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FACTORS AFFECTING RESOURCE MANAGEMENT DECISIONS: A CASE STUDY OF THE MANITOBA RAPESEED PRIMARY PRODUCER

Submitted by
Richard Kenneth Baydack

In Partial Fulfillment of the Requirements for the Degree of
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A dissertation submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

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ABSTRACT

This study investigates resource management decisions of farmers. Specifically, the research focuses on attitudes and behaviours of farmers with respect to rapeseed production decisions. Information was collected from the farming community by means of a questionnaire.

Six predominant decision factors (insect control, weed control, cash income per acre, risk of growing, harvesting techniques, cost of production) were identified as important evaluation criteria for growers and non-growers of rapeseed. These two sets of individuals differed in their rankings of factors; non-growers seemed more concerned with technical rather than economic problems associated with the crop.

Rapeseed was viewed as being significantly less favourable than both wheat and barley for five of the above criteria. In spite of a small sample size, identification of farm or farmer characteristics associated with particular attitudes was made. For single decision factors and characteristics, insect control was associated with % 1975 costs due to rapeseed, risk of growing with recent growing experience, and cash income per acre with age of respondent.

Four farming practices (crop rotation, type of seeding implement, time of swathing, type of insect control) were identified as showing significant deviation from recommended

procedures. For these practices, most poor behaviour was due to moderately experienced growers and high farm income class.

Implications of the findings are discussed and recommendations are made regarding actions that interested agencies might take to influence and correct specific attitudes and behaviours among farmers in rapeseed growing areas.

ACKNOWLEDGEMENTS

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CHAPTER 1

INTRODUCTION

Perspectives

Decision-making is a central theme of natural resource management. Efficient or optimal decision-making is difficult to attain, yet decisions must always be made, often to the applause of some, and to the chagrin of others. Natural resource managers usually have specific criteria to aid them in making decisions. For example, government program coordinators use guidelines formulated by the respective political party in power. Wildlife managers have theories based on biological principles. Resource economists use theoretical precepts of welfare economics in formulating decisions. But what about the farmer, certainly a resource manager, on what does he base his resource management decisions?

Let us focus away from the general resource manager to the more specific primary producer. One of the first commodities man sought to draw from the resources of his environment was food. In our time, and particularly in the past two or three years, rising food prices and increasing frequency of malnutrition and starvation have again raised the question of capacity of the resources of earth under management of man to produce enough nutrition to feed a growing human population.

The Great Central Plains of North America are one of the major food exporting regions of the world (Young 1975). Here, high technology is employed by a sophisticated population working with an adequate stock of capital to produce basic and staple food stuffs for the population of North America and for export to many parts of the world. Tonge (1976) reports that each farmer in this region today produces enough food to feed himself and 52 other people.

The sum total of the decisions of the farmers on the Great Central Plains may, for example, produce surpluses of wheat and shortages of poultry, or shortages of beef and surpluses of oilseeds. The farmer, obviously the first decision-maker in this process, operates on the basis of very imperfect information provided to him by government agencies which are often wrong (Young 1975). The best that a farmer can do is to plan his next year's production based on this year's prices, which is equivalent to forecasting tomorrow's weather to be the same as today's (Shepherd 1947). Thus governments furnish producers with i) basic supply and demand information, and ii) monthly and daily market reports. However, to reiterate Mr. Young's concern, is the advice derived from these sources correct and, possibly even more important, can the farmers use this information correctly and efficiently? Agrawal and Heady (1972) state that farmers' plans may be informal, usually directed at specific but uncertain outcomes. Baron (1972) further questions government predictions and policy, claiming that the present system tends to separate the farmer

from his market. The Canadian Agricultural Congress recognized the need for producer involvement in their decision-making process when establishing the following objectives (Canada 1969);

> i) To have producers actively involved in setting goals and to give them an active voice in decision-making concerns which affect them.
> ii) To have all levels of agriculture involved in policy-making decisions.

Background

Rapeseed was first produced in Canada during World War II under a government subsidy program for use as an industrial lubricant (Broeska 1970). During the past 30 years, rapeseed has progressed in importance to its present status as Canada's fourth most extensively sown annual crop (McLeod 1974).

Figure 1 shows the general trend to increased rapeseed acreage across western Canada during the past 30 years. The upward trend generally begins about 1954 and continues to the present. Cyclic fluctuations, characteristic of many prairie crops, can also be observed in the yearly acreage data. Shepherd (1947) feels these fluctuations can be attributed to producer decisions based on physical and economic supply and demand criteria.

It is important to note that after the 1971 peak, three successive years of decreased production occurred. Another peak was observed in 1975, followed by the estimated reduc-

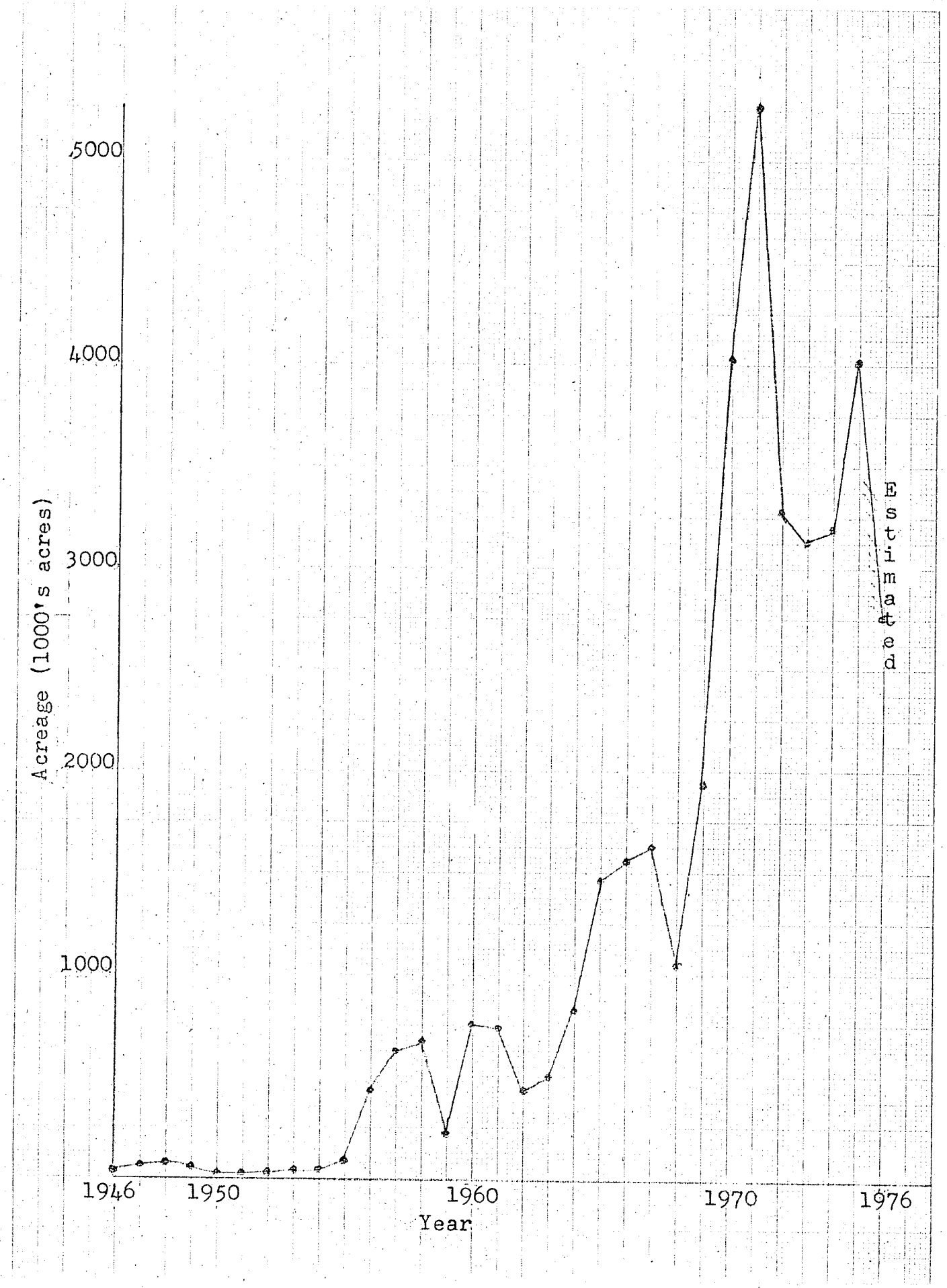

Figure 1. Seeded acreage of rapeseed across western Canada, 1946 to 1976

tion of 1976 rapeseed acreage to pre-1970 levels. These fluctuations are of considerable concern to the Rapeseed Association of Canada, in its attempts to maintain rapeseed acreage between 1971 and 1975 levels. Estimates for 1976 rapeseed acreage range between 1.98 and 3.1 million acres, (Statistics Canada and Canadian Grains Council) both substantially less than the proposed Rapeseed Association of Canada figure (Winnipeg Free Press 1976a).

What has attributed to acreage decline for this relatively new yet popular oilseed crop? This question can best be answered by determining what factors affect the farmers' decision of how much rapeseed (or any other crop) to grow. Heady and Dillon (1961) propose that this decision is affected by price and non-price factors, as shown by the following formula:

$$A = f(\text{Price} + \text{Non-price factors} + \text{error})$$

where A = number of acres in a certain crop

Non-price factors can include attitudes and behaviours of farmers concerning the crop in question (Heady and Dillon 1961).

Broeska (1970) states that in past years, farm price of rapeseed was critical in the producer's decision to grow the crop. Farm price of rapeseed is directly dependent upon supply conditions in the international oilseeds market.

In 1976, Canadian rapeseed encountered mounting sales competition from European rapeseed, Malaysian palm nut oil, and American and Brazilian soybean oil, forcing the Canadian

price downward. French rapeseed and Brazilian soybean oil, in particular, are undercutting prices of other substitutes. Canadian rapeseed is at a disadvantage to communist rapeseed (Poland, East Germany) since these countries often adopt a "sell at any price" policy (Broeska 1970). However, the major cause of the relatively low price of rapeseed is palm nut oil from Malaysia (Clark 1976). McAnsh (1976) feels that this commodity may soon replace soybean oil as the world price-setter for vegetable oils and fats.

Palm oil can be used as a substitute for rapeseed oil. The oil palm tree, from which palm oil is derived, takes about five years from time of planting to become productive. After that period, however, the tree will produce for 25 years at a relatively miniscule (compared to Canadian rapeseed) cost of production. To worsen matters for Canadian producers, oil palms yield approximately 4000 pounds of oil per acre compared to about 350 pounds from rapeseed (Clark 1976).

Time delays in rapeseed shipments have not enhanced rapeseed market expansion nor sales. Japanese importers have particularly become disturbed over the inefficient export system for Canadian rapeseed (Elanco 1976). Their processing plants have lay idle for two to three weeks awaiting arrival of French rapeseed to replace Canadian rapeseed held up in Vancouver during grain handlers strikes. The deciding factor in choosing which of the various oilseeds to purchase is not always price, which remains in relation, but quality and availability (Elanco 1976).

The above factors were mainly responsible for farmers facing a lower price for rapeseed in 1976 than in the past. Rapeseed reached an all-time high of $10.50 per bushel in October 1974 and was still strong at $7.50 per bushel in August 1975, but bottomed out at the end of 1975 and spring of 1976 at about $4.65 per bushel (Francis 1976).

Non-price factors may also be responsible for acreage decline in the past year. Agrawal and Heady (1972) state that attitude toward a particular crop can drastically affect acreage in bad crop years and moderately in good years. Thomsen (1952) claims that producers base their production decisions primarily upon prices, but suggests that past success with a crop is likely important as well. Baron (1972) submits that farming practices (producer behaviour) indirectly affects farm management decisions. Those producers following good production behaviour (for certain crops), can expect relatively higher returns for those crops, serving to stimulate the individual to produce again.

Given that rapeseed producers are making rational economic decisions, it is assumed that a depressed price will be one cause for decreased rapeseed production. The Rapeseed Association of Canada is concerned that large numbers of farmers will exit from the rapeseed growing market (F. J. Anderson, personal communication). Such an occurrence may cause considerable damage to Canada's reputation as being a source of rapeseed, as well as rapeseed oil and meal. Of national significance, Canadian rapeseed crushers have

delayed or completely abandoned future plant expansion due to the unsettled rapeseed marketing situation (Canada 1976).

The Problem

The Rapeseed Association of Canada is finding it difficult to identify strategy to employ in encouraging rapeseed production in Western Canada (F. J. Anderson, personal communication). As shown earlier, a farmer's decision of how much rapeseed to grow is a function of price and non-price factors. Since international oilseed prices control the farm price of rapeseed, it is virtually impossible for the Association to affect a change in this regard. However, their effectiveness in sustaining rapeseed production within certain limits could indeed be enhanced by obtaining information from the farming community regarding attitudes and behaviours toward rapeseed.[1]

Research Objectives

The major objectives of this study are to identify and analyze existing attitudes and behaviours concerning rapeseed in Manitoba's farming community.[2] This information will then be presented in the form of recommendations to agencies interested in influencing rapeseed production.

In the present report, attitude will be considered the dimension or criterion along which rapeseed is evaluated by

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[1] Although a category of environmental factors (spring rainfall, spring temperature, crop quotas, etc.), considered advantageous to rapeseed production, may also affect whether and how much rapeseed is grown, these will not be studied in this report.

[2] See Definition of Terms, p.11.

the decision maker.[1] Behaviour will consist of a farmer's rapeseed farming practices.[1] Guides have been prepared (Hetland 1975, Manitoba 1974) recommending particular farming practices which result in efficient rapeseed production.

Specifically, this study proposes to:

i) identify and compare decision factors of both rapeseed growers and non-growers,

ii) evaluate grower attitude towards rapeseed versus wheat and barley,

iii) determine farm or farmer characteristics associated with particular decision factors,

iv) analyze producer farming practices concerning rapeseed against recommended procedures,

v) determine farm or farmer characteristics associated with incorrect behaviour patterns.[2]

Recommendations will be presented to interested agencies suggesting which decision factors and farming practices could be influenced to help bring about sustained rapeseed production.

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[1] See Definition of Terms, p. 11.

[2] Incorrect behaviour is identified as less than 60% compliance with the norm.

Assumptions and Delimitations

This study will assume that rapeseed will continue to be a valuable crop grown by farmers in Manitoba. It will also assume that producers do have some definite attitudes about rapeseed production, and some reasons for or against growing the crop which they wish to express. Data collected will be assumed to represent a valid cross-section of Manitoba's farming community.

This study will not comment upon the suitability of the price for rapeseed nor upon any taxes, subsidies, or surcharges. This study, in its present form, will limit itself to the agricultural districts of Manitoba. This study will concern itself with other crops only if their planting results in decreased rapeseed acreage.

This study will not attempt to define an optimal rapeseed production function[1] for each farmer sampled. It assumes that every farmer already possesses a production function for rapeseed, and this study will only indirectly comment upon the relative favourability of these.

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[1] See Definition of Terms, page 11.

Definition of Terms

Attitude/Decision factor. Terms used synonomously in this report; both refer to the dimensions or criteria along which rapeseed is evaluated by the farmer.

Behaviour is considered an individual's conduct in certain situations (Sanford and Wrightsman 1970).

Cash crop means an agricultural commodity that gives an instant return at the grain elevator at harvest.

Farmer/Primary producer. Terms used synonomously in this report; both refer to an individual exercising control over an aggregate of land, labour, and capital resources.

Farming practice consists of procedures advocated by a primary producer regarding production of a particular product.

Management decision represents an exercise of authority of control by an individual over an aggregate of land, labour, and capital resources (i.e. a farm).

Marketing agency represents any entity concerned with furthering the production or reputation of rapeseed.

Production function links up factors of production with final output at various levels of cost.

Rapeseed means any variety of the species Brassica napus L. (Argentine type) or Brassica campestris L. (Polish type) now grown in Western Canada.

CHAPTER 2

RESEARCH METHODOLOGY

Primary and secondary data were used to generate information for this study. The former was obtained through a survey of Manitoba primary producers and provided the basis for analysis and recommendations. The latter consisted of published literature and personal communication which was used to design the survey and subsequent analyses. Due to time and budget constraints, Manitoba was selected as the province under study and a mail-out questionnaire was chosen as an appropriate data collection method.

Sample Design

Sampford (1962) has developed finite population sampling theory to measure social and economic characteristics of human populations. Sampling results in a saving of time, labour, and cost as compared to complete enumeration. If sampling is carried out correctly, inferences may be extended to a target population, in this case, primary producers in Manitoba. Sampford (1962) warns that inferences beyond the target population are dangerous.

The appropriate sample size for a survey is determined by the precision required and variability of the population to be sampled. The following formula was used to estimate the required sample size, assuming the study popula-

tion is normally distributed (Costis 1972)

$n = \frac{pq}{Sp^2}$ where n = sample size

p = proportion of population with a certain characteristic (rapeseed growers)

q = 1-p

Sp^2 = variance of p

Since $Sp = \frac{w}{Z}$ where w = estimation error

Z = Z-value corresponding to specified confidence level from normal table (ie. Z = 1.96 at 95% level)

$\therefore \quad n = \frac{p.q.Z^2}{w^2}$

Choosing a maximum value of p.q = 0.25

Z = 1.96 (95% level)

Costis (1972) recommends a practical estimation error (w) to be 0.10.

Thus, solving for n:

$$n = \frac{0.25 \times (1.96)^2}{(0.10)^2}$$

n = 96 responses

This means 96 responses would be significant at the 95% confidence level using maximum value for p.q and estimation error (w) equal to .10. Rogers (1960) states that farmers are difficult individuals to survey and a return rate of no better than 30% can ever be expected. Of course, this is one notable disadvantage of the mail-out questionnaire. To be sure that sufficient responses could be obtained from

one mailing, an expected return rate of 20% was estimated. This required (96/.20) or about 480 mailouts to guarantee a significant sample return.

Using 1971 census data, Manitoba's 35,000 farmers were stratified according to census division. In each division, total number of farmers, number who had grown rapeseed, and percentage who had grown rapeseed were determined (Table 1). This table shows that about 21% of all Manitoba's farmers had tried growing rapeseed. From this table, high, moderate, and low rapeseed producing areas could be derived.

Since the population of farmers was clearly divided into growers and non-growers, both of these sub-groups were to be included in the sample. This criteria was chosen to allow views of each sub-group to be expressed. Five census divisions of relatively high percentage rapeseed growers were chosen. These were divisions 2, 13, 14, 15 and 17 (Figure 2 and Table 2). Both growers and non-growers of the crop in such regions were expected to have firm and meaningful convictions as to growing or not growing rapeseed. Although census divisions 11 and 16 had greater incidence of growers than division 2, they were not included in the sample: 11 was omitted to allow for wider geographical diversity; 16 was omitted due to its low total number of farmers and isolated geographical location.

As a safety measure, an initial mailing of 550

Table 1. Manitoba farmers by census division and rapeseed production (Source 1971 Census Data).

Census Division Number	Total Farmers in Division	Number Grown Rapeseed	% Grown Rapeseed
1	2500	110	4.4
2	3135	944	30.1
3	2546	609	23.9
4	1870	318	17.0
5	2420	123	5.1
6	1908	454	23.8
7	2153	349	16.2
8	1843	210	11.4
9	1231	31	2.5
10	1997	371	18.6
11	1576	531	33.7
12	2646	116	4.4
13	1452	502	34.6
14	859	298	34.7
15	1503	958	63.7
16	147	80	54.4
17	1950	915	46.9
18	1741	364	20.9
19	1132	29	2.6
20	354	13	3.7
TOTAL	34,981	7325	20.9 (AVE.)

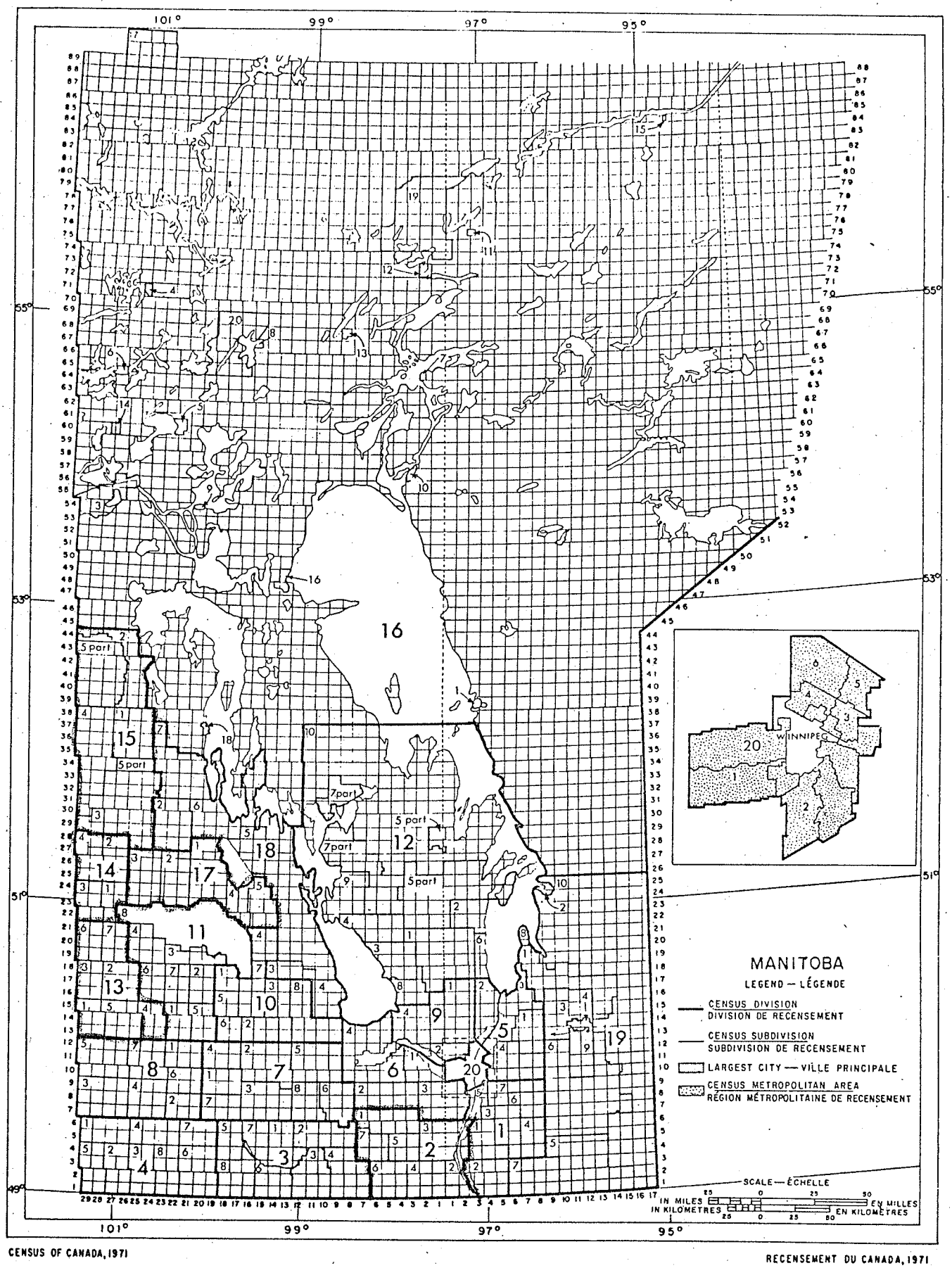

Figure 2. Map of Study Area

Table 2. Rural municipalities in census divisions of Manitoba (Statistics Canada Cat. 96-708)

Division No. 2

Dufferin
Montcalm
Morris
Rhineland
Roland
Stanley
Thompson

Division No. 13

Archie
Birtle
Ellice
Hamiota
Miniota
Russell
Silver Creek

Division No. 14

Boulton
Hillsburg
Shellmouth
Shell River

Division No. 15

Minitonas
Mountain
Park
Swan River

Division No. 17

Dauphin
Gilbert Plains
Grandview
Ochre River
Ste. Rose

questionnaires was used rather than the 480 necessary for statistical validity. To determine the number of farmers selected from each rural municipality, total number of farmers and stratum (census division) percentage breakdown were determined (Table 3). Each stratum represented a percentage of the study population, and this value was used to designate percentage of mail-out samples. Sampford (1962) refers to this as a proportionate stratified random sample. The stratum total was allocated to sub-strata (rural municipalities) by direct breakdown (Table 4). A small subset of questionnaires (54) sent out at a later date were allocated two per sub-strata (ie. 27 x 2 = 54).

Questionnaire Distribution and Retrieval

The relatively large sample size, wide dispersal of study population, and time and budget constraints created the need for an inexpensive yet accurate research tool. In such a situation, the self-administered mailed questionnaire is an appropriate survey method (Oppenheim 1966). Young (1966) acknowledges this;

> "Questionnaires can be sent through the mail - interviewers cannot."

Names and addresses of farmers were selected at random from provincial land-holding records for required rural municipalities. Each individual was numbered to correspond with a questionnaire number to allow later identification, but only for delivering an incentive - a summary of study results.

Table 3. Total and percentage of farmers in each stratum of study population.

Census Division (Stratum)	Total Farmers	% of Study (Sample) Population
2	3135	35
13	1452	16
14	859	10
15	1503	17
17	1950	22
Study Population	8899	100%

Table 4. Sample selection for rural municipalities.

Stratum	Questionnaires Per Stratum	Number of Sub-Strata (RM's)	Questionnaires Per Sub-Strata
2	189	7	27
13	91	7	13
14	56	4	14
15	92	4	23
17	120	5	24
Totals	548	27	101

The questionnaire was pre-tested one month before mail-out and redesigned where necessary. One individual from each rural municipality was sent the questionnaire, cover letter, and an additional memorandum explaining his significance. Of 27 questionnaires sent by mail, 11 (41%) were returned, 9 of which had suggestions for improvement. A further 20 individuals were pre-tested in person (nearby farmers, university professors, industry representatives) who also provided valuable criticisms.

The mail-out survey (548) began in early June; replies were requested by July 15. The Manitoba Department of Agriculture facilitated the postal process. Addresses were typed onto plain stamped envelopes. A typeset return envelope bearing an Olympic postage stamp was inserted with the questionnaire. Questionnaires were returned to the Manitoba Department of Agriculture and from there delivered to the researcher.

A second mailing of 54 questionnaires (two per RM) was conducted during the first week of August with return requested by August 15 to bolster sample size. These were posted by the researcher and included University of Manitoba stamped return envelopes. August 15 was set as final date for acceptance of returned questionnaires, and none were received after that date.

Questionnaire Design

The questionnaire was designed primarily to answer questions posed by the objectives with special attention given to stimulating a high response rate. A sample copy of the questionnaire complete with cover letter is included in Appendix A.

Question 1 was used as a control to determine if the respondent was being truthful, since each respondent number could be identified to a rural municipality. Selltiz et al. (1959) state the first question should be easy to answer, thereby giving the respondent confidence to continue.

The second and third questions were directed basically toward non-growers of rapeseed, allowing them to state their attitude toward the crop. Question 3 produced non-grower decision factors. Questions 4 and 5 were included to differentiate rapeseed grower experience. Question 6 asked for a prediction of future behaviour as a consequence of producer attitude. Question 4 through 6 composed grower interest variables.

Questions 7 and 8 were producer attitude questions (grower decision factors) designed to measure concerns (perceived problems) of growing rapeseed (i.e. negative rather than positive evaluations). The Likert scale was chosen for responses since this type of scale is frequently used in studying attitudes (Selltiz et al. 1959). The ten factors included were ascertained through readings and conversations with agricultural specialists. Questions 9 through 16 were chosen to

provide information on rapeseed producer behaviour (grower farming practice variables), Hetland (1975) and Manitoba (1974) used as basis. Questions 17 through 22 (sample characteristic variables) were used to allow comparison of farm/farmer information with other responses. Question 23 was included to identify the relative importance of information sources to producers.

Where possible, the following principles were adhered to in questionnaire preparation. Shorter questions and questionnaires usually gain a higher return rate (Selltiz et al 1959). Yellow, tan, and brown are colors which give significantly high rates of return (Oppenheim 1966), hence yellow was the selected color. Since rapeseed is often identified by its prominent yellow flower color, it was hoped this might also give a psychological advantage in questionnaire return. Crapo and Chubb (1969) suggest that questions should be kept simple and straight-forward; ambiguous, vague, or leading questions must be avoided. Birdie and Anderson (1974) state that all possible answers must be considered in designing pre-coded questions. Such questions help to standardize responses, facilitate data processing, and simplify the questionnaire (Young 1966).

Mail-out questionnaires should include an explanatory covering letter which outlines the purpose of the study, tells why and by whom it is considered important, assures confidentiality of all responses, and invites respondents to respond

by a given data (Crapo and Chubb 1969; Oppenheim 1966). A reward or incentive will generally increase the response rate (Crapo and Chubb 1969).

The questionnaire was printed on 8.5 x 14 inch yellow bond paper. The cover letter was printed on 8.5 x 11 inch white bond paper bearing the letterhead of the Natural Resource Institute, University of Manitoba. It was signed by the researcher, and an incentive was included (summary of findings of the study).

Data Processing and Analysis

Returned questionnaires were coded onto IBM General Purpose Data Forms using a predetermined coding scheme. Key punching of the above forms transferred data onto IBM computer cards for ease of analysis.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), Version 6.01, on the University of Manitoba computer. The 133 variables created and their labels are listed in Appendix B. Data were studied with univariate (FREQUENCIES) and bivariate (T-TEST and CROSSTABS) statistical procedures (Nie et al. 1975).

Detailed frequency distributions of data not central to this report (grower interest variables and sample characteristic variables) can be found in Appendix C.

Limitations of the Study

Much of the information obtained in this study is subjective in nature. This is likely due to it being obtained

through survey rather than experimental research. Raw frequencies are often reduced to fewer categories in an attempt to identify relationships. Since this may result in loss of certain information, judgements about significance are made on a conservative basis so that only real differences or similarities are identified. Any shortcomings in data are clearly stated when statistically significant relationships do not necessarily denote practical importance. These limitations are presented to make the reader aware of the procedure followed, but they do not in any way detract from the validity of the findings.

CHAPTER 3

RESULTS

Results will be presented in the following sequence to enhance clarity in studying the desired objectives:

i) Return Statistics

ii) Attitude Measures

iii) Behaviour Measures

Return Statistics

On August 15, 1976, 170 questionnaires had been returned out of 602, representing a response rate of 28%. Of these, 21 were classified as unusable (partially completed, requested French copy, etc.) leaving 149 usable responses (25% return).

Table 5 depicts respondent's rural municipalities and frequency of return from same. All rural municipalities contributed at least 1 response, with one (Morris) contributing 12. The modal response rate per rural municipalities was four.

Table 6 shows crops grown by respondents. Wheat and barley were most popular, followed closely by oats. Rapeseed ranked fifth after flax, followed by other minor crops. Ninety-two out of the 149 responses were from rapeseed growers, 57 from non-growers.

Attitude Measures

This section deals with information required to answer research questions i through iii:

i) identify and compare decision factors of both rapeseed growers and non-growers;

ii) evaluate grower attitudes towards rapeseed versus wheat and barley;

iii) determine farm or farmer characteristics associated with particular decision factors.

Table 7 identifies rapeseed decision factors of importance to Manitoba's farming community. Table 8 depicts the rather negative attitude toward rapeseed relative to wheat and barley.

Table 7 shows that non-growers and growers rank decision factors differently. Non-growers seem to select technical rather than economic factors as reasons for never having grown rapeseed. Cash income per acre and cost of production rank lower than such technical factors as insect control, weed control, harvesting techniques, and need for special machinery. There is no significant difference between insect control and weed control for non-growers, but both are significantly different from all other factors. Thus, attitudes toward insect and weed control seem to be the most important determinants for never having grown rapeseed, but their exact placing is uncertain.

Growers appear to consider economic as well as technical factors in making their crop production decisions.

Table 5. Respondent breakdown from rural municipalities.

Rural Municipality	Census Division	Number of Responses	Relative Frequency
Dufferin	2	10	6.7
Montcalm		8	5.4
Morris		12	8.1
Rhineland		9	6.0
Roland		8	5.4
Stanley		7	4.7
Thompson		8	5.4
Archie	13	1	0.7
Birtle		4	2.7
Ellice		2	1.3
Hamiota		3	2.0
Miniota		4	2.7
Silver Creek		4	2.7
Russell	14	4	2.7
Boulton		4	2.7
Hillsburg		3	2.0
Shellmouth		2	1.3
Shell River		5	3.4
Minitonas	15	7	4.7
Mountain		5	3.4
Park		1	0.7
Swan River		9	6.0
Dauphin	17	4	2.7
Gilbert Plains		6	4.0
Grandview		6	4.0
Ochre River		6	4.0
Ste. Rose		7	4.7

Table 6. Crops grown by respondents.

Question: Which of the following crops have you grown?

Crop	Number of Growers	% of Total Respondents
Wheat	143	96
Barley	138	93
Oats	128	86
Flax	98	66
Rapeseed	92	62
Sunflowers	20	13
Rye	17	11
Peas	17	11
Faba Beans	12	8
Buckwheat	12	8
Other Crops	39	26

Table 7. Relative importance of Rapeseed decision factors in Manitoba farming community.[1]

Question: Which factors explain:

a) why you have never grown rapeseed[2] b) why you grow rapeseed[3]

Decision Factor	Non-Growers frequency	Non-Growers %(N=57)	Growers frequency	Growers %(N=92)	Combined frequency	Combined %(N=149)	Rank
Insect control	29	50.9	20	21.7	49	32.9	1
Weed control	21	36.8	24	26.1	45	30.2	1
Cash income per acre	8[4]	14.0	30	32.6	38	25.5	1
Harvesting techniques	12[4]	21.1	11[5]	12.0	23[6]	15.4	2
Risk of growing*	-	-	23	25.0	23[6]	15.4	2
Cost of production	6[4]	10.5	16[5]	17.4	22[6]	14.8	2
Disease control	7[4]	12.3	6	6.5	13	8.7	-
Production time	3	5.3	9	9.8	12	8.1	-
Need for special machinery*	10[4]	17.5	-	-	10	6.7	-
Lack of information*	8[4]	14.0	-	-	8	5.4	-
Storage requirements*	-	-	7	7.6	7	4.7	-
Wrong soil type*	3	5.3	-	-	3	2.0	-
Transportation difficulties*	3	5.3	-	-	3	2.0	-
Drought tolerance*	-	-	3	3.3	3	2.0	-
Other reasons*	4	7.0	-	-	4	2.7	-
Total responses		200.0		162.0		176.5	

*factors presented to either growers or non-growers.

1 Multiple response question, hence % totals exceed 100%.

2 See Appendix A, question 3.

3 See Appendix A, question 8.

4 Chi-square test shows significant difference from insect and weed control, $P \leq .05$.

5 Chi-square test shows significant difference from cash income per acre, $P \leq .05$.

6 Chi-square test shows significant difference from insect control, weed control, and cash income per acre, $P \leq .05$.

Table 8. Mean producer attitude scores of specified crops for decision factors.

Decision Factor	Mean Score[2] Wheat	Barley	Rapeseed
- Cash income per acre[1]	1.833**	2.488*	2.898
- Costs of production[1]	2.375*	2.407NS	2.736
- Risk of growing[1]	1.528**	2.318**	3.678
- Drought tolerance	1.789**	3.044NS	3.022
- Insect control[1]	1.289**	1.977**	4.157
- Production time	2.023**	2.138**	3.047
- Disease control	1.494**	2.207**	2.907
- Harvesting techniques[1]	1.644**	1.830*	2.218
- Weed control[1]	1.725**	1.753**	2.693
- Storage requirements	1.689**	1.816**	2.886
Mean	1.739**	2.198**	3.024

1 indicates decision factors considered of most importance to respondents with respect to rapeseed (see Table 7).
2 T-test of significance for difference in means, rapeseed vs. wheat and barley.

*P = $\leq$0.05 **P = $\leq$0.01 N.S. = non significant

Cash income per acre, weed control, risk of growing, insect control, cost of production, and harvesting techniques gain highest rankings. The order of ranking is not discernible as no significant difference exists among the first four selections, and only cash income per acre is significantly different from the other two high ranking factors--cost of production and harvesting techniques.

For the total sample, insect control, weed control, and cash income per acre rank as the most important decision factors. They are not significantly different from each other but differ from the factors of secondary importance; harvesting techniques, risk of growing, and cost of production.

About half the non-growers selected insect control as an important decision factor compared to about 20% of the growers. About one-third of the total sample chose insect control as an important decision factor.

Weed control ranked as another important decision factor, cited by about 30% of the entire sample. This total was composed of 37% of the non-growers and 26% of the growers.

Cash income per acre selected by one-quarter of the sample, was also considered important. In this case, however, only 14% of non-growers concurred, compared to roughly 33% of growers.

Harvesting techniques, risk of growing, and cost of production ranked very closely in total sample response. Of these, only harvesting techniques obtained a higher percentage from non-growers. Risk of growing, a very general term presented only to growers, established quite a high ranking.

Other decision factors--disease control, production time, need for special machinery, lack of information, storage requirements, wrong soil type, transportation difficulties, and drought tolerance--received less than 10% response from the entire sample, indicating that they are relatively unimportant factors affecting resource management decisions.

Attitudes toward crop alternatives (wheat, rapeseed or barley) concerning specified decision factors are contained in Table 8. These three crops were selected to allow relative comparisons among one another; as wheat is accepted as the optimal crop, barley a viable alternative, and rapeseed fighting for a portion of acreage. Mean scores were calculated for each decision factor, and then these means used to calculate a crop mean. Wheat scored the best crop mean (1.739) followed by barley (2.198) and finally rapeseed (3.024). Wheat ranked best in all decision factors, generally followed by barley and rapeseed, in that order.

To evaluate whether attitudes among crop alternatives were significantly different, a t-test for difference of means was used (Appendix D). Mean valuation of rapeseed was significantly less favourable than wheat for all but one decision factor at the 0.01 level; the exception, costs of production, was significant at the .05 level. Comparing rapeseed with barley, there was no significant difference for costs of production or drought tolerance. Cash income per acre and harvesting techniques were significantly less favourable for

rapeseed at the .05 level. The remaining factors were significantly different at the .01 level, rapeseed being considered less favourable than barley.

Rapeseed was viewed less favourably than both alternative crops ($P \leq .01$) for the following decision factors--risk of growing, insect control, production time, disease control, weed control, and storage requirements. Five of the six decision factors identified in Table 7 as most important are significantly less favourable for rapeseed as opposed to wheat and barley (insect control, weed control, cash-income per acre, risk of growing, harvesting techniques). The remaining important decision factor (cost of production) is not significantly different from both crop alternatives; though the wheat/rapeseed difference is significant at the .01 level, the barley/rapeseed difference is non-significant.

Bearing this in mind, an attempt was made to identify whether significant relationships existed among farm/farmer characteristics and the five important decision factors having significant difference between rapeseed, barley, and wheat (i.e. identify type of farmer that views rapeseed less favourably). These decision factors and characteristics are presented with their Chi-square significance level in Tables 9 and 10, corresponding to non-grower and grower responses.

There were no apparent farm or farmer characteristics associated with particular reasons for not growing rapeseed (i.e. a given reason does not seem to be associated with any particular segment of the farming community (Table 9). Three

Table 9. Chi square significance levels for non-grower decision factors against farm/farmer characteristics.

Decision factor	Characteristics				
	Age	Farming Experience	1975 Income	1975 Costs	Information Source
Insect control	0.152	0.148	0.297	0.550	0.247
Weed control	0.098	0.501	0.796	0.851	0.168
Cash income per acre	0.562	0.603	0.362	0.486	0.261
Harvesting techniques	0.295	0.177	0.687	0.694	0.213

Table 10. Chi-square significance levels for grower decision factors against farm/farmer characteristics.[1]

Decision Factor	Farm/Farmer Characteristics								
	Information Source	Rapeseed Experience		Farming Experience		1975 Income	% Income from Rape	1975 Costs	% Costs from Rape
		Total	Recent	Age					
Insect control	0.276	0.410	0.434	0.340	0.891	0.904	0.442	0.458	0.018[1]
Weed control	0.232	0.593	0.965	0.573	0.515	0.988	0.584	0.709	0.174
Cash income per acre	0.182	0.165	0.514	0.048[1]	0.747	0.116	0.277	0.451	0.625
Risk of growing	0.599	0.061	0.031[1]	0.945	0.398	0.493	0.325	0.612	0.278
Harvesting techniques	0.489	0.231	0.375	0.369	0.192	0.209	0.524	0.284	0.807

1 indicates significance at $P \leq 0.05$ level.

significant relationships existed between characteristics and importance of grower decision factors. Table 11 presents the relationship between insect control and % 1975 costs from rapeseed. Individuals not selecting insect control as an important decision factor tend to have relatively low % rapeseed costs, (i.e. $\leq$ 20% accounts for 78% response) whereas a generally even distribution exists for those considering it important. Table 12 shows young (32%) and middle-aged (39%) farmers are most likely to consider cash income an important decision factor. Farmers over 44 (64%) account for the majority not citing cash income as important. Table 13 presents the association between risk of growing and recent rapeseed growing experience. Farmers not considering risk important appear to have 3-5 (45%) or 6-7 (48%) years of rapeseed growing experience, whereas a generally even distribution exists among individuals considering it important.

Behaviour Measures

This section deals with information necessary to satisfy research questions iv and v:

iv) analyze producer farming practices concerning rapeseed against recommended procedures,

v) determine farm or farmer characteristics associated with incorrect behaviour patterns.

Tables 14 through 27 report current rapeseed farming practices (behaviours) employed by sampled producers. In each table, the recommended practice[1] is starred to allow comparison with sample results.

[1]Recommended practices were obtained from Hetland (1975) and Manitoba (1974), which are generally considered the most reputable and reliable sources.

Table 11. Detailed frequencies of associated variables - insect control versus % 1975 costs from rapeseed.[1]

	% 1975 Costs from Rapeseed									
	≤10%		11-20%		21-30%		≥30%		Row Total	
Insect Control	N	%	N	%	N	%	N	%	N	%
Important	5	(28)	4	(22)	5	(28)	4	(22)	18	100
Not Important	14	(44)	11	(34)	5	(16)	2	(6)	32	100

[1] A chi-square analysis indicates that these findings are significant at the .05 level of confidence.

Table 12. Detailed frequencies of associated variables - cash income versus age.[1]

	Age									
	25-34		35-44		45-54		54		Row Total	
Cash Income per acre	N	%	N	%	N	%	N	%	N	%
Important	9	(32)	3	(11)	11	(39)	5	(18)	28	100
Not Important	3	(16)	4	(21)	6	(32)	6	(32)	19	100

[1] A chi-square analysis indicates that these findings are significant at the .05 level of confidence.

Table 13. Detailed frequencies of associated variables - risk of growing versus rapeseed growing experience in past seven years.[1]

Risk of Growing	Growing Experience (Years) 1-2 N	%	3-5 N	%	6-7 N	%	Row Total N	%
Important	8	(35)	7	(30)	8	(35)	23	100
Not Important	2	(7)	13	(45)	14	(48)	29	100

[1] A chi-square analysis indicates that these findings are significant at the .05 level of confidence.

Table 14. Years between rapeseed crops on the same parcel of land.

Question: How many years do you leave between rapeseed crops on the same parcel of land?

Number of Years	Response	Adjusted %
0	1	1.2
1	1	1.2
2*	13	15.3
3*	31	36.5
More than 3	39	45.9
No answer	7	-
		100.0%

* recommended practice in Tables 14 through 29.

Table 14 indicates number of years left between rapeseed crops on the same parcel of land. The recommended practice is two or three years, which 51.8% of the sample employed. The remainder preferred to leave more than 3 years between rapeseed crops.

Table 15 shows the type of land producers prefer to seed into rapeseed. Recommendations are not clear as to the optimal practice, it probably varies depending on the individual grower and his specific environment. Hetland (1975) suggests summerfallow, whereas Manitoba (1974) claims that both summerfallow or stubble will give high yields. One half of the sample prefers to seed on summerfallow, one quarter prefers stubble, the remainder feels it doesn't matter.

Table 16 indicates a strong sample preference for using certified seed, the recommended practice. However, 11% do not recognize certified seed as being very important.

Table 17 indicates preferred seeding rate for Argentine rapeseed. Sixty-one percent of the sample conform to the standard, 32.5% seed at a higher rate and 6.5% seed below the standard. A large number of respondents (15) missed the question entirely.

Table 18 shows 61.5% of the sample use the recommended seeding rate for Polish rape; 3.1% seed below that level, 35.4% seed at a higher rate. Again, a large number of respondents (27) missed this question.

Table 19 presents the practice concerning seeding depth. The recommendations, less than 1.5 inches or to moisture, account for 55.6% of the response. Most of the remainder (40%)

Table 15. Land type for seeding rapeseed.

Question: Do you prefer to seed rapeseed on stubble or summer fallow land?

Land Type	Response	Adjusted %
Stubble	20	22.7
Summer fallow	44	50.0
Doesn't matter	24	27.3
No answer	4	-
		100.0%

Table 16. Use of certified seed.

Question: Do you use certified seed in any given year.

Category	Response	Adjusted %
Yes*	78	88.6
No	4	4.5
Doesn't matter	6	6.8
No answer	4	-
		100.0%

Table 17. Seeding rate for Argentine rapeseed.

Question: What seeding rate do you use for Argentine rapeseed?

Seeding Rate (lbs/A.)	Response	Adjusted %
0 to 4	5	6.5
5 to 7*	47	61.0
8 to 11	25	32.5
No answer	15	-
		100.0%

Table 18. Seeding rate for Polish rapeseed.

Question: What seeding rate do you use for Polish rapeseed?

Seeding Rate (lbs/A.)	Response	Adjusted %
0 to 3	2	3.1
4 to 6*	40	61.5
7 to 10	23	35.4
No answer	27	-
		100.0%

is accounted for by the category 1.5 to 2.5 inches. A small part of the sample (4.5%) selected a seeding depth greater than 2.5 inches.

Table 20 indicates preference for seeding implement. The double disc press drill, considered the best implement for seeding rapeseed, was used by 42.3% of the sample. The double disc drill (25.6%) and the discer (20.5%) were used by smaller segments. The hoe drill was selected by the smallest proportion of respondents (11.5%).

Use of seed color to determine correct time of swathing is a common practice of rapeseed farmers (Table 21). Accepted standards, however, seem to be in direct conflict. Hetland (1975) claims the crop is ready for swathing when only 21 to 30% of seeds in a pod are still green, the remainder being brown, purple, or red. Manitoba (1974) suggests swathing begin when about 25% of seeds have turned brown, the remainder being greenish-red or completely green. Almost 30% of the sample conform to the Hetland (1975) norm. Most of the others appear to swath earlier, possibly considerate of the Manitoba (1974) recommendation. Since the question was designed using only Hetland's recommendation, individuals following Manitoba (1974) were somewhat neglected in the response category.

Although height of swathing would depend upon plant height, approximately 70% of respondents conform to the recommendation (10 to 20 inches) (Table 22). Most of the

Table 19. Depth of seeding for rapeseed.

Question: How deep do you seed rapeseed?

Depth (inches)	Responses	Adjusted %
Less than 1.5*	37	42.0
1.5 to 2.5	35	39.8
More than 2.5	4	4.5
To moisture*	12	13.6
No answer	4	-
		100.0%

Table 20. Seeding implement for rapeseed.

Question: Which implement do you use to seed rapeseed?

Implement	Response	Adjusted %
Double disc press drill*	33	42.3
Double disc drill	20	25.6
Discer	16	20.5
Hoe drill	9	11.5
No answer	14	-
		100.0%

Table 21. Use of seed color to determine correct time of swathing rapeseed.

Question: When do you begin swathing rapeseed?

% of green seeds in pod	Response	Adjusted %
0 to 20	8	9.3
21 to 30**	25	29.1
31 to 40	22	25.6
41 to 50	18	20.9
More than 50***	13	15.1
No answer	6	-
		100.0%

** according to Hetland (1975)
*** according to Manitoba (1974)

Table 22. Height of swathing rapeseed.

Question: At what height do you swath rapeseed?

Height of Swath (inches)	Response	Adjusted %
Less than 10	25	29.4
10 to 20*	59	69.4
More than 20	1	1.2
No answer	7	-
		100.0%

remainder swath at a lower level.

Table 23 indicates the type of pest control technique used for rapeseed. Almost half of the respondents use both seed treatment and insecticide spray; about 25% using only the former, 12% the latter. Eighteen per cent use no control whatsoever.

Neither Hetland (1975) nor Manitoba (1974) favour specific seed treatments or insecticide sprays. Furadan or lindane seed treatments are mentioned by both sources. Guthion, furadan, or malathion are also suggested as insecticide sprays. Of the seed treatments used by the sample, gammasan and furadan are most popular. Lindasan and thiralin were also reported. A rather large percentage (31.7) of respondents did not know type of treatment used (Table 24).

About half (45.8%) of those respondents using seed treatment claim its per acre cost to be less than $2.00; the remainder (54.2%) feel the cost is $2.00 or greater (Table 25). The model per acre cost was $3.00, selected by 7 respondents.

Table 26 shows types of insecticide sprays in current use by rapeseed farmers. Furadan is most popular (42.9%), followed by malathion (18.4%) and guthion (10.2%). Lanate and DDT were also recorded, but at the low figure of 4.1%. Several respondents (20.4%)did not know the type of spray they used.

Per acre costs of insecticide sprays are presented in Table 27. Two dollars or less per acre accounts for 50% of responses, greater than $2.00 for the remaining 50%. The

Table 23. Type of insect control treatment used for rapeseed.

Question: Do you use seed treatment, insecticide spray, or both to control insect pests of rapeseed?

Type of Control	Response	Adjusted %
Seed treatment	22	24.7
Insecticide spray	11	12.4
Both*	40	44.9
None	16	18.0
No answer	3	-
		100.0%

Table 24. Type of seed treatment used for rapeseed.

Question: What type of seed treatment do you use?

Type of treatment	Response	%
Gammasan	19	31.7
Furadan	17	28.3
Lindasan	3	0.2
Thiralin	2	0.1
Don't know	19	31.7

Table 25. Per acre cost for seed treatment.

Question: What is your approximate per acre cost for seed treatment?

Cost ($/A.)	Response	%	Cumulative %
Less than $1.00	6	12.5	12.5
$1.00	5	10.4	22.9
$1.25	4	8.3	31.2
$1.50	4	8.3	39.5
$1.75	3	6.3	45.8
$2.00	6	12.5	58.3
$2.50	2	4.2	62.5
$2.75	2	4.2	66.7
$3.00	7	14.6	81.3
$4.00	5	10.4	91.7
More than $4.00	4	8.3	100.0

Table 26. Types of insecticide spray used for rapeseed.

Question: What type of insecticide spray do you use to control insect pests of rapeseed?

Type of spray	Responses	%
Furadan	21	42.9
Malathion	9	18.4
Guthion	5	10.2
Lanate	2	4.1
DDT	2	4.1
Don't know	10	20.4
		100.0%

Table 27. Cost per acre of insecticide sprays.

Question: What is your approximate per acre cost for insecticide sprays?

Cost per acre ($/A.)	Response	%	Cumulative %
≤ 0.50	5	12.5	12.5
$0.51 to 0.99	7	17.5	30.0
$1.00 to $1.49	4	10.0	40.0
$1.50	2	5.0	45.0
$2.00	2	5.0	50.0
$2.50	3	7.5	57.5
$3.00	5	12.5	70.0
$3.50	2	5.0	75.0
$4.00	4	10.0	85.0
>$4.00	6	15.0	100.0

modal figure places the per acre cost between $0.51 and $0.99 per acre. However, the distribution appears to be trimodal. This shape is likely explained by rounded-off cost figures ($1, $2, $3).

Table 28 is a comparison of reported rapeseed farming practices to the suggested norm. Those practices adhered to by at least 60% of the sampled growers will be considered as correct behaviour in the sense that there appears to be no urgent need to attempt to alter these existing practices. Four farming practices - years between rapeseed on same land, type of seeding implement, time of swathing, and type of insect control - do not fall into this category and will be arbitrarily defined as incorrect behaviour. That is, these four behaviours are prime candidates for alteration attempts.

Information on farm or farmer characteristics associated with these questionable behaviour patterns is presented in Table 29. This information may indicate farmer types following incorrect behaviours, possibly making it easier for agencies to correct them. The significance levels of these associations show whether any significant relationships exist (i.e. $P \leq 0.05$). Three such associations were identified, and their detailed frequency distributions are presented in Tables 30 to 32. These tables attempt to identify the characteristics of those growers not following suggested farming practices.

Table 30 shows less experienced growers (≤ 8 years) are more likely to follow incorrect crop rotation practices than experienced growers (≥ 9 years). Table 31 shows most questionable

Table 28. Comparative evaluation of rapeseed growers' farming practices with suggested norm.

Farming Practice	% Conforming to Norm
Years between rapeseed	51.8[1]
Type of land for seeding	-
Use of certified seed	88.6
Argentine rapeseed-seeding rate	61.0
Polish rapeseed-seeding rate	61.5
Depth of seeding	65.6
Type of implement	42.3[1]
Time of swathing	44.2[1]
Height of swathing	69.4
Type of insect control	44.9[1]

1 denotes incorrect behaviour pattern

Table 29. Chi-square significance levels for incorrect farming practices against farm/farmer characteristics.

Farming Practice	Farm/Farmer Characteristics								
	Information Source	Rapeseed Experience Total	Rapeseed Experience Recent	Age	Farming Experience	1975 Income	% Income from Rape	1975 Costs	% Costs from Rape
Years between rapeseed	0.290	0.014[1]	0.296	0.469	0.325	0.122	0.163	0.484	0.145
Type of implement	0.502	0.382	0.768	0.640	0.519	0.129	0.169	0.280	0.450
Time of swathing	0.697	0.130	0.165	0.543	0.815	0.311	0.100	0.430	0.068
Type of insect control	0.198	0.607	0.614	0.737	0.412	0.004[1]	0.028[1]	0.163	0.394

1 indicates significance at $P \leq 0.05$ level.

Table 30. Detailed frequencies of associated variables - crop rotation versus total rapeseed growing experience.[1]

	Growing Experience (Years)										Row Total	
Crop Rotation	≤2 N	%	3-5 N	%	6-8 N	%	9-11 N	%	>11 N	%	N	%
2 or 3 years*	3	(7)	18	(42)	8	(19)	6	(14)	8	(19)	43	100
0, 1, or ≥4 years	5	(12)	18	(43)	13	(31)	5	(12)	1	(2)	42	100

* indicates recommended behaviour in Tables 30-32.

[1] A chi-square analysis indicates that these findings are significant at the .05 level of confidence.

Table 31. Detailed frequencies of associated variables - type of insect control versus 1975 farming income.[1]

	1975 Farming Income ($)										Row Total	
Type of Control	20,000 N	%	20,000-24,999 N	%	24,999-30,000 N	%	30,000 N	%			N	%
Seed treatment	5	(25)	3	(15)	2	(10)	10	(50)			20	100
Insect spray	1	(9)	2	(18)	2	(18)	6	(55)			11	100
Both*	1	(3)	4	(10)	1	(3)	33	(85)			39	100
None	4	(29)	1	(7)	1	(7)	8	(57)			14	100

[1] A chi-square analysis indicates that these findings are significant at the .05 level of confidence.

behaviour concerning insect control is found in the highest farming income class (50%, 55%, 57%). However, note that most good behaviour (85%) is also contained in the same category. It should also be noted that artifacts may exist for this practice, as control procedures are normally site-specific based on need for use (i.e. insect control behaviour is difficult to categorize as correct or incorrect). Table 32 illustrates that 83% of individuals using no control derive less than 20% of their income from rapeseed. The majority of those conforming to the standard (44%) or using insect spray (45%) grain more than 20% of their income from rapeseed.

Table 32. Detailed frequencies of associated variables - type of insect control versus % 1975 farming income attributed to rapeseed.[1]

Type of Insect Control	% 1975 Farming Income Rapeseed 0 N %	0-10 N %	11-20 N %	>20 N %	Row Total N %
Seed treatment	4(21)	5(26)	8(42)	2(11)	19 100
Insect spray	1 (9)	3(27)	2(18)	5(45)	11 100
Both*	6(17)	5(14)	9(25)	16(44)	36 100
None	6(43)	3(21)	4(29)	1 (7)	14 100

[1]A chi-square analysis indicates that these findings are significant at the .05 level of confidence.

CHAPTER 4

DISCUSSION

Return Statistics

The 25% return rate obtained was somewhat higher than the expected rate of 20%. This response rate may have even been better had it not been for a very hot, dry summer which caused farmers considerable anguish. Another factor influencing return may have been competition provided by the Canada Census which took place in early July. Moser (1958) has shown that response rate declines when respondents are subjected to subsequent surveys. Crapo and Chubb (1969) recommend that a sample should be checked to ensure that no other survey has recently made use of them.

Sample composition (92 growers, 57 non-growers) was surprising considering 1971 census data. Sixty-two per cent were growers whereas census data suggested 42% in the study area (Table 1). This may be due to more growers being interested in responding to a questionnaire about a crop which they grow. Non-growers may have little interest in rapeseed and may, therefore, dispose of the questionnaire rather than take time to answer.

The sample breakdown by rural municipality suggests that individuals in census division 2 were highly interested in the survey (42% of total respondents). This might be due

to their relative proximity to Winnipeg, possible participation in similar surveys, or ethnic origin. Further research, however, would be required to positively identify reasons for the high response rate in this census division.

Attitude Measures

As defined earlier, attitudes are criteria, decision factors, or evaluations upon which individuals base their choices. In this study the choice is how much rapeseed to grow. Individuals consistently making a zero acre choice are non-growers, others are growers.

There appear to be two ways to increase rapeseed production given the attitudinal data gathered.

(1) Encourage non-growers to grow by changing the negative evaluations (attitudes) of non-growers, which may result in a change in behavior (ie. they may grow rapeseed)

(2) Encourage growers to grow more by reinforcing these with positive evaluations of the crop and changing the attitudes (evaluations) of those growers who view the crop in a negative way. This can more easily be done by determining which decision factors are of most importance.

Non-growers and growers selected similar factors as important to their production decisions, but ranked them differently (Table 7). Insect control, weed control, and cash income per acre surface as the three most important decision factors for the entire sample.

The high ranking of insect control as a reason for not

growing the crop per se (in the case of non-growers) or as a reason for not growing more of the crop (in the case of growers) is not particularly surprising given the much publicized problem that a particular pest, the flea beetle, has caused over the past few years. This pest has achieved the distinction of being Manitoba's most serious crop pest (Ent. Soc. 1976). Flea beetles cause damage to seedling rape plants by feeding upon leaves to the point of complete destruction and subsequent death of the plant (Canada 1974). Plant injury is very severe during hot, dry weather when more intense beetle activity occurs (Canada 1974). Because of their small size and rapid movements, flea beetles are not often detected and are very difficult to control.

Note that non-growers rank this factor as one of the most important reasons for not growing, whereas growers consider it of less importance in deciding whether or not to grow. This may suggest non-growers tend to focus on negative attributes of a problem, which growers have partially solved. Nonetheless, further research toward finding an efficient, low cost and easy to use control procedure appears necessary if substantial non-growers are going to be attracted to growing rape. In the short term, farmers should be better educated to use recommended insecticides for flea beetle control.

Weed control was cited as another important decision factor by the sample. Percentage of non-growers selecting this factor once again exceeded growers, suggesting negative

connotation on the part of non-growers. In the past few years, weed control in rapeseed has been difficult. Herbicides have been devised (TREFLAN, AVADEX, COBEX) which are considered very good methods of weed control, if used properly (Hetland 1975). However, environmental parameters can grossly affect control efficiency. Increased publicity about the availability and effectiveness of all recommended herbicides should be undertaken to lessen the negative evaluation of rape on the weed control factor. Farmer education programs devised to teach correct herbicide application procedures and practices may also be necessary.

Cash income per acre, ranked as another important factor overall, was less important to non-growers than to growers. Growers likely cited this reason because of recent uncertainty in the rapeseed pricing market. Non-growers appear to be less concerned with this economic factor but are more concerned with technical factors. This is likely due to a non-grower basing his decision upon factors of immediate concern, namely, field practice factors. Cash income per acre may become of greater importance in future years for reasons cited in Chapter 1. The best solution to solving the uncertain price situation is a guaranteed price, but this is likely difficult to attain.

Harvesting techniques, risk of growing, and cost of production were three decision factors obtaining roughly equal responses, although from different sources. A larger fraction of non-growers considered harvesting techniques

whereas the other two factors contained more growers.

Correct harvesting techniques are presently documented in government publications (Manitoba 1974 and Downey et al 1974). Non-growers may simply not realize the existence of these information sources, or may not know how to harvest the crop at all. Duplication of two response categories by non-growers (harvesting techniques=need for special machinery) suggests they think rapeseed production requires unique equipment. However, since 12% of growers also consider this factor in rapeseed production decisions, recommendations may require updating. Increased publicity and/or education regarding the apparent ease with which rapeseed can be harvested should be undertaken.

Risk of growing was also cited as an important decision factor for rapeseed production but only by growers. This category is difficult to pinpoint as it could mean different things to different people, such as risk due to frost, risk due to lack of moisture, risk due to too much moisture, risk due to low price or market uncertainty, etc. Assuming for the moment that the risk factor means "environmental risk", there is very little that can be done to correct this problem. Increased research into hardier varieties might reduce some environmental risk. Assuming the risk factor to mean economic risk, this could be eliminated partially by a more stable price level being achieved for rapeseed. The notion of risk of growing rapeseed could be reduced using communication programs that emphasize advantages of rapeseed production.

Cost of production for rapeseed was also selected as an important decision factor by more growers than non-growers, probably because non-growers would not have information on this factor. Presence of high costs of production for rapeseed, possibly a deterrent to production, are totally unfounded. McRorie (1976) shows that rapeseed and barley have very similar costs of production per acre ($105/A rapeseed as opposed to $100/A barley). On a 100 acre segment, this would account for an extra $500.00. This amount, however, turns out to be insignificant when one considers the price the farmer will obtain for his crop at harvest. McRorie (1976) shows that the price for barley would not even meet total costs of production per acre, whereas rapeseed would more than cover total costs.[1] Such examples should be more widely publicized. Even though per acre cost of production is greater for rapeseed, final profit based on price is greater for rapeseed than barley.

Other decision factors were selected by a small portion of the total sample and will not be considered important. Some of these, however, should be noted.

An omission from the "important" decision factors is disease control. Although Runciman (1976) states that correct management of rapeseed will minimize disease, Japanese importers have reduced purchases of Canadian rapeseed due to Sclerotinea disease (Winnipeg Free Press 1976 b).

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[1] Note that McRorie (1976) uses 1976 prices for both crops, barley at a high level and rapeseed at a low level.

This infection could attack Japan's mulberry bushes, the basis of that country's natural silk industry (Winnipeg Free Press 1976 b). The apparent lack of knowledge about this problem should be overcome via information programs directed to the farming community. Presence of the disease in an individual's crop could influence his yearly rapeseed sales if government regulations are enacted prohibiting sales of rapeseed containing the disease.

Non-growers also cited need for special machinery in relatively large numbers as a reason for not growing rapeseed. This may in part be due to the presence of non-cereal farmers in the sample who would not have any production equipment suited to seeding the rapeseed. Machinery used for any cereal crop would be sufficient for rapeseed, better equipment, of course, would enhance yield. As mentioned earlier, the similarity in responses by non-growers for this category with harvesting techniques tends to suggest non-growers believe rapeseed production machinery is somewhat unique.

This study has discovered that six factors appear to be most important in a farmer's resource management decision for rapeseed. These include:

i) insect control
ii) weed control
iii) cash income per acre
iv) harvesting techniques
v) risk of growing
vi) cost of production

Agencies interested in maintaining rapeseed production should focus on these factors. Some possible methods of influencing the farming community have been discussed above.

This study also evaluated how growers compared rapeseed to wheat and barley. Wheat, as expected, was regarded as the most accepted crop in the study area, followed by barley and rapeseed (Table 8). If one assumes that a crop could not score better than wheat, one can observe that rapeseed has a relatively large disadvantage to overcome in establishing itself. Attitude difference between rapeseed and wheat was more significant than between rapeseed and barley (Table 8). Of the six important decision factors presented earlier, five were significantly less favourable for rapeseed as opposed to alternate crops. This would suggest that for these factors, rapeseed is not as favourable as barley or wheat. These factors are insect control, weed control, cash income per acre, harvesting techniques, and risk of growing. Further study is especially needed for these criteria to identify means of enhancing rapeseed's image.

The remaining important decision factor - cost of production - was not significantly different between rapeseed and barley. This suggests that rapeseed has closely approached barley regarding favourability of this factor. Merits or advantages of producing rapeseed should be sufficient to stimulate or maintain production.

This study also attempted to identify farm or farmer

characteristics for the five important rapeseed decision factors regarded as unfavourable (Tables 9 and 10). No significant relationships existed among non-grower decision factors and selected characteristics. For growers, insect control was associated with % 1975 costs from rapeseed; cash income per acre with age; and risk of growing with recent rapeseed experience (Tables 11 to 13). Low % rapeseed cost producers probably do not consider insect control important because they produce small amounts of rapeseed, or reside in areas where insect control is not a major problem. Young and moderately aged producers consider cash income per acre important. This may be due to younger farmers not yet being established in their profession and thus working on borrowed money. To pay off their debt and develop a good credit rating, it is essential to consider economic conditions of the crops they choose to plant. Individuals having moderate or substantial recent rapeseed growing experience do not consider risk of growing an important factor. This may be due to reduction in risk as an individual gains experience with the crop (i.e. he begins to realize how to cope with risky situations). Further research (with a larger sample size) into more accurate identification of individual characteristics corresponding to particular attitudes is necessary to better describe trends in attitudes in the farming community.

Behaviour Measures

None of the farming practices were adhered to by 100% of the sample.

Hetland (1975) suggests 2 or 3 years should be left between rapeseed crops on the same parcel of land. This prevents disease and insect spread, allows soil to regain required nutrients, and lessens the chance of heavy weed infestations. About half of the sample does not conform to the requirement (Table 14). This figure may be inflated somewhat due to the category "more than 3 years." If an individual grew rapeseed one time 10 years ago, he would fall into that response category. Nonetheless, increased yield and/or decreased production costs could likely be achieved with increased adherence to this standard.

Hetland (1975) suggests seeding on summerfallow, but other literature (Elanco 1976 and Manitoba 1974) claim stubble seeding can achieve high yields. Fifty per cent of the respondents seed on summerfallow, 23% on stubble, 27% on either (Table 15). Because of the uncertainty in the literature, this farm practice does not appear to be of major significance.

Hetland (1975) suggests certified seed should always be used to achieve higher, cleaner yields. Almost 90% of the sample conforms to this standard, hence, further promotional work seems unnecessary (Table 16).

Seeding rates are suggested as 5 to 7 lbs./acre for Argentine rape, 4 to 6 lbs./acre for Polish rape (Hetland 1975, Downey et al. 1974). Sixty-one per cent of the sample conforms to these standards, with most of the remainder seeding at a higher rate (Tables 17 and 18). Individuals seeding lower than recommendations are of concern, as they may not achieve profitable yield especially in dry years when germination is poor.

Those seeding above recommendations may incur needless excess costs of production, and should be so informed. One must note that seeding rate may be site-specific, requiring adjustments to satisfy environmental conditions.

Hetland (1975) suggests seeding no deeper than 1.5 inches or to moisture as reasonable standards. Fifty-four per cent of the sample conforms to this recommendation, the remainder does not (Table 19). Those individuals seeding too deep may get a lower germination rate, delayed germination, and thus all-round delay in crop production resulting in reduced yields. Publicity should be directed toward improved acceptance of this practice.

The double disc press drill, used by 42.3% of the sample, is the best implement for seeding rapeseed (Hetland 1975). The majority of the respondents use other implements which are likely not as well-suited to rapeseed (Table 20). Increased publicity is definitely needed in correcting this farming practice.

Hetland (1975) suggests gauging correct time for swathing from seed color in pods (swath when 25% of seed in pods is still green). Manitoba (1974) suggests swathing when 25% of seeds are brown, a direct conflict.[1] Only 30% of the sample follows Hetland's recommendation (Table 21). Most of the remaining 70% swath too soon, which reduces yield up to 400 pounds per acre (Hetland 1975). Too late swathing gives a fluffy swath susceptible to wind action and heavy losses. However, it is virtually

[1]This may be due to Hetland being a seed grower thus leaving a crop longer for better germination. However this should be explained to growers who may use these recommendations incorrectly, not even realizing it.

impossible for a producer to gauge his swathing time if recommendations are diametrically opposed. Correction of this information in the literature is needed to allow the farmer to make a correct decision.

Hetland (1975) suggests a swathing height range between 10 to 20 inches, swathing too high results in pod loss and too low in excess trash. Almost 70% of the sample conform to this standard, the remainder appear to swath too high, thus losing pods and reducing yield (Table 22). This practice, however, is very dependent upon plant height.

Hetland (1975) recommends insect pest control using a seed treatment followed by insecticide spray. Of course, control method will depend on the individual situation. Almost half the respondents conform to this standard, several use only one control measure (Table 23). Eighteen per cent use no control at all, which may be appropriate for their specific situation. All seed treatment types cited were acceptable (Table 24). A great deal of variation occurred in per acre cost of seed treatment, partly due to lack of differentiation between years used (Table 25). Johnson (1975) found seed treatment costs for rapeseed at $0.89 per acre, which would represent about 12% of the present sample.

Guthion, furadan, or malathion are recommended insecticides for controlling insect pests on rapeseed (Manitoba 1974 and Hetland 1975). Furadan, the favored compound, was used by roughly 43%. Malathion was used by 18%, guthion by about 10% (Table 26). Insecticide per acre costs show great variability with $2.00 representing the mean level (Table 27). As previously stated,

seed treatment followed by application with insecticide if necessary is an optimal control procedure and should therefore be publicized to producers having insect problems.

Four rapeseed farming practices were identified as containing incorrect behaviour patterns - years between rapeseed on the same land, type of seeding implement, time of swathing, and type of insect control (Table 28). Increased publicity of the suggested practice should be especially implemented for the above practices, as crop yield could be drastically affected. Identification of the absolute correct practice is necessary for one of those (i.e. time of swathing).

This study also attempted to identify farm or farmer characteristics associated with various behaviour patterns (Table 29). Moderately experienced rapeseed growers (3-5 years) and high income class growers were most likely to be following incorrect behaviour patterns (Tables 30 to 32).

Growers not leaving sufficient time between rapeseed crops on the same parcel of land were primarily moderately experienced growers. These growers may increase susceptibility to disease on their land. These individuals may have had success with rapeseed in a particular area in one year and tried for success in subsequent years. Further research would be necessary to determine if they indeed had continued success. These growers may simply have been unaware of the recommendation, hence the need for increased publicity.

Most poor behaviour regarding type of insect control is found in the highest farm income class. This is possibly due

to question design, not allowing sufficient response categories for higher income levels. However, insect control behaviour is very site-specific and individuals should be taught to adapt their situation to changing environmental conditions.

Because much of the discussion advocates an increase in communication programs designed to influence attitudes or behaviours of farmers, it is appropriate to comment on which information sources and vehicles would appear to be most effective in bringing about desired changes (Table 33). The information regarding possible and most valuable information sources does show how to best reach producers with information. Although personal sources (neighbours or friends) are recognized as the most valuable source, it is difficult to provide this source with material directly. They can be indirectly affected by increased use of all information sources. The apparent importance of farm papers and agricultural representatives can definitely be used to good advantage by simply printing correct farming practices in an easily distributable form. Rogers (1960) substantiates these data as he finds informal channels (neighbours, friends, relatives) to be of prime importance, followed by farm magazines.

Table 33. Information source utilization.

Question: Please indicate which of the following information sources you use and which is most useful.[1]

Information Source	Exposure Measure	Usefulness Measure
Neighbours or friends	90	31
Farm Papers	91	21
Agricultural Representatives	48	21
University researchers	33	7
Self-experiments	9	5
Chemical dealers	46	4
Rapeseed Digest	20	3
Elevator agents	50	3
Government researchers	21	3
Radio or television	32	2
Government publications	40	1
CSP Foods Ltd.	3	1

[1]See Appendix A, questions 23a and b.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Recent events in the international oilseeds market have depressed the price of Canadian rapeseed. This along with non-price factors have caused Canadian producers to reduce their rapeseed acreage. This result is of considerable concern to agencies such as the Rapeseed Association of Canada, who would like to maintain rapeseed production at a reasonably constant level.

This study was undertaken to identify and analyze farmers' attitudes and behaviours which could serve as a basis for marketing strategy formulation. With this basic interest in mind, the following specific objectives were developed:

i) identify and compare decision factors of both rapeseed growers and non-growers

ii) evaluate grower attitude towards rapeseed versus wheat and barley

iii) analyze producer farming practices concerning rapeseed against recommended procedures

iv) determine farm/farmer characteristics associated with particular decision factors and farming practices.

The research study was carried out through the spring and summer of 1976. A sample of Manitoba primary producers was selected from areas showing high incidence of growing rapeseed. About 600 pre-tested mail-out questionnaires were sent to farmers in these areas with final response date set at August 15. Data were transferred onto computer cards and analyses undertaken, using the SPSS computer program at the University of Manitoba Computer Centre.

Study results were divided into three sections: attitude measures, behaviour measures and related information. The latter is not central to the study and can be found in Appendix C.

Major conclusions arising from this study include:

i) Growers and non-growers have similar perceptsions about the negative attributes of rapeseed production. Non-growers and growers cite similar factors in making rapeseed production decisions; the former are more concerned about technical problems associated with the crop, the latter with economic ones.

ii) Six important decision factors of concern to both growers and non-growers were identified in this study (in no particular order of importance):

   a) insect control
   b) weed control
   c) cash income per acre
   d) harvesting techniques
   e) risk of growing
   f) cost of production

iii) Rapeseed growers view rapeseed less favourably compared to wheat and/or barley for any of these factors except cost of production.

iv) It is difficult to identify farm/farmer characteristics associated with particular decision factors because of the relatively small sample size. For single decision factors and characteristics, insect control was associated with % 1975 costs due to rapeseed; risk of growing with recent growing experience, and cash income per acre with age of respondent.

v) None of the recommended farming practices are followed by 100% of the sample, but some are deviated from to a greater extent than others. Greater than 60% of growers did not follow the recommended practice for:

   a) years between rapeseed
   b) type of seeding implement
   c) time of swathing
   d) type of insect control

vi) It is difficult to identify farm or farmer characteristics associated with bad behaviour patterns. For single farming practices, most poor behaviour was due to moderately experienced growers and high farm income class.

vii) Other than person to person communication, farm papers and agricultural representatives are the most viable vehicles for disseminating information to farmers.

Recommendations arising from this study include:

i) Further research toward finding efficient, low cost, and easy to use insect and weed control procedures is necessary. In the short-term, farmers should be better educated to use recommended insecticides for flea beetle control.

ii) Increased publicity about the availability of all recommended herbicides should be undertaken. Where necessary, farmer education programs should be implemented to teach correct herbicide application procedures and practices.

iii) Establishment of a stable farm price for rapeseed might help to alleviate yearly acreage fluctuations.

iv) Increased education regarding the apparent harvesting ease for rapeseed is necessary.

v) Hardier rapeseed varieties obtained through increased research may help reduce the notion of environmental risk. A stable price would reduce the notion of economic risk.

vi) Increased publicity regarding the similar costs of production of rapeseed and barley, especially when final price is considered, should be undertaken.

vii) Increased education and research into Sclerotinea disease is necessary to ensure that farmers do not incur losses because of lack of an international market for their diseased crop.

viii) Increased publicity regarding all recommended farming

practices should be utilized, especially concerning the four showing greatest deviation from the norm.

ix) Correction in the literature of the conflict between Hetland (1975) and Manitoba (1974) regarding correct time of swathing rapeseed. The present situation leaves farmers with two diametrically opposed recommendations.

x) Further research could be directed toward identifying more accurately individuals having certain negative attitudes and/or not following recommended procedures. This would allow influential strategy to be more efficiently directed toward farmers requiring the greatest amount of encouragement.

xi) Increased use of farm papers and agricultural representatives would likely be the most viable way to disseminate information to farmers. Use of all information sources would increase the number of contacts into the most accepted information source for farmers - neighbours and friends.

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APPENDIX A

QUESTIONNAIRE AND COVER LETTER

THE UNIVERSITY OF MANITOBA

NATURAL RESOURCE INSTITUTE WINNIPEG, MANITOBA R3T 2N2

June 14, 1976

Dear Landowner:

You have been selected to assist in a research study on rapeseed production in Manitoba. The knowledge and information that only you can provide are of utmost importance in maintaining production and increasing the profitability of this Canadian crop.

The purpose of this study is to obtain farmers' attitudes toward rapeseed production, as well as an indication of rapeseed farming practices. This information will be used as a guideline for efficient management of rapeseed production.

I have enclosed a questionnaire which I am asking you to complete. It is essential to the study that both growers and non-growers of rapeseed complete and return the questionnaire. The questionnaire has been designed so that it requires a minimum of your time to complete. In most cases you can answer with a simple check mark ✓.

Please be assured that all information that you provide will be strictly confidential, so do not put your name on the questionnaire. As your answers are extremely important for the completion of this research, I would greatly appreciate if you would return the completed form in the envelope provided as soon as possible.

Please return your completed questionnaire by July 15, 1976. You will receive an advance copy of the findings of this study. Discovering what your fellow growers do may prove not only interesting but helpful.

Thank you for your co-operation.

Yours truly,

R. K. Baydack

1976 RAPESEED SURVEY

Please check ✓ the appropriate answer.

1. In which Rural Municipality(s) do you farm? _____

2. Which of the following crops have you grown?

___ wheat ___ rapeseed ___ flax

___ barley ___ oats ___ other _____

If you have grown rapeseed, please skip to question 4.

3. Please check as many of the following which explain why you have never grown rapeseed?

___ wrong soil type
___ have never received information about it
___ low cash income it provides
___ high costs of production compared to other crops
___ need for special machinery
___ transportation difficulties
___ insect control is difficult
___ weed control is difficult
___ disease control is difficult
___ harvesting problems
___ time required to produce it
___ government recommendations
___ other (please specify) _____

Now, would you please skip to question 17 on page 4.

4. How many years of experience have you had growing rapeseed?

___ less than 2 years ___ 9 to 11 years
___ 3 to 5 years ___ more than 11 years
___ 6 to 8 years

5. Please complete the following table for the years you grew rapeseed.

	1970	1971	1972	1973	1974	1975	1976
Number of Acres in rapeseed							
Average Yield of rapeseed per Acre							
Total available acres of cropland							

6. What are your 1977 plans for rapeseed?

___ continue production with increased acreage
___ continue production with same acreage
___ continue production but decrease acreage slightly
___ continue production but decrease acreage substantially
___ discontinue production altogether
___ undecided

6a. What is the main reason for your plans? _____

7. How do you feel wheat, rapeseed, and barley compare for the characteristics listed below? Please try to estimate your feelings, on a scale of 1 to 5, about each of the crops for every characteristic. You can think of the numbers being: 1 = very favourable; 2 = moderately favourable; 3 = in-between; 4 = moderately unfavourable; 5 = very unfavourable. Circle the number which best describes your feeling about each crop.

For instance, suppose you were comparing three cars concerning gas mileage. If you thought that a Ford product gets very good mileage you would circle number (1) or (2). If you thought a GM product gets in-between mileage, you would circle number (3). If you thought a Dodge product gets poor mileage, you might circle number (4) or (5).

		Very Favourable				Very Unfavourable	Don't Know
___	Cash income per acre						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Costs of production						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Risk of growing						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Drought tolerance						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Insect control						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Time spent producing crop						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Disease control						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Harvesting techniques						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Weed control						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6
___	Storage requirements						
	wheat	1	2	3	4	5	6
	rapeseed	1	2	3	4	5	6
	barley	1	2	3	4	5	6

8. Now I would like to know which three of the above factors are most important in affecting your decision to produce rapeseed in any given year. Please place a check mark ✓ in the space provided in the left hand margin for the three of your choice.

Please check ✓ the most appropriate answer.

9. How many years do you leave between rapeseed crops on the same parcel of land?

___ none ___ 2 years ___ more than 3 years

___ 1 year ___ 3 years

10. Do you prefer to seed rapeseed on stubble or summerfallow land?

___ stubble ___ summerfallow ___ doesn't matter

11. Do you use certified rapeseed in any given year?

___ yes ___ no ___ doesn't matter

12. What seeding rate do you use for:

a) Argentine Rape (midas, Zephyr, tower, target)

___ 0 to 4 pounds per acre

___ 5 to 7 pounds per acre

___ 8 to 11 pounds per acre

___ more than 11

b) Polish Rape (torch, span, echo, R-500)

___ 0 to 3 pounds per acre

___ 4 to 6 pounds per acre

___ 7 to 10 pounds per acre

___ more than 10

13a. How deep do you seed rapeseed?

___ less than 1½ inches

___ 1½ to 2½ inches

___ more than 2½ inches

___ always to moisture

13b. Which implement do you use to seed rapeseed?

___ double disc drill

___ double disc press drill

___ hoe drill

___ discer

___ other (please specify) _____

14. When do you begin swathing rapeseed?

___ when 0 to 20% of the seed in the pods is green

___ 21 to 30%

___ 31 to 40%

___ 41 to 50%

___ more than 50%

15. At what height do you swath rapeseed?

___ so that less than 10 inches of stubble remains

___ 10 to 20 inches of stubble remains

___ more than 20 inches of stubble remains

16a. Do you use seed treatments, insecticide sprays, or both to control insect pests of rapeseed?

___ seed treatment brand: _____

___ insecticide spray brand: _____

16b. Approximately what percentage of your rapeseed acreage do you treat in any given year with:

seed treatment _____%

insecticide spray _____%

16c. What is your approximate insecticide cost per acre in any given year for:

seed treatment $_____ per acre

insecticide spray $_____ per acre

17. Into what age bracket do you fall?

___ 24 or younger ___ 35 to 44 ___ 55 to 64
___ 25 to 34 ___ 45 to 54 ___ over 65

18. How many years has farming been your principle form of income?

___ less than 5 years ___ 16 to 30 years
___ 6 to 10 years ___ over 30 years
___ 11 to 15 years ___ principle source is not farming

19. Total gross (before expenses were deducted) 1975 farm income?

___ $4,999 or lower ___ $20,000 to $24,999
___ $5,000 to $9,999 ___ $25,000 to $29,999
___ $10,000 to $14,999 ___ over $30,000
___ $15,000 to $19,999

20. Approximately what percentage of your total gross 1975 farm income would you attribute to rapeseed sales?

___ none ___ 31 to 40%
___ less than 10% ___ 41 to 50%
___ 11 to 20% ___ more than 50%
___ 21 to 30%

21. Total gross 1975 farm costs of production?

___ $4,999 or lower ___ $20,000 to 24,999
___ $5,000 to $9,999 ___ $25,000 to $29,999
___ $10,000 to $14,999 ___ over $30,000
___ $15,000 to $19,999

22. Approximately what percentage of your 1975 farm costs of production would you attribute to rapeseed production?

___ none ___ 31 to 40%
___ less than 10% ___ 41 to 50%
___ 11 to 20% ___ more than 50%
___ 21 to 30%

23a. Which of the following sources have you used to get information about rapeseed production (check as many as necessary)

___ neighbours or friends ___ university researchers
___ Rapeseed Digest ___ government researchers
___ farm papers ___ radio and television
___ elevator agents ___ government publications
___ chemical dealers ___ none of the above
___ ag. reps. ___ other (please specify) _____

_____

23b. Which of the above would you consider to be the most valuable source?

_____

PLEASE ADD ANY ADDITIONAL COMMENTS ABOUT THE QUESTIONNAIRE OR ABOUT RAPESEED IN GENERAL IN THE SPACE PROVIDED BELOW. THANK YOU.

_____

APPENDIX B

CATEGORIES OF VARIABLES UNDER STUDY

1. Non-grower decision variables (reasons for not growing rapeseed.)

NSOIL	wrong soil type
NOINFO	lack of information
NLOCASH	low cash income
NCOPROD	high costs of production
NSPECMA	need for special machinery
NTRANS	transportation difficulties
NINS	insect control
NWC	weed control
NDC	disease control
NHARV	harvesting problems
NTIME	time required for production
NGOVREC	government recommendations
NOTHER	other reasons

2. Sample characteristic variables.

RM	rural municipalities
GWH	grown wheat
GBA	grown barley
GRA	grown rapeseed
GO	grown oats
GFL	grown flax
GRY	grown rye
GFB	grown faba beans
GSU	grown sunflowers

2. Sample characteristic variables (Cont'd)

GBW	grown buckwheat
GP	grown peas
GOT	grown other crops
AGE	age of respondent
YRFARM	farming experience
GROSINC	1975 gross farm income
GROSCOST	1975 gross farm costs of production
RAPEINC	% 1975 income due to rapeseed
RAPECOST	% 1975 costs due to rapeseed
ISNB	information source

3. Grower interest variables.

TOTYRS	total experience with rapeseed
YR7076	experience in past 7 years
A70 to A76	yearly rapeseed acreage, 1970 to 1976
Y70 to Y76	yearly rapeseed yield, 1970 to 1976

4. Grower decision factor variables (RW = wheat, RR = rapeseed, RB = barley, NB = most important).

RWCAINC, RRCAINC, RBCAINC, NBCAINC	cash income per acre
RWCOPROD, RRCOPROD, RBCOPROD, NBCOPROD	costs of production
RWRISK, RRRISK, RBRISK, NBRISK	risk of growing
RWDROT, RRDROT, RBDROT, NBDROT	drought tolerance
RWINS, RRINS, RBINS, NBINS	insect control
RWTIME, RRTIME, RBTIME, NBTIME	time spent producing
RWDIS, RRDIS, RBDIS, NBDIS	disease control

4. Grower decision factor variables (Cont'd)

RWHARV, RRHARV, RBHARV, NBHARV	harvesting techniques
RWWEED, RRWEED, RBWEED, NBWEED	weed control
RWSTOR, RRSTOR, RBSTOR, NBSTOR	storage requirements

5. Grower farming practice variables.

YRBETWN	years between rapeseed crops
SEEDLAND	type of land used for seeding
CERT	use of certified seed
ARGRATE	rate of seeding Argentine rapeseed
POLRATE	rate of seeding Polish rapeseed
DEPTH	depth of seeding
IMPL	type of seeding implement
SWATH	time of swathing
HEIGHT	height of swathing
TREAT	type of pest control applied
SDBRND	type of seed treatment
SPBRND	type of insecticide spray
SDCOST	cost per acre of seed treatment
SPCOST	cost per acre of insecticide spray

APPENDIX C

RELATED DATA

Grower Interest Variables

These variables differentiate among different types of rapeseed growers comprising the sample. Table C-1 lists total rapeseed growing experience. Most growers sampled had 3 to 5 years experience, but over 20% had more than eight years.

Table C-2 shows recent grower experience with rapeseed (since 1970). The breakdown appears rather even, suggesting the sample is made up of growers having different interest levels. Growers with one or two years experience could be labeled as light or occasional growers; those with 3, 4 or 5 years could be considered as moderate growers; those with 6 or 7 years, heavy or regular growers. The two experience variables will be used in later analyses.

Growers were asked to designate recent yearly acreage in rapeseed (since 1970). On an individual basis, these values ranged from 0 to 920 acres in any of the given years. Possibly of greater importance is Table C-3, which lists mean yearly acreage reported in rapeseed. When compared to government reports for Manitoba for these same years (Figure C-1), one can see that the sample is generally representative of Manitoba rapeseed growers.

Growers also provided yearly yield data which ranged from 0 to 46 bushels per acre for the various years. Table C-4 shows the mean yearly yields for rapeseed, and Figure C-2 compares these to overall yields for Manitoba obtained using government survey data. Once again the sample can be seen as generally representative, although higher in reported yield.

Table C-1. Total experience growing rapeseed.

Question: How many years of experience have you had growing rapeseed?

Years	Number of Growers	Relative Frequency	Cumulative Frequency
Less than 2	14	15.2	15.2
3 to 5	36	39.1	54.3
6 to 8	21	22.8	77.1
9 to 11	12	13.0	90.1
More than 11	9	9.8	100.0

Table C-2. Experience with rapeseed since 1970.

Question: Please indicate recent growing experience with rapeseed.

Years	Number of Growers	Relative Frequency	Cumulative Frequency
1	7	7.6	7.6
2	13	14.1	21.7
3	18	19.6	41.3
4	13	14.1	55.4
5	10	10.9	66.3
6	13	14.1	80.4
7	18	19.6	100.0

Table C-3. Mean reported yearly rapeseed acreages, 1970 to 1976.

Question: Please indicate recent rapeseed acreage - (since 1970).

Year	Mean Acreage
1970	87.3
1971	107.9
1972	114.3
1973	117.7
1974	117.6
1975	143.4
1976	104.6

Table C-4. Mean reported yearly rapeseed yields, 1970 to 1976.

Question: Please indicate average yield per acre for rapeseed (since 1970).

Year	Mean Yield
1970	21.0
1971	20.9
1972	20.1
1973	20.7
1974	21.4
1975	20.2
1976	21.0[1]

[1] Expected yield.

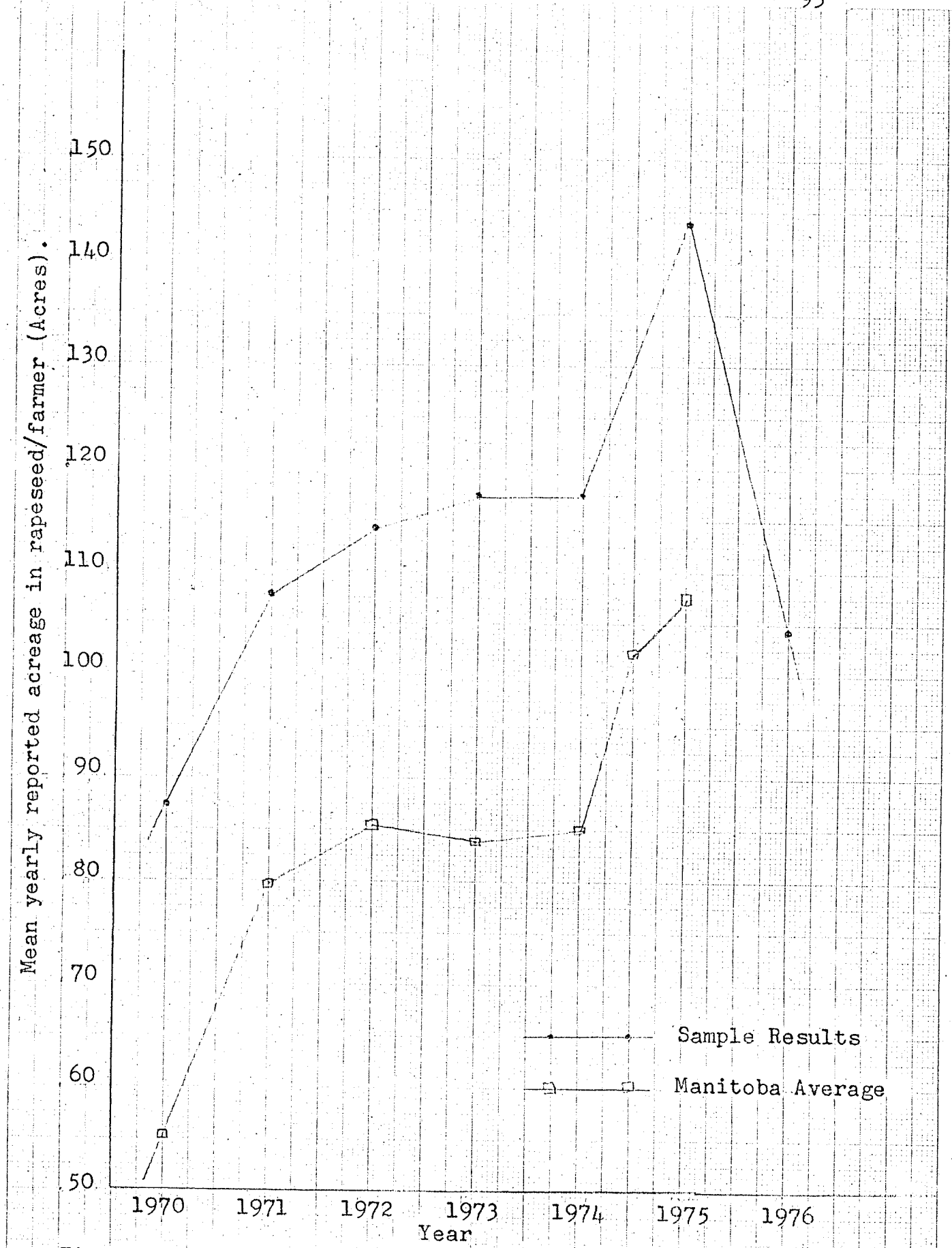

Fig. C-1. Comparison of sample with Manitoba average for mean yearly reported acreage.

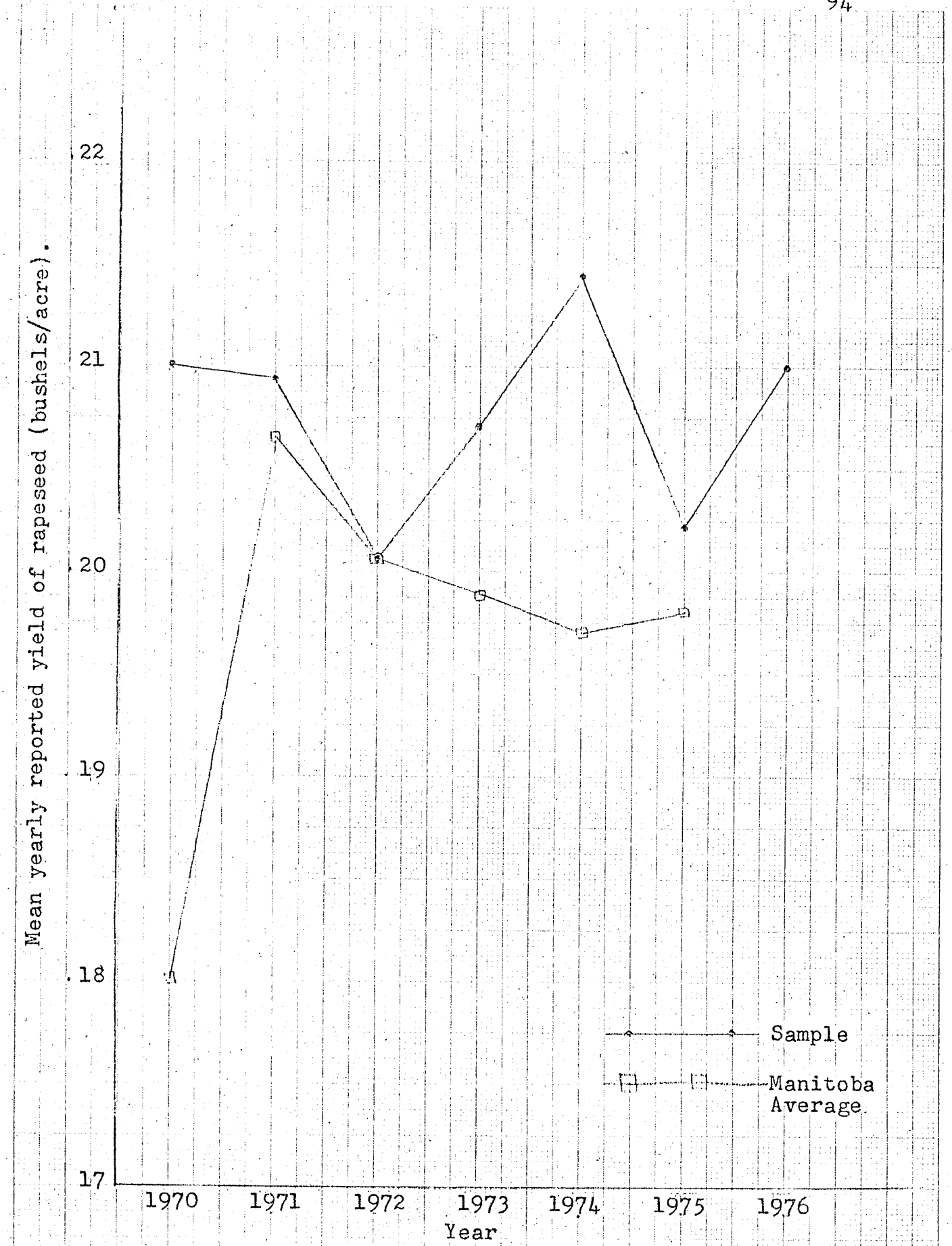

Figure C-2. Comparison of sample and Manitoba average for mean yearly reported yield.

This may be due to unwillingness to report poor yields, pride, or above average growers comprising the sample.

Table C-5 shows proposed plans for rapeseed in 1977. Although almost half (43%) of the growers were still undecided, a relatively large number stated they would sustain their production (23%), while 20% claimed they would discontinue production of rapeseed altogether.

Growers sustaining or increasing production (25) cited only crop rotation, enjoyment from growing, and cash income provided as important reasons for their proposed plans. Table C-6 shows low price and crop pests to be two important factors in the decision not to increase or sustain rapeseed production. On a percentage basis, these two factors account for 62% of the respondents decisions.

Sample Characteristics

Tables C-7 to C-13, including both growers and non-growers of rapeseed, show general characteristics of the sample. Table C-7 indicates age breakdown of farmers sampled, and Table C-8 shows years of experience as farmers. These tables indicate that the sample was composed of a high percentage of very experienced and relatively older individuals (60% older than 45). Table C-9 shows gross farm income for 1975, about half of the sample selecting the category of greater than $30,000.00. Table C-10 shows the breakdown of percent of income generated from rapeseed. Since only 57 non-growers comprised the sample, it is interesting to note

Table C-5. Proposed plans for rapeseed in 1977.

Question: What are your proposed plans for rapeseed in 1977?

Response	Number of Growers	%
Increase production	4	4.4
Sustain production	21	23.3
Decrease production slightly	5	5.6
Decrease production substantially	3	3.3
Discontinue production	18	20.0
Undecided	39	43.3

Table C-6. Reasons for 1977 plans of growers not sustaining production.

Question: What is the main reason for your 1977 plans?

Reason	Number Citing Reason
Low price and crop pests	13
Low price	12
Crop pests	11
Market uncertainty	8
Lack of land	6
High production costs	3
Poor yield	1
Other reasons	4

Table C-7. Age of respondents in sample.

Question: Into what age bracket do you fall?

Age (years)	Responses	Adjusted %
Less than 24	5	3.5
25 to 34	24	16.8
35 to 44	27	18.9
45 to 54	49	34.3
55 to 64	29	20.3
More than 65	9	6.3
No Answer	6	-
		100.0%

Table C-8. Number of years farming has been principle source of income.

Number of Years	Responses	%
Less than 5	18	12.8
6 to 10	11	7.8
11 to 15	15	10.6
16 to 30	47	33.3
More than 30	44	31.2
Not farming	6	4.3
No Answer	8	-

Table C-9. Gross 1975 farm income.

Gross Income ($)	Responses	%
Less than $4999	7	5.1
$5000 to 9999	10	7.3
$10,000 to 14,999	11	8.0
$15,000 to 19,999	16	11.7
$20,000 to 24,999	16	11.7
$25,000 to 29,999	8	5.8
More than 30,000	69	50.4
No Answer	12	-

Table C-10. Percent of 1975 gross income attributed to rapeseed sales.

% of Income	Responses	%
0	70	51.9
Less than 10	17	12.6
11 to 20	25	18.5
21 to 30	15	11.1
31 to 40	6	4.4
41 to 50	2	1.5
No Answer	14	-

that 13 growers either did not grow the crop in 1975 or felt rapeseed contributed nothing to their 1975 total income. Eleven to twenty per cent of 1975 income from rapeseed is the modal level. Table C-11 presents 1975 gross costs of production. Roughly half the respondents incur costs of less than $15,000.00. Percent of costs due to rapeseed is shown in Table C-12. Once again, 11 (68-57) growers either did not grow in 1975 or felt rapeseed contributed nothing to their total costs. The modal number of growers chose a relatively low percent of costs due to rapeseed (i.e. 10%).

Table C-11. Gross 1975 farm costs of production.

Gross Costs ($)	Responses	%
Less than $4999	16	11.9
$5000 to 9999	22	16.4
$10,000 to 14,999	20	14.9
$15,000 to 19,999	22	16.4
$20,000 to 24,999	9	6.7
$25,000 to 29,999	10	7.5
More than $30,000	35	26.1
No Answer	15	-

Table C-12. Percent of 1975 gross costs attributed to rapeseed production.

% of Costs	Responses	%
0	68	48.6
Less than 10	31	22.1
11 to 20	20	14.3
21 to 31	13	9.3
31 to 40	2	1.4
41 to 50	3	2.1
More than 50	3	2.1
No Answer	9	-

APPENDIX D

SAMPLE CALCULATION: T-TEST

DIFFERENCE IN MEANS

Sample calculation of T-test used in Table 9:

$H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$

$\bar{X}_1$ = Mean Score for wheat: cash income per acre

= 1.833

S_1^2 = Variance for wheat: cash income per acre

= 0.545

$\bar{X}_2$ = Mean score for rapeseed: cash income per acre

= 2.898

S_2^2 = Variance for rapeseed: cash income per acre

= 1.541

n_1 = sample size: wheat

= 90

n_2 = sample size: rapeseed

= 90

S^2 = "pooled variance"

$$= \frac{(n_1 - 1)\, S_1^2 + (n_2 - 1)\, S_2^2}{(n_1 - 1) + (n_2 - 1)}$$

$$= \frac{(90 - 1)\,(.545) + (90 - 1)\,(1.541)}{(90 - 1) + (90 - 1)}$$

$S^2 = 1.043$

Sd^2 = sample variance for difference in means

$= S^2/n_1 + S^2/n^2$

$= 1.043/90 + 1.043/90$

$Sd^2 = .023$

Sd = sample standard deviation

$= \sqrt{Sd^2}$

$= .153$

t corresponding to the difference in sample means

$t = \frac{\bar{x}_1 - \bar{x}_2}{Sd}$ with $(n_1 + n_2 - 2)$ degrees of freedom

$= \frac{1.833 - 2.898}{.153}$

$t = - 6.961$

For $(90 + 90 - 2) = 178$ df

$t_{.01} = 2.576$

$t_{.05} = 1.960$

Since $t > t_{.01}$, the difference of means is significant at the .01 level. The null hypothesis can be rejected as a farmer's attitude toward cash income of rapeseed and wheat differ.