

HISTORICAL PROGRESS OF AGRICULTURAL ENGINEERING IN CANADA

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History has a habit of repeating itself, but not always in the same way, in the same place. The history of agricultural progress in Canada is the story of ingenuity, with a large share of emphasis upon engineering application for production problem solution in an expanding frontier and economy.

The progressive development of engineering has moved step by step with the advance of settlement and land use for food production across the 3,500 mile breadth of Canada. The story of engineering for progress has been positive and spectacular. It started with the early application of engineering principles in dyke and abiteau construction by the Acadians, in what is now Nova Scotia. It was part of the land clearing techniques of British Columbia. It was the significant factor in the abolition of the 10,000 to 30,000 men Eastern "harvest specials" by mechanization of the Western grain harvest.

All too little has been written and credited to the inventors of mechanical devices which laid the groundwork for production progress, but even less has been credited to those pioneer engineers who succeeded in applying engineering techniques and designs to the production enterprises of agriculture as it expanded and intensified across the land area of Canada. The Colleges and Schools of Agriculture were the first agencies to recognize the need to apply engineering skills and techniques to production enterprises. The first engineering extension efforts were undertaken as summer assignments for college staff. The Ontario Agricultural College at Guelph was the first to be established, and to undertake an elementary teaching and extension program in "farm" engineering. Drainage was the most urgent problem requiring engineering skills, with general "blacksmithing" and carpentry as the next basic needs for efficient functional success. Professors J. Evans and W. H. Day were mainly responsible for the early developments in drainage and farm mechanics. From 1872 until 1900, the Ontario Agricultural College

served most of the agricultural area of Central Canada, when MacDonald College was established at St. Anne-de-Bellevue, and where Professor L. Hiempel was instrumental in making major contributions in the field.

The Nova Scotia Agricultural College at Truro, and other schools in Quebec, served as primary training centres for students and extension agencies in these areas. Large numbers of students transferred to Guelph and MacDonald Colleges for advanced training to diploma or degree level. Professor A. Banting developed an active program at Truro, and continued his work at MacDonald College. Before the turn of the century, the Manitoba territory was rapidly being settled, and during the next twenty years the agricultural invasion of the entire Canadian prairies was in full swing. Colleges and Schools of Agriculture were established in all provinces, and each had an active Agricultural Engineering Department. Manitoba's college was established at Winnipeg in 1905, and Professor L. Shanks was the leader in activities that emanated from here. The college in Saskatchewan followed in 1910, and was located at Saskatoon. The Agricultural Engineering Department became a part of the College of Engineering also in the early 1920's, and Professor E. A. Hardy developed the most complete program there, which included the first professional agricultural engineering course in Canada. Alberta established a college in 1914 at Edmonton. Professor J. MacGregor-Smith developed and carried out the programs from here. The British Columbia College of Agriculture was much later in establishing an Agricultural Engineering Department, but gave effective engineering guidance for many years through other departments and agencies.

In 1886 the Government of Canada recognized the need of establishing systematic investigations and guidance for agricultural production in both the older and newer farming areas of Canada. By 1888, four experimental

farms had been established in the already recognized and settled areas, with a fifth farm located well out on the "fringe" of the open plains of the North-West Territories — or an unorganized area which was to become the extension of the Province of Manitoba, and the Provinces of Saskatchewan and Alberta (1905). From these original five experimental farms, the present Research Branch of the Canada Department of Agriculture grew to the present establishment of forty-three Research Stations, Experimental Farms and Sub-stations, strategically located throughout the potential farming area of Canada. J. K. MacKenzie and H. G. Kemp contributed much in the way of early innovation and equipment for research workers at the Swift Current Station. This has been expanded in a more sophisticated way in recent years at the Central Experimental Farm in Ottawa through W. Kalbfleisch. The Provincial Colleges of Agriculture, and the Government of Canada Research Stations formed the spearhead and bulwark of plant, animal and engineering development required to keep pace with expanding and intensifying agriculture in Canada during the past one hundred years.

Advanced agricultural technology and tools of production have less than one hundred and fifty years of history. Most of this advance has taken place in the past fifty years. As greater and greater engineering balance was applied to production — on a cause and effect basis—the greater was the acceleration of mechanization with its consequent improvement in quantity, quality and economic returns, and the release of manpower from the historical drudgery, or subsistence existence in the "agricultural way of life". The story of engineering contribution to agricultural advancement and progress is usually quite difficult to document in a clear and specific manner. The most graphic presentation is probably most effectively portrayed by occupational statistics.

From the early settlement of Canada (1620), when farming was first prac-

ticed, until well into the late 1880's, it required over 90% of the available manpower to provide the basic products for food and clothing from the land. By 1900 only very slight improvement had been achieved, with a figure of 80% to 85% engaged full-time in this same enterprise. The 1910, 1920 and 1930 Dominion Census indicated a progressively better balance, but the harvesting problem of western grains still required a peak of 85% of total manpower resources for an 8 to 12 week period each fall. The war period of 1939 to 1945 effected such a tremendous change from surplus to a serious manpower shortage that the 1950 Census indicated only 12.5% of the population engaged in Agriculture; the 1960 figures went to a low 9.5%.

An early mile post in mechanization occurred when Daniel Massey introduced the first threshing machine near Cobourg, Ontario, in 1830. This was the fore runner of a major farm machinery industry for the country. The conversion from animal power to tractor power started about the turn of the century. The first Tractor Trials in North America took place near Winnipeg, Manitoba, in 1906. But the greatest practical impetus came 15 years later with the advent of the general purpose, utility tractor of the 2 and 3 plow size. The development of suitable varieties and tillage practices enabled the successful adaptation of the combined reaper-thresher to most grain growing areas in the late twenties and early thirties, with the result that mechanization and engineering for maximum efficiency and economy became a recognized essential element in all phases of agriculture.

Rural electrification, drainage, irrigation, erosion control, land clearing, and improvement, as well as modernization of farm buildings and facilities of all types, became practical programs of agricultural importance, with the availability of trained engineering personnel from 1930 to 1940. Most of this increase in engineering awareness as a practical means to production economies and refinement of quality came at periods of major depression or recessions or under the impulse of wars, which had direct influence on the economy and manpower of the nation. The regional influences of major weather or climatic factors have indicated strong trends and historic timing to engineering progress area by area.

Governmental action such as the implementation of the Prairie Farm Rehabilitation Act in 1935, the Maritime Marshland Rehabilitation Act in 1948, the Land Clearing and Improvement Acts of the Quebec, Alberta and British Columbia Governments during the late 1930's and 1940's, had the effect of creating a major upsurge in the systematic application of technical engineering to agriculture. The post-war period from 1945 to 1960 witnessed a tremendous reassessment of agricultural production with major emphasis upon size of enterprise in relation to economic returns. Service industries of all types became aware of the need for, and advantages of, engineering aid in their developmental programs for agriculture, with the result that advanced engineering technology could be realistically applied on a completely balanced basis to production, processing and servicing.

Trained personnel in the professional

area of engineering as specifically applied to agriculture has been traditionally in short supply. The awakening of engineering awareness in all areas of agricultural production and processing has intensified the need for a greatly increased number of specially trained engineers in all of the special fields required to meet the challenge of increased food and fibre production. Canadian Schools of Engineering in Agriculture are rapidly expanding to meet this challenge.

Any comment on the historical progress of agricultural engineering in Canada would be meaningless without mention of the dedicated pioneer engineers whose inspiration and foresight made it possible to record an accelerated progress during the past 50 years. Major engineering developments are indelibly associated with individuals whose ability and foresight led to the introduction or development. A number of names, each one of which will quickly conjure up visions of major agricultural developments in various decades or areas of Canada have been listed and identified for historical record. History should also record the struggle of these agricultural engineers to overcome their frustration of individual isolation by their persistent efforts to organize into an effective association for interchange of ideas and more effective national progress, but space does not permit. Ever so much has been accomplished in the past 30 to 50 years that has formed a solid foundation upon which the next 15 to 25 years can indeed expect an increased acceleration in engineering application and refinement in Canadian agriculture.

