choice.28

27 OAC Annual Report, 1944, 58; OAC Annual Report, 1945, 64, 66.
28 Ibid.
This complex of factors constitutes the “decision environment,” a term used by geographers Philip D. Keddie and Johanna Wandel to explain the competitive and complimentary diffusion of grain corn and soybeans through southern Ontario. Corn succeeded largely because, by the late 1950s, high-yielding hybrids were replacing open-pollinated varieties. The early diffusion of hybrid corn, from 1951 through 1981, introduced a “cash crop culture” to areas in Ontario where previously little or no such tradition existed. This included central and eastern Ontario, where farms were still primarily livestock-based. Farmers became accustomed to cash cropping which required special equipment: planters, harvesters, storage facilities and trucks. A support technology evolved around corn and, serendipitously, much of it also accommodated soybeans. Some of this equipment was gradually modified for soybeans: for example, the depth precision planter that improved germination and facilitated reduced tillage and improved soil management, and the floating cutter bar which minimized harvest losses.29

While chemical weed control for soybeans was not well-developed until the 1970s, they benefitted from early research on herbicides for use in corn. Atrazine (one of the family of triazine herbicides) was developed in the United States and sold beginning in 1958 for cheap and efficient control of annual and perennial grassy and broad-leaved weeds in corn. Control was so effective that even quackgrass (*Agropyron repens* (L.) Beauv.), a perennial weed which spread when tillage operations designed to uproot and kill it merely chopped the rhizomes up into propagules and spread them around the field, was almost entirely eradicated and soybeans following corn were weed free. No longer was it necessary to plant soybeans in rows “the width

of a horse’s ass” for regular weeding with a horse-drawn cultivator; narrow rows, dense stands, and high yields became standard in all of southern Ontario.³⁰

As regionally-adapted soybean varieties came available, and as soil management and weed control improved, soybeans faced their toughest test: were markets strong enough to give them a competitive advantage over grain corn? Fixed costs for the two crops were comparable, especially since on many farms they shared land and buildings, machinery, vehicles and fuel, and management and labour. Some inputs (for example, nitrogen fertilizer, herbicide and seed) were more costly for corn. When prices and yields were compared, and even taking into account the annual fluctuations in yields and prices which were so typical in crop agriculture, the competitive position, defined as economic profitability, of soybeans relative to corn improved between 1950 and 1980.³¹ In addition to measured advantages, cautious conservatism was implicit in spreading risks over more than one crop. In this regard, the mixed farming mentality persisted even among cash crop farmers.

Ontario production continued to be intimately connected to the activities of American producers and processors: another complicating factor in crop planning. In the Corn Belt, farmers had enthusiastically embraced soybeans as soon as researchers released suitable varieties, and expert advice about growing the crop was readily available. This occurred several decades before Canadian acreage began to increase significantly in the early 1950s. Canadians received the benefit of that early adoption; while they continued to plant familiar crops (like grain corn and alfalfa), they watched as American farmers tested the new crop, particularly in

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rotation with corn. The situation can be likened to a vast demonstration plot, where American farmers were the risk-taking innovators and Canadians the cautious followers.

Canadian mills also profited from early American adoption; they were able to stay in the soybean crushing business because they imported the bulk of their raw soybeans from the United States. This continued to at least 1980 despite increased acreages in Ontario and some small plantings in southern Manitoba.

A most important benefit to both groups was the *Soybean Digest*, a trade magazine which circulated worldwide. In November 1940, the American Soybean Association (ASA; the same organization, although renamed from the National Soybean Growers Association in 1925, that had convened an annual meeting of the soybean community of scientists, producers and processors since the early 1920s) published its inaugural issue of the *Soybean Digest*. From the start, the magazine reported regularly on the Canadian situation, although much of this material was cursory and simply condensed from government circulars or bulletins. The column “Soybeans in Ontario,” a concise county-by-county report, was featured every month, with details submitted by a Canadian correspondent. The magazine published information about North American markets which was especially useful to the Ontario Soya-Bean Growers’ Marketing Board (OSGMB). Processors solicited deliveries of harvested soybeans, especially for the manufacture of margarine and related foods such as shortening and salad oil. A large amount of page space was devoted to advertisements for everything related to soybean production that a farmer might need; many of these were for equipment and storage facilities, but also for financing. In the early 1950s, the *Soybean Digest* added the useful *Blue Book* directory and resource guide. The November 1951 issue consisted almost entirely of an extensive list of soybean-related companies; it was a “clearing house for business contacts for farmers.” Over
time, the ASA had expanded the focus of its activity from production (by now well understood) to marketing and utilization.32

Canadians gained access to market information, business contacts, and research results reprinted from experiment farms in both countries. And because the magazine featured a regular Ontario report, the rest of the soybean world kept abreast of the progress of the Canadian industry. Evidence of this global network is the Asian export market which started tentatively in about 1973 with new varieties for specialty foods. In 1973, Canada exported approximately 5.5 thousand metric tonnes to Japan; by 1981 this amount had increased almost tenfold to 49.4 thousand metric tonnes of soybeans destined for human consumption.33

**Prices and Markets: Oil, Protein, and New Markets for Specialty Soybeans**

Soybeans succeeded on mixed farms in southern Ontario because a market existed for oil and protein, and farmers and scientists were at long last able to supply a substantial part of that demand by integrating regionally adapted varieties into mixed farming in all parts of southern Ontario. Both yield and dollar value per bushel continued to rise, albeit with considerable variation from year to year (Figure 4-2). This is the nature of farming.

While the plot of average bushels of soybeans per acre per crop year only begins in 1941, it graphically encapsulates the results of agricultural science and scientific agriculture since the late 1870s, when the influence of OAC and the Ag Union began to be felt. Progress was slow but steady, as average annual yields (the parameter of greatest interest to scientists and farmers)

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32 “Behind the Scenes”, *The Soybean Digest* 1, no. 1 (November 1940): 2; F. Dimmock, “Canada Includes Many Excellent Soybean Acres,” *The Soybean Digest* 1, no. 7 (May 1941): 5.
inched upward. Smooth progress was checked by “the temporality of natural processes”, 34 a rather academic turn of phrase used by economic geographer Margaret FitzSimmons which barely does justice to the literal ups and downs of field crop agriculture (Figure 4-2, solid line). Changes in yields per acre, as well as farm value per acre, between 1881 and 1974, were both predictable (the daily, seasonal and annual cycles mentioned by FitzSimmons) and unpredictable (the same environmental cycles, as well as social and economic forces which affected production of all crops, including soybeans).

Early yields (prior to 1941) were not recorded, but they had varied tremendously; Charles Zavitz recorded a range of 14.11 to 21.83 bushels of grain per acre for the best few plants of Habaro, selected in 1918 and containing the original parent of OAC No. 211. Granted these values were for small plots extrapolated to whole acres, but the spread is nevertheless striking given that these were superior plants. By 1930, yields were still erratic, mainly due to weather, and they remained so through the Depression and World War II. In comparison with the early yields from varieties available at the time, average yields doubled from 1945 to 1980, and then
leveled off.\textsuperscript{35} This dramatic increase was achieved by higher harvest index of individual plants as well as greater planting densities.

Consistent average farm price (dollars per bushel) for Ontario soybeans is also only available from 1940 (Figure 4-2). The price paid to farmers was equally variable: explainable with the benefit of hindsight, although terribly confusing at the time. Price stability was attractive to farmers and purchasers (processors and manufacturers), who needed to maintain a regular cash flow to run a business. In the case of farmers, expenses included purchase, maintenance and depreciation of capital investments (vehicles, buildings and possibly land), taxes, and short- and long-term loan payments. In addition to these traditional costs, innovative management systems (adapted from scientific research) demanded inputs such as fuel, fertilizer, herbicides, and purchased seed, most of which relied directly or indirectly on fossil fuels. The farm price of soybeans was closely tied to American harvests as well; falling prices in the 1950s resulted from American surpluses.

The negotiating and promotional activities of the Ontario Soya-Bean Growers’ Marketing Board (OSGMB) were crucial in confirming the success of Ontario soybeans. When the OSGMB was created in 1948 and 1949, low prices for soybeans had become a contentious issue with growers in southwestern Ontario. By this time, the advantages to be gained from rotating soybeans with corn and small grains (all annual crops) were increasingly evident. Five important soybean districts were represented on the board: Pelee Island, as well as Essex, Kent, Elgin, Middlesex and Lambton Counties. Due to their close proximity to one another, communication among board members was regular; even Pelee Island was accessible, in part because of

improved air travel in rural Ontario following World War II. From the outset, the OSGMB was strongly supported by its members; beginning in 1951 with a committed group of slightly more than five per cent of farmers reporting soybean cropland (approximately 7,000 farms), more than fourteen per cent of Ontario crop farmers reported growing soybeans by 1981.

A favourable price was the greatest incentive to committed growers to expand the area they planted to soybeans, and therefore the most important responsibility of the OSGMB was to negotiate annually with elevator operators and processors to arrive at prices paid to growers. Until 1985, most of the domestic crush was imported from the US, and prices paid to Canadian growers varied according to the American crop. In the early 1950s, American soybean production reached a record high, and the glut on world markets which followed depressed prices in Canada just when acreage had begun to increase. Prices per bushel drifted downward from $3.06 in 1947, to $2.75 in 1951, $2.50 in 1954, $2.09 in 1955, $2.15 in 1956 and $1.95 in 1957 (all Canadian dollars.)

Even without quoting grain corn prices, it is pertinent to recall that during this period, Keddie and Wandel found the soybean to grain corn ratio to be in soybeans’ favour: in other words, despite falling prices, soybeans were the more profitable crop, and acreages therefore continued to increase. Once again farmers’ cautious conservatism came into play in their cropping decisions, only this time (unlike the 1930s, when they opted not to grow soybeans but to choose grain corn or alfalfa), they knew a lot about soybeans’ potential and chose to replace some acres of corn or small grains with soybeans.

In 1952, the *Soybean Blue Book* featured an annual comprehensive list of processors and suppliers in the United States, Canada and a few European countries. In the early 1950s, six Canadian crushers were listed. Four small-capacity mills served regional growers; soybeans were one oilseed among several local specialties crushed. Co-Op Vegetable Oils opened in Altona, Manitoba, in 1945 to crush sunflower seed; the federal government purchased all the oil and by-products, and the plant soon diversified to serve producers of the very small soybean crop in southern Manitoba.40 Edible Oils, Ltd., of Fort William, was headquartered in the Grain Exchange Building, Winnipeg, Manitoba. The Winnipeg Grain Exchange (re-opened in 1919) owned an elevator terminal at Fort William at the head of Lake Superior. It is not clear when Edible Oils Ltd. was formed, or what prairie oilseed crops it handled, although it reportedly had a storage capacity of 500,000 bushels, and a crushing capacity of 50 tons per day. Dominion Linseed Oil Co., Ltd., of Baden, was established in Waterloo County, Ontario, in the late 1800s, and began to crush soybeans in 1932. Canadian Vegetable Oil Processing, Ltd., of Hamilton, Ontario, established during World War II, began crushing American soybeans in 1948, after moving from Vancouver in 1942.41

These four companies crushed approximately ten per cent of the total Canadian capacity of 22,300 bushels per day in 1953. The remainder was divided equally between the two Toronto plants, Victory Mills and Toronto Elevators, both located on the Toronto waterfront. The two Toronto companies together were capable of storing over three million bushels in on-site elevators, more than the others combined. Each of these plants marketed oilmeal under a brand...

name which identified the company. For example, the Dominion Linseed Oil Co., Ltd., sold “Blue Blossom” oil meal, in reference to the colour of flax flowers. Victory Mills marketed “Veeline” oil meal and “Soywhite” fat free soy flour. Edible Oils Ltd. marketed “Edible” soybean meal. In 1951, Ontario growers harvested close to four million bushels (not all of which was sold for processing), an amount which would have satisfied the Toronto processors for about half a year; the difference was made up with imported American soybeans. By the 1959-60 crop year almost 7 million bushels were harvested in Ontario, and another 45,000 in Manitoba. All six companies were served by the Canadian Pacific Railroad (CPR), the Canadian National Railroad (CNR), or both. Co-Op Vegetable Oils of Altona and Dominion Linseed Oil Co., Ltd. of Baden were landlocked (although Dominion Linseed Oil had an elevator at Owen Sound on Georgian Bay). 42 This did indeed evidence an optimism for oilseeds and the future of Canadian soybean oil production.

As production improved, however, crushing capacity also increased. Only three Ontario processors remained: Canadian Vegetable Oil Processing Limited (Hamilton), Victory Soya Mills Limited (Toronto) and Maple Leaf-Monarch Company, a new plant constructed at Windsor at the Detroit River deep water terminal to replace the old Toronto Elevators/Maple Leaf plant on the Toronto waterfront. By 1980, Ontario production increased to a record high 25.3 million bushels. Net imports dropped in response to the increased crushing capacity close to southern Ontario growers: from seventy-five per cent of total crush in 1963-64 to twenty-five per cent in 1981-82 with a projected 10 per cent for the 1982-83 crop year. Oil and oil meal were still the main crushing products, although the importance of each was changing in response to relative demand and price of each. With the opening of the Windsor oilseed crushing plant, the flow of

42 These values were calculated from crushing capacity per day published in Kent Pellett, “Room for big expansion of soybean crop in Ontario,” Soybean Digest (December 1953): 14-15; Soybean Blue Book (November 1952): 94. Capacity in tons was converted to capacity in bushels using the factor 60 pounds per bushel.
soybeans in Ontario was expected to change direction: Windsor would capture the entire soybean meal market of southwestern Ontario served by American suppliers, but depending on the proximity of a local elevator to either Windsor or Toronto, Ontario, soybeans would go to either port for crushing and shipping.⁴³

In post-World War II Ontario, soybean oil found a lucrative and almost unlimited market when the butter monopoly was successfully challenged, and margarine was specifically exempted from the edible oil products prohibited from manufacture by the Edible Oil Products Act. One of the dairy lobby’s strongest arguments for a margarine ban was the purity of butter, presented as a natural product, unadulterated in colour, consistency, or content. In comparison, the statement of composition, “100 % vegetable oil”, which typically appeared on margarine labels, was imprecise although the product was regulated and safe. A longstanding argument against a ban was that butter was more expensive than margarine, and poor families had a right to a spread for their bread. In the relatively prosperous post-World War II period, this economic argument expanded beyond social justice into the realm of resource use and farm accounts. The economic efficiency of butter (pounds of butterfat harvested per acre farmland) was low in comparison to the economic efficiency of soybean oil (pounds of soybean oil per acre farmland). Canadian dairy farmers responded to falling butter sales by enlarging their herds and investing in barns, milking machines and modern short-term milk storage facilities, incurring substantial fixed costs that actually kept the cost of butter high. As a result the low cost of margarine, which

had been its most attractive feature since it was introduced to Canadians in the early 1900s, remained and even dairy farmers put margarine on their dinner tables.44

The long and ultimately successful struggle for Canadians’ right to choose what they spread on their bread has been carefully documented by social historian W.H. Heick. Arguments for the control of margarine extended beyond individual farmers and farm families. The dairy sector – historically, Ontario’s most important primary producer of agricultural commodities – claimed that it contributed much more to Ontario’s economy than soybeans, and rightly so if all factors, especially the relative ages of dairying and soybean production – were considered. Despite the acrimonious debate between dairy farmers (who feared for a large part of their livelihood) and oilseed growers and processors, margarine gained ground as a preferred bread spread, and soybean oil was a major ingredient. The annual meeting of the Ontario Federation of Agriculture in January 1953 was the setting where various sides in the margarine controversy aired their differences, and attempted to reach a compromise. At the heart of the debate was “the recognition that the 8,000 soybean growers were sensitive on the subject of a ban on edible vegetable oils. They represented the innovative side of Ontario agriculture”, especially the faction of producers and consumers who wished to manufacture and purchase margarine coloured to closely resemble butter. The government equivocated, and amended the Edible Oil Products Act to specifically exempt margarine (although not coloured margarine) from the list of prohibited edible oil products.45

The dairy sector also appealed to Canadian nationalism: “Ontario remained a net importer of both kinds of products, but edible oil imports would mean foreign imports, while dairy imports were from Quebec”. In the meantime, soybean oil was in demand by American

44 Ibid., 129-131.
manufacturers who advertised aggressively in *Soybean Digest* for delivery of soybeans.\(^{46}\) Ontario agriculture was a hotbed of vested interest and fear that the status quo would be upset, although, according to Heick, some dairy farmers and their supporters were not above serving margarine at home.

By the 1970s soybean oil exceeded all other vegetable, animal and marine oils (including rapeseed oil) in margarines available across Canada. In 1978, the Department of Supply and Services Canada commissioned an analysis of the fatty acid composition of 95 different margarines in response to consumer concerns about dietary polyunsaturated fatty acids. Results revealed that both hard margarine, sold as a brick, and the new soft, spreadable version were widely available, including in southern Ontario. Six of 95 samples were made wholly of soybean oil; of these, one was a diet margarine (which had a similar fatty acid composition to others in that group). Margarine offered a very acceptable substitute for butter and occupied a permanent spot on the grocery lists of Ontario consumers.\(^{47}\)

With increasing crushing capacity at Ontario mills, supplies of oilmeal were abundant. The demand for livestock feed rations turned a former by-product into a second major commodity. The consumption of soybean meal responded mainly to two factors: livestock production, as the meal was almost entirely used for feed, and the price of all feeds relative to the price of livestock. In post-war Ontario, consumers wanted animal protein – meat, milk and eggs – on their plates. Soybean hay had almost entirely disappeared from farm production systems by the 1950s, but soybean oilmeal was routinely added to a ration as a protein supplement. Ruminants (in Ontario, these were primarily cattle) consumed less soybean meal than monogastric animals; their diets were supplemented with an inorganic nitrogen source, urea,

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\(^{46}\) Ibid., 114-115.  
\(^{47}\) M.R. Sahasrabudhe, *Fatty Acid Composition of Margarines in Canada* (Ottawa: Agriculture Canada, 1978), 4-6, 46-69.
which they are able to digest. Poultry and hogs cannot digest non-protein nitrogen such as urea; soybean oilmeal, a balanced source of dietary protein, was therefore added to their feed.

As the demand for pork and poultry products grew, the consumption of soybean meal went up. All imported meal entered Canada duty free from the United States; the largest meal markets in Ontario were in the corridor between the Toronto-Hamilton centre, where the oilmeal originated, and the Woodstock-Kitchener district of intensive livestock husbandry. While this area was inland, it was accessible by rail and improving road transportation. Ontario and American processors competed for customers, and prices were competitive, varying mainly with costs of transportation. Up until the 1970s, Canada continued to import an increasing amount of soybean meal, although the new Windsor plant was expected to alleviate the demand for imported oilmeal, and supply feed to livestock farmers who did not grow their own.48

Soybean growers had faith in the OSGMB, which did not disappoint them; in 1958, following submissions by the OSGMB to the federal government, soybeans were brought under the Agricultural Stabilization Act, and the price per bushel was set at $2.10 to the grower. Prices per bushel were supported under the Act several times until the mid-1970s. During this period, the prices of most North American grain crops were stable and the majority of farmers sold their soybeans for cash at harvest.

In 1972-1973, however, the price rose from $114 per metric tonne in October to over $400 in June. This unexpected surge affected the harvest of one single growing season; farmers who sold at harvest watched in amazement and dismay as the same soybeans went for three and one-half times the price only six months later. This jump resulted from an unprecedented set of global environmental circumstances: in effect, a perfect storm, when Soviet crop failure,

disastrous drought in India, and an El Niño ocean current which drove fish away from Peruvian shores and decimated their marine oil industry all coincided. Global oilseed supplies dropped to a dangerously low level, and fish oil was also scarce. Added to this were oil price shocks of 1973, when international oil prices quadrupled virtually overnight. The tight linkage between agricultural management practices, as well as transportation of commodities and manufactured goods, and petroleum use caused the prices of inputs and food prices to soar.⁴⁹ Canadian soybean growers were not exempt from this crisis.

The demand for North American oilseeds (sunflower, rapeseed and soybean) escalated. Not only did the price of Ontario soybeans rise accordingly, but volatility from month to month induced growers to hang on to their soybeans in hopes of a better future price. In 1973, prices ranged from $3.02 to $11.39 per bushel to the grower; one year later in 1974, as bumper crops of Argentine flax and Brazilian soybeans mitigated shortages, the price range was more moderate, at $4.77 to $8.10. One longer term result of price volatility was the initiation of pre-harvest contracting with dealers and processors as high prices for Ontario soybeans persisted for the remainder of the decade. Another was a move by farmers themselves to erect storage facilities on farms, and hold their soybeans until conditions for selling were most favourable.⁵⁰

The “chaotic” season of 1972-73, when prices skyrocketed on the Chicago market, made headlines around the world and reflected a global supply and demand for protein as well as oil that filtered down to Ontario plant breeders and producers. Based on rising consumption through

⁴⁹ Clapp, Food, 44-49.
the 1960s and 1970s, world oilseed and fish meal demand was projected to keep increasing, and at an accelerated rate.\textsuperscript{51}

A research program was already ongoing at Ottawa to develop high-oil and high-protein strains for cool, short-season areas. The main obstacle to a high-protein line was the apparent genetic linkage between high protein and reduced yield, and scientists continued to work on the problem. A breeding nursery was established at Brandon, Manitoba. Nevertheless, breeders at Ottawa and HRS, and at OAC, continued to focus on regional adaptation (days to maturity and low temperatures) and tolerance to root rot until the growing utilization of whole “full-fat” soybean meal on farms stimulated the initiation of programs to develop cultivars with higher protein at the expense of oil.\textsuperscript{52}

The move to develop varieties with high protein content for whole “full-fat” soybean meal was driven by farmers who were responding to the need to balance commodity crops sold for necessary cash with livestock operations, and it further “tweaked” the soybean production network. By 1978, many farms in Ontario were moving to install on-farm storage bins for their own harvested soybeans. Drying and loading capabilities were extras, and custom operators in particular invested in these costly and petroleum-dependent technologies.\textsuperscript{53}

Farmers typically sold only a portion of a crop under contract (either before or at delivery), since while the elevator operator who purchased the soybeans absorbed the “cost” of a harvest delay, it was incumbent on the farmer to make up a short supply of soybeans resulting from a crop failure.\textsuperscript{54} To add to the uncertainty, crop carryover in either a supplying or a


\textsuperscript{52} Research Report 1973, 102; Research Report 1975, 102.

\textsuperscript{53} M. Jaeger, \textit{The Likely Effects on Ontario Soybean Producers of the Shift in the Location of a Soybean Crushing Plant from Toronto to Windsor} (Toronto: Ontario Ministry of Agriculture and Food, 1979), 15.

purchasing country reduced a processor’s crushing capacity and purchases. For example, American carryover of approximately 165 million bushels added to chaotic price fluctuations in the early 1970s and demonstrated the need for alternative uses for bountiful crops which resulted from biological and technological innovations.  

In a 1974 commentary on the future of soybeans, OAC breeder Jack Tanner suggested that the protein quality of soybeans made them “too good to feed to livestock,” but he underestimated global demand for meat. On the other hand, animal nutritionists at OAC had already commenced studies on feeding “extruded” (heated to 125°C) full fat soybeans to pigs and chickens as a forty per cent supplement to a standard basal diet. The results were promising: extruded soybeans were well digested by pigs, making them attractive sources of energy and protein. Inclusion of a high level of dietary soybeans reduced growth of chicks, although the reduction was less marked for extruded beans. Elsewhere, animal scientists measured the effect of adding heated full fat soybeans to the diets of sheep, cattle, and lactating dairy cows. The results were also favourable; as a matter of interest, much of this early research was conducted at universities in Minnesota and Wisconsin, respectively, where soybean production had accelerated since the 1950s, and livestock was a significant sector of the agricultural economy. These were regions of mixed farming.  

Feeding full fat soybeans alleviated much of the market uncertainty, and reduced transportation costs. This practice also fit the mixed farming model in Ontario.

55 Morrison, “What is Protein?,” 43-45.  
A small but important export market for Canadian oil and oilmeal had existed since the 1930s, when the Soya Bean Oil and Meal Co-operative (SBOMC) was established in Chatham. In 1954, the OSGMB organized the shipment of almost 1.5 million bushels of whole, uncrushed soybeans to “interests in the United Kingdom” from Port Stanley in Elgin County on Lake Erie. Exports of uncrushed soybeans continued through the 1980s. The United States was a consistent customer, as were European countries (West Germany, Netherlands, Sweden, and Switzerland) making up deficits in supplies for domestic consumption or for re-export with value added.57

In the mid to late 1970s a new export opportunity emerged: the shipment of specialty soybeans to Asian markets for the manufacture of tofu, miso, and natto, all ancient and traditional soy-based foods. Harwood, another new cultivar developed from a complicated series of crosses between Harosoy 63, Mandarin (Ottawa) and Clark (a 1953 release from the Illinois Agricultural Experiment Station and US Regional Soybean Laboratory), was licensed and released to seed growers in 1970 from HRS. This category of specialty soybean had a revolutionary physical feature selected for by breeders who understood the soybean market: a yellow hilum, as opposed to the black hilum characteristic of oilseed soybeans. The yellow hilum (the same colour as the seed coat and inner endosperm) did not impart any undesirable colour to processed products sold as human food. This highly visible characteristic permitted growers of Harwood to clearly label their crop and claim a premium price.58

First Line Seeds, headquartered near Guelph, exploited this opportunity and developed a breeding program and successful export trade in whole soybeans with Japanese food processors. This innovative company was founded by Peter Hannam, an OAC alumnus whose first

successful business venture was to import a vegetable soybean from Europe, improve it by repeated selection, and increase seed stocks for resale to European farmers.

Thus the soybean had come full circle. From its beginnings as a staple Asian food and feed crop, it made its way to Austria and Hungary, from there to Canada and eventually back to Europe and Asia. This journey took an entire century and was never a direct route. Important groups in the Ontario farming community participated in this chronicle: farmers, public researchers, processors and manufacturers, and some politicians. The century began and continued with seed.

**From Research Plot to Farm: A New System for Producing and Distributing Field Crop Seed**

The contribution of seed production to the history of soybeans and the trade in soybean seed has not figured prominently in this narrative up to the post-World War II period. Often, the story of seed was buried in accounts of more spectacular events. The Soya Bean Oil and Meal Co-operative (SBOMC) at Chatham opened and closed. The Ontario Soya-Bean Growers’ Marketing Board (OSBGMB) was formed by growers to license all producers, but the emphasis in the official marketing plan was decidedly on production for processing. Processors and manufacturers advertised heavily in the *Soybean Digest*. In the historical record at lease, the seed for planting was overshadowed by the seed or grain for oil and protein.

A few growers went into the business of soybean seed production and sales. Growers who were registered members of the Canadian Seed Growers’ Association (CSGA) received new releases from breeders at public institutions: OAC and CEF stations at Ottawa and Harrow. Growers and retailers who operated without legal sanction from the CSGA to sell registered seed
also increased and sold field crop seed, although buyers had no guarantee of varietal or mechanical purity. Farmers also continued the time-honoured practice of saving their own seed, and sometimes exchanged with neighbours.

The CSGA was founded in 1904 to “develop programs to expand the use of pedigreed seed for increased domestic crop production and for export.” The appointment in 1921 of Committees of Plant Breeders by the Seed Commissioner for Canada to advise the grower members of the CSGA was intended to safeguard the work of plant breeders and the government’s investment in the program. Grower members paid nominal dues to the CSGA. Costs incurred in growing seed were ideally to be offset by income from sales, and the result to the economy of the country as a whole would be reduced losses to poor quality seed and weeds, and increased income from efficient field crop production. The Canada Seeds Act of 1923 defined Elite Seed Stock and legislated inspection not only of seed lots (for mechanical purity, pedigree and germination percentage), but also of fields where crops were grown, to check for weeds as well as their proximity to fields of other varieties of the same crop.

While breeding programs at publicly-funded institutions were mandated to develop new varieties useful to farmers, the CSGA imposed a road block on the availability of these varieties by restricting the receipt of field crop seed to its members for increase and sale. The Canada Seeds Acts of 1923 incorporated standards of purity and uniformity into the regulations governing seed production and sales; it also reiterated the exclusive responsibility of the CSGA for registration, increase and sales of varieties released by breeders. This was a move designed to protect farmers from purchasing poor quality seed by advertising, through the highly visible bagging and tagging system, registered seed. It was also intended to improve agricultural

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efficiency across the country, as registered seed was genetically pure, of high germinability, and weed free. The CSGA was also founded to boost field crop seed production as a regional business specialty, and field crop seed as an early commodity, mostly for purchase by local farmers.

In the case of soybeans, very few registered growers took advantage of available seed stocks, and it is likely that the majority of farmers planted seed saved from the previous year’s crop. Although a few new varieties were released between 1925 and the 1950s, they were not widely grown until the CSGA and the Canadian Seed Trade Association (CSTA) collaborated to find a more efficient way to encourage farmers to purchase registered seed, and make it more accessible to farmers.

But the cost of purchasing large quantities necessary for planting many acres was prohibitive. A.G.R. Smith, Superintendent of the Special Soils and Crops Train which traversed Ontario, contended that registered seed “was too expensive for the ordinary farmer” although W.T.G Weiner of the CSGA defended his organization and the regulations it enforced. He claimed that with reasonable care, registered seed would last a farmer for several years before weeds became a problem and varietal integrity broke down. Weiner was admitting that even with the most careful program of cultivation and hoeing, weeds survived and contaminated a seed lot. His argument was also philosophical: “once a farmer commenced paying attention to the seed sown he automatically started to do better work and get more satisfactory results,” thus improving the efficiency of his entire farm. In the meantime, farmers should practice diligent weed control, and clean their harvested seed supplies. Nevertheless, even when seed cleaning
was accessible, many farmers chose to plant uncleaned seed and hope for a large enough harvest to compensate for the poor quality of the crop.  

Most of the seed crops of this period were wheat, oats, barley, flax, field peas and beans, and corn, with a small but growing demand for forage crops such as clovers, alfalfa, and some grasses. Seed houses like John A. Bruce encouraged farmers to buy their products:

Farmers all over the Dominion are awakening to the fact that it pays to buy the very best seeds that can be procured, and our long connection with the best growers in the seed-producing districts gives us exceptional advantages in securing the best samples offered, while our cleaning facilities are unequalled. The large annual increase in our trade with the farmers of the Dominion is an evidence of the superiority of our stocks and of the personal attention we give to the interests of our patrons. Our first grades of Clovers and Timothy are in all cases export seed.

While reputable companies maintained a high standard of quality, others were not so scrupulous, and the Canada Seeds Act of 1923 tightened up standards and regulations for marketing pedigreed seed. CSTA members argued that the Act was “unfair, impossible to live up to and far too expensive to operate,” and membership stagnated until the 1950s.

The CSGA, while it rightly claimed to perform a service to Canadian agriculture, could not improve the availability of new varieties to Canadian farmers. Historically, the CSGA had concentrated most of its resources on inspection and testing samples for weed seeds and germination. The first seed testing laboratory was established in Ottawa in 1902, and by 1928, seven additional facilities had been set up across the country. The CSGA was therefore mainly a policing body, with no provision in place for making registered seed more readily available to farmers who understood its value. The CSGA could not compel any member to go into the business of growing soybean seed, although grains were popular. For example Alex Stewart, who was a member of the Ontario Field Crop and Seed Growers’ Association (OFCSGA) and

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60 The Farmer’s Advocate, February 13, 1930.
promoter and first President of the OCIA, was himself a livestock farmers and seed producer. He was champion oat grower at the 1937 Chicago International Grain Exhibition, and his inventory included oats and other feed grains, but not soybeans.\(^\text{62}\)

When clean soybean seed of recognized varieties with reliably high rates of germination was suddenly in demand in the 1950s, the existing system of distributing seed through CSGA members who requested it proved to be inadequate.

The situation was complicated by the slow pace of soybean breeding. Soybeans were a new introduction to North America. The gene pool was limited as many available varieties were related through the exchange of material among breeders in Canada and the US. Years of crossing and selecting, almost entirely during the summer months, were necessary to see results as breeders waited for natural selection to reveal plants with superior desirable characteristics. Furthermore, soybean breeding was only part of ongoing work at research and experiment facilities; for example, HRS was also responsible for maintaining Foundation Stock Seed for distribution to Elite and registered Seed Growers. In 1953, almost ninety-four per cent of Registered Seed produced in Ontario originated from Foundation Seed grown at HRS.\(^\text{63}\) Thus dedicated breeding programs, as well as variety trials and seed increase, all competed for land and labour resources.

Following World War II and other political unrest in eastern Europe, recently-arrived immigrants to Canada introduced new seed cleaning technologies and ideas about field crop rotations and permanent pastures, and founded seed companies to produce and retail crop seed. Farmers welcomed their innovative sales tactics which consisted of cold calls, follow-up farm visits and individualized advice. This approach to selling seed was far different from the days

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\(^\text{62}\) The Farmer’s Advocate. LXXII. December 9, 1937.

when most vendors of field crop seed were farmers who were themselves as busy with farm work as their customers. These newcomers were anxious to establish themselves in Ontario as expert business professionals in the agricultural sector, producing a commodity which was attractive to farmers and available on terms which would induce them to purchase. Commodity crop farmers needed seed of guaranteed mechanical and varietal purity to grow a crop that was acceptable to buyers. They were not equipped to harvest, clean and store seed soybeans.64

In 1959, the CSTA and CSGA conferred to propose revisions to the Canada Seeds Act and facilitate better distribution of new varieties to farmers. In 1960, in co-operation with the CSGA, the CSTA distributed a questionnaire with three main themes to selected members. The first theme concerned the “product,” and specifically included soybeans on the list of crops for consideration. The questions concerned approximate percentages of pedigreed seed sold, the type of seed in greatest demand in the member’s area, and quantities of all field crop seed stocked. The second theme concerned general business practices, especially any advertising campaigns in newspapers and the seed “store,” and the results of those promotions. And finally, the merchant was asked to comment on farmers’ willingness to pay a premium for pedigreed seed in an attempt to understand why some used poor quality seed, even though their income depended on optimizing crop yields.65

The network of scientists, farmers, politicians and various manufacturers and entrepreneurs, which had maintained a robust discourse about soybeans during the later 1920s through the 1940s, continued to investigate and apply new research and technology with

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increasing success. While amendments to the Canada Seeds Act in 1959 retained the authority of the CSGA to regulate seed production and sales in Canada, CSTA membership increased. Registered soybean varieties released from OAC, HRS and CEF Ottawa were all exploited by CSTA members, who built up their own breeding and seed production programs around these varieties. The early legwork – soliciting seed stocks from other centres of research and experiment, growing them, selecting them repeatedly, and eventually planning and making crosses between promising parents – had all been done. Private breeders were skilled and often well educated crop scientists; they were also businessmen who identified national and global markets for soybeans. Farmers who purchased their varieties were able to tap into these markets.

By about 1980, Northrup-King of Hyde Park, near London in Middlesex County, offered several soybean cultivars and associated product lines for Ontario and the northern states, in addition to hybrid corn. First Line Seeds of Guelph and King Agro of Chatham were also developing and marketing their own cultivars using varieties developed over decades of research and experiment with public funds. In 1983, although private breeding programs were already in place for some other field crops, the exclusive relationship between public soybean breeders at agricultural research stations and soybean farmers ended unofficially with the release of KG20 by King Agro of Chatham, the first variety to be developed by a private company in Ontario.66

The Soybean Boom: Context and Consequences

The sudden accelerated demand for oilseed soybeans resulted from shortages during World War II, and succeeded because research programs, farm management protocols and a few varieties adapted to the southwestern Ontario environment were already in place. Most of the

credit for this must go to far-sighted scientists and farmers, all of whom persevered with a crop
whose returns to investment were unclear, and for which there were familiar and equally
effective alternatives. During these early years, soybeans’ most important advantage was their fit
with the scientific, economic and social system of mixed farming in Ontario.

The soybean boom began at the end of World War II and was a part of structural changes
in agricultural science and crop production which swept through Ontario. Despite the emphasis
on commodity crops for off-farm sale, mixed farming – the production of crops and livestock on
the same farm – was still the norm in agricultural southern Ontario to the 1980s. The two
commodities are interdependent. Transportation of feed and manure is costly and cumbersome;
recycling these products on the farm preserves a cycle of soil nutrients and organic matter which
is crucial to sustainable farming and the maintenance of a farm family’s livelihood.

The major feed crops – wheat, oats, hay and pasture – were consistently grown
throughout Ontario from 1921 to the 1980s. Other important field crops included grain corn and
corn silage and soybeans, some barley, and mixed grains. Census reports from 1901 to 1991
demonstrate that fewer farms reported livestock and poultry over the period, although the
average numbers of animals per farm increase substantially for all categories except horses. It is
noteworthy that average numbers of all cattle and pigs began a rapid and continuing increase in
1951: feed crops were available (including corn and soybeans, in addition to wheat, hay and
pasture) and consumer demand for meat products accelerated during the prosperous Baby Boom
years. Subtle changes in farm size accompanied these trends in livestock production. Overall, the
most common farm size from 1961 to 1991 was 70 to 179 acres. Of interest, however, is the
increasing number of very large farms – more than 759 acres. As the total number of farms
dropped steadily from 1941 to 1981, large farms increased in both absolute and relative numbers.
This trend occurred in Essex, Kent, Wellington and Carleton Counties (Ottawa-Carleton beginning with the 1971 Census). It also occurred in the province as a whole. Clearly Ontario’s version of industrial agriculture was mixed farming on a larger scale.67

These trends are corroborated by detailed Census data for Wellington County in western Ontario, a region where soybeans took hold. By 1971, cash crops, especially oilseeds, were increasing; by 1981 farmers reported growing rapeseed, soybeans, flax and sunflowers, in addition to a variety of field and horticultural crops and various livestock. Conditions were similar elsewhere, with variations typical of the different climate and soil conditions. To 1986, the average farm size continued to be between 100 and 200 acres, although very large farms were rare but increasing in absolute as well as relative numbers, as the number of Census farms decreased. Finally, to 1981 farms in Wellington County were primarily owned, occupied, managed and worked by individuals or in partnerships (including family groups), but this too was changing. Farms occupied by a manager appeared as a significant category at 25 per cent, while owner occupied farms decreased from 86 per cent in 1951 and 1961 to 69 per cent in 1971.68

The industrialization of agriculture which progressed as farmers adopted commodity crops such as corn, wheat and soybeans did not disrupt the system of mixed farming. That system underwent a significant and long-term change with no end in sight by the 1980s. By virtue of the success achieved over a century of scientific agriculture, soybeans became an integral part of successful farming in all parts of southern Ontario.

67 White, Dalrymple, and Hume, The Livestock Industry in Ontario, 1900-2000, 2-2, 2-6, 2-17, 2-24 – 2-43; Census 1941, 868-875; Census 1951, 16-1 – 16-8; Census 1961, 12-1 – 12-8; Census 1971, 30-1 – 30-10; Census 1981, 12-1 – 12-10.
With this success came permanent structural changes to a system which had served Ontario well. Further research will tell if farmers prospered from the new mixed farming and stayed in the business after 1983, and if scientists continued to serve the needs of all farmers by selecting varieties adapted to diverse regional conditions, as publicly-educated, privately-employed plant breeders exploited soybean germplasm, developed over a century for free use by the farm community, for profit and investment beyond the boundaries of rural agricultural communities.
Conclusion

The story of soybeans is a valuable case study which brings to life the dynamism of rural Ontario history. This study supplements current work on rural history by including crop production, a fundamental part of rural life, and integrating that essential occupation of farmers and scientists – the introduction and improvement of crops and crop yields for food and feed – into larger studies of rural households and communities. Because soybeans were a component of many diverse processed and manufactured products, this study also provides a glimpse of the contacts between rural and urban Ontario as it developed from 1881 to 1983.

In her article on twentieth-century conservationist Charles Sauriol and Toronto’s Don River Valley, environmental historian Jennifer Bonnell defines biography as the history of a place informed by personal experience; Bonnell tells a compelling story, and even though the Don is a river of “inconsequential size” and Sauriol was a local figure, her account is deeply embedded in a larger provincial, national and ultimately global history of natural resource conservation.1 The biography of soybeans has similar value: the close and multi-layered connections between a single crop and its place add context and meaning to Ontario mixed farming in a time when prairie hard red spring wheat defined Canadian agriculture for many people.

In particular, the story of soybeans calls attention to scientific agriculture as it was interpreted, practiced and evolved in Ontario in the century from 1881 to 1983. Scientific agriculture had its roots in Europe in the mid-1800s with Justus von Liebig’s experiments and reports on nutrition and physiology in plants and animals. Liebig and his colleagues offered very practical explanations for soil deficiencies and crop failures, and American exchange students,

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mainly chemists, returned from studying at institutions in Europe, England and Scotland to work on restoring the exhausted soils of the eastern states. Scientific agriculture was interpreted and taught differently in Ontario, because it responded to different soil and climatic conditions. The history of soybeans, which begins just as scientific agriculture becomes institutionalized at OAC, is a valuable tool for highlighting this aspect of Ontario’s rural past.

Soybeans’ first century in Ontario agriculture was shaped by co-operation between farmers and scientists who worked at publicly-funded institutions. The relationship was malleable and evolved in response to challenges imposed by physical and social environmental factors unique to southern Ontario, global economics, and contemporary science and scientific agriculture. Research and experiment on soybeans were supported almost exclusively by the public sector. Scientists’ work was distributed freely, and often in quasi-social settings where scientist and farmer – public employee and private citizen – came face to face to argue and discuss the application of science to production. Innovative science was put to the test and finally found to be satisfactory when farmers planted soybeans for feed and food.

During the first approximately fifty years of soybeans, agricultural science depended mainly on the experience and expertise of a few scientists and educated farmers to create and expand a base of knowledge about the new crop. Charles Zavitz at OAC, in co-operation with members of the Ontario Agricultural and Experimental Union (the Ag Union), ensured that soybeans were a permanent choice for mixed farmers, even when acreages remained very small. He continued to give them a few plots in summer trials, and he worked hard at pure line selection

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until he was able to release the first soybean variety to be registered in Canada by the Canadian Seed Growers’ Association (CSGA). Scientists and farmers, as well as a few crushing mill owners, were well aware of soybeans’ success as an oilseed crop south of the border, and the promise of profits for selling soybeans to under-supplied American crushers. Ontario farmers also understood the social and physical environmental limitations to growing soybeans on their farms. They opted, with cautious conservatism, to watch the American soybean scenario play out, and wait until conditions were right in Canada before investing resources in oilseed production.

As the second half century unfolded (from the late 1930s to 1983), new scientific disciplines emerged. They were engendered by wartime necessity for secure food and feed products from plants. The value of soybean oil persisted following the war, as well as the value of oilmeal as a source of protein, and their agronomic value as a soil improver. In southwestern Ontario, soybeans’ long association with corn matured into an equal partnership: scientists developed new varieties and farm management plans for farmers, who metamorphosised from co-operative experimenters to producers and marketers. Soybeans moved into eastern Ontario when breeders were finally able to develop varieties with tolerance to cooler temperatures and shorter seasons. In every region of the province, farmers responded to consumers’ demands for oilseed and protein products, and soybeans became entrenched in mixed farming as a dependable commodity crop.

Over the course of time, other groups, from both the private and public sectors, played parts at certain junctures in this narrative. The earliest recorded arrival of soybean seed at OAC was sponsored by a seed merchant, “Mr. Bruce” of Hamilton, whose company sought the support and approbation of scientific agriculture in advertising seed for a crop that would grow
well in Ontario to interested farmers. Soybeans played an insignificant role in Canadian seed business to the 1950s, as production and sales were regulated by the Canada Seeds Acts. The seed trade, including plant breeders, seed producers, and retailers of seed and other necessary inputs, reappeared when commodity crop production became a growing trend. The seed trade, dominated by a group of specialists, acted effectively as an intermediary between scientists who developed adapted varieties and farmers who planted, cultivated, harvested and marketed them.

Once a market for Ontario soybeans was assured, processors and manufacturers took the initiative to construct large, central facilities to take delivery of farmers’ crops at negotiated prices. Victory Mills at Toronto pioneered this post-war confidence in soybeans; the added value to raw oilseeds included conversion to margarine, salad oils and meat. Thus the Canadian consumer (as part of a North American phenomenon) influenced the development and expansion of a new concept, agribusiness. Agribusiness encompassed production of soybeans and businesses associated with supplying farmers; transportation and storage companies; processors and manufacturers; companies who advertised food products; money-lenders and financiers; and any other enterprise involved with commodity soybeans.

The end of the first century was marked by the release of the first soybean variety, KG20, developed by a private breeder. This was not a landmark per se. American companies had been in the business of creating and selling hybrid seed corn since the early 1900s. In Canada, private hybrid corn breeding coincided with early work at OAC and CEF in the late 1920s and 1930s, and the first hybrid corn seed produced by a private breeder was sold in Ontario in 1938.3 Unlike

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the situation in the US, where public and private interests were quick to jump on the soybean bandwagon, Canadians were more hesitant. Farmers and scientists in the provincial and federal Departments of Agriculture recognized that mixed farming, combining a spectrum of field crops with livestock, was a reliable and low-risk system for Ontario agriculture’s continued success.

This study ends in 1983, when King Agro of Chatham, a privately-owned company which employed a staff of plant breeders and agronomists, released KG20. Development and sales of soybean seed for private profit was part of a trend in Ontario agriculture which had its roots in post-war supply and demand. Decisions made by crop farmers to adopt the science and technologies offered by crop scientists in order to optimize production and continue farming on mixed family farms increased supplies of commodity crops, including soybeans. Consumers’ demands for plentiful foodstuffs of high quality were instrumental in perpetuating what may be called a cash crop culture in southern Ontario. Agribusiness, a complex network of goods and services, grew in the middle to satisfy the needs of producers and consumers. Ironically, most foodstuffs which farmers consumed were moved far from the farm as a raw commodity and back as a processed good; this cannot be judged here as good or bad without much more extensive research in rural sociology, but it was a departure from the traditional mixed farming system of previous decades when many households and communities provisioned themselves.

Specialized commodity farming (either crops or livestock, but not both on the same farm), began to emerge as the most common system of agricultural production in Ontario. Without the integration of plants and animals, farmers were obliged to purchase feed, fertilizers, and other supplies, and Ontario agriculture began to look more like the industrial models described by FitzSimmons and Fitzpatrick. Because they were so successful as a commodity crop, soybeans were a big part of this change.
During the century covered by this dissertation, virtually all soybean research was conducted in the public domain: at CEF and its satellite research stations and farms, OAC and related facilities in Ontario, and agricultural colleges in Manitoba (the Manitoba Agricultural College at Winnipeg) and Quebec (Macdonald College at Montreal.) Agricultural improvements derived from publicly-funded research and experiment (including new crop varieties) were released for the free use of Canadians; the primary recipients of the benefits of this work were educated farmers, followed by consumers in general. By the 1970s, soybean varieties had been released from government institutions for most environmental niches in agricultural southern Ontario.

When the success of soybeans for Ontario was evident, private companies took note. Some of these had been active in the American Midwest for decades, but were reluctant to move into Canada until the legwork of improving varieties to the point of profitability had been accomplished. For example, Henry A. Wallace’s Hi-Bred Corn Company was founded in Des Moines, Iowa, in 1926. In 1964, the renamed Pioneer Hi-Bred established a corn breeding program in Canada when returns to investment in the new market, which was smaller and therefore less profitable than the giant American Corn Belt, looked promising. In 1973, Pioneer Hi-Bred obtained a soybean product line through its purchase of Peterson Seed Company of Waterloo, Iowa. Smaller companies also capitalized on public research and moved into soybean variety development and seed sales. The release of KG20 by King Agro in 1983 was the first of many varieties released by companies which quickly established co-ordinated breeding and sales programs. Private companies exploited varieties released from public institutions. In the case of soybeans, they also took advantage of decades of valuable information amassed by scientists and
farmers. Unlike public institutions, companies increased and sold registered seed for profit. Both groups continue to distribute varieties through the CSGA and the SeCan Association/l’Association SeCan, chartered in 1976. Although private individuals and companies had served Ontario farmers by producing registered soybean seed for decades, the move by companies into research and seed production had a profound impact on mixed farming.

As part of this general move to commodity production (including seed), soybeans, corn, and winter wheat began to displace most other crop kinds everywhere in Ontario. These three annual commodity crops had proven to be very successful in rotations, and markets for them were reliable. Risk avoidance, still intrinsic to farmers’ decision-making, was offset by their ability to adjust rotations depending on relative markets for each crop, and commodity production prevailed. Acreages of commodity crops were expanded to pay for inputs such as seed, chemicals, equipment and fuels. Scientists and farmers, who had successfully renegotiated the relationship between corn, soybeans, winter wheat and the Ontario environment, ultimately experienced a dependence on commodity markets which was next to impossible to break.

In the meantime, livestock production became another kind of specialty, also distinct from traditional mixed farming. While dairy farmers typically grew much of their own feed, hog and poultry farmers purchased feed, including soybean rations. Without a land base on which to spread manure from very large herds and flocks, some operators resorted to dumping manure in quantities which severely taxed the ability of the soil and ground water to absorb. Manure was trucked to other locations and spread, and valuable nutrients in the manure were lost to the soils where the feed was originally grown. Thus the cycles of water and nutrients were disrupted, and ecosystems were thrown out of balance. While mixed farming persisted in some sections of the

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province, for example the milkshed, commodity production has had a revolutionary effect on Ontario’s physical and cultural environments.

In conclusion, only when soybeans were found to have an exclusive and specific value (in rotations with corn and wheat, to provide edible oil and meal and complement the production of valuable corn and cereal crops) did they become successful. Their widespread adoption was integral to changing a traditional system of mixed farming to what can truly be called industrial farming, where large acreages of a few crops and dense populations of livestock and reliance on purchased inputs predominated in certain areas of the province. The release of KG20 by King Agro in 1983 symbolises the beginning of the end of mixed farming in Ontario.

While this project stops in the early 1980s, the improvement, promotion and adoption of soybeans by scientists, farmers, politicians and entrepreneurs did not. By 1983, Ontario was still a region of regionally specialized mixed farming, although commodity crops sold off the farm for cash were displacing resources which had previously also supported livestock. Public and private sector research and experiment continued, and robust communication continued among all groups.

The next period of soybeans and Ontario crop agriculture must be an entirely new research project. It might begin with the decisions made by individual farmers and farm families to grow soybeans on farms that may or may not resemble the farms of the earlier period in size, ownership, management and degree of specialization. It must consider private and public agricultural science and scientists, and farmers and farm families, and the complicated relationships among these groups which influenced crop and livestock production. It should familiarize its audience with the agronomic and environmental impact of soybeans on Ontario farms; this theme might extend to the impacts of commodity production in Ontario on the
communities where they were processed and the households which consumed them. The next project must also expand the rural community to include agents of agribusiness and financialization of food at local, national and global levels.

A study of the next three or four decades in Ontario agricultural history would also be a logical undertaking for an historian of science and technology. The work space for plant breeders changed; it was no longer necessary for them to include outdoor or greenhouse trials. Field work disappeared from some research programs, and with it the connection to farms, farmers and farm families. By the 1980s, biotechnology and genetic engineering had become important tools for plant improvement, and by the 1990s, genetically modified soybeans were available. According to historian of science Robert Bud, biotechnologists failed to comprehend that farming was historically, and continued to be, an intimate part of the global physical, cultural and economic environment. Soil and climate were absent from plant breeding and improvement, even though they were major factors in successful farming. The “new biotechnology” lacked a history, at least prior to the discovery of the DNA helix in 1953. Therefore, the history of soybeans might be continued by a very specific investigation of the history of scientific and applied agriculture as it unfolded in the decades following the 1980s, when my research ends.

The history of crop agriculture is integral to the history of rural Ontario. As this case study of soybeans demonstrates, hopefully convincingly, field crop agriculture in Ontario is a dynamic part of rural history. Many changes, important to food production and consumption, occurred during the last two decades of the nineteenth and first eight decades of the twentieth centuries, in a cascade of social, economic, environmental and scientific forces affecting households, communities, regions, provinces, nations, and indeed the planet. This biography of

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soybeans contributes to and informs the study and understanding of past and current production and consumption of food and food products by rural and urban citizens alike.
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