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IMPACT OF THE ST. LAWRENCE SEAWAY ON CANADIAN AND NEW ENGLAND AGRICULTURE

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The present assignment involves an attempt to separate out the net effect of a single development, the St. Lawrence Seaway, from the entire complex of economic changes which will affect Eastern Canada and the United States, particularly the New England region. To make over-all projections of a national economy or of regional economies not only involves difficult problems of method but is fraught with special risks which derive from the character of the assumptions which must be made. I am avoiding personal responsibility for these difficulties by employing projections of the Canadian economy which derive largely from the recently released preliminary report of the Royal Commission on Canada's Economic Prospects. In the case of the United States, I depend on the work of Dewhurst and associates,[1] and the Paley Commission Report.[2]

Regardless of the Seaway, the expectation is for a very rapid development of the Canadian economy. The Royal Commission report referred to indicates that over the fifteen year period from 1955 to 1970 the expected increase in population is from 15.6 million to 21.6 million, or 38 percent. The corresponding expected increase in gross national product in this period is from 26.9 billion to 50 billion dollars of 1955 purchasing power, or 86 percent. Disposable income per capita is projected to increase by more than forty percent over this period. It is estimated that manufacturing output will increase by ninety percent and mineral production to three times the 1955 level.

The Seaway will clearly augment other factors which are leading to an increased population agglomeration in the Great Lakes-Seaway area (Ontario and Quebec). In 1955 this Central Canadian region accounted for sixty-two percent of the nation's population. The expectation is that by drawing population from the Maritime and Prairie regions this proportion will rise to sixty-five percent by 1970.

I shall deal very briefly with the corresponding development of the United States. The Paley Commission Report projected a 100 percent increase in gross national product for the United States from 1950 to 1975. This is a rate of three percent compounded annually. The increase indicated above for Canada is at an annual rate of more than four percent. The more detailed American study by Dewhurst and his associates indicates a thirty percent increase in gross national product from 1950 to 1960, which is at an annual rate of less than three percent. The projection of a more rapid rate of expansion of the Canadian economy depends not only on the fact that the population is expected to increase at a faster rate, but also that Canada is at an extremely advantageous point in history with regard to exploitation of her resources. Her position today might be thought of as comparable to the United States fifty to sixty years ago.

1/ America's Needs and Resources, New York, Twentieth Century Fund, 1955.

2/ Resources for Freedom, The President's Materials Policy Commission, Washington, G.P.O., 1952.

General Seaway Effects

The productivity of a few industries will rise rapidly as a result of the Seaway and there will be a small but perceptible influence on the productivity of a wide range of other industries. The major direct influence will be in the transportation of iron ore, of grains, and of coal and petroleum. Next in importance will be the shift of a considerable part of the productive capacity of some manufacturing industries from seaport to inland locations. This will apply to industries using bulky raw materials, and might be illustrated in terms of the cane sugar refining industry.

The United States Seaway Corporation has estimated the potential traffic of the Seaway at 36.5 million tons in the first year of operation. This would be composed as follows (in millions of tons):1/

Grain	12.1	Wood Pulp	0.7
Iron Ore	10.5	Non-ferrous ores	0.8
Petroleum	2.3	General cargo	6.4
Coal	3.7	T O T A L	36.5

The same study indicated a potential traffic of 52 million tons in 1965. A corresponding Canadian Government estimate is 44.5 million tons. Other estimates suggest considerably larger traffic after ten to twenty years of operation. These figures contrast with a present canal capacity of about ten million tons.

However, data on the major industries affected and even potential traffic fail to throw into relief the importance of the Seaway to the economies of the two countries. It will insure the availability of a high grade, rapidly expansible iron ore supply to a steel industry which will urgently require it. Eighty percent of America's steel capacity is located north of the Ohio River and between the Alleghenies and the Mississippi. The Seaway will also provide substantial additional quantities of electric power and augment the capacity and flexibility of the transportation systems of the Continent. This last advantage is to me clearly the most important. As we consider a seventy to ninety percent increase in manufacturing in a region over a period as short as fifteen years, it is not difficult to visualize the increased demand for transportation. In making possible a vast addition to transportation facilities, and particularly since this will be in the form of economical water transportation, the Seaway will bring very great benefits to the economies of the Continental neighbors.

1/ St. Lawrence Seaway Manual, Washington, Senate Document 165. G.P.O., 1955.

The estimated cost of the Seaway was placed at $263,000,000 in 1952, divided so as to involve Canada in an outlay of $175,000,000 and the United States in costs of $88,000,000. Since that date, as a result of increased construction costs and of revisions of cost estimates, the total cost is now placed at $400,000,000 to $420,000,000 - the extent of these increases being from fifty to sixty percent. However, the costs of the navigation portion of the project are not large compared to the power project. The 1952 estimates on the power aspect were $520,000,000. This has likely increased to about $700,000,000, the extent of the increase being somewhat less than that applicable to the navigation work.

The Physical Capacity of the Seaway[1/]

The capacity of the Seaway will be a function of the two limiting links in the system, namely the Welland Canal and the canals currently being constructed between Lake Ontario and Montreal. Of these the Welland Canal has the smaller capacity. Twenty-six to twenty-eight ships per day can be put through the locks of this canal. With an operating season of 244 days, a maximum of 6,300 to 6,800 ships could be locked through the canal. Thus the capacity of the canal in terms of tonnage becomes a function of cargo size. If all vessels were fully loaded bulk cargoes, a total yearly tonnage of approximately 150 million tons would be possible. In contrast to this, if all passages were made by package freighters of 2,500 tons capacity, the canal would have the limiting capacity of 15 million tons. It is generally assumed that bulk carriers of iron ore will represent the major upward movement through the Welland Canal. In an analysis of the prospective traffic on the Seaway, the United States Bureau of Foreign and Domestic Commerce estimates that during a normal operating season there will be 3,400 passages in each direction on the Welland Canal. To move the estimated output of Labrador iron ore, 20 million tons for the year 1960, would require between 1,000 and 1,500 vessel passages. This would leave 1,900 to 2,400 passages for other types of traffic. If the movement of Canadian and American grain through the canal amounted to 400 million bushels, about 600 bulk carrier passages of 20,000 tons would be required. Thus more than forty percent of the capacity of the Welland Canal would be left for other types of traffic. It thus becomes evident that if the ore movement to the lower lakes were to increase substantially over the projected 20 million ton output for 1960, that duplication of the Welland Canal would be required. This may be necessary in the not distant future since delays at the canal already occasion losses to shippers and shipping companies. The canal capacity indicated above assumes equal distribution of demand on facilities throughout the navigation season. But this, of course, could never be achieved.

The canals now under construction between Lake Ontario and Montreal have a capacity of 1,000 more vessel passages per operating season than the Welland Canal. Thus if the Welland Canal were duplicated, the bottle-neck in the Great Lakes-Seaway region would be transferred to the link between Lake Ontario and Montreal. Some analysts have suggested that traffic might increase sufficiently over a twenty to thirty year period not only to require duplication

1/ This section reports the results of a study undertaken on behalf of the Canadian Pacific Railway by a group of Harvard economists under the direction of Professor Galbraith.

of the Welland Canal but also of the St. Lawrence canals. In considering these two bottle-necks in the system, their partial independence should be noted. Perhaps as much as twenty percent of the passages through either canal will have destinations which do not require use of both canal systems.

Power Aspects

The energy requirement to produce the projected output in this region in 1970 is from 75 to 80 percent larger than that used in 1955. (If one might criticize economic projections in general, it would be by stating that they give too little attention to energy requirements.) What are the energy sources of the region and what is the prospect for meeting prospective demands? In 1943, 38 percent of Central Canada's energy consumption was derived from water power and the balance from fuels.1/ Among these coal was by far the most important, accounting for 53 percent of the total energy. In contrast with this situation, the Great Lakes-St. Lawrence region of the United States derives little energy from water power--perhaps less than two percent. But by contrast, the American region has access to high quality coal, to petroleum, and to natural gas. These latter two likely account for forty to fifty percent of the energy used in the Great Lakes-St. Lawrence area. In fact, the relative cheapness of coal and other fuel energy sources on the American side has likely more than offset the advantage Central Canada has with water power.

However, the Central Canadian energy situation is changing rapidly and for the better. In 1951 a 16-inch pipeline was completed from the Alberta oil fields to the Great Lakes. Next year a 24-inch natural gas pipeline will be completed from Alberta to Toronto and Montreal. Further, on the basis of the rate at which proven reserves of oil and natural gas are increasing and of the prospective demand for energy, it should not be long before these pipe lines are duplicated. In fact, I suspect that there is a better chance of the prospective power deficits of the St. Lawrence and southern New England region being met from Canadian imports than from Maine.

However, I should deal more specifically with water power and the Seaway. This undertaking is adding 2.2 million horsepower of energy to be divided equally between the United States and Canada. Apart from the Seaway development, the existing installations at Niagara Falls are being increased from 2,400,000 H.P. to 3,670,000 horsepower on the basis of the incorporation of a pumped storage installation. On the Canadian portion of the St. Lawrence it is possible at two sites to secure about two million additional horsepower. No planning for these installations has yet been undertaken. However, it is not expected that there will be long delays in these developments.

Even when fully developed the St. Lawrence and Niagara projects will represent but a small proportion of either the developed or potential water power of the region. As you already know, the major developed water power resources of Central Canada are in fairly remote areas and are used largely by the pulp and paper and metal reduction industries. On the whole, Canadians see the end of the expansion of hydro energy in the next twenty years. By that time it is expected that the large and economically situated sites will be developed.

1/ Dales, J. H., "Fuel, Power and Industrial Development in Central Canada," American Economic Review, XLIII: 1953, p. 182.

Effects of Transportation on Grain

More than two-thirds of the Prairie grain which is marketed commercially moves to the Great Lakes and from there eastward in a complex pattern of all water, all rail, or rail and water combinations. This pattern is represented graphically in the accompanying flow chart which pictures this movement for the 1952-53 crop year. The movement from the Lakehead in that year, 455 million bushels, was the largest in the history of Canadian grain movement over the Great Lakes. Of this more than 300 million bushels moved over the area to be served by the Seaway. Over the past decade about two-thirds of the Prairie grain which has moved east has been exported, the balance being used domestically, most of it for feed. The amount of American grain which moved from Lake Superior and Lake Michigan ports in 1953 was 147 million bushels, about one-half of it being wheat. Of course neither of these figures represent the potential of the Seaway. In one sense they overstate the potential since 1953 was a year of heavy grain movement. On the other hand, they understate the potential since the shipping area tributary to the Great Lakes will expand.

Both the physical and economic bottle-neck in the movement of grain from the Lakehead to export positions is the area where the Seaway is presently being constructed, or from the eastern end of Lake Ontario to Montreal. The cost of moving a bushel of grain over less than one hundred miles by small canal boats operating on the present fourteen foot canals in 1953 was, as will be shown, estimated at more than six cents. This contrasted with the cost of 15.9 cents per bushel for moving grain from the Lakehead to lower Lake Ontario ports. The high cost of this short canal haul, just as much as the fact that Great Lakes operations are limited to eight months per year, accounts for the importance of the rail movement, particularly from Georgian Bay ports to St. Lawrence ports. This rail haul is illustrated on the chart presented earlier. It will be noted from this chart that in 1952-53 combined water-rail transport was more important than the movement over the present canal system from Lake Ontario to St. Lawrence ports. However, to a very considerable extent the use of rail facilities has resulted from export demands during the period in which water transportation is not possible. To some extent this situation will continue to prevail. However, the economy of the Seaway may well result in a new configuration of storage location which will avoid considerable use of rail facilities.

One means of assessing the economy in the movement of grain as a result of the construction of the Seaway is to project the present water rates from the Lakehead to Georgian Bay ports, to lower Lake ports, to upper Lake Ontario ports on to Montreal. Despite the high cost of moving grain through the St. Lawrence canals, the all-water route is by a wide margin less costly than the all-rail or any water-rail combination. The 1953 rate from the Lakehead to Georgian Bay ports (Port McNicholl) for wheat was 5.5 cents per bushel for 468 miles, that for movement from Lakehead to Port Colbourne (just opposite Buffalo and at the entrance of the Welland Canal) was 7.5 cents per bushel for 735 miles; and the rate from the Lakehead to Prescott, Ontario, at the entrance to the St. Lawrence, was 9.0 cents per bushel for 960 miles. The rate from the Lakehead to Montreal involving transfer to canal boats at Prescott was 15.9 cents for 1,056 miles including transfer to canal boats. Thus the short journey through the St. Lawrence apparently costs about seven cents per bushel.

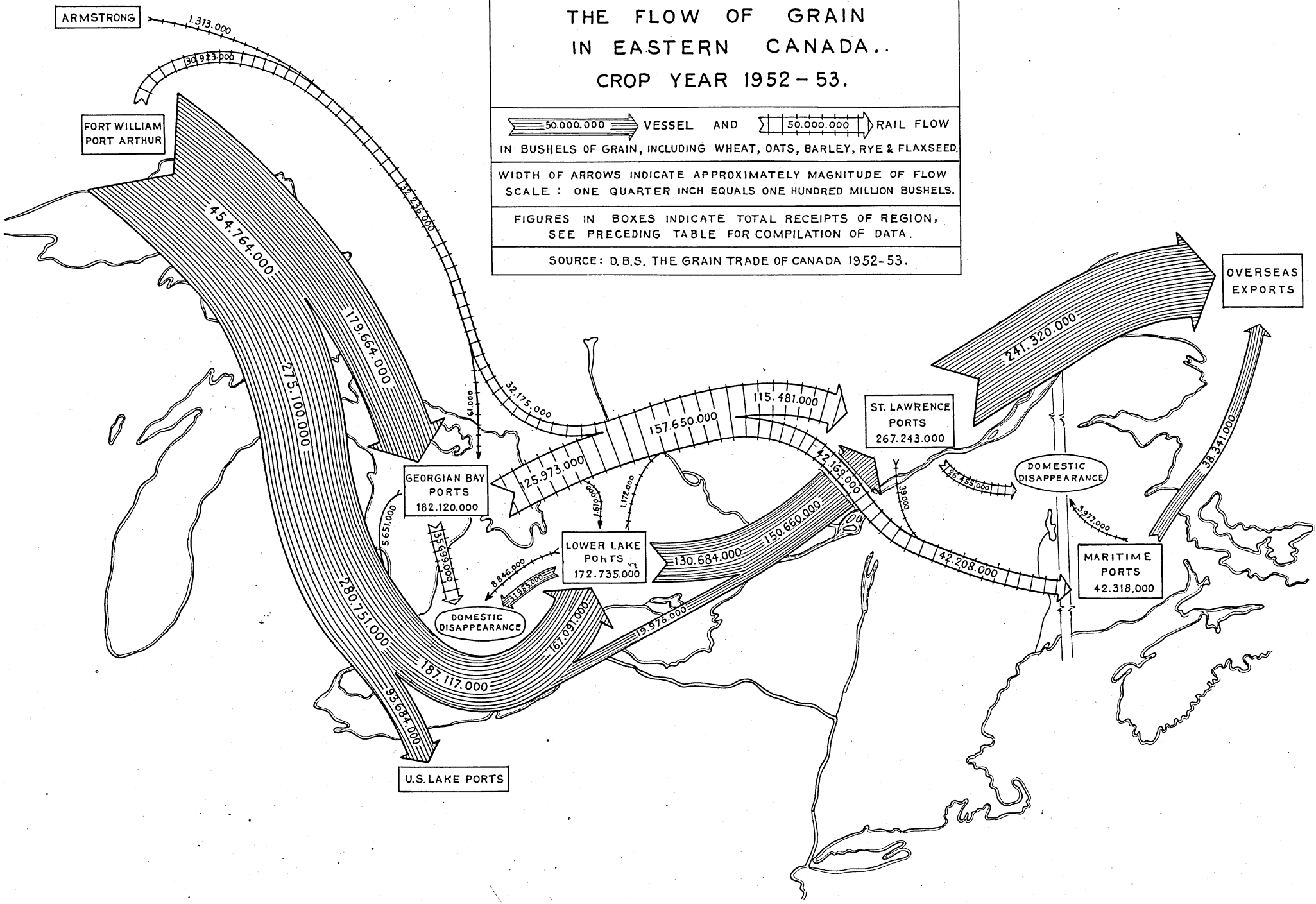
THE FLOW OF GRAIN IN EASTERN CANADA.. CROP YEAR 1952 – 53.

50.000.000 VESSEL AND 50.000.000 RAIL FLOW
IN BUSHELS OF GRAIN, INCLUDING WHEAT, OATS, BARLEY, RYE & FLAXSEED.

WIDTH OF ARROWS INDICATE APPROXIMATELY MAGNITUDE OF FLOW
SCALE : ONE QUARTER INCH EQUALS ONE HUNDRED MILLION BUSHELS.

FIGURES IN BOXES INDICATE TOTAL RECEIPTS OF REGION,
SEE PRECEDING TABLE FOR COMPILATION OF DATA.

SOURCE: D.B.S. THE GRAIN TRADE OF CANADA 1952-53.



With the completion of the Seaway and transfer to canal boats no longer necessary, it is logical to project the linear relationship for existing rates through the Great Lakes on to Montreal. Applying this technique to 1953 rates, it would be possible to move grain from the Lakehead to Montreal for about 9.6 cents per bushel, and there would be a saving of more than six cents. This comparison, however, assumes the use of the generally existing types of lake carriers. But the current trend is toward super carriers which can handle from 500,000 to 800,000 bushels of wheat. Since a very large proportion of lake ships are more than forty years old, we may expect a fairly rapid replacement by larger vessels. These might effect a further economy of two to three cents per bushel from the 9.6 cent level suggested as possible with existing craft but operating through the Seaway. Thus a cost reduction of about nine cents seems to the writer about as far as it is safe to go in estimating possible economies. It is admitted that this is considerably less than that suggested by the recent University of Indiana study.[1/] That work, however, provides less than a satisfactory defense of its finding. Both the Indiana work and the present one require further checking with respect to daily operating costs of large lake vessels and the time required to load, move cargo across the Lakes, and unload it. I might point out, however, that the indicated possible economy of nine cents per bushel of wheat is not far out of agreement with the results of a study by the Cleveland Electric Illuminating Company.[2/] That work shows that a saving of about four dollars per ton will be possible; this compares with about three dollars for the present study.

Tolls

But this neglects the problem of tolls. The only thing we know about tolls over the Seaway is that we shall have them. But there has been considerable speculation about the level of these tolls.

In 1954 the Department of Commerce proposed a level of tolls which would cover the annual operating charges for both Canada and the United States. The level of tolls proposed, and involving full amortization over a fifty year period, with annual fixed and operating charges of 14.6 million dollars were:

(1) 29 cents per ton on 50 million tons of cargo.
(2) 32⅛ cents per ton on 45 million tons of cargo.
(3) 36½ cents per ton on 40 million tons of cargo.

Since 1954 there has been increasing evidence that the cargo to be carried over the Seaway would exceed 50 million tons and thus allow the use of the minimum level proposed or even lower tolls. The proposals of the Department of Commerce involve a schedule of charges varying from fifteen cents per ton on ballast to $1.25 on a wide range of manufactured goods. The proposed charges for grain ranged from a minimum of 25 cents per short ton to a maximum of 35 cents per ton. However, since the Department of Commerce study the estimated cost of the Seaway

1/ Hartley, J. R., The Effects of the St. Lawrence Seaway on Grain Movements. Bloomington, Indiana University, 1957.

2/ It's Cheaper to Export Through Cleveland, Mimeo, 1956.

has been raised by more than fifty percent. Allowing even a sixty percent increase, which is suggested by the study of the Cleveland Electric Illuminating Company, the tolls would range from 24 cents per ton on ballast to $2.00 per ton on manufactured articles, and on grain would range from 40 to 56 cents per ton or 1.2 to 1.7 cents per bushel on wheat with correspondingly lower rates for other grains. Still one further adjustment should be made--this for the fact that a three percent interest charge was used in the amortization proposal. If a rate from four to five percent were used, the necessary tolls would be increased by another 25 to 40 percent. This would bring the tolls on wheat to 1.6 to 2.8 cents per bushel. We conclude, on the basis of present evidence, that the prospective level of tolls will range from 2.25 to 2.50 cents. This would not appear to detract from use of the Seaway.

Effects on Tributary Grain Areas

One of the most obvious effects of the Seaway will be on changes in the competitive position of eastward as against Pacific Coast grain shipments. This portion of the study was commenced by examining the tributary areas for grain shipment to the Atlantic and Pacific seaboard areas under the existing configuration of freight rates. The dividing line, determined by equivalence of rail rates east and west, is near the Saskatchewan-Alberta border. The expected share of grain which would move to the Great Lakes on this basis is 72 percent based on marketings over a thirty-year period. In 1953 shipments to the Pacific ports exceeded those expected on the basis of the assumption, being 80 percent. This was due to such circumstances as the particular nature of demand in that year, and the availability of storage and box cars. However, this does not render invalid the basis of the analysis. If the economy effected as a result of the Seaway, after payment of tolls, was about 6.5 cents per bushel, as suggested by previous analysis, the entire Prairie grain area would become tributary to the Great Lakes. But because of market considerations, particularly supplying grains to the Orient, and the advantages of using vessels which normally call at Pacific ports and which may be seeking return cargoes, it is doubtful whether the shift of grain shipments toward Eastern Canada would be nearly as large as suggested. Nor can one neglect political considerations which might influence grain marketing so as to maintain substantial grain shipments from the Pacific region.

Prospective Changes in the Agriculture of Eastern Canada

I have been requested to give some attention to changes which are expected to occur in the agriculture of Eastern Canada. I am happy to undertake this portion of the assignment since I am able to report on work done over the past two years in collaboration with Professor Black. In fact, I cannot overstate my indebtedness to him for establishing the framework for the analysis and giving much valuable assistance with substantive matters. If I appear to be dealing unduly briefly with a very large topic I should report that I am compressing a seventy-page report into a few paragraphs.

Within the context of the population and income data which were presented earlier and employing income elasticity coefficients for major agricultural products, we concluded that prospective demands for Canadian farm products would increase by 38 to 40 percent over the fifteen-year period 1955-1970. This represents an increase of slightly more than 2¼ percent compounded annually.

The agriculture of Eastern Canada is predominantly a livestock economy. Fruits and vegetables, tobacco, grain, honey, and forest products account for about twenty percent of cash farm income. We project that in comparison with the 38 to 40 percent increase in the volume of output required for Canada as a whole, that farm output in Central Canada will increase by approximately 35 percent. This projection takes account of:

(1) The increased pressure on farm labor supplies in Central Canada.

(2) The comparative advantage which the Prairie area has in producing and converting grains to meats.

We conclude that Eastern Canada has the land resources which will allow such an expansion without difficulty, but that this expansion will require an increase in size of farms and in the use of capital, particularly for machinery and equipment. It is interesting that since the completion of our work, parts of the 1956 Canadian Census of Agriculture have been published. It indicates a five percent reduction in total land in farms and a seven percent reduction in the number of farms in Ontario and Quebec. These are rapid changes for a five-year period. However, the decline in the agricultural labor force is even more striking. At the present time the number of workers in Quebec Agriculture is more than one-third less than in 1950. Perhaps the best measure of the effect of these changes is reflected in the real net output per worker. In the Province of Quebec this measure has increased by about eighty percent since 1950. This is extremely striking in an area which has been looked upon as backward in terms of reluctance to effect substantial changes in numbers and sizes of farms and in the agricultural labor force. I feel that it is safe to conclude that the agricultural revolution has finally reached Quebec.

I do not want to give the impression that the agriculture of Central Canada has made the necessary adjustments to meet the projected demand; rather I am suggesting that agriculture has the capacity to meet them. Judging by standards of mid-western United States or by parts of New England, the agriculture of Central Canada is not highly developed. However, there is encouraging evidence that the changes necessary are being effected and that the requirements of agricultural products for a target date such as 1970 will be met without difficulty; and while being met the agricultural industry will be strengthened and returns to farmers come more closely into line with those of industrial workers.

Effects on Eastern Canadian and New England Agriculture

Perhaps the most significant conclusion we may reach on the question of effects of the Seaway development on Central Canadian and New England agriculture is that these will be indirect rather than direct. Certainly the economy of the Central Canadian region will be strengthened as a result of the Seaway. I prefer to wait and hear others more expert than I discuss the probable course of the New England economy as influenced by the Seaway. I suspect the answer may be that the effect will be neutral to slightly favorable.

It is interesting to note that the University of Indiana study of the effect of the Seaway on farmers producing grain in the area tributary to the Seaway concluded that the indirect effects from the general strengthening of the economy and the improvement of the demand for farm products would be more important than direct effects in terms of reduced transport costs. This would be still more true of the areas under consideration.

Of course we must recognize that the effects of the Seaway will be more favorable to the Central Canadian region than New England. Similarly, the Maritime region of Canada will be least favored and may be adversely affected. One must face the prospect in the early years of the Seaway development of a loss of some import and export trade now handled through New England. However, this is not considered to be of particular importance. In the first place, a large proportion of the types of cargo (grain, iron ore, coal and petroleum) which will be handled over the Seaway are not now and would not be transported in significant quantities through New England ports. While I have no data which shows the importance of New England ports in receiving shipments which ultimately move on to the mid-western states, I suspect they are not important. On the other hand, I am sure that the indirect benefits to New England from the domestic commerce of this region with the states adjacent to the Seaway will not be inconsiderable.

Of direct importance perhaps the most significant possibility lies in the cost of shipping feed grains for use in New England. Rail rates are now competitive with rail-water movement of grain from the Midwest to New England. And the rates are surprisingly low. At the present time dairy ration prices in New England are generally less than fifty cents a hundredweight more than in Indiana and Wisconsin. Poultry rations are actually priced lower in New England. The only possible gain from the Seaway would be in shipment of feed grains to Montreal and thence by rail to New England points. But with existing low rail and rail-water rates from the Midwest through Buffalo and with a forty to fifty cent rail rate from Montreal to most New England points, there is little prospect of securing cheaper feed grains after the completion of the Seaway.

Finally, we summarize the results of our analysis of power opportunities. The present plans for the use of power from the International Rapids Section includes the provision of considerable power to the western portion of New England. However, with respect to power, perhaps the most that may be expected is the availability of greater quantities of power and preventing as rapid an increase in power costs as would occur outside of the context of this development.