The History of Irrigation

THE ECONOMIC ASPECTS OF IRRIGATION

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The legitimate purpose of irrigation is a decision of society. Economic study should indicate an efficient means by which to achieve the decision of society. This paper will attempt to illustrate that due to differences of purpose and ideologies, irrigation has not developed as a secure and stable unit of agriculture.

> "They have demonstrated the merits of irrigation. While wheat is still grown, they are gradually turning to mixed farming by growing forage crops and by stock feeding, a valuable adjunct to prairie pasture lands, and by growing canning products, sugar beets, vegetables, etc. for market, berries and hardy fruits for home use. They have found security, confidence and the opportunities for a comfortable farm home. They are creating a valuable asset in aiding to stabilize Canadian Agriculture". (1)

The quotation above by D.W. Hay, General Manager, Canada Land and Irrigation Company, Medicine Hat, Alberta, in 1941 was a competent statement of societies intention for irrigation. The attitude of certain sectors of society changed over time and space which caused considerable stress for fixed physical projects of irrigation structures in serving a changing agriculture.

The opportunities for home building and security from the hazards of crop failure due to drought (2) were the water users initial purpose for irrigation. Alternative techniques for coping with drought developed with

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the maturity of prairie agriculture. Success in irrigation required ability and offered no opportunity for the incompetent. Provision to remove farmers who proved incapable of adapting to irrigation practices was legislated and administered. The majority of water users have therefore added the profit motive to their objectives.

Construction of irrigation projects prior to 1920 was mainly by development companies using private financing. The Canadian Pacific Railway and the Alberta Railway and Coal companies had received land grants from the Federal Government. The purpose for irrigation as viewed by these companies was "to create or increase traffic" for the railroads (2). The Canada Land and Irrigation Company, a British firm, acquired more than a half million acres of land with the intention of irrigating 200,000 acres. The adventure was a speculative investment to return a profit to the company's share holders.

The development companies had fully intended to recover their capital costs, operate and maintain the projects at cost (or better), and make a profit on their land sales.

Construction of the C.L. & I. Company project progressed very slowly and receivership proceedings were instituted against the Company in 1927 before it had provided water to more than 15,000 acres. Debts were liquidated by transfer of lands reducing the company's property to 225,700 acres. By 1936, 52,500 acres were being irrigated.

The land was sold to water users at about $25.00 per acre and the annual charge for water was $1.50 per acre. Production in the area was limited to grain, forage and livestock. The agricultural returns were modest and the company continued to suffer losses. The project was eventually purchased by the Government of Canada in 1951.

The Canadian Pacific Railway held 1,500,000 acres in its Eastern Section surrounding Brooks, Alberta, of which the irrigable parcels were sold to settlers at $50.00 per irrigable acre and $25.00 per dry acre.

The revenue was calculated to pay off the company's $18,000,000 construction expenditure and return a profit. An ambitous promotion successfully settled the lands, but oversold the direct benefits of irrigation to the water users. Farmers were unable to pay out on the agreements. The C.P.R. realized that their costs would not be returned from agricultural revenue so in 1935 transferred the land, irrigation project and an operating fund of $300,000.00 to the Eastern Irrigation District, an organization of all the water users.

Lethbridge The Alberta Railway and Coal Company received a land grant of about 1,250,000 acres which was consolidated into a solid block in the Lethbridge area and sold it at $2.00 per acre to its subsiduary the North West Irrigation Company. Irrigation construction began in 1901. The irrigable parcels were sold at $25.00 to $50.00 per acre which most of the water users were able to successfully pay over a period of years. The capital cost of under two million dollars was moderate and water users were required to construct and maintain and operate small connecting ditches between their farms and the company's canals. Farm charges were minimized, but the projects, canals and structures deteriorated.

These two companies, which were financed by British capital, amalgamated as the Alberta Railway and Irrigation Company which was acquired in 1912 by the Canadian Pacific Railway. The C.P.R., in turn, sold the project to the Province of Alberta in 1946.

The C.P.R. extended its project into the irrigation districts of Magrath, Raymond, and Taber where the water users organized to operate and maintain the irrigation facilities. In the latter case, the construction cost was $16.00 per acre which was paid off at 5% interest over twenty years after a ten year deferment on the principal. During the depression years four of the annual payments of principal were deferred and paid in later years. The Taber Irrigation District has proven an outstanding success because of its ample water supply, low capital and operating costs and the

advantages of being able to produce high value crops. Needs for drainage and rehabilitating the canals and structures in recent years have imposed financial stresses upon the District.

"The prime purpose of providing irrigation is to increase production by eliminating the hazard of drought"(2). This was the purpose for irrigation expressed by the Government of Canada, which through the North West Irrigation Act of 1894, provided extensive irrigation surveys on the prairies. Some limited financial assistance, was also provided to some projects during the first four decades of the 20th century.

The Government of Alberta guaranteed bond issues by irrigation districts as a means for farmers or potential water users to construct their own irrigation projects. Several projects were effectively constructed by this method, but the Province accepted nearly $10,000,000.00 of the bonded indebtedness.

The Prairie Farm Rehabilitation Administration constructed a number of small projects in Saskatchewan and Alberta, including some extensions to existing larger projects. Most of the construction was contributed as a grant to agricultural development.

> "It has become a generally accepted principle that the total costs of an irrigation project ... should not be charged to the lands immediately benefited. To ensure completion and successful operation of the project, there must be government assistance. The development .. would not only be of benefit locally and provincially, but would ... be to the general advantage of Canada." (2)

It was upon this philosophy and for the purpose afore stated, plus a need for an alternative to agricultural relief experienced during the depression and the need for post-war employment following 1945, that federal and provincial governments decided to appropriate funds without recovery into several major irrigation development schemes.

Another objective emerged which seemed to supercede the agricultural alternatives to irrigation. Even though agricultural technology and

farm adjustment demonstrated increased production during periods of drought, the pressure for irrigation development was building within the halls of government.

> "It is, therefore, of utmost importance, not only because of the practical benefits to accrue to the people of this western country, but still more because of the St. Mary's and Milk Rivers problem is one that might easily become a source of serious irritation and misunderstanding of the people of the two countries, that every effort should be made to obtain the maximum efficiency in irrigation from these waters ..." (3).

This purpose of federal and provincial governments was to protect Canada's share of international streams by proving beneficial use. Construction of a canal from the Milk River prior to 1904 demonstrated Canada's intention to put the water to beneficial use. Even though the canal was never used it helped to bring about agreement in the Boundary Waters Treaty between Great Britain and the United States in 1909. In the years that followed, the U.S.A. put its share of the water to beneficial use, while a large portion of Canada's share was flowing on through the Saskatchewan River basin.

The post-war construction program harnessed the international waters before moving on to projects using other streams.

The needs of existing districts while clearly expressed, were given little consideration during the post-war period.

The Meeks report of 1942 emphasized the necessity for technical advice and financial and other assistance to prepare land for irrigation. The decisions at the action level were made by engineers who were more knowledgeable and interested in dams, canals and structures than in farm lands and farming.

Support for effectively developing farm lands and farm business enterprises was a noted deficiency (2).

The economic experiences on the earlier developed projects influenced the charges levied against water users on post-war projects. Charges to pay construction costs on some of the earlier projects were beyond the repayment capability of many farms. Arrears of payments accumulated to sizable proportions. Repayable levels were established at $17.00 per acre on the Lethbridge Northern Irrigation District; at $10.00 per acre on the Eastern Irrigation District; and at $7.00 per acre on the United Irrigation District. The Taber Irrigation District was able to pay its total construction cost of $16.00 per acre. The farmers of the Alberta Railway and Irrigation Company project were also successful in paying off the construction cost of about $20.00 per acre.

Construction charges levied on water users on the post-war projects were consequently set at $10.00 per acre.

The older projects were not making provisions for the future. Land development was advancing slowly and to irrigate undeveloped land required extremely tedious labour and was expensive in relation to returns. Canal seepage and inadequate drainage caused the occurrence of saline soils. Canals and structures were deteriorating due to age and, in cases, neglect.

Farm development, reclamation and rehabilitation was an apparent need. Some of the early construction was also obsolete due to advances in irrigation and farming technology. The water users were meeting the costs of operation and maintenance, but were unable and unwilling to face the total costs of reconstruction and reclamation.

The farm attitude seemed compatible with their objective at least in the short run. If almost all farm returns were to be directed to the continuance of the irrigation systems, then their homes, standard of living and social advantages would diminish. The argument in the long run called for national, provincial and local inputs due to the stated benefits accruing widely throughout the country as reported in a number of studies and investigations (2,4).

Response to arguments on benefits were continuously refuted on the grounds that facts and analysis were lacking.

Studies to determine the facts and analyse conclusions upon which policy direction could be decided were initiated in 1963. Economics, engineering, agricultural and administrative studies* provided the basic information upon which the Province of Alberta enacted new irrigation legislation in 1968 (5).

All aspects of the studies examined the Eastern Irrigation District which contains about one-fourth of Alberta's irrigation acreage.

The Engineering Branch of the Prairie Farm Rehabilitation Administration estimated that $4,727,000.00 was needed for reconstruction of structures within the next few years. The Bassano Dam would need to be replaced in about 25 years at a cost of $6,000,000.00. Replacement of the remaining structures would cost $896,000.00 over a 40 to 50 year period. This at 1963 price levels totalled $11,623,000.00 (6).

The Alberta Department of Agriculture determined the cost of drainage for the district at $8,000,000.00 (7).

Rogers and Manning (8) examined the direct and indirect benefits that could be attributable to irrigation in the E.I.D. The direct benefits, or value of additional agricultural production for 1963 was estimated at $11,132,000.00 with production costs at $8,187,000.00 giving a net direct benefit of $2,945,000.00. The gross farm income was estimated at $15,843,000.00, but $4,710,000.00 was deducted as the comparable income under simulated dryland conditions. The project operation and maintenance costs and including sunk capital costs, but not replacement costs, were estimated at $974,000.00 annually for 25 years. The ratio of net direct benefits to

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* The irrigation studies consist of 14 volumes authored by personnel of Canada Department of Agriculture Economics Branch, Prairie Farm Rehabilitation Administration, University of Alberta Faculty of Agriculture - Economics Department, and Alberta Department of Agriculture.

project costs was 3.0 to 1.0. The ratio of total direct benefits to total costs was 1.2 to 1.0.

Indirect benefits stemming from and induced by the additional agricultural production was estimated at $10,826,000.00 by processing and marketing, $8,187,000.00 by producing, distributing and servicing the inputs in production, and $638,000.00 induced by the operation of the irrigation project. The total benefits of $19,651,000.00 were assumed to be net on the basis that the resources used would become unemployed if the project were to cease operation.

The distribution of total benefits was estimated for irrigation farmers, others in the local area, others in the province, and others in the nation. Assuming that water users should bear all of the project operation and maintenance costs, the capital costs above could be allocated on the basis of the distribution of net benefits as follows: irrigation farmers, 11%; local area, 22%; Alberta, 32%; and Canada 35%.

An alternative method of allocating project costs may be based on cumulative shares of benefits in that the local share includes the irrigation farmers, the province includes the local area, and the national share includes the province. The allocation would then be 5%, 16%, 31% and 48%, respectively for capital costs.

The allocation of capital costs for reconstruction and reclamation according to the 11:22:32:35 formula was recommended to the Province of Alberta for consideration (5). The Province accepted the recommendation in principle by providing engineering services which costs about a half million dollars annually, and grants that for 1971 were set at $1,000,000.00 and distributed equitably to all irrigation districts.

The Federal Government participated in the studies and has continued to discuss the resulting proposals. It has recently made an offer to participate, but the negotiations have not been concluded.

The local share from other than irrigation farmers has not been pursued by the irrigation districts or the governments. The counties and municipalities do contribute, however, to some drainage construction. This part of the formula and proposals will probably be reviewed if the positions of the two senior governments are firmly established and known.

The studies have been severely criticized by some experts and officials. Expertise from the University, the Province, and the Federal Government was involved in the design, research, supervision and advice on the performance of the key studies. A consultant of considerable reputation advised on the economic analysis of the above referrenced study on the E.I.D. The water users and the provincial officials concluded that the studies provided a wealth of facts and the analysis of data is the best that any organization has yet been able to offer on the subject of irrigation in Alberta.

The purpose for which governments, society and various groups view irrigation may be continuing to change.

The federal government may not be interested in irrigation for the purpose of stabilizing agriculture and increasing production. The goal of putting international waters to beneficial use has been achieved, and other uses of the water has furthered the goal of multi-purpose beneficial use.* The Department which administers the federal interests in irrigation is no longer the Department of Agriculture. The Department of Regional Economic Expansion is concerned about regional disparities with an industrial development incentives approach to stimulation of the economy.

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*Canadian Agriculture in the Seventies, Report of the Federal Task Force on Agriculture, December, 1969, on page 245 states "Further, irrigation is highly subsidized in Alberta"; this is typical of statements made at arms length from the facts and the situations; much of the government funds have constructed dams and control works on the rivers which provide multi-purpose benefits.

Alberta is part of a large agricultural region. The Province is interested in advancing the agricultural sector and diversifying its agricultural products for domestic and export trade. Its purpose for irrigation is to provide social and economic opportunities for farmers and increased market opportunities for Alberta.

Canadian society may not be seeking an increase in food production, but is interested in productivity that can compete in the market place. The food products produced on irrigated land can, to a great extent, find a market that is not in competition with dryland prairie production.

The business communities continue to promote irrigation as the increased population on irrigated farms and the increased agricultural inputs and outputs stimulate the business activities.

Engineering technology has advanced so that underground pipelines and automatic valves could replace seepage-prone earth canals and manually operated control gates. The costs involved, however, could account for the most generous amounts of financial resources.

> "Irrigation enterprises as a rule have been considered mainly from the physical or engineering side. The promoters, more concerned with irrigation developments, have approached the subject from the standpoint of the details of building the works ... It has been a matter of surprise to them to discover, after the works are built and are in condition for operation, that the real elements of success are those more dependent upon proper relations with the farmers and with the soil than those upon the works themselves ..." (9).

More recently, there has been a realization of the increased likelihood of success by farm operators on irrigation projects if all phases of development are considered in detail. The integration of all disciplines and all levels of support remains incomplete.

The ideologies of economics argue whether in fact, the projects should exist or not. Those who believe that irrigation has a low priority in todays economy would shift supporting resources to alternate developments. The water user would carry full responsibility for the continuance of irrigation. Others believe that irrigation projects are a useful form of infrastructure and that support is warranted for the benefit of the broader economy.

The socio-economic fact is that we do have irrigation which involves dams, canals, structures and a great many people. If the projects had never been constructed, the resources, including the people, would have gone elsewhere. To revert to non-irrigated agriculture would demand enormous relocation and adjustment.

The economic facts and analysis that are available indicate positive benefits not only to farmers, but even more so to local, provincial, and federal sectors of the society.

The social benefits of irrigation have not been questioned. All sectors of society recognize these benefits as plentiful and of considerable scope. Fishing and hunting are well known sports. Education, health, utilities and community services are examples of positive benefits due to the population that is supported by irrigation.

The negative arguments tend to be theoretical and idealistic. They have not been reduced to facts that are understood by water users nor indeed by the author.

The farmer continues to rationalize his position as best he can from the flow of conflicting views. His purpose is firm in that he wishes to be independent and self-sufficient as a homemaker, an agricultural producer and as a contributor to the social and economic betterment of his society. He is willing to give and to take, as in this regard he is experienced.

The history of irrigation is largely a history of water and the trials and tribulations, physical and legal, incidental to its use. The process seems to be continuing with the issues and the dimensions of relevance being variable. The end results will not easily be achieved.

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