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(Signed).....John T. Wilson

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1620 Idylwyld Drive

Saskatoon

Saskatchewan

DATED...May 23.........1973

THE UNIVERSITY OF ALBERTA

AN ECONOMIC EVALUATION OF EXTENDING AGRICULTURE IN NORTHEASTERN SASKATCHEWAN

© by

John T. Wilson

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled An Economic Evaluation of Extending Agriculture in Northeastern Saskatchewan, submitted by John T. Wilson in partial fulfilment of the requirements for the degree of Master of Arts.

.....Bruce Proudfoot........
Supervisor

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....

Date...9th February 1973....

ABSTRACT

This thesis deals with agricultural expansion into wildland areas in the Saskatchewan River Delta. The results of the investigation prove that such expansion is not economically feasible. A secondary result is the proof that there is no relationship between soil capability data and land use for farm units in this area.

Chapter One is a general introductory chapter. It describes the study area and evaluates it as regards its location, physiography, climate and agriculture. Of particular interest is the section on climate. This section contains an evaluation of the microclimate of the study area and deals with the influence of topography on micro-climate of the study area and deals with the influence of topography on microclimate for the area.

Chapter Two reviews all agricultural settlement projects in the study area from the earliest agricultural settlement to present and proposed projects. Included in this chapter is a review of the Smoky Burn Co-operative Settlement Project.

Chapter Three commences with an examination of the influence of the bio-physical environment on farming systems in the study area; and examines the significance of this influence on agricultural expansion. The economic factors and hazards involved in expanding agriculture along the Northern Pioneer Fringe are examined, as is the economic significance of the bio-physical environment.

Chapter Four discusses the methodology of the study. Included is an

appreciation of benefit:cost analysis procedures as applied to the Saskatchewan River Delta Project and the Cracking River Project. The last section of Chapter Four is a discussion of the sampling procedures used in gathering data.

Chapter Five contains the results of the study. The first result is proof that there is no relationship of any kind between soil capability data and land use. The second result is a negative benefit:cost ratio for both the Saskatchewan River Delta Project and the Cracking River Project.

The concluding chapter, Chapter Six, contains the author's conclusions and recommendations regarding present and proposed agricultural settlement projects. For the Saskatchewan River Delta Project, the author recommends that it be abandoned; and that the Cut Beaver Forage Project be integrated with the Cumberland House Farm Project. Although the Cracking River Project is not economically feasible, the author recommends that an attempt should be made by the Lands Branch to reduce the number of physically and economically marginal units in the project. As well, in the future, no projects similar to the Cracking River Project should be started. Throughout the Carrot River-Arborfield area the policy of the Saskatchewan government of leasing undeveloped quarter sections to local farmers should be abandoned because it creates high-cost agricultural production. The author has shown in this study that agricultural expansion along the Northern Pioneer Fringe creates high-cost agricultural production and reflects a faulty investment strategy. Future expansion must be examined very closely if Western Canadian agriculture is to remain competitive.

ACKNOWLEDGEMENTS

The author would like to express a special gratitude to Dr. V.B. Proudfoot for his very competent assistance and advice to the author, and for his patience and good humor. Equal gratitude goes to the many farmers who participated in this study for their confidence and kindness. As well, the author acknowledges the assistance of F. Langley, D. Conacher, C.G. Werner, J. Danyluk, P.O. Moen, E.H. Wilson, S. Turek (Saskatchewan Dept. of Agriculture), K. Ayres (Institute of Pedology), K. Bowren (C.D.A., Melfort Research Station) and H. Dirschl (Canadian Wildlife Service) for their advice and data.

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PURPOSE OF THE STUDY

There are two objectives in this study. The first is to provide the necessary data to evaluate the economic viability of expanding agricultural settlement in the Cracking River area and the Saskatchewan River Delta area in Saskatchewan. The second is to further develop and refine methods for studying agricultural capability and the expansion of agricultural settlement. Together such evaluation of existing projects and methods of assessing land capability should enable more rational decisions to be made as to the spatial allocation of different types of land use.

With regard to the first objective, the required data were obtained from a benefit/cost study of the Cracking River Project, the Cut Beaver Project and a sample of farm units in the Carrot River-Arborfield area. These data are in the form of land development costs, farm enterprise and budget data, productivity indices and benefits resulting from agricultural development. From these data benefit/cost ratios for the Cracking River Project and the Saskatchewan River Delta Development Project (S.R.D.D.P.) were calculated to determine the economic viability of the Project.

The second objective, of studying agricultural capability was met by an evaluation of cropping patterns and farm outputs in relation to supposed soil potential for agriculture. This was done by using a stratified random sampling procedure. The stratification was based on the Canada Land Inventory's Soil Capability for Agriculture classification of soils in the study area. This was done to ascertain if this information from the Canada Land Inventory (C.L.I.) can be used for rural planning at this regional level. The test of the premise that it can be used, was carried out to see if bio-physical-economic models could be developed that could have been used in the benefit/cost analysis of the Cracking River Project and the S.R.D.D.P.

The result of the study is an evaluation of whether or not these two agricultural developments are economically feasible as expressed by benefit/cost ratios. The secondary result is an evaluation of whether or not the Canada Land Inventory, Soil Capability for Agriculture information can be used in land use planning at this regional level.

CHAPTER ONE

THE AREA

A. Location.

The location of the study area is in the far northeast corner of the agriculturally settled part of the Province of Saskatchewan, Canada. The area is within a quadrangle bounded by latitudes 53^{o}N and 54^{o}N and longitudes 102^{o}W and 104^{o}W. The area is covered by the National Topographical Series, scale 1:250,000, Pasquia Hills map sheet number 63E. It contains an area of approximately 5,597 square miles (14,328 square kilometres) or 3,570,080 acres (1,435,660 hectares).

B. Physiography.

The study area contains portions of three physiographic regions: the Cumberland Lake Lowland, the Pasquia Hills Upland and the Carrot River Lowland.[1]

The Cumberland Lake Lowland is situated in the northeastern part of the area and includes most of the delta, levee and floodplain deposits of the Saskatchewan River; including its tributaries the Carrot and Birch Rivers. Elevation of the Cumberland Lake Lowland varies from 850 to 1,000 feet above sea level with gentle gradients prevailing throughout the region. The levees are mainly wooded and are imperfectly to well drained. The floodplain and delta areas are very poorly drained or are flooded alluvial deposits overlain with varying depths of peat. They support a range of vegetation from wooded bog to

[1] Acton, G.J. et al. General Description of the Pasquia Hills Map Sheet 63E.

sedge meadow and aquatic plant successions.[1]

The Pasquia Hills Upland extends northward from the south central part of the area with elevations ranging from about 1,300 to over 2,800 feet above sea level. It forms a prominent feature overlooking the Cumberland Lake Lowland and the Carrot River Lowland, standing above them by as much as 1,800 to 1,500 feet. External drainage from this upland flows to the Carrot River on the north and the Pasquia and Overflowing rivers on the south and east. The vegetation is that of the mixed-wood Boreal Forest, ranging from mixed-wood with white spruce and balsam dominant on intermediate to well-drained soils, to black spruce and tamarack in muskeg areas and jackpine dominant on sandy soils. Gradients in the upland area are generally steep and difficult to traverse.[2]

The Carrot River Lowland, with elevations ranging from 1,000 to 1,300 feet above sea level, occupies most of the western part of the area that lies west of the Cumberland Lake Lowland and northwest of the Pasquia Hills. It is drained by the Saskatchewan River and its tributaries, the Carrot, Torch and the Missipuskiow rivers. The recent construction of a hydro-electric power dam on the Saskatchewan River at Squaw Rapids has resulted in the development of Tobin Lake, a large artificial reservoir that separates the area into a north and south part. Most of the better drained soils on lacustrine and alluvial lacustrine materials south of the Saskatchewan River and Tobin Lake are

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1 Acton, <u>op cit</u>.

2 Acton, <u>op cit</u>.

extensively developed for agriculture. The vegetation throughout the rest of the area is that of the mixed-wood Boreal Forest.[1]

C. The Climate.

The study area is in a transition zone between a humid continental climate with a cool summer and one with a short cool summer. These two climates are classified as Dfb and Dfc respectively.

The mean annual temperature for the study area is approximately 31°F to 32°F. In areas of Dfb climate, the Carrot River Lowlands and the Cumberland Lake Lowlands, summers are cool and short with July mean daily temperatures being between 60°F and 66°F. Dfb winters are cold with mean daily January temperatures between -4°F and -6°F. The northern portion of the Carrot River Lowland and the Pasquia Hills are areas of Dfc climate. Here summers are cool and very short with less than four months over 50°F mean monthly temperature. January mean daily temperatures for Dfc areas are -6°F and lower. One of the most important factors in temperature is the great amount of variation between summer day and night temperatures.[2]

The thermal growing season varies throughout the study area. The thermal growing season is determined by the mean annual duration of air temperatures at or above 42°F; this being the lower temperature threshold for the growth of most temperate crops. The start of the growing season varies between April 30 and May 5 and ends between October 6 and October 9; a period of approximately 150 to 160 days in

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[1] Ibid.

[2] Chakravarti, A.K., The Climate of Saskatchewan, p. 60.

areas of Dfb climate and probably 140 days and less in areas of Dfc climate.[1]

Degree days combine the length of the growing period with mean daily temperatures to produce a cumulative measure of the growing period. The settled portion of the Carrot River Lowlands has approximately 2,250 degree days. The Pasquia Hills Upland has less than 2,000 degree days; as has the northern portion of the Carrot River Lowlands. Throughout the Cumberland Lake Lowlands the number of degree days varies between 2,000 and 2,250. Most probably the area immediately along the Saskatchewan River and immediately near Cumberland Lake has approximately 2,250 degree days. The floodplain areas of the Cumberland Marshes are probably closer to 2,000 degree days because of cold air drainage from the Pasquia Hills.[2]

The most important climatic factor in the growth of crops in the Northern Pioneer Fringe is the frost free season. This is the period of time between the last frost of spring and the first frost of fall; a frost being defined as an occurrence of a screen temperature of 32°F or less. The most important feature of the frost free season is the great variability in its length. As well, local influences such as water, topography, elevation and cold air drainage can significantly modify the length of the frost free season.

In the settled portion of the Carrot River Lowlands the frost free

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[1] Canada Land Inventory, The Climates of Canada for Agriculture, Report #3, Figures 7 and 8.

[2] Canada Land Inventory, op cit., Figure 9.

period averages 90 days in length. In this region the occurrence of frost is hampered by the lack of tree cover which allows for the free movement of wind thus helping to prevent the settling of cold air and thereby lengthening the frost free period. In the remainder of the Carrot River Lowlands and in the Cumberland Marshes the frost free period averages 70 to 90 days in length. In the Cumberland Marshes, cold air drainage from the Pasquia Hills causes the frost free season to be frequently less than 80 days, an effect which is reinforced by the impedance of cold air drainage to the Saskatchewan River. This impedance is caused by the levees and the vegetation on the levees in the Delta. The frost free season immediately along the Saskatchewan River and immediately near Cumberland Lake is 90 to 100 days in duration. In the Pasquia Hills Upland the frost free season averages 50 to 60 days in length.[1]

Precipitation is adequate for the whole area. Average annual precipitation is 16 to 18 inches. Rainfall during the growing season is adequate and averages 10 to 12 inches. Average annual actual evapotranspiration is approximately 15 inches which with 4 inches of soil water storage and the precipitation that falls during the growing season leaves a deficit of 1 inch or less. Any deficit that does occur, occurs late in the growing season during a period when crops are ripening and does not, therefore hamper cereal production. Drought is not a problem in this region and the region can be termed "hydroneutral". Fall rains during the period when crops are ripening are a general hazard

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[1] Chakravarti, op cit., p.57.

to agriculture throughout the area with differing degrees of environmental stress to crops depending on the land type the crop is situated on. Afternoon convectional showers are an extremely common occurrence in the Cumberland Lowlands. Winter precipitation falls as snow and averages 50 to 55 inches per year.[1,2]

D. Agriculture.

Agriculture occupies the southwest part of the study area and includes approximately 1,137 square miles (2,911 square kilometres) or 727,680 acres (294,607 hectares). Agriculture in the study area varies from some of the most highly developed and productive to some of the least developed and unproductive in the province. Improved acreage ranges from about 90 per cent of the occupied area for the fertile Dark Gray Carrot River Valley soils of the southwest, and 80 per cent for the soils of the central portion of the central portion of the settled area, to about 50 per cent for the Dark Gray Wooded soils at the northern and eastern margins of settlement. Along the north, recency of settlement plus heavy bush cover have restricted development of improved acreage; towards the eastern margin of settlement the added factor of poor drainage has also restricted development of agriculture.[3]

Mixed-cropping and mixed crop-livestock systems dominate the farming systems of the area. The major cropping patterns include oilseeds, wheat and coarse grains as the dominant crops with seeded forage crops and seed-production being of secondary importance. Especially

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[1] Chakravarti, op cit., p.56.

[2] Canada Land Inventory, op cit., Figures 15, 16, 17, 18, 19, 20.

[3] Acton, op cit.

important in seed-production is the production of such forage seeds as alfalfa and colvers.[1]

Livestock enterprises are common in the area but are typically of a small scale. Beef cattle are the most important kind of livestock and average less than twelve head per farm for the area. Hogs are somewhat more important than in most other parts of the province but the usual enterprise is also small, averaging the equivalent of about two litters annually per farm for the area.[2]

Cropping systems include a broad admixture of the two-year cereal rotation (cereal-fallow) and the more common three-year system (rapeseed-cereal-fallow) with varying lengths and forms of forage and seed cropping. Summerfallow acreage averages one-third of the area available for annual crops.

Farm sizes throughout the general area average approximately one section (640 acres, 259 hectares) in size; with the normal range being from three quarter sections (480 acres, 194.3 hectares) in size to five quarter sections (800 acres, 324 hectares) in size. East, south and west of the town of Arborfield there is a very strong tendency to a bimodal distribution in farm size with small farms averaging three quarter sections in size and large farms averaging six to twelve quarter sections (960 acres, 388.5 hectares to 1,920 acres, 777 hectares) in size. West of the town of Carrot River in the Moose Range, Aylsham and Nipawin areas, farm size averages one section in size. The same

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1 Acton, op cit.

2 Ibid.

applies to the area east of the town of Carrot River in the Smoky Burn and Battle Heights districts where farm size averages one section, but these areas also contain a number of farms with over six quarter sections. Northwest, northeast and north of the town of Carrot River, farm size is bimodal in distributionwith small farms averaging three quarter sections in size and large farms being over six quarter sections in size. There is a very marked tendency throughout the study area towards a bimodal distribution in farm size with small farms averaging three quarter sections in size and large farms averaging well over six quarter sections in size. The largest farm in the area is a family corporate farm of a mixed crop enterprise type that contains approximately fifty-four quarter sections (8,640 acres, 3,499 hectares).

CHAPTER TWO

LAND DEVELOPMENT PROJECTS

A. Pre-World War II Settlement.

Land development in the Carrot River-Arborfield area started in 1911 with the establishment of a French-Canadian community, Zenon Park, in the far southwest portion of the study area. Settlement gradually extended in the Zenon Park area until 1920, at which time veteran settlement substantially increased agricultural settlement in that area and in the Arborfield area.

After 1924 and through the late twenties homesteading increased following the completion of the Tisdale-Nipawin railroad line in 1924. More northerly and easterly settlement occurred following the completion in 1930 of the Melfort-Carrot River railway line. Most of the present agricultural area was settled in the nineteen thirties during the Great Depression. The main cause of this increase was the ability of this northern area to support a crop while the southern Prairie areas were drought stricken. The result was an influx of homesteaders into the Carrot River-Arborfield area.

Most settlement during the Pre-World War II period was by free homestead; there were no pre-emptions or purchased homesteads in this region. A settler was allowed to take up a free homestead of 160 acres (64.8 hectares), that is, one quarter section. Cost of filing a homestead entry was $10.00, payable by the homesteader. The homesteader had to reside on the homestead for three years and at the end of that period could obtain title to the land. Homesteading was an individual project limited to the pioneer agriculturalist himself.

By 1939 the Northern Pioneer Fringe had extended eastward from the town of Carrot River approximately seven miles to include the districts of Battle Heights and Jordan River. Settlement stretched northward from the town of Carrot River approximately twenty-three miles to the Saskatchewan River and included the districts of Mossyvale, Ravendale, Pas Trail and, Petaigan. The Pioneer Fringe was now bounded on the north by the Saskatchewan River and on the east by the Carrot River and the Pasquia Hills.

However, by the start of World War II there were very few areas remaining that could be developed in the general Carrot River-Arborfield region. The only areas left lay east of the Carrot River, in the poorly drained lowlands extending northward from the Pasquia Hills and bounded on the north and on the west by the Carrot River, on the east by the Cracking River. As there were no bridges across the Carrot River into this area, no development had occurred there.

B. The Smoky Burn Co-operative Settlement Project.

Immediately after World War II there was a demand by returning veterans for agricultural land. The Smoky Burn Project was an attempt by the Saskatchewan provincial government to provide such land.

The site chosen for the Smoky Burn Project was an area some ten miles east of the town of Carrot River. This covered an area of approximately 33,300 acres (10,482 hectares) or 51.75 square miles (132.48 square kilometres) in Twp. 51, Rge.8 and 9 and Twp.50, Rge.8 and 9, W. 2 M., east of the Carrot River. Land development costs in this area would be less than in other adjacent areas because forest fires had greatly reduced the vegetation cover. In 1937 a forest fire had gone through this area killing the growing timber and leaving large numbers of standing but dead trees. This remaining timber was almost completely destroyed when a forest fire raged through the area in 1942, also giving the area its name 'Smoky Burn'. As a result, there was very little land clearing to be done and development costs would be low. This area was chosen to be developed for agricultural settlement by returning veterans.

The Smoky Burn Project is unique in that it was an experiment in applying co-operative organization to pioneer agricultural settlement. The provincial government required the individual leaseholds of the veterans to be pooled and nine co-operative farms were formed from them during 1948-1950.[1] Prior to 1952, each co-operative farm was responsible for completing any clearing and for the working down of the soil in preparation for seeding to crops. In 1952 a clearing and breaking payment policy was introduced whereby the provincial government paid the leasee up to $25.00 per acre for the combined job of clearing and breaking.[2]

Management problems and conflicts between the leaseholds plus

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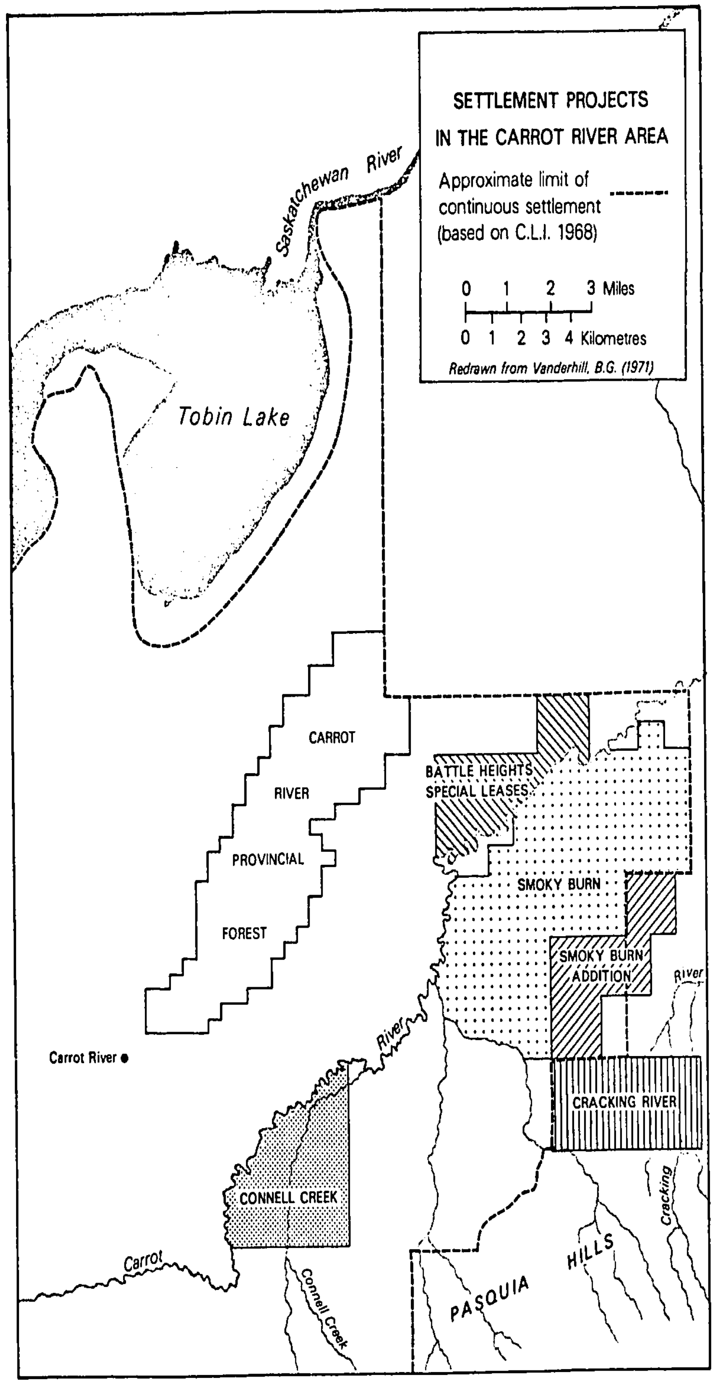
1 Vanderhill, B.G. "The Ragged Edge: A Review of Contemporary Agricultural Settlement Along the Canadian Northern Frontier." K.N.A.G. Geografisch Tijdschrift V (1971) Nr.2, p.129.

2 Danyluk, J. Personal Communication. Aug.28, 1972.


SETTLEMENT PROJECTS
IN THE CARROT RIVER AREA
Approximate limit of continuous settlement (based on C.L.I. 1968)
0 1 2 3 Miles
0 1 2 3 4 Kilometres
Redrawn from Vanderhill, B.G. (1971)
Saskatchewan River
Tobin Lake
CARROT
RIVER
PROVINCIAL
FOREST
BATTLE HEIGHTS
SPECIAL LEASES
SMOKY BURN
SMOKY BURN
ADDITION
River
CRACKING RIVER
Carrot River
River
CONNELL CREEK
Carrot
Connell Creek
PASQUIA
HILLS
Cracking

Map 1

poor adjustment to the bio-physical environment on the part of the farming system and poor market conditions led to disbandment of the co-operative farms during the period 1952 to 1960. On most co-operative farms this disbandment occurred before the land was fully developed.[1] The whole project has now been converted to individual holdings.

C. The Connell Creek Project.

A second settlement project for World War II veterans was the Connell Creek Project. This project provided land for veterans who wished to farm on an individual basis.[2]

This project was located approximately six miles southwest of the town of Carrot River. It was located in Twp. 40, Rge. 10, W. 2 M., and was approximately 11,200 acres (4,534 hectares) or 17.5 square miles (44.8 square kilometres) in size. It was bordered on the west by the Carrot River and on the south by Connell Creek.

Leases with an option to purchase were given to veterans by the provincial government. Lessees were responsible for the land development work. The provincial government paid the lessee or the contractor up to $25.00 per acre for the combined job of clearing and breaking.[3] Land development work and farming was to be done on an individual basis, unlike the co-operative system established at Smoky Burn.

By the middle nineteen-fifties the Connell Creek Project had been

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1 Danyluk, J.F., op.cit.

2 Vanderhill, B.G., op.cit.

3 Danyluk, J.F., op.cit.

completely settled. By and large it has been more successful than the Smoky Burn Project in establishing prosperous farm units. There are at present over thirty farm units in this area.

D. The Smoky Burn Addition.

After 1962, there was a large increase in the local demand for Crown land in the Carrot River area. Successful farm conditions in the area created a demand for undeveloped land for both the establishment of new farms and for the expansion of already developed farms.

Approximately 10,240 acres (4,144 hectares) or 16 square miles (41 square kilometres) were developed for agricultural settlement. On each lease unit, an initial 100 acres were cleared by contractors hired by the Saskatchewan Department of Agriculture. The breaking and balance of the clearing was the responsibility of the lessees;[1] although they were reimbursed $30.00 per acre for the combined job of clearing and breaking or $10.00 per acre for breaking alone. The Smoky Burn Addition required extra drainage works to ensure adequate drainage of the fields. These drainage works were completed during 1963-1964, as was the initial clearing of 100 acres per lease unit. At that time, this area was opened up to leasing and 14 leases were let, the approximate size of each lease unit was 640 acres.

E. The Cracking River Project.

The large local demand for undeveloped Crown land in the Carrot River area continued even after the opening of the Smoky Burn Addition

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1 Danyluk, J.F., op.cit.

in 1964. In response to this demand the provincial government decided to open an area of loamy soils south of the Smoky Burn Addition, near the base of the Pasquia Hills.[1]

As a consequence the Cracking River Project was initiated to provide land for agricultural settlement. In 1966 land development work in the Cracking River Project commen-ed. In 1967 an area of approximately 18,771 acres (7,700 hectares) or 29.3 square miles (75 square kilometres) in size was opened for leasing. Potential leasees applied to a board set up under the Lands Branch of the Saskatchewan Department of Agriculture. This board then allotted the leases to the twenty-nine successful applicants.

Most of the twenty-nine successful applicants were from the Carrot River-Arborfield area; twenty-one being from this area. Another four lived within sixty miles of the project and the remaining four lived more than sixty miles from the project. By 1970, seven of the original leasees had either cancelled their leases or had traded them for other leases within or outside the project. Of the twenty-nine leasees in 1970, twenty-three came from the Carrot River-Arborfield area, three lived within sixty miles and, three came from more than sixty miles from the project. At present (1971), there are eighteen leases that are directly connected with older established farm units, another ten that are indirectly related to other farms and, only one that is not related to other farm units in an area within one hundred miles of the

[1] Vanderhill, B.G., op.cit., p.129.

project. Of the twenty-nine leases, fourteen units are operated independently of other farm units outside the project while, the remaining fifteen units are operated in conjunction with other older established farm units outside the project.

Under the conditions of the lease the lessee either by hiring a contractor, or himself, removes the timber from the land using mechanized clearing equipment and carries out the initial breaking of the former forest floor by ploughing. The remaining land development operations, such as root picking, discing down the surface, and the burning of windrows are the responsibility of the lessee. Prior to 1972 the lessee was reimbursed up to a maximum of $30.00 per acre for the combined operations of clearing and breaking. Within this $30.00 limit was included a maximum of $20.00 per acre for clearing timber or removing windrows and a maximum of $10.00 per acre for breaking.[1] In 1972, a policy of paying up to $25.00 per acre for clearing, $10.00 per acre for breaking, and $5.00 per acre for picking roots and/or working down the breaking was authorized. For the removal of windrows and the breaking of the ground there under, a maximum of $30.00 per acre was authorized, $20.00 per acre for removal and $10.00 per acre for breaking. The 1972 maximum for the combined operations of clearing, breaking and working down is $40.00.[2]

Twenty-nine leases have been established in the Cracking River

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[1] Saskatchewan Department of Agriculture, Crown Land Clearing and Breaking Policy, April 1, 1971.

[2] Saskatchewan Department of Agriculture, Crown Land Clearing and Breaking Policy, April 1, 1972.

Project; on them, agricultural enterprises have been started and land development continues.

F. The Battle Heights Special Leases.

The Battle Heights Development is an experiment in which a wilderness area was opened to agricultural development at no cost to the government.[1] Between 1965 and 1967 leases were granted to three development companies; Battle Height Developers, R.N.C. Realty, and the Pine Ridge Land Co. Ltd. These development companies appear to be new companies formed for the purpose of developing this land by local entrepreneurs who were not necessarily farmers. The leasing period is fifteen years during which time the lessees pay no rental but are responsible for all access work, drainage, clearing, breaking, and working down. Land development is continuing on these leases and parts of them have been seeded to crops.

The Battle Heights Project is located north of the Carrot River, northwest of Smoky Burn. It covers an area of approximately 10,920 acres (4,421 hectares) or 17.25 square miles (44,68 square kilometres).

G. The Development of Leased Lands in the Study Area.

In the general Carrot River-Arborfield area, the provincial government has a policy of leasing undeveloped quarter sections to local farmers. These quarter sections were initially allocated to small farmers to enable them to have an economic farm unit. This policy is intended to stablize and maintain the small family farm by

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1 Vanderhill, B.D., op.cit. p. 129.

increasing the area of cultivated land.[1]

Established farm units are given ten year leases on undeveloped quarter sections. During the lease period they are developed jointly by the provincial government and the lessee. Under the terms of the leases the provincial government is required to pay for the clearing and breaking done on the lease. The lessee is responsible for engaging a contractor for clearing and breaking. The contractor is entitled to cash payment for the acres satisfactorily cleared and broken within the acreage authorized for a cash payment.[2] At the end of the lease, the lease will be renewed to the former lessee, provided all terms of the lease agreement are followed and taxes and rentals paid.[3]

H. The Saskatchewan River Delta Project.

In 1963 the Saskatchewan government formed the Saskatchewan River Delta Development Committee (S.R.D.D.C.). The committee was charged with establishing the potential for future development in the Delta area.

In order to assess the potential of the Delta area, a joint federal-provincial A.R.D.A. project was established. As a result, eight studies of the Saskatchewan portion of the Delta were undertaken, including a wildlife study, a forestry study, a fisheries study, a

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1 Saskatchewan Department of Agriculture, op.cit., April 1, 1972.

2 Ibid, April 1, 1972.

3 Danyluk, J.F., op.cit.

sociological study, an engineering study, and an economic development study, a soils study, and a recreation study.

The results of these studies were considered by the S.R.D.D.C. The committee's decision was to allot approximately 860,000 acres (348,178 hectares) of the Delta to recreational, trapping, forestry and wildlife uses. Along the western edge of the Delta about 120,000 acres (48,445 hectares) were allotted to agricultural use, of which approximately 90,595 acres (36,611 hectares) would be utilized primarily by agriculture. The remaining 27,405 acres (11,096 hectares) in the agricultural area would be utilized jointly by agriculture and wildlife.[1]

The primary area of interest in this study is the area of 90,595 acres, the site of the proposed agricultural development. The development project envisaged by the S.R.D.D.C. in the proposed agricultural area would result in the construction of drains in this part of the Delta and the erection of dykes with roads on top to provide flood protection and access to the farm units. Upon completion of the preliminary drainage, dyking and road building, preparation of the land for agricultural settlement would begin. Land development would take the form of clearing the land of timber and the initial ploughing of the soil. The establishment of agricultural settlement in the area would commence and continue over an eight year development period.

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[1] Saskatchewan River Delta Development Committee, An Evaluation of the Development Potential of the Saskatchewan River Delta Area, 1963, p.40.

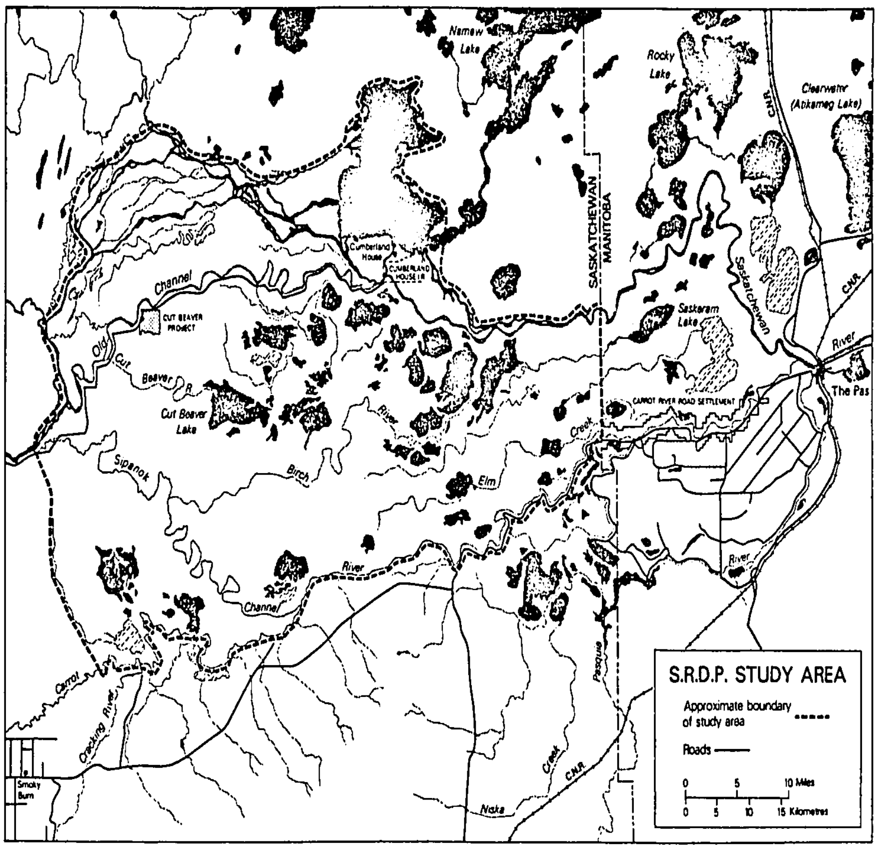
I. The Cut Beaver Project.

The Cut Beaver Pasture and Forage Project is a part of the Saskatchewan River Delta Development Project (S.R.D.D.P.). It is a pilot project to determine agricultural potential in the Delta area.

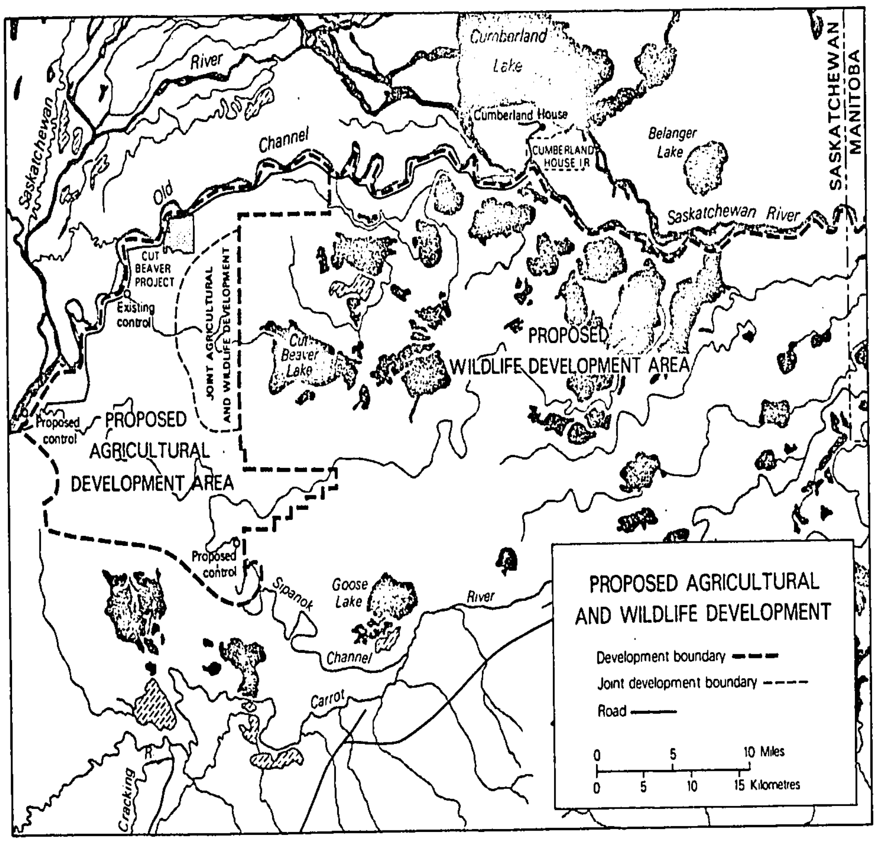
The Cut Beaver Project includes the study of fertilizer response plant variety trials and cultivation techniques. It is also a pilot project for land development methods and costs.

From the project's initiation in 1966, 2,250 acres (911 hectares) have been developed in sections 28, 29, 30, 32 and 33 in Twp. 56, Rge. 6, W. 2M. It is located east of Mile 29 on Highway 123 in the Saskatchewan River Delta, some 60 miles northeast of the town of Carrot River. Presently, some 2,100 acres (837 hectares) are seeded to cereal and forage crops plus experimental plots. Approximately 150 acres (51 hectares) are unclultivated. This project is operated by the Conservation and Development Branch of the Saskatchewan Department of Agriculture.[1]

[1] Melfort Research Station, Canada Department of Agriculture, Cut Beaver Research and Development Report, 1970.


S.R.D.P. STUDY AREA
Approximate boundary of study area
Roads
0 5 10 Miles
0 5 10 15 Kilometres
SASKATCHEWAN
MANITOBA
Namew Lake
Rocky Lake
Clearwater (Atikameg Lake)
Cumberland House
Saskeram Lake
The Pas
Cut Beaver Lake
Channel
Old Cut
Beaver R.
Sipanok
Birch
River
Elm
Creek
Saskatchewan
River
Carrot
Cracking River
Smoky Burn
Pasquia
Naka
C.N.R.

Map 2


Cumberland Lake
Cumberland House
CUMBERLAND HOUSE I.R.
Belanger Lake
SASKATCHEWAN
MANITOBA
Saskatchewan River
Saskatchewan
River
Channel
Old
CUT BEAVER PROJECT
Existing control
JOINT AGRICULTURAL AND WILDLIFE DEVELOPMENT
Cut Beaver Lake
PROPOSED WILDLIFE DEVELOPMENT AREA
Proposed control
PROPOSED AGRICULTURAL DEVELOPMENT AREA
Proposed control
Sipanok
Goose Lake
River
Channel
Carrot
R.
Cracking
PROPOSED AGRICULTURAL AND WILDLIFE DEVELOPMENT
Development boundary
Joint development boundary
Road
0 5 10 Miles
0 5 10 15 Kilometres

Map 3

CHAPTER THREE

THE HAZARDS OF PRESENT DAY PIONEERING

A. Introduction.

The Concise Oxford Dictionary defines a pioneer as a "beginner of enterprise".[1] In Canada since the early 1900's the pioneers of agricultural settlement have had to begin their agricultural enterprises on the northern edge of agricultural settlement. The result has been a 'Pioneer Fringe' along the northern edge of agricultural settlement. All of the areas in northeast Saskatchewan mentioned previously in this study have been or are presently part of this 'Pioneer Fringe'.

Problems or hazards of three types are encountered in the establishment of farms in the Pioneer Fringe. These problems are: 1) those resulting from the bio-physical environment, 2) those due to the economics of the location of the area and, 3) those arising from the social conditions prevailing during development. These three types of problems combine to make the establishment of farming systems extremely difficult in these areas under present conditions.

The major objective of present agricultural pioneers in Western Canada is to establish temperate commercial agriculture. As such, their major aim is to earn income from their farming enterprise that at least realizes the minimum income necessary to meet their socio-economic objectives. Only farm enterprises that can produce this

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[1] Fowler, H.W., Fowler, F.G. The Concise Oxford Dictionary of Current English. 1964, p.922.

minimum income can be incorporated into a commercial farming system. In the Pioneer Fringe the bio-physical environment reduces enterprise choice either by prohibiting the growth of certain crops altogether or by reducing levels of output to an unprofitable degree. The actual influence of the bio-physical environment on enterprise choice will depend on the limitations it imposes on the economically preferred enterprises, available technology, and the ability of the farmer.[1] The spatial variations in economic phenomena and the economic significance of the bio-physical environment, rather than ecological considerations per se, will dictate spatial variations in the agricultural activity of temperate commercial agriculture.[2]

B. The Hazards of the Bio-Physical Environment.

The bio-physical hazards of an area are the result of the interrelationships between the environmental factors of climate, landform, soil and groundwater interacting with the living organisms of the farming system through time.

The interrelationships between the climate, landform, soil and, groundwater on a particular site affect the individual significance of each. For example, the importance of a soil type in its relation to a farming system will depend to a large extent on the interaction of the soil type and the climate. The availability of moisture to plants will depend on the amount and timing of rainfall in relation

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1 Morgan, W.B., Munton, R.J.C. Agricultural Geography. p.40.

2 Ibid. p.40.

to the texture, structure, and organic matter content of the soil. This relationship may be further modified by the type of landform on which the soil is developed or by the groundwater relationships that exist in the soil and the landform. The integration of these four environmental factors on a given site affects the significance of each factor in its relationship to the living organisms of a farming system. Each land type has its own bio-physical environment which interacts with the farming system to impose ecological limits.

The two most notable ecological problems of the Northern Pioneer Fringe are the long cold winter and the short, unreliable growing season.

The long, cold winters prevent the production of winter cereals. In perennial crops the varieties that can be grown are determined by their cold resistance. Winter also tends to lower the efficiency of ruminants in converting crops into animal products and farmers therefore require added investment in protective housing.

It is the length of the 'effective crop season' which is the most important bio-physical hazard for the establishment of farming systems in the Northern Pioneer Fringe. The 'effective crop season' is the duration of time required to prepare and seed the land in spring, to grow and ripen the crop, and to harvest the crop and prepare the land for its winter dormancy. The main challenge facing the agricultural pioneer in these areas is to effectively match his farming enterprise to the effective crop season in order to minimize crop losses and therefore maximize his long-term returns. In the spring a period of delayed snowmelt and runoff, a late spring snowstorm, or an early spring rain may cause delay in spring seeding. A late spring frost may destroy the new crop and reseeding may have to be carried out. Late summer rains may prevent the crop from ripening quickly and cause delay in the date for harvesting. In the fall, rain or a snowstorm can cause a significant reduction in the length of the effective crop season. Early fall frost may also reduce the effective crop season. The effective crop season is very variable in its length. It is also variable as to the type of hazard (rain, snowmelt runoff, and frost) that influences its length.

Farming systems attempt to match their enterprises to environmental stresses in order to reduce costs and to maximize profits. In the Northern Pioneer Fringe the uncertainty as to length and type of bio-physical hazard during the effective crop season plus the long cold winters make the matching of farming systems to the bio-physical environment very difficult.

C. The Economic Hazards of Development on the Northern Pioneer Fringe.

Throughout Western Canada, the federal government has by and large attempted to counteract the economic effects of location. It has pursued this goal by supporting the building of railroads, subsidizing transportation costs, and encouraging uniformity and consistancy in cropping patterns and land use through the grain delivery quota system. This effect has been reinforced by Provincial Marketing Boards which in the past have pursued policies which have treated each province as a quota area, as though there was no significant variation in economic rents. The net effect has been to produce economic policies for agriculture which treat Western Canada as one vast homogenous region with no variation in economic rents. There is one major area in which government policy, until the present, has not affected economic rent, namely the vertical integration of farm enterprises with agricultural industries.

According to classical economic theory the basic principles governing the location of production are determined from Comparative Advantage. In order that an increase in the area of production should occur an increase in demand and hence supply must occur. To increase supply, units of input are added in the form of an increase in capital (crop inputs, labour, management, land) until marginal cost equals marginal revenue or the demand is satisfied, whichever occurs first.

The Margin of Production is the point at which the farmer decides it is no longer worthwhile to continue increasing his input, including adding to his acreage. The Margin of Production is determined by the Law of Diminishing Returns. This law states that successive applications of inputs to a given area of land must ultimately, other things remaining the same, yield a less than proportionate increase in outputs. This rate of decline of returns can be expressed as a change in economic rent.

The Margin of Transference separates zones each dominated by a particular enterprise or group of enterprises and farming may be said to be marginal for both systems of production at the contact point. The Margin of Transference separates the extensive margin of one enterprise from the intensive margin of another enterprise, and the intensive margin of one enterprise from the extensive margin of the same enterprise. The fluctuation of the Margin of Transference will depend upon the Margin of Production as the two are coincident, under ideal conditions.

Economic rent can be considered to be the net value of the returns generated by production on a given piece of land in a given time period. It represents the residual remaining after all costs of production are subtracted from the gross income. At the Margin of Production, which is also the Margin of Transference, economic rent becomes a factor in choice and so enters the costs of production. The costs of production must be calculated in their full economic value. This includes the costs of the inputs which must represent not only the cash value paid by the operator, but must also take into account the value the input might gain in alternative uses, that is, the opportunity cost of the input. Hence economic rent in the form of income from alternate uses for that capital enters into the full costs of production even if those uses are non-agricultural. The location of the Margin of Production is of paramount importance in determining where to invest development capital. Does the Margin of Production occur within the individual farm unit, within the agricultural region as a whole or, outside the agricultural region? Of equal importance, is the form the capital investment should take - crop inputs, labour, management or land.

In reality, the spatial unit on which the decision process is made to increase production is that of the individual farm unit. As the farm unit is located in an agricultural region, the ability of any agricultural region to meet increases in demand is determined by the collective ability of all the farm units in that region. The form of capital input that the individual farm unit chooses to increase production will be in its collective sum the form of capital investment that the region chooses. In assessing the form that the capital inputs for the region should take to meet the demand for increased supply, the best form of capital input for individual farm units must be known. The individual farm unit is competing with other farm units, other agricultural enterprises and non-agricultural enterprises for capital. Its success in gaining the required capital is dependent on the expectation that the enterprise will yield in future an economic rent higher than other enterprises. The failure of the enterprise to do so will mean that it would not gain the necessary capital to meet the increased demand, under perfectly competitive conditions. For the purposes of further discussion let us suppose that agriculture in Western Canada can compete with other investment sectors to gain the required capital to expand its production. The questions of 'where' and 'how' this capital should be invested in agricultural production then must be answered.

The decision to increase production is made on the individual farm unit. In this decision process the single most important factor of government policy that the farm manager can easily perceive is the quota system that applies to his farm enterprise. In Western Canada the single most important quota system is the Canadian Wheat Board grain delivery quota system. The Board has complete control over the way wheat is marketed and the price at which it is sold. It has a lesser degree of control over the marketing and pricing of barley and oats. Before a producer can deliver his grain to any licensed elevator he must obtain a delivery permit book from the Board. When and how much grain may be delivered by the individual producer is determined by a system of grain delivery quotas established by the Board.[1] The Canadian Wheat Board finds it necessary to impose these delivery quotas because the amount of grain which producers want to deliver to elevators normally exceeds the elevator capacity available.[2] The country elevator acts as an agent for the Board and delivers the grain received from the farmer to terminal points or other destinations under instructions issued by the Board.[3] The grain delivery quota system discriminates against more productive farmers and high yielding varieties. This discrimination results from the decision that all producers should be able to deliver roughtly equal amounts of grain per acre regardless of the kind and grade they have produced.[4]

The grain delivery quota system has contributed to a situation in

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[1] Federal Task Force on Agriculture, Canadian Agriculture in the Seventies, 1969. p.65.

[2] Ibid., p.75,76.

[3] Ibid., p.65.

[4] Ibid., p.75, 76.

Western Canada where virtually all grain production can be described as extensive. This extensive grain production is characterized by high-cost, low-productivity and low-profitability per unit of land. The discrimination of the grain delivery quota system prevents the farmer from intensifying his grain production by increasing crop inputs, management inputs and labour inputs per unit of land. He can only increase his production by increasing his total acreage, thus his farm unit must become larger. This trend to larger farm units has been actively encouraged and backed by the federal and provincial governments. These two levels of government have through personnel of their Departments of Agriculture extended advice to farmers in Western Canada to enlarge their farm units. This advice has been reinforced by the Farm Credit Corporation which has advanced large amounts of money to farmers for the purpose of enlarging their farm units.

In the older established regions outside the Northern Pioneer Fringe, farm units have been enlarged through the purchase of portions of other existing farm units. Thus in these older regions the total number of farm units has declined while the total area farmed in these regions has remained stable. Farm units along the Northern Pioneer Fringe were for the most part originally established as relatively small sized farms. The grain delivery quota system has not allowed intensification on the small farm units of the Northern Pioneer Fringe, just as in other regions to the south. Therefore, the operators of farms in the Northern Pioneer Fringe have also had to enlarge their farms to increase their production and hence their net income or returns to labour. Along the Northern Pioneer Fringe the enlargement of farm units through the purchase of already developed farm land is evident to a lesser degree than in older established regions. Agricultural settlement in the Northern Pioneer Fringe being more recent has created a situation where there are very few farmers who are of retirement age. Consequently, there is less already developed farm land for sale. Because of the lack of developed farm land for sale the farms of the Northern Pioneer Fringe have had to enlarge their size by developing wildland to be agriculturally developed. This demand has been reinforced by the widespread and erroneous belief that such land can be developed and serviced at a cost less than that of buying already developed agricultural land in that or another area. The end result is that the increased production on this newly developed land is higher-cost production than that on previously developed land.

D. Relationships Between the Bio-Physical Environment and Economic Factors.

Additional high production costs are incurred in the Northern Pioneer Fringe by the lack of adjustment of the farming systems of this area to the hazards of the bio-physical environment. This lack of adjustment is caused in part by the grain delivery quota system, as we have alredy seen. The quota system does not allow farmers to intensify crop enterprises that are lower-cost in this region. As a consequence farmers can only mix high-cost and low-cost crop enterprises to a degree that gives them the best possible advantage under the quota system, and produces as high a net income as possible.

Nevertheless, this mixed cropping pattern is high-cost production. It is high-cost because the low-cost enterprises cannot be intensified, and hence there are high opportunity costs. The economic rent that should be gained on the low-cost cropping enterprises is not as great as it could be, if the grain delivery quota system allowed intensification of these cropping enterprises. The same argument applies to the high-cost crop enterprises. In this case, production costs are high and returns are low. These high-cost cropping enterprises also incur high opportunity costs resulting from the exclusion of this land area from low-cost production. The economic rent gained from high-cost production is less than it could be if that land area were used for low-cost production.

Production costs in the Northern Pioneer Fringe are high and this is the real economic hazard in encouraging expansion of this area. This high-cost production is reflected in an increased proportion of marginal incomes and economically marginal units in this area. Most significantly, such high-cost production is reflected in high priced agricultural products which are not competitive on the World's markets and eventually in the Canadian market. The continuing encouragement of extensive high-cost agriculture is further damaging in that money and time that could be invested in intensive low-cost production is wasted. Thus the strategy of investing in extensive high-cost production is, in the long-term, damaging to Western Canadian agriculture. The exapansion of the Northern Pioneer Fringe is a part of this faulty investment strategy.

E. Relationships Between Costs of Production and the Location of the Margin of Production.

The Report of the Federal Task Force on Agriculture, December 1969, deals with the costs of production in relation to the "cost-price squeeze." They state the following: ". . .it is apparent that there has been a more rapid increase in the prices of inputs than of prices of products sold. Now the real questions arise out of comparing changes in productivity of inputs, price of inputs and price of products sold. If average farm productivity per unit of input does not rise faster than the price of inputs, the cost of production will rise, tending to reduce farm income and the competitiveness of Canadian products in world markets."[1] The cost-price squeeze has been encouraged by federal-provincial government agricultural policies which in Western Canada have created a situation where virtually all grain production can be described as extensive in terms of area cultivated. This extensive grain production is now characterized by low-productivity, high-costs and low-profitability per unit of land.

Low productivity in Western Canada certainly reduces farm income. As discussed in parts C and D of this chapter this low productivity is partly the result of the grain delivery quota system. The result has been the present extensive form of agriculture. However, Western

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1 Federal Task Force on Agriculture, op.cit., p. 17, 18.

Canadian agriculture is capable of higher levels of biomass productivity both in terms of the bio-physical environment and the economic viability of such increased production. Such production would only be viable under more intensive farming systems.

Reduction in the cost of production per unit of output could result from more intensive use of fixed capital inputs. The major item in fixed capital inputs in Western Canada is the land. More intensive use of the land resource of Western Canadian farms would decrease the cost per unit of production. In Western Canada, extensive agriculture is near the Margin of Production. To remain efficient and competitive, Western Canadian agriculture must turn to intensive forms of agricultural production. Under an intensive form of grain production the total overall costs per unit of production would be lower. Before such changes could be initiated at the individual farm level, changes would have to be made at the institutional level within which the farmer operates.

Rising land costs in Western Canada are a significant factor in the increase in production costs. This price rise can be explained by farmers buying land at inflated prices to gain economics of scale by adding land to their existing units, and to some extent also by interests outside agriculture competiting on the land market. An excellent example of the effects of inflation on the value of land can be gained from the published table of "Average Land Values (including buildings) per acre of Occupied Farm Land in Saskatchewan, 1908-1970"[1]

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1 Saskatchewan Department of Agriculture, Farm Land Prices in Saskatchewan, 1971, p.15.

(see Appendix A).

"Land value normally refers to one of two things: (1) the contribution which land makes in the production process or (2) the price which one receives or would expect to receive from sale of one's land."[1] The value of the land to the farmer is the amount of economic rent it will yield. The equation for evaluating the present value of land is $V = e/r$, where V is the present value, e is the expected yearly economic rent (a constant), and r is the interest rate (a constant).[2]

Farmers who pay inflated land prices, prices which are higher than the present economic rent would warrant, can recoup these excess costs in two ways. Firstly, they can obtain higher returns (economic rent) per acre to justify the cost, and this has been a major factor in the intensification of farming systems elsewhere in recent years.[3] The second method is to rely on inflation to decrease the relative value of the cost of land in the total cost of production at some date in the future. Which of these two strategies to adopt is a key issue for future land use and production strategy.

The farmer who choses to obtain higher net returns per acre, that is economic rent, can do so in two ways. Firstly, he can intensify his production and produce more per acre. Secondly, he can attempt to increase the price he gets for his product. Given the amount of

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[1] Found, W.C., A Theoretical Approach to Rural Land-Use Patterns, 1971, p.23.

[2] Ibid., p.24.

[3] Morgan, W.B., Munton, R.J.C., op.cit. p.54.

production in Western Canada that is destined for World markets, there is very little that an individual farmer can do about prices of produce sold on the World market and consequently in Canada. The only realistic method by which he can increase his economic rent is to increase his production, that is to intensify. The author believes that more intensified production in regions that are economically and bio-physically better suited is the correct production strategy.

The author rejects the reliance on inflation to decrease the relative costs of land in future agricultural production. Reliance on inflation requires that in the future, the economic rent per acre must rise more rapidly than the increased cost of land in the production process, which is brought about by inflation. As the economic rent approaches zero, then the value of land in the production process must also ultimately approach zero. At this point, production is at the Margin of Production.

Many Western Canadian farmers have bought land in recent years at inflated prices. As farm prices for their produce, and their productivity have not increased significantly during the intervening time period, these farmers have become high-cost producers. On the Northern Pioneer Fringe, this situation is of special importance. The pioneer by developing land, is in the same position as the farmer who buys developed land at inflated prices. At present, the costs of developing land are either near the Margin of Production or beyond it. It could quite easily come to pass that these new farms will rapidly become economically marginal. Thus, the strategy of investing in areally extensive high-cost production is, in the long term, damaging to Western Canadian Agriculture and expansion of the Northern Pioneer Fringe is faulty investment strategy.

F. The Socio-Economic Hazards of Development.

Agricultural pioneering in Western Canada has traditionally been associated with economic hardship and sacrifice. The pioneer, to be successful, must put the goal of establishing his farm above all other socio-economic goals for himself and his family. For a person to adopt the role of an agricultural pioneer means that he has chosen a role that is rich in the traditions of Western Canada but poor in present monetary and social returns.

The establishment of a farm on the Northern Pioneer Fringe requires a very large input of capital into the farm enterprise in a relatively short time. As a result, investments by the family in social amenities, be they material goods, education or personal experiences, have to be foregone. The degree of deprivation will depend on the amount of capital that the pioneer brings to the start of his enterprise. If the pioneer has ample funds for development and maintenance, the effects of deprivation will be slight. However, a pioneer that brings very little capital to his enterprise will soon be experiencing instantaneous poverty. For the impoverished pioneer the social amenities he experiences are the barest minimum. Unfortunately, very few modern pioneers have capital available in sufficient amounts to develop their enterprises and to purchase an "average" quantity of social amenities. The end result is that the living conditions of many pioneers are below the average level of other Canadians and often could be described as impoverished. Consequently, if basic social equality is to be maintained with other areas of Canada, social services in health, welfare, and education for the Northern Pioneer Fringe have to be highly subsidized by government, as local financial resources cannot supply the amounts of money required.

Within the local context of Western Canadian society the agricultural pioneer is becoming a rarity. During the pioneering era of Western Canada the agricultural pioneer was a social and economic necessity. Today, in Western Canada, the agricultural pioneer is neither a social nor an economic necessity in terms of society in general and, the person who adopts this role therefore, faces both social and economic deprivation. In line with these arguments, present government policy in Saskatchewan is essentially geared towards expanding present farm units, rather than the establishment of new farm units.[1]

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[1] Saskatchewan Department of Agriculture, Crown Land Clearing and Breaking Payment Policy, April 1, 1972.

CHAPTER FOUR

THE METHODOLOGY OF THE STUDY

A. Benefit:Cost Analysis.

1. The Saskatchewan River Delta Project.

In order to assess the economic viability of the proposed agricultural development of the Saskatchewan River Delta, the S.R.D.D.C. carried out a benefit:cost analysis of the project.[1] In the present study the author also carries out a benefit:cost analysis of that project but in the following way which differs from the original study.

The method of analysis used by the S.R.D.D.C. to calculate the net return per acre was based on farm enterprise and budget estimates developed to simulate farm conditions anticipated in the Delta area. The data for these farm models were obtained from data for integrated grain-livestock farms contained in the Saskatchewan Department of Agriculture's 1965 Farm Business Summary for the Black Soil Zone. However, because the farms participating in the preparation of the Farm Business Summary are superior in the use of management skills and capital resources, they are not representative of farms in the Black Soil Zone or the Carrot River-Arborfield area, as the Summary itself indicated.[2]

The present author makes the assumption that if farm enterprises were to be started in the Saskatchewan River Delta, they would be similar, both in enterprise type and budget to coincident farming

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1 Saskatchewan River Delta Development Committee, An Evaluation of the Development Potential of the Saskatchewan River Delta Area, 1967, p.39 to 58.

2 Saskatchewan Department of Agriculture, Farm Business Summary 1965, 1966

conditions in the adjacent Carrot River-Arborfield area. This assumption is supported by the report of the S.R.D.D.C. which has as one of its objectives the following: "Recommend a program for development and settlement, having full regard to providing opportunities for rehabilitation, re-establishment and employment for those people living in or adjacent to the area and also of farmers on submarginal lands including credit requirements and measures necessary to achieve the ultimate desirable social and economic development of the area within a reasonable period of time."[1] To obtain the farm enterprise and budget data required to calculate the net return per acre that would result from agricultural development, similar to that already existing, the author sampled farms in the Carrot River-Arborfield area.

The second portion of the benefits from agricultural development is the residual land value. This value is equal to the amounts spent on clearing breaking, working down the broken ground, drainage, and road building. These data are available from the land development cost data contained in the present study.

Income from the timber cleared during development is the third and last part of the benefits. The amount of this benefit the author takes from the figure given in the S.R.D.D.C. report.[2]

The cost estimates for the Saskatchewan River Delta Project have five parts. Firstly, there are the initial capital costs of providing access roads and drainage. These have been calculated by the

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1 S.R.D.D.C., op. cit., p.1

2 S.R.D.D.C., op. cit., p.43.

Conservation and Development Branch of the Saskatchewan Department of Agriculture and the author accepts these figures as given.

The second portion of the agricultural development costs are the costs of clearing, breaking, root picking, and discing down the surface. The author obtained these data from a study of land development costs in the Cracking River Project and the Cut Beaver Forage Project.

The third portion of the cost estimates is the yearly cost of operating and maintaining the drainage and road works. These were worked out by the Conservation and Development Branch for the S.R.D.D.C. and are again accepted by the author as given.

The fourth portion of the development costs are alternate value costs. The first of these is the value for the number of moose that will not be killed by recreation hunters as a result of agricultural development. This number has been revised by H.J. Dirschl of the Canadian Wildlife Service from the value originally published by the S.R.D.D.C. The second of the alternate value costs is the Timber Net Revenue lost per year. The Timber Net Revenue lost has been calculated for the S.R.D.D.C. by the Saskatchewan Forestry Branch, and is accepted by the author as given.

The fifth part is the opportunity costs that would accrue if the money allotted for agricultural development was invested in another sector of the economy that gave a net return based on current rates of interest.

2. The Cracking River Project.

As this Project is presently under development, the author has been able to obtain accurate data on land development costs, procedures, and stages, which enable a benefit:cost analysis to be undertaken.

To obtain the net return per acre, farm enterprise and budget models were elaborated for the Cracking River farms when fully developed. As in the author's study of the Saskatchewan River Delta Project, the assumption is made that the Cracking River farms when fully developed will be similar in enterprise type and budget to coincident farming conditions in the adjacent Carrot River-Arborfield area. This premise is supported by two items. First, as illustrated in Chapter Two, most of the settlers in the Cracking River Project are from the Carrot River-Arborfield area. Second, as originally envisaged by the Lands Branch, the farm units would each contain approximately 500 cultivated acres. This makes each Cracking River unit approximately equal to a section farm, 640 acres (259 hectares), in the adjacent Carrot River-Arborfield area. From the models representing future fully developed Cracking River farms the potential net return per acre was calculated.

The second part of the benefit portion of the study is the residual land value. This benefit is equal to the costs of clearing, breaking, working down the ploughed ground, root picking, windrow removal; in short, all land development costs. This value was obtained from the land development costs data contained in this study.

As no timber was officially removed from this land for commercial purposes there is no income from timber cleared during development.

The cost estimates for the Cracking River Project have four parts. The first is the cost of providing access roads and drainage ditches. These costs have been obtained from the Conservation and Development Branch and are the actual costs of such development, as this development has already been carried out.

The second part of the costs is the land development costs, reflecting the costs of clearing, breaking, and working down the ploughed ground. These data came from the land development portion of the present study.

Thirdly, there are the operating and maintenance costs for the roads and drains, these data are contained in the land development costs study.

The fourth and last portion of the costs are the opportunity costs.

3. Time Period and Discounting Rate.

For both the Cracking River Project and the Saskatchewan River Delta Project, most future benefits and costs were discounted at 6 percent per annum to arrive at "Present Value", this being the same discounting rate used in the S.R.D.D.C.'s evaluation. The effect of using 5, and 7 percent interest rates was also determined. In the case of opportunity costs, the interest rates were the same as the interest rate used for the other future benefits and costs.

The time period used in calculating the "Present Value" was 50 years, the same time period as used by the S.R.D.D.C.

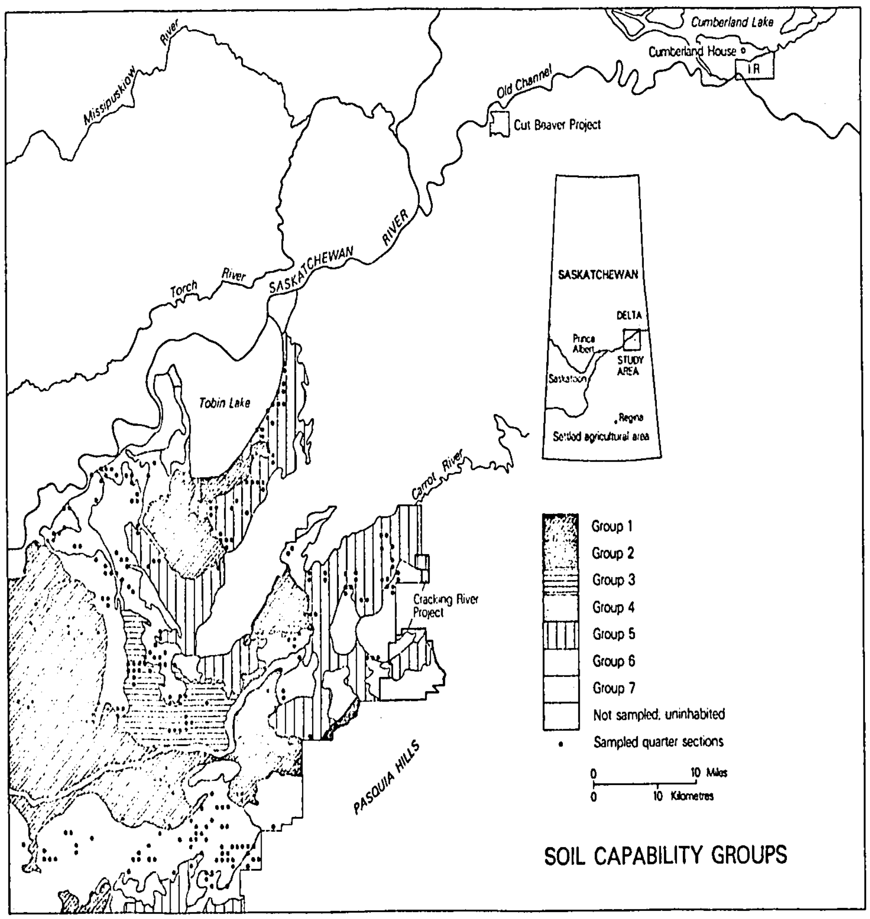
B. Sampling Procedures.

There are three sample areas in this study, as shown in Maps 2 and 4: the already established agricultural area, the Carrot River-Arborfield area; the Cracking River Project; the Saskatchewan River Delta area originally studied by the S.R.D.D.C.

In the Carrot River-Arborfield area, the sampling procedure was a stratified random sample. Stratification was based on Canada Land Inventory, Soil Capability for Agriculture classification of the area. In total, there were seven sample sub areas based on the C.L.I. classes or groupings of classes. (See Appendix B). It was clearly impractical to sample each class because of their number and their small areal extent. Areas described by the C.L.I. as complex were grouped with each other rather than with extensive areas designated as single class. Data were collected from seventy-six farm units by personal interview, done by the author using a short form questionnaire (see Appendix C).

The Cracking River Project was sampled by the author in personal interviews with the lessees using the long form questionnaire (see Appendix C). Of the twenty-six interviews the author was able to gain information on all twenty-nine leases.

In the Saskatchewan River Delta area the only active farm unit is the Cut Beaver Project. This project was visited by the author and the necessary information required was gathered in personal interviews with Mr. Fred Langley, supervisor of this project.


Missipuskiow River
Cumberland Lake
Cumberland House
IR
Old Channel
Cut Beaver Project
SASKATCHEWAN
DELTA
Prince Albert
STUDY AREA
Saskatoon
Regina
Settled agricultural area
Torch River
SASKATCHEWAN RIVER
Tobin Lake
Carrot River
Cracking River Project
PASQUIA HILLS
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Not sampled, uninhabited
Sampled quarter sections
0 10 Miles
0 10 Kilometres
SOIL CAPABILITY GROUPS

Map 4

CHAPTER FIVE

THE RESULTS

Introduction.

This chapter contains the results of the study. These results summarized briefly are as follows: The first major result is that there are no significant differences between land use and type of farm enterprise on soils of assumed different agricultural capabilities. Analysis of data on the basis of farm size likewise proved futile. The variance within groups of similar size is so great as to make their means have no significance. Of the 76 sampled farms in the Carrot River-Arborfield area only 25 had a positive net return; 51 had a zero or negative net return. Of 26 sampled farms in the Cracking River Project, 1 had a positive net return and 25 had a zero or negative net return.

Specific cost: benefit data and ratios for both the Saskatchewan River Delta Project and the Cracking River Project are presented in this chapter. Modification of the original cost estimates of the S.R.D.D.C. are based on land development cost data that were gathered from the Cut Beaver Forage Project. These data from the Cut Beaver Project were also used by the author in calculating costs in the Cracking River Project. The direct benefits of development were calculated from the net returns to land of the 76 sample farms, and applied to the Delta Project only. The direct benefits of development for the Cracking River Project were calculated from the net return to land of 20 farms of similar size in the Carrot River-Arborfield sample. In all cases the cost:benefit rations for both projects were not capable of proving either project's feasibility. As well, the economic rent that is returned to farms in the area shows that expansion of the present farming systems in this area is not feasible.

A. Models Based on C.L.I. Soil Capability for Agriculture.

As discussed in the section entitled "Purpose of the Study" one of the objectives of this study is to further refine methods for studying agricultural capability. The method chosen was to examine the relationship between farm enterprise and soil capability. To achieve this end, the author conducted the stratified random sample in the Carrot River-Arborfield area discussed in Chapter Four. The acreage devoted to various crops on the individual quarter sections was first analysed.

Grain crops for which acreages were listed separately were wheat, barley, oats, rape, and flax. Acreages were also recorded for grass seed production, hay production, summer fallow and "other crops. The most common "other" crops were improved pasture, rye, and buckwheat. As well, the total acreage of improved and unimproved land was recorded for each quarter section.

To achieve an accurate C.L.I. soil classification for each quarter section the original classification data for each municipality were obtained. These data had been drawn up from the original municipal assessment sheets for each section which showed the different soils on that unit with a very high degree of accuracy. In more than 15 percent of cases the original soil classification of the quarter section and the soil classification on the published 1:250,000 C.L.I.

map differed. Some of these differences appeared to be errors in transcription while others were the result of the generalization necessary on the smaller scale published map.

The crop acreage data were analyzed in relation to eight soil capability groups. The first seven of these capability groups were the same as those used to establish the sample subareas within the Carrot River-Arborfield area. The eighth soil capability group contained a miscellany of approximately 55 units with classifications lower than C.L.I. Class 3, or without classification altogether. Each quarter section was assigned to one of the soil capability groups, using the acreage of each crop per quarter section the occurence of that crop on each soil capability group was calculated in terms of the mean ($\bar{x}$) and the standard deviation (d). The statistical results are shown in Table I.

As can be seen from this Table it is generally meaningless to compare average frequency of crop occurrence between different soil capability groups, because of the great variance within groups. The author believes that this variance is the result of several factors.

The amount of land devoted to a crop, or the degree of mixed cropping will depend largely on market demand. In Western Canada, Market demand is to a large degree determined by quota systems, be they the grain delivery quota system or a marketing board quota system. In such instances, the quota allotted is not dependent upon soil quality. Quota systems do not necessarily determine land use for a particular quarter section although they probably have a large degree of influence on land use in the total farm unit. As a result a variety of patterns may occur on quarter sections.

Farming practices as they relate to a farming system will have an influence on land use patterns, an example is crop rotation. In Western Canada, good farming practices dictate crop rotation and as a result, a mixed cropping pattern will occur on quarter sections. With the use of large farm machinery it is common, especially for farmers with more than one quarter section, to have few cropping units or fields within each quarter. Therefore, on a farm with, say, 3 quarter sections, each of a different soil type, a particular crop may be grown in successive years on each different soil type, because of the necessity for rotation.

Another factor is the relationship between climate, soil quality, and the farming system. The extent to which climate limits productivity in this area is difficult to determine. However, it may well be that for some crops climate rather than soil quality is the major factor limiting production. As a result the farmer may, rightly, not take into account soil quality in deciding the land use patterns for individual quarter sections.

The amount of technological inputs by the farmer may also affect the land use of quarter sections. As stated previously in Chapter Three inputs on farms in Western Canada may be insufficient to adequately reflect differences in soil quality. Conversely, inputs for some crops may be great enough to be beyond marginal returns and the effect may be to nullify land quality. Different crops may have reached their intensive or extensive margins on the same quarter section. Therefore, soil quality may not enter into management decisions regarding land use.

Farm size influences land use patterns. While conducting the sample the author observed that frequently smaller farms had smaller sized fields and grew a more mixed variety of crops. Large farms tended to be less mixed in crop varieties grown and had larger fields, such farms often having whole quarter sections devoted to one crop. In a sample containing both large and small farms a great deal of variance is to be expected. This fact is of increasing importance as farm size becomes increasingly bimodal, as noted by the author in Chapter One.

Just as there is no direct relationship between crop acreages and soil capability groups, there is none between the percentages of improved and unimproved land and the capability groups. The mean percentage of improved land does not vary significantly between groups. Had soil quality been an important factor in determining land use one would have expected the amount of improved land to decrease with decline in soil capability, but no such relationship was found. The author interprets the lack of significant difference in the means of improved and unimproved acreage as illustrating the relative unimportance of soil quality as a factor in determining land use in this area.

The basic unit of spatial analysis in this study is the quarter section, which is a part of the township and range survey pattern. Ownership of land in Western Canada is based on the quarter section but quarter sections were laid out irrespective of physical conditions for agriculture. Consequently, farmers often end up with quarter sections containing soils of varying quality. How the farmer can deal with this situation varies from managing different soils as separate entities to managing the quarter section without regard for differences in soils. The author believes that the data contained in Table I illustrates that farmers by and large do not consider soil quality in their management schemes. This does not mean that farmers do not perceive differences in soils, they do. However there are other factors that are more important in land use management than soil quality.

B. Models Based on Farm Enterprise Size.

As the analysis of data from the 76 sampled farms based on Canada Land Inventory, Soil Capability for Agriculture, were not satisfactory, the author chose farm size as a base for further data analyses. The method chosen was to examine the relationship between farm enterprise and farm size. The results of this analyses are shown in Table II.

The analysis of acreage data, cost data, and income data were conducted for seven sizes of farms. Within each size category the data were divided into two groups, one for mixed crop-livestock farms and the other for grain crop farms. In virtually every case either the number in the group was too small to provide meaningful results, or, in the majority of cases, the standard deviations were so great that it was meaningless to compare frequencies of occurrence between different farm sizes. This great variance within groups in illustrated in Table II. As a consequence it can be stated that there is no such thing

TABLE I-A
SOIL CAPABILITY AND LAND-USE (QUARTER SECTIONS) 1970

Sample Subarea		n	Impr-oved.	Unimpr-oved.	Wheat.	Barley.	Oats.	Rape.	Flax.	Grass Seed.	Hay.	Other.	Summer-fallow.
1	$\bar{x}$	28	153.60	6.30	9.46	23.75	0.71	39.60	1.60	5.96	14.46	0.00	58.03
	d		12.26	12.26	21.14	33.39	3.71	37.75	8.35	15.53	34.10	0.00	42.96
2	$\bar{x}$	28	142.60	17.40	8.03	19.46	4.75	23.92	7.25	7.67	6.25	5.35	61.07
	d		24.29	24.29	17.11	28.84	16.00	30.35	15.54	15.09	20.72	21.60	44.12
3	$\bar{x}$	58	148.39	11.61	14.98	12.44	1.96	35.75	4.27	0.00	8.72	8.25	62.43
	d		23.28	23.28	29.12	21.88	7.02	43.41	16.78	0.00	21.11	25.46	47.44
4	$\bar{x}$	61	145.83	14.17	17.01	16.40	2.54	28.67	6.45	1.98	8.04	7.95	56.04
	d		22.96	22.96	27.29	32.18	8.71	38.23	16.57	8.37	16.15	22.56	44.48
5	$\bar{x}$	33	144.30	15.70	7.84	24.48	4.27	27.00	6.81	4.18	2.81	5.24	61.63
	d		18.88	18.88	18.58	32.47	10.24	35.71	20.22	11.77	7.72	14.29	41.68
6	$\bar{x}$	18	146.83	13.17	7.83	9.88	8.94	22.66	2.66	5.27	3.88	7.22	79.00
			17.49	17.49	14.72	23.99	15.44	28.74	8.38	15.13	13.80	16.26	46.33
7	$\bar{x}$	14	123.40	36.60	11.64	12.28	3.21	13.57	1.64	7.28	16.07	2.50	55.21
	d		32.90	32.90	12.42	17.39	7.93	18.26	5.92	15.81	20.37	9.01	26.98
8-A	$\bar{x}$	28	121.00	39.00	6.75	10.75	6.78	16.85	2.92	1.25	27.17	4.28	44.21
	d		43.72	43.72	19.89	19.35	11.59	27.82	5.88	4.50	42.54	9.68	33.39
8-B	$\bar{x}$	16	123.50	36.50	23.81	19.37	4.06	14.87	2.50	0.00	0.00	0.00	58.87
			43.12	43.12	30.40	33.58	11.62	22.89	9.41	0.00	0.00	0.00	39.00

TABLE I-B
SOIL CAPABILITY AND LAND-USE (QUARTER SECTIONS) 1971

Sample Subarea		n	Impro-ved.	Unimpr-oved.	Wheat.	Barley.	Oats.	Rape.	Flax.	Grass Seed.	Hay.	Other.	Summer-fallow.
1	$\bar{x}$	28	154.33	5.67	16.81	27.89	0.89	33.21	1.42	0.42	13.50	3.21	57.64
	d		11.94	11.94	25.27	36.10	4.64	35.93	5.15	2.22	27.21	11.89	45.25
2	$\bar{x}$	29	142.60	17.40	21.55	9.48	4.44	22.82	2.58	6.37	18.44	7.41	41.37
	d		24.29	24.29	26.78	22.33	11.30	38.39	6.90	14.38	35.36	22.30	47.97
3	$\bar{x}$	57	148.18	11.82	16.77	33.27	3.10	31.58	1.68	0.68	9.41	7.68	37.29
	d		23.53	23.53	35.08	43.08	9.68	44.99	12.75	5.20	21.61	23.86	39.66
4	$\bar{x}$	56	145.09	14.91	21.54	23.22	2.19	22.77	3.45	1.66	19.57	10.80	36.87
	d		23.75	23.75	32.17	36.24	8.11	34.06	12.73	7.68	33.93	23.73	38.28
5	$\bar{x}$	32	144.30	15.70	16.00	26.43	7.75	29.56	1.56	4.78	14.62	3.53	38.53
	d		18.88	18.88	28.70	31.89	15.23	37.88	5.78	16.99	24.97	11.52	39.74
6	$\bar{x}$	17	147.28	12.76	9.64	25.52	4.05	39.64	2.35	10.88	2.05	7.35	45.41
	d		16.35	16.35	15.69	38.66	8.19	48.17	6.44	25.91	6.20	17.83	40.38
7	$\bar{x}$	15	123.40	36.60	16.53	16.26	13.20	23.66	1.20	7.33	5.80	1.33	32.26
	d		32.90	32.90	25.76	24.76	17.75	25.01	4.63	14.81	11.44	3.86	27.83
8-A	$\bar{x}$	28	121.00	39.00	9.96	14.00	5.00	17.96	0.78	1.39	30.89	3.32	36.53
	d		43.72	43.72	17.20	19.49	11.79	24.91	3.71	4.25	45.09	6.56	34.11
8-B	$\bar{x}$	17	122.11	37.89	20.58	24.88	10.70	9.41	2.35	0.00	6.76	0.00	48.11
	d		42.22	42.22	44.79	40.15	23.93	21.82	6.44	0.00	27.06	0.00	39.32

TABLE II-A
INCOME - 1970

Size		N	Crop	Livestock	Operator	Family.	Custom.	Lift.	Insurance.	Other	Total.
0-240	$\bar{x}$	1	2307.00	0.00	0.00	0.00	0.00	180.00	0.00	0.00	22487.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	2	2362.50	2866.00	768.00	1250.00	0.00	82.50	0.00	0.00	7329.00
livestock	d		128.50	1234.00	732.00	1250.00	0.00	82.50	0.00	0.00	3170.00
0-400	$\bar{x}$	6	5158.71	0.00	505.71	0.00	150.71	151.28	171.42	0.00	6137.85
crop	d		1360.36	0.00	661.68	0.00	393.17	126.57	447.21	0.00	1947.74
crop &	$\bar{x}$	4	4314.50	2513.75	50.00	0.00	0.00	122.50	0.00	1750.00	8750.75
livestock	d		1549.47	2447.70	50.00	0.00	0.00	164.37	0.00	3031.08	3880.94
401-560	$\bar{x}$	5	9313.40	0.00	144.00	3000.00	0.00	236.00	121.00	0.00	12812.60
crop	d		4264.02	0.00	288.00	4000.00	0.00	238.12	242.00	0.00	7511.54
crop &	$\bar{x}$	15	7501.20	5394.33	345.00	0.00	218.66	138.80	29.33	16.66	13697.33
livestock	d		3882.99	11381.00	669.07	0.00	510.91	206.76	80.28	62.36	11805.87
561-720	$\bar{x}$	7	14000.42	0.00	0.00	1428.57	214.28	82.42	0.00	0.00	15725.71
crop	d		5169.52	0.00	0.00	3499.27	339.87	140.97	0.00	0.00	5956.82
crop &	$\bar{x}$	13	10463.76	1684.30	115.38	0.00	10.76	99.84	7.69	332.30	12714.07
livestock	d		3285.85	1218.78	399.70	0.00	27.33	154.14	26.64	628.23	2801.49
721-880	$\bar{x}$	1	13497.00	0.00	0.00	0.00	0.00	534.00	0.00	0.00	14031.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	10	11794.60	4496.30	262.00	0.00	160.00	76.90	86.20	120.00	16996.00
livestock	d		5366.60	6510.08	510.42	0.00	480.00	141.16	180.82	360.00	8732.79

TABLE II-A
INCOME – 1970 (Continued)

Size.		N	Crop	Livestock.	Operator.	Family.	Custom.	Lift.	Insurance.	Other.	Total.
881-1040	$\bar{x}$	1	17433.00	0.00	0.00	0.00	0.00	550.00	0.00	0.00	17983.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	5	16534.60	2109.20	85.00	1200.00	52.20	378.00	0.00	0.00	20356.80
livestock	d		5668.49	1868.07	170.00	1859.03	98.59	322.99	0.00	0.00	6305.37
1041+	$\bar{x}$	2	40219.50	0.00	0.00	0.00	1500.00	470.00	0.00	0.00	42180.50
crop	d		13253.50	0.00	0.00	0.00	1500.00	470.00	0.00	0.00	14283.50
crop &	$\bar{x}$	4	22009.25	15403.00	180.00	0.00	0.00	353.00	0.00	0.00	37747.25
livestock	d		6470.51	7685.83	311.76	0.00	0.00	303.16	0.00	0.00	9819.28

TABLE II-B
EXPENSES – 1970

Size.		N	Machine.	Crop.	Livestock.	Other.	Debt.	Depreciation.	Interest.	Total.
0-240	$\bar{x}$	1	960.00	655.00	0.00	180.00	0.00	384.00	375.00	2554.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	2	750.00	453.50	1757.00	1246.00	48.00	483.50	624.00	6390.50
livestock	d		250.00	16.50	347.00	638.00	48.00	51.50	79.00	885.50
241-400	$\bar{x}$	6	1150.83	487.16	0.00	503.66	499.83	1208.16	1011.66	5028.00
crop	d		510.06	327.09	0.00	179.73	652.98	731.55	466.55	2260.36
crop &	$\bar{x}$	4	1549.25	530.50	1478.25	499.75	157.00	920.00	1168.75	6293.00
livestock	d		1133.05	229.97	556.82	189.66	271.93	638.57	798.23	3103.60
401-560	$\bar{x}$	5	1598.20	994.40	0.00	635.80	547.60	1629.40	1398.00	7013.80
crop	d		505.75	348.77	0.00	250.08	581.02	552.00	425.72	1626.15

TABLE II-B
INCOME-1970 (Continued)

crop & livestock	$\bar{x}$	15	1917.20	654.46	5203.60	748.40	1209.48	1733.40	1657.80	13012.80
	d		565.45	464.12	9601.10	391.82	1878.36	1251.53	1069.60	13212.61
561-720 crop	$\bar{x}$	7	2393.57	987.28	0.00	1184.14	2042.57	2378.28	1680.14	10379.85
	d		997.53	763.42	0.00	1149.40	2042.57	1415.85	680.62	5382.61
crop & livestock	$\bar{x}$	13	2121.00	681.84	2705.92	821.69	967.84	1617.15	1410.69	9696.92
	d		843.02	450.62	1378.43	444.51	1335.56	873.40	556.92	3121.94
721-880 crop	$\bar{x}$	1	2015.00	1017.00	0.00	1364.00	4509.00	1735.00	1656.00	12876.00
	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop & livestock	$\bar{x}$	10	2145.30	951.30	3215.50	1461.50	1552.40	1998.00	1758.10	12589.00
	d		876.78	649.97	2212.18	485.60	1411.08	850.56	610.72	4150.99
881-1040 crop	$\bar{x}$	1	4500.00	2415.00	0.00	569.00	5696.00	5631.00	4098.00	22909.00
	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop & livestock	$\bar{x}$	5	2684.00	2225.80	4138.60	1359.80	2024.20	1550.80	1685.60	16655.80
	d		1205.26	1596.57	2845.04	1531.48	1610.13	428.86	477.34	7497.98
1040+ crop	$\bar{x}$	2	2625.00	4839.00	0.00	2097.50	280.00	5667.50	3990.00	23699.00
	d		375.00	950.00	0.00	452.50	280.00	57.50	90.00	4150.00
crop & livestock	$\bar{x}$	5	4451.00	3843.25	11144.25	1480.75	4109.50	4766.50	5458.75	35274.00
	d		698.06	3072.74	7477.55	643.98	2294.66	1965.50	2194.99	12895.49

TABLE II-C
ACREAGE-1970 (PERCENTAGE)

Size		n	Impr-oved.	Unimpr-oved.	Wheat.	Barley.	Oats.	Rape.	Flax.	Grass seed.	Hay	Other.	Summer-fallow.
0-240	$\bar{x}$	1	100.00	0.00	16.00	0.00	0.00	0.00	21.00	0.00	0.00	0.00	63.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	2	94.00	5.50	0.00	16.00	4.50	3.50	0.00	14.00	15.00	7.50	34.00
livestock	d		1.50	1.50	0.00	16.00	4.50	3.50	0.00	14.00	15.00	7.50	1.00
241-400	$\bar{x}$	6	89.83	10.17	5.16	14.00	2.33	18.33	1.50	5.33	11.00	0.00	31.33
crop	d		12.26	12.26	5.49	17.43	3.35	9.50	3.35	6.62	13.24	0.00	18.54
crop &	$\bar{x}$	4	92.25	7.75	8.50	15.00	5.50	11.75	1.00	0.00	10.25	1.50	38.75
livestock	d		7.56	7.56	2.50	5.95	6.53	6.09	1.73	0.00	11.09	2.59	11.21
401-560	$\bar{x}$	5	91.80	8.20	1.80	3.60	0.00	27.00	2.80	0.00	8.00	0.00	48.40
crop	d		5.84	5.84	3.60	4.45	0.00	15.92	3.65	0.00	13.63	0.00	19.35
crop &	$\bar{x}$	15	87.53	12.47	8.93	13.26	4.06	12.46	0.93	1.53	7.20	1.33	37.00
livestock	d		12.45	12.45	6.41	10.32	3.61	9.02	1.91	3.24	7.02	2.36	11.48
561-720	$\bar{x}$	7	90.00	10.00	8.14	5.71	0.00	25.42	7.00	3.14	1.71	0.00	38.85
crop	d		6.04	6.04	7.30	4.27	0.00	14.47	7.30	3.68	3.15	0.00	5.48
crop &	$\bar{x}$	13	82.76	17.24	11.53	8.30	3.84	13.46	3.07	2.92	5.38	5.61	30.53
livestock	d		16.02	16.02	12.40	7.06	4.04	11.02	4.27	5.85	8.69	6.15	9.09
721-880	$\bar{x}$	1	92.00	8.00	12.00	0.00	0.00	19.00	0.00	0.00	0.00	0.00	61.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	10	82.70	17.30	6.50	14.10	2.80	12.60	1.90	2.30	1.80	6.60	36.30
livestock	d		16.79	16.79	6.81	9.49	3.15	7.37	2.98	3.22	2.22	10.49	8.95

TABLE II-C
ACREAGE-1970 (PERCENTAGE) (Continued)

Size		n	Impr-oved.	Unipr-oved.	Wheat.	Barley.	Oats.	Rape.	Flax	Grass Seed.	Hay.	Other.	Summer-fallow.
881-1040	$\bar{x}$	1	93.00	7.00	0.00	0.00	5.00	36.00	3.00	0.00	0.00	0.00	49.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	5	90.40	9.60	8.20	9.20	0.80	21.00	0.00	3.00	9.00	3.80	35.40
livestock	d		11.20	11.20	3.96	8.13	1.73	6.54	0.00	6.00	9.54	2.99	14.54
1040+	$\bar{x}$	2	99.50	0.50	7.00	8.00	0.00	21.50	8.00	4.00	4.00	0.00	47.00
crop	d		0.50	0.50	0.00	3.00	0.00	10.50	8.00	4.00	0.00	0.00	1.00
crop &	$\bar{x}$	5	89.50	10.50	5.00	13.75	1.75	12.50	2.50	1.00	10.75	6.00	35.75
livestock	d		4.92	4.92	5.43	5.26	2.04	2.29	1.50	1.73	6.45	4.24	8.34

TABLE II-D
ACREAGE-1971 (PERCENTAGE)

Size		n	Impr-oved.	Unipr-oved.	Wheat.	Barley.	Oats.	Rape.	Flax	Grass Seed.	Hay.	Other.	Summer-fallow.
0-240	$\bar{x}$	1	100.00	0.00	16.00	9.00	0.00	0.00	19.00	16.00	0.00	0.00	41.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	2	94.50	5.50	2.00	23.50	15.00	0.00	0.00	0.00	6.50	25.00	24.50
livestock	d		1.50	1.50	2.00	23.50	15.00	0.00	0.00	0.00	6.50	25.00	5.50
241-400	$\bar{x}$	6	89.83	10.17	13.16	11.66	1.83	22.33	0.00	8.50	3.50	1.00	33.00
crop	d		12.26	12.26	13.50	9.90	4.10	14.93	0.00	9.46	5.15	2.23	20.98
crop &	$\bar{x}$	4	92.25	7.75	14.75	12.00	7.00	8.50	0.00	0.00	15.00	3.00	30.75
livestock	d		7.56	7.56	6.45	5.85	7.84	7.08	0.00	0.00	21.10	3.00	8.55
401-560	$\bar{x}$	5	93.00	7.00	7.50	16.66	0.00	29.33	0.00	0.00	5.33	0.66	35.00
crop	d		5.56	5.56	8.15	3.71	0.00	11.50	0.00	0.00	9.86	1.49	9.32

TABLE II-D
ACREAGE-1971 (PERCENTAGE) (Continued)

crop &	$\bar{x}$	15	88.33	11.66	13.46	13.80	7.53	9.86	1.13	1.06	8.60	5.00	29.93
livestock	d		12.83	12.83	8.44	10.86	5.02	9.90	2.39	2.29	10.71	6.82	12.97
561-720	$\bar{x}$	7	90.00	10.00	12.83	4.83	0.50	25.83	0.83	7.16	2.33	0.00	34.83
crop	d		6.04	6.04	6.72	6.32	1.11	13.02	1.86	7.56	3.20	0.00	12.96
crop &	$\bar{x}$	13	83.26	16.74	13.86	13.86	3.60	11.46	2.46	1.93	7.86	4.13	24.13
livestock	d		15.06	15.06	10.71	11.46	4.58	9.17	4.81	4.40	10.79	4.59	9.77
721-880	$\bar{x}$	1	92.00	8.00	11.00	17.00	0.00	36.00	0.00	0.00	10.00	0.00	18.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	10	83.90	16.10	9.09	17.27	2.18	13.81	0.36	2.09	6.90	3.63	29.09
livestock	d		16.49	16.49	6.08	9.30	2.55	10.97	1.15	2.64	5.98	4.94	12.68
881-1040	$\bar{x}$	1	93.00	7.00	9.00	7.00	0.00	29.00	5.00	0.00	0.00	0.00	43.00
crop	d		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
crop &	$\bar{x}$	2	82.00	18.00	7.00	8.00	2.50	13.50	0.00	8.00	4.00	4.00	34.00
livestock	d		14.00	14.00	7.00	8.00	2.50	13.50	0.00	8.00	4.00	4.00	18.00
1041+	$\bar{x}$	2	99.50	0.50	10.00	23.00	1.50	28.50	5.50	12.50	7.50	0.00	11.00
crop	d		0.50	0.50	4.00	8.00	1.50	7.50	5.50	12.50	7.50	0.00	1.00
crop &	$\bar{x}$	4	89.50	10.50	12.75	16.50	1.00	18.50	0.00	0.25	12.50	7.75	20.25
livestock	d		4.49	4.49	3.76	5.40	1.22	7.22	0.00	0.43	4.27	3.34	6.83

as an "average farm" in this area. There are farms that could be considered "representative" of farms in the area but there are no "average" farms. However, in order to assess a net return to the land, the net return for each unit was calculated, and is shown in Table II. Of the 76 sample farms from the Carrot River-Arborfield area only 25 farms had a positive net income and 51 had net incomes of zero or a negative value. In the calculation of crop incomes the author used the farmer's long term average yields instead of the actual yields for that year. Actual yields experienced during 1970 were less than the long term average, and if the actual yields had been used by the author the positive net incomes would have been fewer.

In the author's opinion the major reason for the small number of positive net incomes and the lack of meaningful averages is the difference in managerial ability. There is no evidence that the length of time a farm has become established is significant in this area. Of the 23 farms established prior to 1946 only 5 had a positive net income. Of the 35 established between 1946 and 1956 only 14 had a positive net income, and of the 18 farms established after 1956 there were only 6 with a positive net income. Therefore, time does not aid in removing the marginality of these units.

C. Farms in the Cracking River Project.

Of the 29 lease units in the Cracking River Project the author was able to gather accurate farm budget data on 26 leases. Of the 26 leases, only 1 had a positive net income and 25 had negative net incomes, assuming average yields. Several problems become very apparent from observations made while doing field work in the Cracking River Project and from the data that were collected by the author. The most serious problem is the slow rate of development of land that has been cleared and broken. For example, by April 1, 1970 there had been 6,632 acres cleared and broken in the Cracking River Project. However, only 3,645 acres were actually under cultivation and of this 776 acres were being summerfallowed leaving only 2,869 acres in crop. As a consequence there were at least 2,987 acres remaining to be worked down during the 1970 crop season. Of these 2,987 acres, 1,273 acres had been broken in 1968 and 1,714 acres had been broken in 1969. Of the 3,645 acres under cultivation in 1970, 3,475 acres had been developed in 1967 and 170 in 1968. By April 1, 1971, 8,063 acres had been cleared and broken but only 5,441 acres were under cultivation and of these only 4,586 acres were in crop, while 865 acres were being summerfallowed. There were 2,622 acres remaining to be worked down and of these 1,431 acres had been broken in 1970 and 1,191 acres had been broken in 1969. During 1970, 1,273 acres broken in 1968 were worked down and 623 acres broken in 1969 were worked down. The development of land that had been cleared and broken was 1,273 acres behind schedule in 1970 and 1,191 acres behind schedule in 1971. There are two main reasons for this delay. First, heavy rains in the Cracking River Project area during 1968, 1969 and 1970 seriously hampered the working down activities. Second, cost per acre for working down is estimated by the author to be $28.18 per acre. The cash cost of developing a unit of over 400 cultivated acres will be greater than $11,000. As a consequence a number of farmers have already been financially exhausted and are unable to continue working down operations. Yet, these farmers do not have an economically viable farm as is indicated by their negative net returns. There are a large number of farmers in the project who have income from other sources be they off farm income or income from other farms. These farmers with outside sources of income may succeed in completing the establishment of their farms, the other farmers may well not be successful.

D. Costs of the Development Projects.

1. The Saskatchewan River Delta Project.

(a) Road Building and Drainage Costs.

Road building and drainage costs cannot be calculated from Cut Beaver cost figures. As the Cut Beaver Project is experimental, it does not necessarily duplicate future development methods in the Delta area. For the purposes of this study the author will use the same road building and drainage cost figures used by the S.R.D.D.C. The total cost of providing roads, drains and dykes is estimated by the S.R.D.D.C. at $3,538,200.[1]

(b) Operating and Maintenance Costs.

The annual operating and maintenance costs for the Delta Project have been estimated at $1.39 per acre, this gives a yearly total of $125,565. The present value of the operating and maintenance

[1] S.R.D.D.C., An Evaluation of the Development Potential of the Saskatchewan River Delta Area, 1967, p.55.

costs for 50 years discounted at 6 per cent equals ($125,565) (15.762) or $1,979,100.

(c) Land Development Costs.

These costs are based on those of the Cut Beaver Project.

i. Timber Clearing Costs.

Timber clearing costs can vary greatly in this project, according to the size and density of timber to be removed. In the project average clearing costs are $35[1] per acre with a range of $10 to $40 per acre.[2] Langley has identified three vegetative cover patterns on the more elevated lands near the Cut Beaver Project and has estimated clearing costs for each of these areas.[3] Levee areas heavy with large Black Poplar and tall willow growth would cost approximately $40 to $50 per acre to clear. Cover around old natural drains with fairly heavy tall willow would cost $20 to $30 per acre to clear. Areas covered by a sparse growth of the short Arctic Dwarf or Beaked Black Willow would cost $0 to $10 per acre to clear.

Future timber clearing costs in either the Cut Beaver Project or the proposed Delta Project will vary depending on where the future developments are sited. The most probable areas for future development are the levee areas. The two major vegetation types on the levees are the White Spruce - Hardwoods Forest and a Tall Willow - Alder Shrub

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[1] Wilson, E.H. Personal Communication, Oct.3, 1972.

[2] Langley, F. Cut Beaver Report, Jan. 31, 1971, p.2

[3] Ibid., p.4.

complex. As estimated previously by Langley, clearing of the White Spruce - Hardwoods Forest would cost $40 to $50 per acre, and clearing of the Tall Willow - Alder Shrub would cost $20 to $30 per acre. For fen peat areas covered with Medium Willow Shrub the author estimates the costs of clearing would be approximately $10 to $30 per acre. Expansion into areas of Bog Birch Shrub would as estimated by Langley, cost $0 to $10 per acre for clearing.

ii. Breaking Costs.

After timber removal the former forest floor is ploughed. Ploughing is carried out using three types of ploughs: the moldboard breaking plough, the rome disc plough, and the rotary plough. Costs of ploughing vary with the type of plough used.

In 1969 K.E. Bowren of the Melfort Research Station conducted a Breaking and Packing Study[1] at Cut Beaver. The cost per acre for breaking was $12 per acre using the moldboard plough, $10 per acre using the rome disc plough, and $15 per acre using the rotary plough. The Conservation and Development Branch[2] has estimated, for the author, cost figures of $20 per acre for rotary ploughing and $18.50 per acre for a combination of moldboard ploughing and one application of a lightweight rome plough to work down the broken furrows. Of the $18.50 the author would allot $12 per acre for moldboard ploughing and $6.50 per acre for working down with the rome plough. Langley[3] has

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1 Bowren, K.E. Cut Beaver Project: Breaking and Packing Study, March 29, 1971, p.3.

2 Wilson, E.H. op.cit.

3 Langley, F. Personal Communication, June 15, 1971.

calculated, on the basis of the rotary ploughing of 340 acres at Cut Beaver, that the cost per acre of rotary ploughing is $15.85.

From these data the author would estimate that the "average" costs of ploughing at Cut Beaver are $12 per acre for moldboard ploughing, $10 per acre for rome disc ploughing, $15.85 per acre for rotary ploughing, and $6.50 per acre for working down moldboard ploughing with a rome disc plough.

iii. Working Down Costs.

Following the ploughing of the former forest floor the ploughed ground is disced, cultivated, and harrowed to create a smooth surface suitable for seeding. The kind and amount of working down depends upon the future use of the land.

Basically, there are four types of tillage operations that can be used in working down the ploughed surface. These are rome ploughing on moldboard plough breaking, discing using a rome discer, cultivating using a deep tillage cultivator, and harrowing. After moldboard ploughing the first tillage is done with a rome plough to work down the furrows. Bowren found the cost for this to be $10[1] per acre and the author has estimated $6.50[2] per acre when done by the Conservation and Development Branch. For discing, Bowren found the cost to be $2.03[3] per acre per application, under dry weather conditions.

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[1] Bowren, K.E., op.cit., p.3.

[2] Ibid., p.3.

[3] Ibid., p.3.

Langley has calculated the cost of rome discing on some 1,460 acres, under wet weather conditions, to be \$3[1] per acre per application. Bowren has estimated the costs of cultivating and harrowing from the Guide to Farm Practice in Saskatchewan as \$1[2] per acre for cultivating and \$0.50[3] per acre for harrowing.

iv. Root and Wood Debris Removal.

On the Cut Beaver Project root removal has been carried out by mechanical root raking and by hand picking. Mechanical root raking has been carried out using a Dika drum type root rake and a Wade wheel type root rake. The C. & D. Branch has estimated costs of root raking at \$5 per acre per application for the Dika drum rake and \$2.75 per acre per application for the Wade wheel rake.[4] Bowren's cost estimates for Cut Beaver were \$2.58 per acre per application for the Dika drum rake and a contract cost of \$4 per acre per application for the Wade wheel rake.[5]

Root picking by hand has been carried out in the project during inclement weather. Removal of raked windrows during the fall of 1969 and the summer of 1970 was effected by using a tractor

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1 Langley, F., Personal Communication, June 15, 1971.

2 Bowren, K.E., op.cit., p.3.

3 Ibid., p.3.

4 Wilson, E.H., op.cit.

5 Bowren, K.E., op.cit., p.3.

and rack at a cost of $5 to $15 per acre, depending on the original amount of tree cover.[1] Removal of the raked windrows by tractor and rack, to piles, was necessary because the wet weather conditions experienced during 1969 and 1970 prevented removal of the windrows by the normal practice of burning.

Bowren gives a cost figure of $5[2] per acre for the combined job of hand root picking and the removal of raked windrows Langley gives a cost figure for the same operations of $8.50 per acre on moldboard ploughed land, $6.50 per acre on rome disc ploughed land, and $2.50 per acre on rotary ploughed land.[3] Langley also gives a figure of $4.92 per acre for the removal of wood debris from 1,800 acres.[4]

v. Costs of Land Development.

As can be seen from the preceeding sections on development costs a wide range of costs exists. The author has organized these costs in the following tables to illustrate what the total costs of development are for the various methods of development and for various land uses. These costs, exclude road building costs, drainage costs, and land clearing costs. They only refer to the costs of breaking, working down, and root raking and wood debris removal costs.

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1 Langley, Cut Beaver Report, Jan.31, 1971, p.5.

2 Bowren, K.E., op.cit., p.3.

3 Langley, F., Cut Beaver Report, Jan.31, 1971, p.5.

4 Langley, F., Personal Communication, June 15, 1971.

TABLE III

BREAKING AND PACKING COSTS STUDY BY K.E. BOWREN[1]

		Method of Breaking		
		Moldboard Plough $ per acre	Rome Disc Plough $ per acre	Rotary Plough $ per acre
Breaking		12.00	10.00	15.00
Operation	Implement			
1st Tillage	Rome Plough	10.00	-	-
1st Tillage	Rome Disc	-	2.03	2.03
2nd Tillage	Rome Disc	2.03	2.03	-
2nd Tillage	Drum Root Rake	-	-	2.58
3rd Tillage	Drum Root Rake	2.58	2.58	-
3rd Tillage	Wheel Root Rake	-	-	4.00
4th Tillage	Wheel Root Rake	4.00	4.00	4.00
5th Tillage	Wheel Root Rake	4.00	4.00	-
Picking Roots		5.00	5.00	5.00
Cultivating		1.00	1.00	1.00
Harrowing		0.50	0.50	0.50
Total Cost of Work				
Done - $/acre		41.11	31.14	33.11

A unit of land that has been developed in this manner is suitable for the production of grain and forage crops or for improved pasture.

TABLE IV

BREAKING, WORKING DOWN, ROOT REMOVAL COST ESTIMATES BY FRED LANGLEY[2]

		Method of Breaking		
		Moldboard Plough $ per acre	Rome Disc Plough $ per acre	Rotary Plough $ per acre
Breaking		12.00	10.00	15.00
Operation	Implement			
1st Tillage	Rome Plough	10.00	-	-
1st Tillage	Rome Disc	-	2.03	2.03

[1] Bowren, K. op.cit.

[2] Langley, F. op.cit.

2nd Tillage	Rome Disc	2.03	2.03	-
3rd Tillage	Drum Root Rake	2.58	2.58	-
3rd Tillage	Wheel Root Rake	-	-	4.00
4th Tillage	Wheel Root Rake	4.00	4.00	-
5th Tillage	Wheel Root Rake	4.00	4.00	-
Picking Roots		8.50	6.50	2.50
Harrowing		.50	.50	.50
Total Cost of Work done- $/acre		44.61	31.64	25.03

As with the methods used in Bowren's study, this land is suitable for grain and forage crop production or for improved pasture.

In the following table, Table V, the author has calculated total costs using minimum cost figures contained in this section on the Cut Beaver Project, and using the same operations as contained in Fred Langley's estimates in Table IV.

TABLE V

MINIMUM COST ESTIMATES

		Method of Breaking		
		Moldboard Plough $ per acre	Rome Disc Plough $ per acre	Rotary Plough $ per acre
Operation	Implement			
Breaking		12.00	10.00	15.00
1st Tillage	Rome Plough	6.50	-	-
1st Tillage	Rome Disc	-	2.03	2.03
2nd Tillage	Rome Disc	2.03	2.03	-
3rd Tillage	Drum Root Rake	2.58	2.58	-
3rd Tillage	Wheel Root Rake	-	-	2.75
4th Tillage	Wheel Root Rake	2.75	2.75	-
5th Tillage	Wheel Root Rake	2.75	2.75	-
Picking Roots		8.50	6.50	2.50
Harrowing		0.50	0.50	0.50
Total Cost of Work Done - $/acre		36.61	29.14	22.78

This land would also be suitable for grain and forage production or for improved pasture.

In the summer of 1971, during a visit to the Cut Beaver Project, Mr. Langley discussed with the author various methods for developing land for improved pasture. It was Mr. Langley's opinion, with which the author entirely agrees, that the cheapest way to develop such pasture is to break the soil using a rotary plough. Such ploughing would shred the roots into relatively small sizes (not over one inch in diameter and one foot in length) which when left on the surface would affect machine operation for grain and forage crops but would not be detrimental for pasture seeding.[1] Thus the only land preparation would be the rotary ploughing at a cost of $15[2] per acre, $15.85[3], or $20.00 per acre.

For the purposes of this study the author will use the cost figure of $66.64 per acre for the total land development cost. This figure represents the $35[4] per acre average timber clearing cost for the Cut Beaver Project. To this clearing cost is added $31.64, the cost figure estimated by Langley for rome ploughing, discing, root raking, wood debris removal, and harrowing. The present value of land development costs discounted at 6 per cent is equal to (90,595) (66.64)(3.465) or $5,236,065.

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1 Langley, F., <u>Cut Beaver Report</u>, Jan.31, 1971, p.4.

2 Bowren, K.E. <u>op.cit</u>., p.3.

3 Langley, F., <u>Personal Communication,</u> June 15, 1971.

4 Wilson, E.H., <u>op.cit</u>.

(d) Alternate Value Costs.

i. Wildlife.

The wildlife estimates of the S.R.D.D.C. and those by the author do not include a value for fur bearers that will not be harvested due to agricultural development in the delta. The estimates of moose that will not be killed by recreation hunters has been revised from the 100 per year of the S.R.D.D.C.'s report for the author by H.J. Dirschl[1] of the Canadian Wildlife Service to 200 moose per year at a value of $150 per moose. Discounted at 6 per cent for 50 years the present value of this alternate cost is equal to ($30,000) (15.762) or $472,860.

ii. Timber.

The amount of timber revenue lost has been estimated by the Saskatchewan Forestry Branch at $1,105 per year. Discounted at 6 per cent for 50 years the present value of the timber net revenue lost is equal to ($1,105)(15.762) or $17,420.

2. The Cracking River Project.

(a) Road Building and Drainage Costs.

Exact road building and drainage costs have been obtained by the author from the Conservation and Development Branch.[2] The

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1 Dirschl, H.J., Personal Communication, December 15, 1970.

2 Moen, P.O., Personal Communication, Oct.3, 1972.

author has calculated the per acre cost for each service on the basis of there being 13,040 cultivable acres in the project.

Generally throughout Western Canada, field drainage is provided by roadside ditches. In the Smoky Burn, Pasquia Hills, and Cracking River areas such roadside drainage is not sufficient. In the Cracking River Project two auxiliary drainage ditches are needed at an approximate cost of $85,000 to serve approximately 13,040 acres. The approximate cost per acre of additional drainage in the Cracking River Project is $6.36.

In the Cracking River Project the cost of constructing approximately 21 miles of road with adjacent drains has been approximately $349,000. This would give a cost figure of $26.76 per acre for road building costs when the project is fully developed.

Total cost of road building and drainage in the Cracking River Project is $434,000, that is, a cost per acre when the 13,040 acres are fully developed of $33.12.

(b) Operating and Maintenance Costs.

Estimates of annual operating and maintenance costs for the project have been estimated for the author by the Conservation and Development Branch.[1]

Annual costs of operating and maintenance for the 7.5 miles of ditches at $200 per mile would be $1,500. Annual costs for 21 miles of roads at $350 per mile will be $7,350. The total annual cost of operating and maintaining roads and drains for the whole project is $8,850. The total annual cost per acre for 13,040 acres is $0.88.

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[1] Moen, P.O. op.cit.

The present value of operating and maintenance costs, discounted at 6 per cent for 50 years, is equal to (8,850) (15.762) or $139,494.

(c) Costs of Land Development.

i. Timber Clearing Costs.

Between April 1, 1971 and March 31, 1972 the allowance made by the Lands Branch of the Saskatchewan Government for clearing on the Cracking River Project was $20 per acre.[1] After April 1, 1972, a new policy statement raised the allowance paid for clearing to $25 per acre.[2] These figures have been used in calculating the costs of land development.

ii. Breaking Costs.

The price of ploughing the former forest floor after clearing is $10 per acre. This price was in effect both prior to and after April 1, 1972 under the Lands Branch's Crown Land Clearing and Breaking Payment Policy.[3]

iii. Working Down Costs.

For these costs, the author uses the cost data from the Cut Beaver Project as discussed previously in this chapter. Using as an index the costs for working down rome ploughed land, as experienced by Langley the following should be the cost of working down broken

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[1] Saskatchewan Dept. of Agriculture, Clearing and Breaking Policy, April, 1971.

[2] Ibid., April 1, 1972.

[3] Ibid.

ground in the Cracking River Project. Median number of discings was 6. The cost per discing is $2.03[1] for a total of $12.18 per acre. Normally the land was root raked twice using a Wade wheel type rake at a cost of $4 per[2] application for a total cost of $8 per acre. Wood debris removal was found by Langley to be $6.50 per[3] acre when rome ploughed. Bowren found the combined cost of cultivating and harrowing to be $1.50 per acre.[4] Thus the total cost of working down the breaking is $28.18 per acre.

iv. Total Land Costs.

Total land development costs prior to April 1, 1972 were $58.18 per acre; and after April 1, 1972 were $63.18 per acre. The author assumes that it will take a total of 9 years to completely develop the Cracking River Project. The land development rates for the first 5 years are equal to the actual amounts of land cleared and broken for the years 1967, 1968, 1969, 1970 and 1971. For the sixth year, 1972, the figure of 944 acres represents the difference between the amount of land cleared and the amount of land broken as of April 1, 1972. The remaining 2,899 acres are developed in years 7, 8, and 9 at the rate of 966 acres per annum. The present value of land development costs for the 13,040 acres in the Cracking River Project is $622,646.

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[1] Bowren, K.E. op.cit.

[2] Ibid.

[3] Langley, F., Cut Beaver Report, Jan.31, 1971, p.4.

[4] Bowren, K.E., op.cit.

E. Benefits From Development.

1. The Saskatchewan River Delta Project.

(a) Residual Land Value.

The residual land value is equal to the amounts spent on land development and dyking. The present value of the residual land value, discounted at 6 per cent for 50 years, is equal to ($6,943,277) (.0543) or $391,778. This value is based on a cost of $79.64 per acre for 90,595 acres.

(b) Net Return Per Acre.

The estimates of the direct net returns to the land vary for this project. Of the 76 established farms sampled, only 25 had a positive net return to the land. The mean value of these 25 was +$7.45 per acre. By taking the sum of all the positive net returns and dividing it by 76 the mean was +$2.45 per acre. However, to be realistic, the values of the net return to the land for all the 76 farms in the sample must be used to get the real net return to the land. This value is a mean of -$4.31 per acre. This negative mean net return to land indicated that in fact this area needs to be subsidized.

Taking as an example the net return to land of +$7.45, the present value of the stream of benefits discounted at 6 per cent for 50 years is +$8,337,917. If the net return per acre is +$2.45 the present value is +2,742,080. If the net return per acre is -$4.31 the present value is -$3,699,928.

(c) Timber Net Revenue.

As estimated by the Saskatchewan Forestry Branch, Department of Natural Resources the annual net return on timber harvested during the first 4 years would be $211,217 per year. The present value of $211,217 for four years at 6 per cent is $731,870.

2. The Cracking River Project.

(a) Residual Land Value.

In the Cracking River Project the author has calculated the residual land value based on the costs of clearing, breaking and working down. Development of the total project would give a residual land value, discounted at 6 per cent for 50 years, equal to (622,646) (.0543) or $33,810.

(b) Net Return Per Acre.

The Cracking River farm units are based upon the potential of the unit to have approximately 500 cultivated acres or more. This is the equivalent of a one section farm (640 acres, 259 hectares). From the 76 farms sampled in the adjacent area, 20 were of the section size. Of these 20, only 8 farms had a positive net return to land and the mean value of these 8 was +$4.54 per acre. Taking the sum of all the positive net returns and dividing them by 20 mean value was +$1.81 per acre. The real net return to land based upon the sum of all the net returns for all 20 farms had a mean value -$1.53 per acre.

F. Benefit:Cost Ratios.

1. Ratios Based on Net Return to the Land.

(a) The Saskatchewan River Delta Project.

The following three benefit:cost ratios are based on a discount rate of 6 per cent and a time period of 50 years.

i. Ratio based on a net return of +$7.45 per acre.

Costs:

Initial Capital Costs:

Year 0	= $3,538,200

Land Development Costs:

Years 1-4 22,649 acres/year @66.64 = (90,595) (66.64) (3.465)	= 5,236,065

Operating and Maintenance:

Years 1-50 $125,565 (15.762)	= 1,979,100

Alternate Value Foregone:

Moose, Years 1-50 (200 Killed annually @$150=$30,000) = $30,000 (15.762)	= 472,860
Timber Net Revenue lost per year for 50 years	
=$1,105 (15.762)	= 17,420
Present Value of Total Agricultural Development Costs	$11,243,645

Benefits:

Residual Land Value:

Permanent improvements of clearing, breaking, dyking @$79.64/acre. =$6,943,277 (.0543)	= $391,778

Net Return to Land:

Year 2 22,649 @ 1/4 potential =22,649(.25) ($7.45) =42,184 (0.8900)	= 37,544
Year 3 22,649 @ 1/4 potential 22,649 @ 1/2 potential = 42,184 + 84,368 =126,552 (0.8396)	= 106,253
Year 4 22,649 @ 1/4 potential 22,649 @ 1/2 potential 22,649 @ 3/4 potential = 42,184 + 84,368 + 126,552 =253,104 (0.7921)	= 200,484

Year 5 22,649 @ 1/4 potential
22,649 @ 1/2 potential
22,649 @ 3/4 potential
22,649 @ full potential
= 42,184 + 84,368 + 126,552 + 168,736
=421,840 (0.7473) = 315,241

Year 6 22,649 @ 1/2 potential
22,649 @ 3/4 potential
45,298 @ full potential
= 84,368 + 126,552 + 337,472
=548,392 (0.7050) = 386,616

Year 7 22,649 @ 3/4 potential
67,947 @ full potential
=126,552 + 506,208
=632,760 (0.6651) 420,849

Year 8-50 90,595 @ full potential
=674,944 (15.762-5.582) =$6,870,930

Net Returns from Lumber:

211,217 (3.465) = $731,870

Present Value of Total Benefits $9,461,585

Benefit:Cost Ratio: = $\frac{\$9,461,585}{11,243,645}$ =+ 0.84

ii. Ratio based on a net return of + $2.45 per acre.

Costs: $11,243,645

Benefits: $3,865,748

Benefit:Cost Ratio = $\frac{\$\ 3,865,748}{11,243,645}$ = +0.34

iii. Ratio based on a net return of - $4.31 per acre.

Costs: $11,243,645

Benefits: - $ 3,699,928

Benefit:Cost Ratio: = $-\frac{\$\ 3,699,928}{11,243,645}$ = -0.32

The following two benefit:cost ratios are based on a net return to the land of +$7.45 per acre and discount rates of 5 and 7 percent respectively for a time period of 50 years.

iv. Ratio based on an interest rate of 5 percent.

Costs: $11,750,248

Benefits: $10,527,148

Benefit:Cost Ratio: $= \frac{\$10,527,148}{11,750,248} = +0.89$

v. Ratio based on an interest rate of 7 percent.

Costs: $10,812,500

Benefits: $ 8,037,624

Benefit:Cost Ratio: $= \frac{\$\ 8,037,624}{10,812,500} = +0.74$

vi. Conclusions:

All benefit:cost ratios show that this project is not feasible.

(b) The Cracking River Project.

The following three benefit:cost ratios are based on a discount rate of 6 per cent and a time period of 50 years.

i. Ratio based on a net return of +$4.54 per acre.

Costs:

Initial Capital Costs: road building and drainage:

Year 0 (1966)	= 434,000

Land Development Costs:

Year 1 (1967) - 3475 acres @ $58.18 = (3475) (58.18) (.9493)	= 191,925
Year 2 (1968) = (1443) (58.18) (.8900)	= 74,719
Year 3 (1969) = (1714) (58.18) (.8396)	= 83,725
Year 4 (1970) = (1431) (58.18) (.7921)	= 65,947
Year 5 (1971) = (1135) (58.18) (.7473)	= 49,347

Year 6 (1972) = (944) (63.18) (.7050)	=	42.048
Year 7 (1973) = (966) (63.18) (.6651)	=	40,519
Year 8 (1974) = (966) (63.18) (.6274)	=	38,291
Year 9 (1975) = (966) (63.18) (.5919)	=	36,125
Operating and Maintenance Costs:		
Year 1-50 = ($8,850) (15.762)	=	139,494
Total Costs of Development:		1,196,140
Benefits:		
Residual Land Value: (622,646) (.0543)	=	$ 33,810
Net Return to Land:		
Year 2 (3475) (4.54) (.890)	=	14,041
Year 3 (4918) (4.54) (.8396)	=	18,746
Year 4 (6632) (4.54) (.7921)	=	23,850
Year 5 (8063) (4.54) (.7473)	=	27,356
Year 6 (9208) (4.54) (.7050)	=	29,440
Year 7 (10,142) (4.54) (.6651)	=	30,624
Year 8 (11,108) (4.54) (.6274)	=	31,640
Year 9 (12,074) (4.54) (.5919)	=	32,057
Years 10-50 (13040) (4.54) (15.762-6.802)	=	530,446
Total Benefits:		$772,010

Benefit:Cost Ratio: $= \frac{\$\ 772,010}{1,196,140} = +0.64$

ii. Ratio based on a net return of + $1.81 per acre.

Costs: $1,196,140

Benefits: $328,269

Benefit:Cost Ratio: $= \frac{328,269}{\$1,196,140} = +0.27$

iii. Ratio based on a net return of - $1.53 per acre.

Costs: $1,196,140

Benefits: - $215,098

Benefit:Cost Ratio: $= \frac{-\$\ 215,098}{\$\ 196,140} = -0.17$

iv. Conclusions.

All benefit:cost ratios show that this project is not feasible.

2. Ratios Based on Economic Rent.

(a) The Saskatchewan River Delta Project.

"Economic rent refers to the net value of the returns generated by production on a given piece of land in a given time period. It is similar to net income in that it represents the residual remaining after all costs of production (except the cost of land) are subtracted from the gross income. But it is different in that all costs of production must be calculated at their full economic value. That is, the cost of an input must represent not only the cash value paid by the operator, but must take into account the value that the input might gain in alternate uses. The highest value that could be achieved in any of the alternate uses is the 'opportunity cost' of the input; and in calculating economic rent, each input must be charged with its maximum value, whether that arises in the production process currently undertaken or in some process providing the input with an opportunity cost".[1]

In the calculation of the benefit:cost ratios based on economic rent, the discount rate used was 6 per cent and a time period of 50 years. The benefits are based upon the residual land value, timber income, and the economic rent of the 76 Carrot River-Arborfield sample farms. Of these 76 farms only 19 had a positive economic rent and 57 had economic rents of zero or a negative value. Of the 19 farms with a positive economic rent the mean economic rent was + $8.40. By taking the sum of all the positive economic rents and dividing it by 76 the mean was + $2.10. To be realistic, all the values for economic rent for all 76 farms were used to get the real economic rent, this value is -$5.89.

The costs of the Delta Project were likewise calculated at their full value. Counted into the total costs of production were the opportunity costs arising from investing the $8,774,265 in capital costs at a 6 per cent interest rate. The total costs of agricultural development, including the opportunity costs, are $140,769,345.

i. Ratio Based on an economic rent of +$8.40 per acre.

Costs: $140,769,345

Benefits: $10,524,755

Benefit:Cost Ratio: $\frac{\$\ 10,524,755}{140,769,345} = +0.07$

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[1] Found, W.C., A Theoretical Approach to Rural Land-Use Patterns, 1971, p.20.

ii. Ratio based on an economic rent of +$2.10 per acre -

Costs: $140,769,345

Benefits: $3,473,974

Benefit:Cost Ratio: $\frac{\$\ 3,473,974}{\$140,769,345}$ = +0.02

iii. Ratio based on an economic rent of -$5.89 per acre -

Costs: $140,769,345

Benefits: -$7,715,669

Benefit:Cost Ratio: $-\frac{\$\ 7,715,669}{\$140,769,345}$ = -0.05

iv. Conclusions.

All benefit:cost ratios show that this project is not feasible.

(b) The Cracking River Project:

The following three benefit:cost ratios are based on discount and interest rates of 6 per cent and a time period of 50 years.

i. Ratio based on an economic rent of +$7.36 per acre.

Costs: $17,228,348

Benefits: $1,231,133

Benefit:Cost Ratio: $\frac{\$\ 1,231,133}{\$17,228,348}$ = +0.07

ii. Ratio based on an economic rent of +$1.47 per acre.

Costs: $17,228,348

Benefits: $272,958

Benefit:Cost Ratio: $\frac{\$\ 272,958}{\$17,228,348}$ = +0.01

iii. Ratio based on an economic rent of -$2.90 per acre.

Costs: $17,228,348

Benefits: -$471,786

Benefit:Cost Ratio: $\frac{-\$\ 471,786}{\$17,228,348} = -0.02$

iv. Conclusions.

All benefit:cost ratios show that this project is not feasible.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

A. The Saskatchewan River Delta Project.

The author has shown in this study that the agricultural development proposals of the proposed Saskatchewan River Delta Project are not economically feasible. The fact that agricultural development in this area is not feasible is illustrated by the negative mean net return to land, the negative mean economic rent, the negative benefit: cost ratios, the economic significance of the bio-physical environment, and the location of the Margin of Transference.

The author recognizes that the Department of Agriculture has a considerable investment in the Cut Beaver Forage Project. As future large scale agricultural development in the Delta is not feasible the problem of what to do with the Cut Beaver Project remains to be solved. It is the author's opinion that the Cut Beaver Project be integrated with the Cumberland House Farm Project, and that it be used as pasture for the Cumberland House Farm. The major obstacle to such integration is the distance between the two projects, some 35 miles, which presents problems in the transport of products from one site to the other.

B. The Cracking River Project.

As with the Saskatchewan River Delta Project, the Cracking River Project is not economically feasible. This is illustrated by the negative mean net return to land, the negative mean economic rent, the negative benefit:cost ratios, the economic significance of the bio-physical environment, and the location of the Margin of Transference.

However, this area has been opened to development and farm units have been established in this area. Given the marginal nature of this project considerable effort will be required by both the farm operators and the Department of Agriculture to make these units economically viable. The author recommends that units in the project that are physically marginal and have been given up by the lessee be abandoned. Units that are physically suitable for sustained crop production and have been given up by the lessee, should be given to another lessee within the project who is capable of operating the increased acreage. In this way, the number of marginal units within the Project should eventually be reduced. In the future, no further projects such as Cracking River should be started.

C. The Development of Leased Lands in the Study Area.

As mentioned previously in Chapter Two, the provincial Government has a policy of leasing undeveloped quarter sections to local farmers to enable them to have economic farm units.

The author believes that the policy of leasing these undeveloped quarter sections is undesirable, for individual farm units land holdings become fragmented. As these undeveloped quarter sections are generally the furthest away from the farm centre they tend to be the most extensively used on the farm. This more extensive use takes four forms. Firstly, because of the distance between the farm centre and these holdings, more time is spent in travelling and less time can be devoted to field work than would be the case if these holdings were adjacent to the farm centre. This means that crops requiring less labour and transport imputs are more likely to be grown on these quarter sections. Secondly, because of the distance factor, these leased units are normally the last to be seeded and the last to be harvested, so shortening the effective crop season. This increases the likelihood of crops suffering damage from climatic hazards. Thirdly, because less time can be devoted to field work, the rate of development of the undeveloped areas of the quarter sections will be slower than if this unit of land were attached to the lessee's main land holdings. Lastly, because of the net effects of distance as outlined above, there are opportunity costs which greatly affect the net return on these undeveloped units and help to create high-cost extensive agriculture. For the farmer the slow rate of development creates opportunity costs because he cannot farm undeveloped land and so he loses potential income that he could have if the unit were fully developed. Losses from climatic hazards which are the result of a reduced effective crop season create opportunity costs for the farmer. The more extensive form of land use necessitated by the need for fewer labour and transport inputs also creates opportunity costs for the farm unit. The municipality that supplies roads and drainage ditches to these leasehold units will not recover its costs very quickly as taxes are based on improved land which is only being developed slowly. Consequently, the municipality has two ways to recoup these costs. Firstly, it can spread the repayment over a greater number of years than normal, and consequently the cost of providing these services will be higher. The second choice is to raise the taxation rate in the municipality and thus the whole minicipality subsidizes these quarter sections. If the provincial government assumes the cost of providing roads and drainage ditches, the result is basically the same.

The author recommends that the land use of these leased quarter sections be rationalized. This rationalization would be aimed at creating more intensive land use and further, it would avoid the problems inherent in fragmenting farm holdings. This rationalization should take the form of an exchange of land holdings. Smaller, developed units could be exchanged for a larger area of these leased quarter sections. However, the developed area on these leased quarter sections should not be less than the developed area on the farmer's former holdings. The holdings in the developed area could be leased or sold to adjacent farm units to enlarge their holdings.

D. The Future of Agricultural Development Projects on the Northern Pioneer Fringe.

The study area has probably the greatest potential as a site for future agricultural development in Western Canada. Yet this apparent advantage is but a snare and a delusion. In reality this area is at the extensive margin of production for temperate commercial agriculture, and future agricultural development projects in this area are neither economically nor bio-physically viable.

Most of the continuously settled part of the study area was developed for agriculture peior to 1940, and has been able to buildup a well-developed social and economic infrastructure. The area possesses a large rapeseed processing plant, two alfalfa pelleting plants, several seed processing plants, four railroad lines, a well developed highway and rural road system, a large capacity grain storage and elevator system, and a large number of farm supply firms. As well, there are two large urban service centres, Nipawin and Carrot River, with populations of approximately 4,000 and 2,000 respectively.

Generally, the climate of this region is superior with regards to moisture supply, frost-free season, and degree days to other areas along the Northern Pioneer Fringe. However, the economic significance of the effects of the bio-physical environments are such as to make agriculture economically inviable in the areas left for agricultural development, including the study area. Of particular signifance in this regard is the lack of adjustment on the part of present farming systems along the Northern Pioneer Fringe to the bio-physical environment.

As discussed in Chapter Three, the Margin of Transference delineates the extensive margin of production of another enterprise. Economic rent determines where the Margin of Transference is located for a particular enterprise. Where the economic rent is equal to zero or is negative, that enterprise is beyond the extensive margin of production. In the Carrot River-Arborfield area the mean value of all farms sampled was a negative economic rent (-$5.89/acre). It can, therefore, be stated that this area should not be chosen as the location for new agricultural development projects which perpetuate agriculture similar in type and organization to that which exists at present. Indeed, the negative economic rent illustrates that this area is the location of the intensive margin for the production of wildlife and forestry resources.

The real future of Western Canadian agriculture lies within the already developed agricultural area. It is of the greatest importance to the future of Western Canadian agriculture that planners and decision makers in agriculture realize that there are very real limits to the agricultural frontier. The snare and delusion of developing more land for agriculture only hurts that future and reflects a faulty investment strategy.

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APPENDIX A

Table 14 - Average Land Values (including buildings) per acre of Occupied Farm Land in Saskatchewan, 1908-1970

Year	Value	Year	Value	Year	Value
1908	$20	1929	$25	1950	$26
1909	22	1930	22	1951	28
1910	22	1931	19	1952	29
1911	23	1932	16	1953	30
1912	23*	1933	16	1954	29
1913	24*	1934	16	1955	31
1914	24	1935	17	1956	32
1915	24	1936	15	1957	32
1916	23	1937	15	1958	33
1917	26	1938	15	1959	34
1918	29	1939	15	1960	36
1919	32	1940	15	1961	37
1920	32	1941	14	1962	40
1921	29	1942	15	1963	47
1922	28	1943	15	1964	55
1923	24	1944	17	1965	66
1924	24	1945	18	1966	76
1925	24	1946	19	1967	83
1926	25	1947	21	1968	86
1927	26	1948	24	1969	76
1928	27	1949	24	1970	70

* Straight line interpolation

Source: Estimates of Crop Correspondents of Saskatchewan Department of Agriculture.
In S.H. Barber, Farm Land Prices in Saskatchewan (Saskatchewan Dept. of Agriculture, 1971)

APPENDIX B

SAMPLE SUBAREAS AND ATTENDANT SOIL CLASSES

		N
1.	1-10, 1-9 3-1w, 1-8 3-2w	12
2.	1-9 5-1w, 1-8 5-2w, 1-7 2-3x, 1-6 2-4x, 1-5 4-4wp 5-1w.	5
3.	2d, 2x, 2m.	9
4.	2-9d 5-1w, 2-8d 5-2w, 2-8d 5-2t, 2-8x 5-2w.	18
5.	2-7d 3-2w 5-1w, 2-7d 3-3d 5-1w, 2-6d 3-3w 5-1w, 2-5d 3-2d 5-3w, 2-5d 3-3dw 5-2w, 2-7s 4-3st.	18
6.	3-8m 5-2m, 3-8w 5-2w.	7
7.	3-7w 5-2w, 3-7s 5-3s, 3-7m 5-3w, 3-6d 2-3d 5-1w, 3-7d 4-2d 6-1w.	7

APPENDIX C

DEPARTMENT OF GEOGRAPHY

THE UNIVERSITY OF ALBERTA
EDMONTON 7, ALBERTA.

"CONFIDENTIAL"

AGRICULTURAL QUESTIONAIRE FOR PRODUCTIVITY AND BUDGET DATA FOR:
THE CRACKING RIVER--SASKATCHEWAN RIVER DELTA PROJECTS

BY: JOHN T. WILSON
DEPT. OF GEOGRAPHY
TORY BUILDING
UNIVERSITY OF ALBERTA
EDMONTON 7, ALBERTA
MAILING ADDRESS:
1620 IDYLWYLD DRIVE NORTH,
SASKATOON, SASK.

NAME OF OPERATOR ______________________

MAILING ADDRESS ______________________

DATE ______________________/1971

SAMPLE NUMBER ______________________

SAMPLE AREA ______________________

RECORD NUMBER ______________________

I LAND DESCRIPTION

	LEGAL DESCRIPTION					ACRES OPERATED			PRESENT TENURE		SOIL TYPE
	Q	S	T	R	M	TOTAL ACRES	ACRES IMP.	ACRES UNIMP	HOW HELD	BY WHOM	
1											
2											
3											
4											
5											
6											
7											
8											
9											
T											

II LAND VALUES & RENTS

	PRESENT MARKET VALUE			TERMS OF RENTAL		PROVINCAL PASTURES		
	ALL REAL ESTATE	LAND	BLDGS	CROP SHARE	CASH RENT	LOCATION	# OF CATTLE	COST
1								
2								
3								
4								
5								
6								
7								
8								
9								
T								

III LAND AQUISTION

	YEAR ACQUIRED	HOW ACQ	CONDITION ACQ		TERMS OF PURCHASE					SOURCE
			ACRES BROKEN	VALUE OF BLDGS	TOTAL PRICE	DOWN PAYMENT	YEARS TO PAY	INTEREST RATE	AMOUNT OWING	
1										
2										
3										
4										
5										
6										
7										
8										
9										
T										

IV CROP ENTERPRISE & LAND UTILIZATION

	1971	1970 PRODUCTION						SALES SINCE LAST HARVEST					
SECTION # CROP	ACRES SOWN	ACRES SOWN	ACRES HARVEST	YIELD	PRODUCTION	VALUE	CROP HAZARD	AMOUNT	GRADE	PRICE	VALUE	TO WHOM	SOIL CLASS
___/______													
TOTAL													
___/______													
TOTAL													
___/______													
TOTAL													
___/______													
TOTAL													

ACREAGE		GRAIN PURCHASES	
TOTAL IMPROVED		FEED	
TOTAL UNIMPROVED		SEED(PURCHASE) "	

V LIVESTOCK ENTERPRISE

	AT START			BIRTHS			PURCHASES			LOSSES			HOME USED			SALES			AT PRESENT		
	#	$	V	#	$	V	#	$	V	#	$	V	#	$	V	#	$	V	#	$	V
COWS(DAIRY)																					
COWS(BEEF)																					
HEIFERS)1YR.																					
STEERS)1YR.																					
H. CALVES(1YR																					
S. CALVES(1YR																					
BULLS																					
TOTAL																					
SOWS & GILTS																					
SUCKLINGS & WEANERS																					
FEEDERS																					
BOARS																					
TOTAL																					
EWES																					
LAMBS																					
RAMS																					
TOTAL																					

	AT START			BIRTHS			PURCHASES			LOSSES			HOME USED			SALES			AT PRESENT		
	#	$	V	#	$	V	#	$	V	#	$	V	#	$	V	#	$	V	#	$	V
CHICKENS																					
TOTAL																					
TURKEYS																					
TOTAL																					
OTHER POULTRY																					
TOTAL																					
OTHER:																					

VI FARM CASH COSTS

TOTAL		
A MACHINE EXPENSE		
1 TOTAL		
2 INVESTMENT		
3 DEPRECIATION		
4 OPERATING		
5 OTHER		
B DIRECT CROP EXPENSES		
1 TOTAL		
2 CROP TREATMENTS		
3 CUSTOM WORK		
4 OTHER		
C DIRECT LIVESTOCK EXPENSES		
1 TOTAL		
2 VET, MEDICINE		
3 BREEDING		
4 TRUCKING & MARKETING		
5 OTHER		
D OTHER CASH EXPENSES		
1 TOTAL		
2 FARM BUILDING REPAIRS		
3 FENCE REPAIRS		
4 LEGAL, ACCOUNTING, INSURANCE FEES		
5 ELECTRICITY(FARM SHARE)		
6 HEATING "		
7 TELEPHONE "		
8 LAND TAX		

VII FARM CAPITALIZATION & INDEBTEDNESS

A FARM ASSETS	
1. TOTAL	
2 LAND	
3 BUILDINGS	
4 MACHINERY	
5 LIVESTOCK	
6 GRAIN & HAY ON HAND	
7 OTHER	

B FARM NDEBTEDNESS

PURPOSE	ORIGINAL AMOUNT	YEAR BORROWED	YEARS TO PAY	INTEREST RATE	PRESENT AMOUNT	SOURCE

VIII ADDITIONAL INCOME

NON-FARM INCOME

	1970 YEAR	DURATION	SEASON	TYPE OF WORK	LOCATION	GROSS INC	EXPENSES
OPERATOR							
FAMILY							
TOTAL							

NON-FARM INCOME---OTHER SOURCES

	AMOUNT
PFAA PAYMENTS	
EMERGENCY FARM ASSISTANCE PAYMENTS	
INSURANCE AWARDS	
OTHER	
TOTAL	

CUSTOM WORK INCOME

TYPE OF WORK	AMOUNT
TOTAL	

PREVIOUS FARMING & WORK EXPERIENCE

FARMING EXPERIENCE	LOCATION	DURATION	TYPE OF FARM
OTHER OCCUPATIONS	LOCATION	DURATION	TYPE OF WORK

VIII ADDITIONAL INCOME

NON-FARM WORK SINCE START

OPERATOR	YEAR	DURATION	SEASON	TYPE OF WORK	LOCATION	GROSS INC.	EXPENSES
	1967						
	1968						
	1969						
	1970						
FAMILY							
TOTAL							

CUSTOME WORK INCOME

TYPE OF WORK	1970	1969	OTHER YEARS	TOTAL
1 CLEARING & PILING				
2 BREAKING				
3 ROOT PICKING				
4 OTHER FIELD WORK				
5 SEED CLEANING				
6 TRUCKING				
7 FORESTRY				
8 OTHER				
TOTAL				

OTHER NON-FARM INCOME SINCE START

	1970	1969	OTHER YEARS	TOTAL
PFAA PAYMENTS				
EMERGENCY FARM ASSISTANCE PAYMENTS				
INSURANCE AWARDS				
NON-FARM BUSINESSES				
OTHER				
TOTAL				

EXPERIENCE PRIOR TO HOMESTEADING

	LOCATION	DURATION	TYPE OF FARM
FARMING EXPERIENCE			

	LOCATION	DURATION	TYPE OF WORK
OTHER OCCUPATIONS			

IX LAND DEVELOPMENT COSTS

A CLEARING & PILING

NO.	YEAR	ACRES	TREE COVER	OPERATOR: EQUIPMENT DAYS OF WORK	OPERATOR: EQUIPMENT TYPE	OPERATOR: EQUIPMENT DAYS	CUSTOM TOTAL COST	CUSTOM COST/ ACRE	CUSTOM EQUIP-MENT
1	1970								
2	1969								
3	1968								
4	1967								
5	1966								
6	1965								
7	1964								

B BURNING & CLEANING UP

NO.	YEAR	DONE BY OPERATOR			DONE BY CUSTOM OR CONTRACT
		DAYS OF WORK	EQUIPMENT USED TYPE	DAYS	TOTAL COST
1	1970				
2	1969				
3	1968				
4	1967				
5	1966				
6	1965				
7	1964				

C BREAKING

NO.	YEAR	MONTH	ACRES	OPERATOR			CUSTOM			DEPTH OF BREAKING
				DAYS OF WORK	TYPE	DAY	TOTAL COST	COST/ ACRE	TYPE OF MACHINE	
1	1970									
2	1969									
3	1968									
4	1967									
5	1966									
6	1965									
7	1964									
8	1963									
9	1962									
10	1961									

DO YOU INTEND TO BREAK ANY MORE LAND THIS YEAR?

YES______ NO______

IF YES; __________ACRES.

D ROOT & STONE PICKING

	DONE BY OPERATOR			BY CUSTOM OR CONTRACT		
	DAYS OF LABOUR	EQUIPMENT USED		TOTAL COST	EQUIPMENT USED	DAYS OF LABOUR
		TYPE	DAYS			
1						
2						
3						
4						
5						
6						

E WORKING DOWN THE BREAKING

	FIRST OPERATION			SECOND OPERATION			THIRD OPERATION		
	EQUIPMENT		HRS. OF WORK	EQUIPMENT		HRS. OF WORK	EQUIPMENT		HRS. OF WORK
	TYPE	HRS.		TYPE	HRS.		TYPE	HRS.	
1									
2									
3									
4									
5									
6									

	FOURTH OPERATION			FIFTH OPERATION			FIRST CROP				
	EQUIPMENT		HRS. OF WORK	EQUIPMENT		HRS. OF WORK	CROP	YEAR	YIELD	FERTILIZER	
	TYPE	HRS.		TYPE	HRS.					KIND	RATE
1											
2											
3											
4											
5											
6											