

Market-Farm Linkages and Land Use Change : A Quebec Case Study

William Smith

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[See table of contents](#)

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Article abstract

The paper presents the results of research into the function of farm-market linkages in the evolution of hybrid grain-corn production in Southern Québec. The evolution of the physical structure of the market, the nature of market demand, and the farmers' perception of the market, are all identified as significant variables in the location pattern of grain-corn production. The direct role of the market as an information source is examined and found to influence positively both the rate and direction of change. The use of free seed samples and the establishment of contract marketing further confirm these findings.

MARKET-FARM LINKAGES AND LAND USE CHANGE : A QUEBEC CASE STUDY

by

William SMITH

Department of Geography, University of Canterbury, Christchurch, New Zealand

As yet, market-farm linkages have been neglected as a geographical research focus, notwithstanding the growing emphasis on linkages in industrial geography. The basis of this paper * is the functional and spatial relationship between individual farm units and their markets. In the evolution of land use patterns, this relationship is demonstrably important. The market influences not only the choice of crop, but also the structure of farm operations and their scale. The approach taken is to review the evolution of a specific agricultural marketing system, seen as a mechanism for change on the farms: the particular marketing system chosen is the newly developed supply of hybrid grain-corn to mills, driers, and distilleries in the lowlands of southwestern Quebec.

Coppock (1968), identified the study of farm linkages as a future focus in agricultural geography, and touched on this topic in his 1964 work. Similarly, Mather (1950), briefly discussed marketing patterns and structures. To date, with the exception of a number of studies on milk supply areas (Barnes, 1958; Simpson, 1959; and Scarlett, 1966), only Gillmor (1969), with a study on beef cattle in the Republic of Ireland, would seem to have attempted any detailed analysis. None of these studies examined the influence of farm linkages at the level of the individual farm. Moreover, while one may extend the search among such writings back to von Thünen (1826), the little work that has been done by geographers is focussed completely on the physical or tangible functions of the market. A growing concern with agricultural marketing as more than a physical structure has been precipitated by the failure of earlier examinations to provide an adequate basis for policy decisions (Irwin, 1962).

* Acknowledgments

The author wishes to thank Drs H. C. Brookfield and J. M. Gilmour of McGill University, Montreal, who greatly assisted in the development of this work and who critically read the manuscript. Dr R. G. Cant of the University of Canterbury, Christchurch, also read the manuscript and made many helpful suggestions which are gratefully acknowledged.

Customary supply / demand coordination using price incentives has increasingly failed to operate effectively. Expanded production has failed to balance with changing demand schedules. Wholesalers now demand highly standardised produce of a given quality and type. The inadequacy of existing market mechanisms has led to a changing functional relationship between producer and consumer, the integration of decision making, and more formalised information flows. This further reflects the increasing interdependence of agriculture and industry, and points-up the need to examine agricultural problems within an industrial context (Goldberg and Davis, 1957).

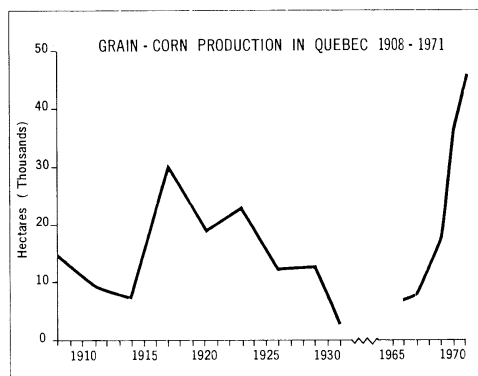
Grain-Corn Production in Quebec

As late as 1967 the *Commission royale d'enquête sur l'agriculture au Québec* noted the structural problems facing Quebec agriculture in its transition from traditional small scale farming and a regional emphasis on dairying, to increasingly specialised production. The *Commission royale* identified the problem as essentially one of communication between advisory bodies and the farmers, stating that, 'Seules des campagnes de vulgarisation des connaissances agronomiques seraient capables de rendre plus efficaces les méthodes de culture', (2, p. 51). Hybrid grain-corn has been viewed as a key factor in the current development of agriculture in the St. Lawrence Lowlands.

It has always been possible to grow corn in southern Quebec. Flint Corn was known to the native Indians prior to European settlement in the area, and was used to a limited extent by the early French settlers (Harris, 1966). Within southern Quebec, agriculture was then and has to some extent remained, an example of polyculture. Thus, while widely grown, Flint Corn commonly occupied only 1-2 hectares (2-5 acres), on any given farm, and was used solely as cattle fodder.

Statistics, presented graphically in figure 1, show some production of grain-corn in Quebec between 1908 and 1932. No statistics are available for the 1932-1965 period, when production is understood to have fallen to between 25 000 and 4 000 hectares (62 000-10 000 acres). Corn was cut green and used as grain silage. This continues today throughout the study area, but particularly in parts least suited for grain-corn production. Since 1965, the area of grain-corn has increased from near zero to over 44 000 hectares (110 000 acres), grown on approximately 2 500 farms (1970), but with

Figure 1



Source : Published Statistics of the Ministère de l'agriculture, Québec

Figure 2

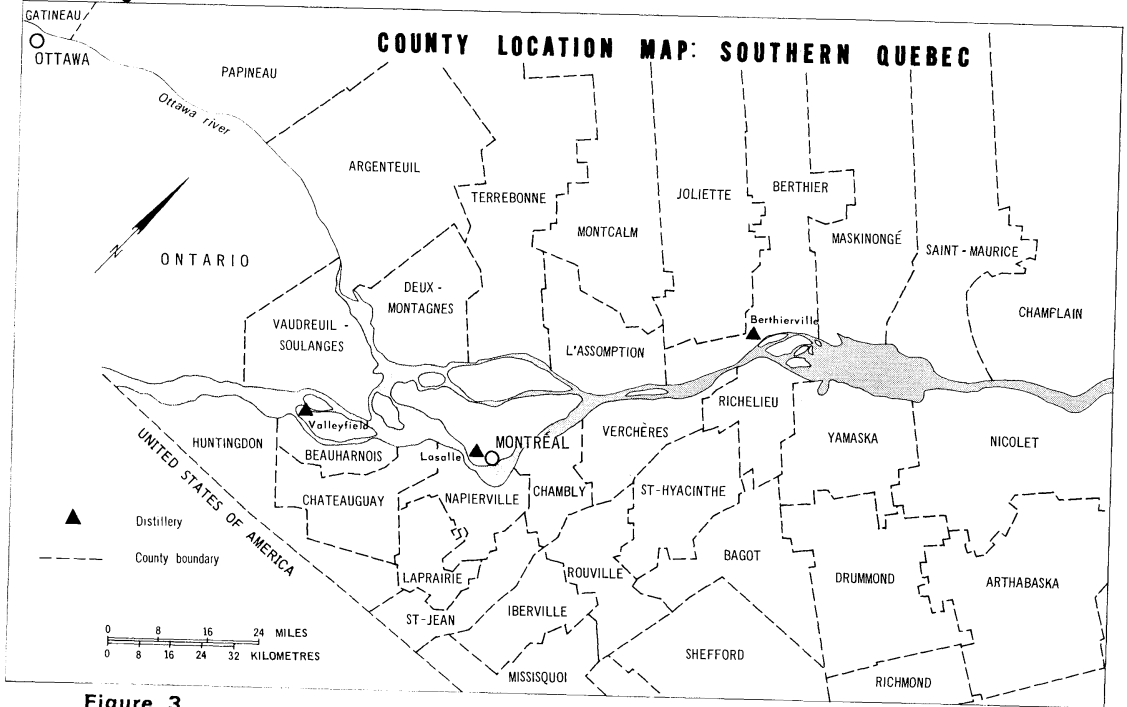
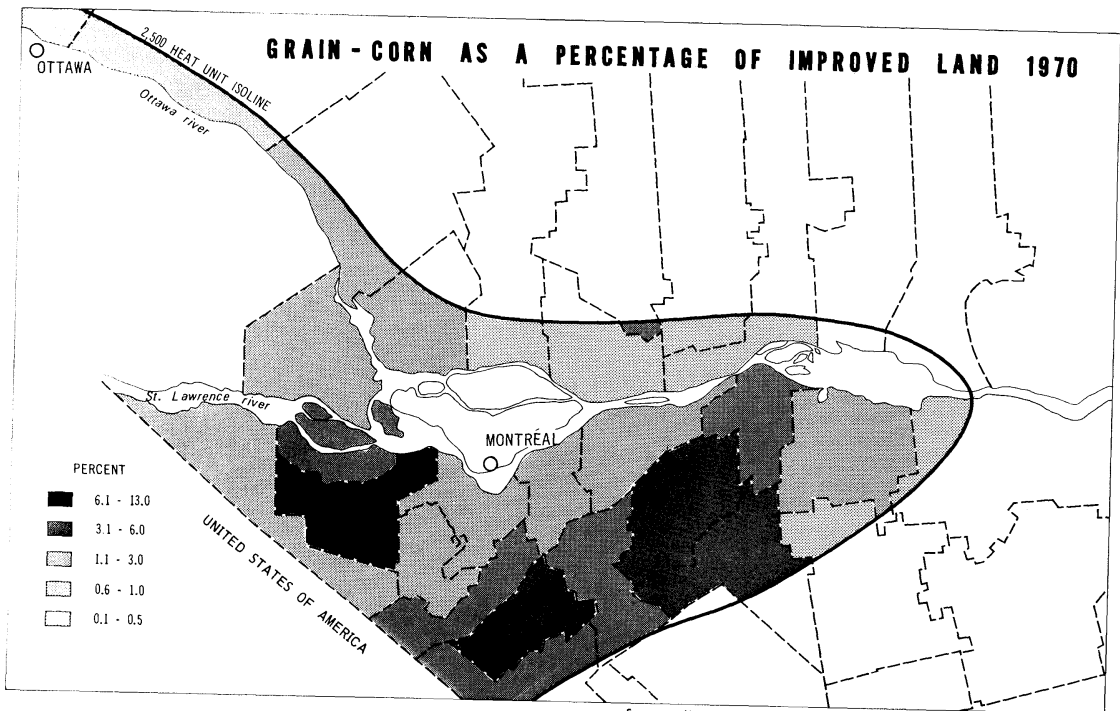


Figure 3



Source: Unpublished Statistics of the Ministère de l'agriculture, Québec

some maintenance of its original concentration in Bagot and Chateauguay counties (figures 2 and 3).

The re-establishment of grain-corn production in the province from the early 1960's is a consequence of the development and diffusion of new high-yielding hybrids. Recent years have seen continual experimentation and the production of varieties of corn which can ripen in short growing seasons. The earliest maturing varieties now require a minimum of 2 500 heat units per annum and the grain has a low susceptibility to damage by the European Corn Borer which devastated the crops of the 1930's. At the same time, technological progress has allowed a reduction of labour in corn production from about 175 hours per hectare in 1910 to about 17 to 20 hours in Quebec in 1970. New strains also show an improved keeping quality, evidenced by their rapidly increasing demand as feed grains.

Procedure

The basis of this study rests on a field survey of a two-stage random sample of 136 farms. Using lists of all hybrid grain-corn producing parishes in Quebec, and random sample tables, a sample of 52 parishes was first obtained. Using these selected parishes, a random sample of grain-corn farms was then taken.

Using the sample method described, it was hoped to maintain a wide over-all coverage, but minimise sample size. Work by Coppock (1964), Farris and Armstrong (1963), and Lasnier *et al.*, (1969), all suggest a tendency for production concentration around processing plants. Corn mills and driers commonly serve farmers grouped at parish level, and as producer behaviour and location with respect to market outlet is one of the factors examined, the research design suggested seemed appropriate.

A ninety-nine per cent response to the questionnaire was obtained, although problems of response were encountered with respect to questions involving yields and prices. It is believed that in general, the farmers were not aware of this latter information, although the nature of the questions may have discouraged an accurate response in some instances.

To clarify the nature of demand and supply arrangements for grain-corn the main outlets for corn were visited, or the appropriate organisation contacted.

Figure 4

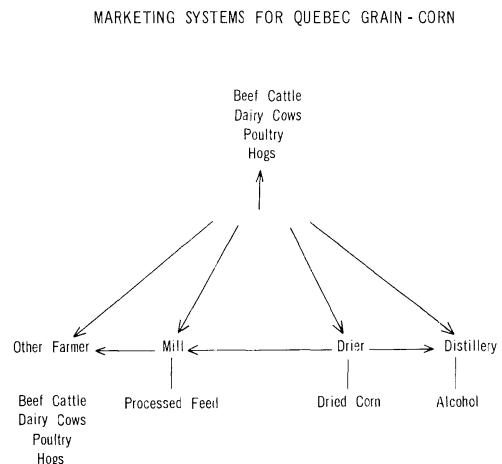
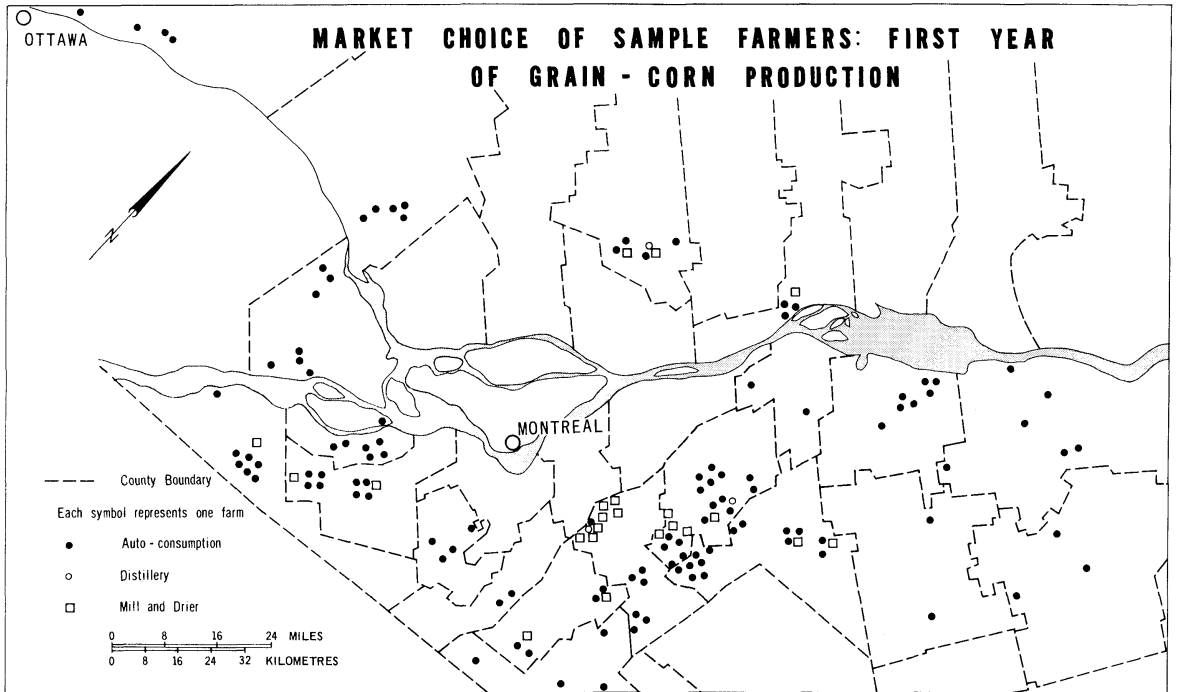
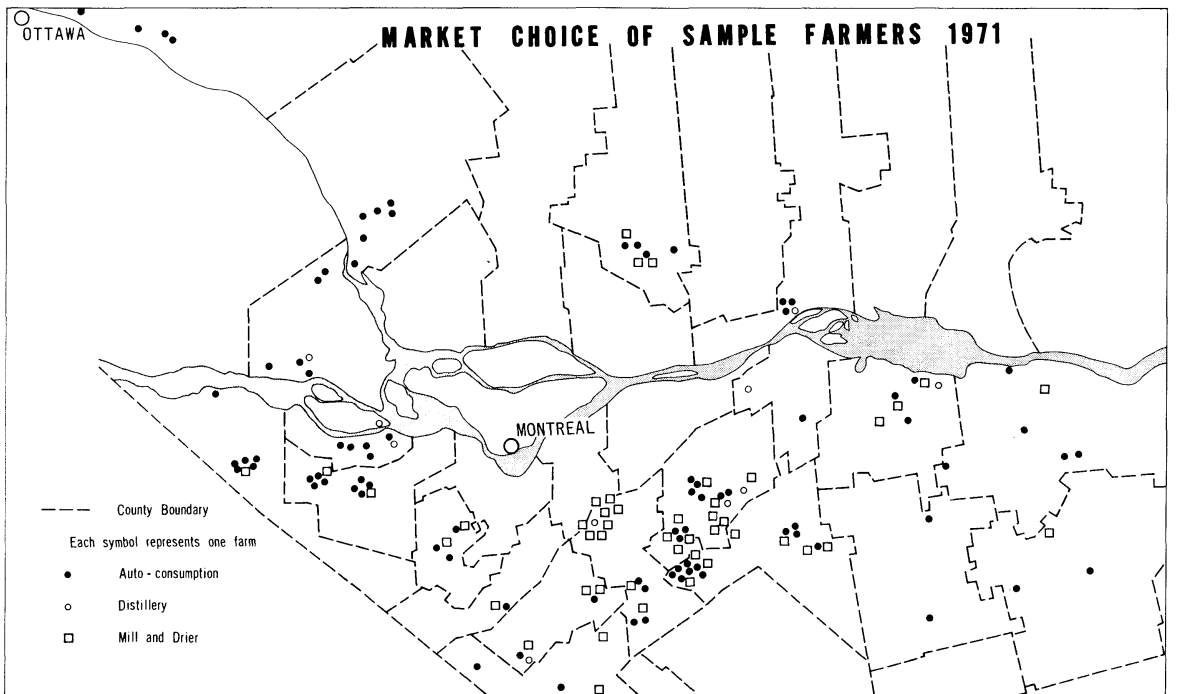


Figure 5



Source : Information obtained on fieldwork

Figure 6



Source : Information obtained on fieldwork

Market Structures and Market Location

Hénault noted the lack of any highly structured market system for Quebec corn comparable to that found in the United States or Ontario. Distinctive market relationships may be identified however (figure 4), and a clear spatial-time sequence was observed (figures 5 and 6).

Auto-Consumption

Lasnier *et al.*, (1969) noted the shortage of fodder crops in the province, given a changing production structure. In nutritional terms, hybrid grain-corn offers the greatest potential value of any of the alternatives open to the farmer in the Montreal area. This is now generally recognised, and corn is increasingly substituted for hay, mixed grains, and pasture. The 'on-farm' use of corn in the development of a livestock economy may be viewed as a form of 'internal' vertical integration, and as such, was found throughout the whole production area. Auto-consumption dominates in the newer, more marginal production areas, and is often a prior stage to the establishment of commercial market linkages.

Of the hybrid grain-corn grown in Quebec in 1970, 31% was used on the farm as fodder, a relative decrease of 58% on the 1967 figure. Sixty-one per cent of current commercial producers visited had initially produced hybrid grain-corn solely for their own use, or if unexpectedly successful, for sale to neighbouring farmers. To some extent this reflected the physical growth of the market system, and the emergence of alternative market outlets. In many areas no commercial market system of any kind existed for corn. This is certainly true in the eastern and western counties at present, and was formerly true throughout the whole production area. The initial focus on auto-consumption further supported a pattern of change identified at an individual farm level. Despite market knowledge and awareness by the farmer, a time lag was commonly identified between initial production and involvement in the commercial system. A similar time sequence was identified by Ryan (1948), with respect to hybrid corn in Iowa.

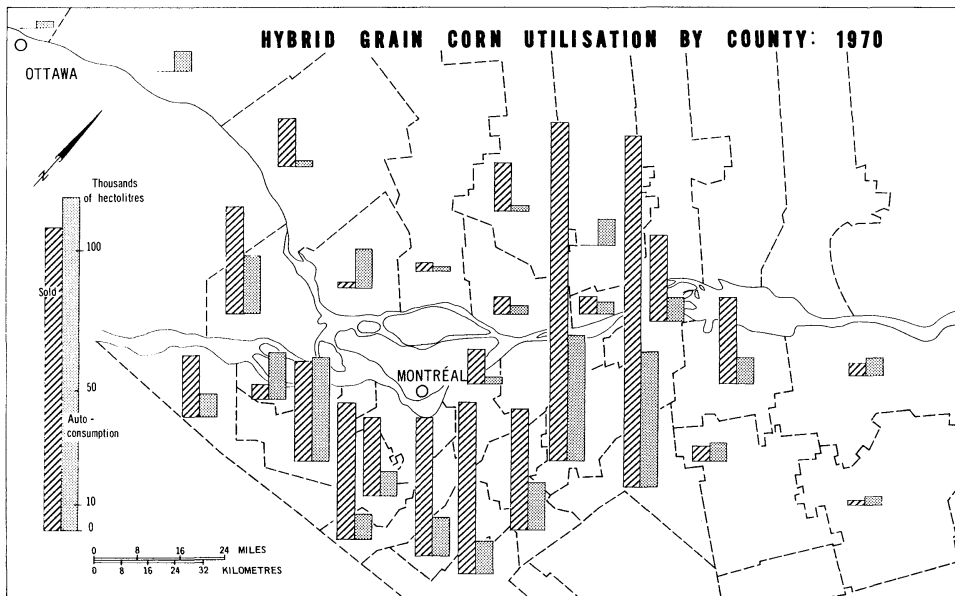
In Quebec, even in areas where hybrid grain-corn had been successfully established for up to eight years, new producers continued to follow a sequence of 'experimental' production on a small scale for their own usage, only later increasing their level of risk, and producing at a larger scale for the commercial market. This sequence is modified by the market system itself, however, and is discussed more fully at a later stage.

As identified from the sample data, while the area of hybrid corn increased with farm size, a significantly higher proportion of the grain-corn grown on the smaller farms was used as fodder. A relationship between hybrid grain-corn for fodder and farm type was also apparent. Using a

simple functional classification of farms based on field data, it was found that on hog and poultry farms auto-consumption reached an average of 54% of the corn produced ; on hog farms alone, an average of 67% was found. It would seem valid to project similar reasoning to the on-farm consumption pattern at a provincial level (figure 7). Thus in the more recent production areas a higher than average percentage of the corn produced was used as fodder, for example, Arthabaska and Gatineau counties ; while within any one county the proportion of fodder corn to different sectors in the farm economy varied with farm type.

Lasnier *et al.*, (1969), viewed the major increase in poultry rearing as particularly significant. Poultry provide a guaranteed market for corn due to minimum substitutability by other grains. With other stock types, price relationships between alternative feed grains (specifically corn and barley), are more significant. Barley may be completely substituted for corn where used as a fodder for dairy cows. An upper level of substitution is

Figure 7



Source : Unpublished statistics of the Ministère de l'Agriculture, Québec

set at 85% for hogs, and barley must be used below this level on an 11:10 replacement ratio.

Commercial Marketing

Four potential commercial markets for hybrid grain-corn may be identified; corn may be, (1) sold for use as fodder; (2) used by mills in composite cattle feeds; (3) processed for human consumption, as in breakfast cereals, flour, or starch; (4) used by distilleries to produce alcohol.

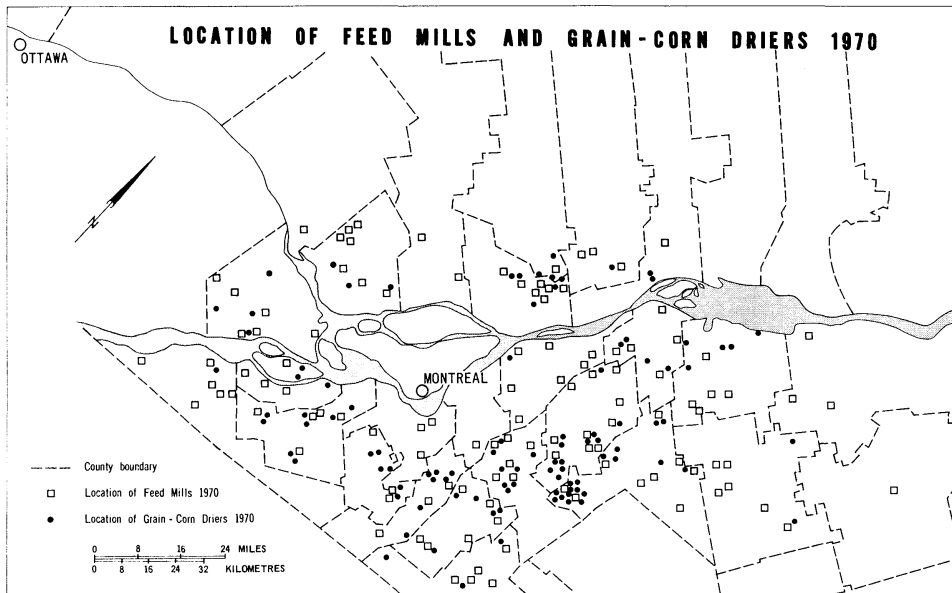
Within Quebec, grain-corn for human consumption may be discounted, almost all the corn produced being used directly or indirectly as fodder, or sold to distilleries. Using calculations by Hénault (1970), it is suggested that in 1968, 39.4% of the grain-corn produced in Quebec entered the commercial market: 34.4% being sold to mills, 5.0% to distilleries. In 1969, of the 51.3% grain-corn sold commercially, 38.8% went to mills, 12.5% to distilleries.

A pre-requisite in the development of a grain-corn marketing system is the availability of drying facilities. Few 'on-farm' storage facilities for high moisture corn are available in Quebec, and are insignificant in the total provincial pattern. Corn is mature when the moisture content of the grain is at a 35% level. Harvesting may take place at any time after this point is reached, and a humidity level at harvesting of between 20 and 30% is commonly aimed for. In general it is planned to reduce the moisture content to around a 15.5% level for storage and/or sale.

Natural drying may be successfully accomplished by means of an open-air crib, on the farm. Crib drying completely dominated in all the most recent areas to enter production, and was similarly common on all farms producing for auto-consumption. It was the only drying method available in the early period of hybrid grain-corn production in Quebec, but was found by many farmers to encourage a high wastage rate due to vermin and birds, and as difficult to regulate to supply the requisite humidity levels. Consequently relatively few commercial corn producers favoured this method (23%), although it is cheap, and easily established.

Since the mid 1960's, a number of propane gas or other type commercial driers have been established. These have evolved both in conjunction with pre-existing mills and co-operatives, and on individual farm holdings. One-third of the commercial hybrid grain-corn farms visited now have their own mechanical drier. Examination of the current locational pattern again brought out the lack of commercial facilities in the newest production areas, where the volume of grain-corn to justify a mechanical drier commonly does not exist.

Figure 8



Source: Unpublished Statistics of the Ministère de l'Agriculture, Québec

The integration of mill and drier has already been suggested. The pattern of mills within the corn growing area again reflected a decline in availability of facilities away from the production core (figure 8). Moreover, the hinterland of the mills was generally fairly small, and of the farms selling to mills, 67% were located within 8 kilometres (5 miles) of the mill. From the data available, a sample of 55 mills, the average volume of local grain-corn handled by any one mill was 500 tonnes per annum (550 U.S.A. tons), but over 55% of the mills handled less than 227 tonnes per annum (250 U.S.A. tons).

Nevertheless, the mills and driers did provide the primary link between farmers and the more distant, often more sophisticated markets with rigorously defined demand schedules; for example, the distilleries. In their function as flow co-ordinators, processors, graders, and storage units, the mills/driers formed a useful component in the development of any more fully integrated market system. This has been recognised and effected with respect to hog and poultry production (*Commission royale*). There was some evidence of this with respect to grain-corn. Much of the grain produced under contract to certain distilleries was supplied in this way. While the linkage provided by the mills and driers clearly allowed the tapping of

a much wider supply area, a zonation of grain-corn production around the market (distillery), was still evident. Such zonation is a consequence of both company policy in the allocation of supply contracts to the closest producers, and transport costs borne by the producer or drier/mill in supplying the distant market.

Thus a marketing hierarchy may be identified tapering up from a base of widely dispersed individual farmers with irregular low quality demands, to the large, highly specified and localised demands of the distilleries. The mills and driers form an intermediate and vital link between these two sectors. The hierarchical structure has both a temporal and spatial element. This has a bearing both on producers' market choice, and their changing perception of market availability through time.

Yet the existence of this marketing hierarchy does not imply a continued 'natural' upward progression. Indeed the sequence of auto-consumption, mills, driers, distilleries might well even be reversed in the future as structural development continues in the Quebec agricultural sector. Corn production in Quebec faces cost disadvantages *vis-à-vis* other production areas in North America. The sale of corn as a cash crop does offer the farmer a quick return, but may leave him unemployed during the winter months and may even leave farm buildings unused. An extension of stock raising in the area could lead to much greater on-farm usage and increase the demand for corn from local farmers. Moreover, as the diffusion of hybrid corn continues, production increases in areas more distant from large commercial market outlets and transportation costs add a further incentive to on-farm consumption.

Market Perception and Market Choice

It is evident from the data collected that awareness of potential markets varies through space and time. Table 1a presents the information obtained with respect to changing market knowledge through time. A maximum of five market groups were identified; stock farmers, mills, driers, distilleries, and 'others'. Farmers were questioned with respect to their current knowledge and as to their knowledge of markets for grain-corn during their first commercial season. It seemed possible that farmers entering the market during the earlier period, 1962-67, might have had a generally low market awareness in relation to later entrants, 1968-71, due perhaps to a shortage of physical facilities in the earlier period, or due to a more effective communication of market knowledge once some market, 'system' had emerged. This cannot be substantiated from the data presented (Table 1b).

Evidence is given in Figure 9, reflecting a decrease in market knowledge with distance from the market. This was assessed with respect to the three distillery companies at Valleyfield, Montreal, and Berthierville (figure 2).

Table 1

a) Level of Market Awareness

<i>No. of Markets</i>	<i>During First Year of Commercial Production No. of Farmers</i>	<i>Awareness in 1971 No. of Farmers</i>
5	2	6
4	1	15
3	8	19
2	23	13
1	21	4

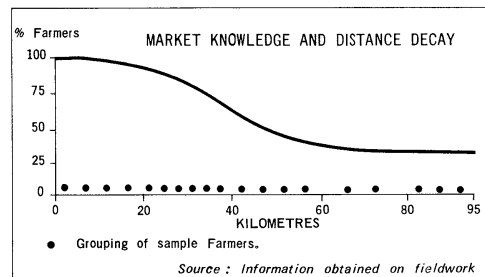
b) Market Awareness of Farmers at First Entry to Commercial Market in Two Time Periods

<i>No. of Markets</i>	<i>Date of First Entry</i>	
	<i>1962-67 No. of Farmers</i>	<i>1968-71 No. of Farmers</i>
5	0	2
4	0	1
3	2	6
2	9	14
1	8	13

Source : Information obtained on fieldwork.

The relationship between distance and market awareness was further backed by field evidence. Despite some 'distortion' due to a direct information flow between selected farms and a distillery, market awareness during the first commercial season was confined very largely to parish levels : namely, local stock farmers, mills, and driers. The latest markets 'discovered' were those most distant from the farm. As noted, these markets were also often less interesting to the farmer as they commonly posed additional transportation costs to reach them. But moreover, while Lundgren (1971), has identified certain unique features in agricultural marketing (for example, the seasonality and perishability of crops), the 'behavioural' evidence presented above, does have parallels in the retail trade. Golledge (1967), has viewed the development of retail marketing as essentially a 'learning process', and postulates similar variations in knowledge of the market with distance and time.

Figure 9



Source : Information obtained on fieldwork

The distance factor is further emphasised in a consideration of market choice. The average distance between a farm and its market for grain-corn was only 12 kilometres (7.6 miles). In addition, when questioned on the basis of market choice, 30% of the farmers identified 'proximity' as the determining factor, 28% 'price', and 38% saw 'proximity and price' as being equally important. While price may be seen as of some significance in market choice, it is suggested that this is a less valid assumption than it initially appears. Few farmers have changed markets. This might be expected, given the short period of commercial production involved. Nevertheless, of the farmers that have changed markets, all expect one switched to a closer market, and of the eight farmers involved, all saw 'convenience' as of major significance in this change.

The willingness of farmers to react to price variations is noted by Schultz (1964), and a significant relationship is suggested. But this fails to emphasise the prior need for knowledge of comparative costs and prices by the farmer. Lack of awareness of price variations has certainly been noted with respect to other farm groups in North America. Kohls in Indiana (1962), studied the relationship between price and market choice for farm inputs, and no positive relationship was identified. When farmers were given a hypothetical choice between two markets with a clear price difference, price was seen as significant. The same study emphasised 'convenient location' and 'the development of habit and inertia' as major factors in farm purchasing patterns. Kohls' work does refer to market purchasing areas, but evidence has been provided above to support a similar hypothesis in this instance.

'Convenience' is thus identified as a dominant factor in the evolution of the marketing pattern for grain-corn in Quebec, and may be considered to some extent in 'distance' terms. As already suggested, however, the structure of the market is also important. Thus one large organised outlet is generally favoured over a series of scattered markets with variable and irregular demand schedules. Each market has its own limitations, these varying from the small scale loads of varying quality for the individual farmer-buyers, to the large scale highly specific needs of the distilleries. However, few farmers saw any limitation on their market choice due to the nature or scale of their production methods, scale of output being noted as a limitation in only six instances, method of grain drying in two.

While this is so, level of output does seem to remain as a significant variable in determining market choice. Indeed although hybrid grain-corn production was found within all farm size groups, the bulk of commercial corn comes from the relatively few large scale producers. Small scale producers more commonly supplied the market on an *ad hoc basis*, and provided only for the irregular demands of neighbouring stock farmers. On the other hand, no farmer producing less than 49 hectares of hybrid grain-corn (120 acres), supplied the grain under contract to the distilleries. As stated, the latter require regular bulk deliveries of corn which fit rigorous

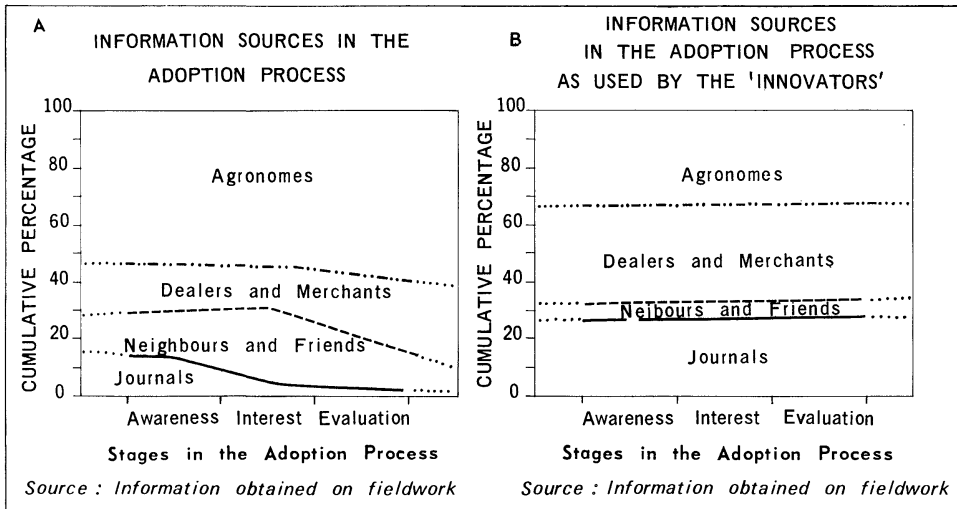
quality constraints. Numerous small, individual suppliers were seen as undesirable and impractical, consequently the large percentage of corn for distilleries is supplied under contract by the mills. This overcomes many of the problems faced by the individual farmer in supplying a distant impersonal market, but lessens any direct benefits that contract farming might bring. There was no evidence of any particular farm type or particular size grouping supplying the mills. Distance as the only variable cost is the primary constraint at this level, farmers trucking their own crops to the appropriate centre.

The Market as an Information Source

It may be postulated that the direct role of the market as an information source will vary with the sequence of change. Jones (1967), considers the adoption process in agriculture as having several distinctive stages. A five stage adoption model first publicised by the North Central Rural Sociological Sub-Committee in 1955, is now generally accepted. These stages are identified as (1) Awareness ; (2) Interest ; (3) Evaluation ; (4) Trial ; (5) Adoption. Assuming this sequence, the corn farmers were questioned accordingly. Information sources were classified into five main groups : *agronomes* ; merchants and dealers ; neighbours and friends ; agricultural journals and newspapers ; radio and television. The results of the work are presented in figures 10a and 10b.

In general farmers found little difficulty in identifying and dating the major information sources used at each stage of adoption, although the evaluation/trial/adoption sequence could rarely be divided.

Figure 10



Certain features stand out from the information presented in figure 10a. The *agronomes* acted as the prime information source to over 50% of the farmers in all stages of the adoption process. Commercial sources, dealers and merchants, provided the second most important information source to the farmers in all stages except 'interest', where 'neighbours and friends' took their place. Radio and television were surprisingly never noted as of any significance at any stage in the change process. Farm literature was likewise unimportant, except in the initial 'awareness' phase, while the visual evidence presented by neighbours and friends seems particularly significant in developing interest in the potential of growing grain corn on one's own farm.

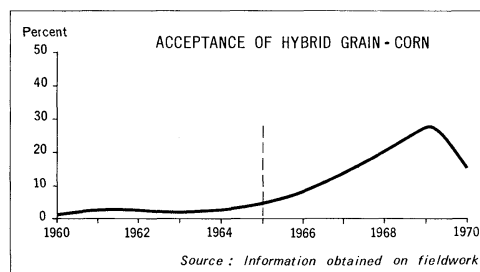
Perhaps the major feature with respect to the present study is the dominance of the provincial *agronomes* as an information medium. Indeed the division between '*agronomes*' and 'dealers and merchants' may be a rather arbitrary one in this instance, as in the diffusion of information for hybrid grain-corn the commercial organizations and the *Ministère de l'Agriculture* have co-operated to a high degree. *Agronomes* helped commercial organizations select farms for free seed samples, and it seems probable that it was the efficiency and joint effectiveness of these two groups that explains the slight importance of the mass media.

The role of commercial bodies, as the main interest focus of this paper deserves particular attention. As shown in figure 10a, farmers rely increasingly on personal contact with merchants and salesmen as they pass through the adoption process. This corresponds to the pattern identified by Beal and Rogers (1960), and is understandable on a logical basis. Clearly while impersonal sources may provide adequate initial information, personal contact and visual evidence is particularly significant in the evaluation and trial of new crops and new production techniques. Most significant perhaps is the impact of commercial information sources on the time sequence of change. Thus those farmers receiving their initial knowledge of grain-corn from commercial concerns took, on average, only 1.9 years from awareness to adoption, while other farmers took an average of 2.9 years. In their contact with farmers, salesmen provide the full sequence of information required for the adoption process, whereas a dependence on a new source for each stage is less efficient, and slower. The over-all time sequence however, compares very favourably with the five year period found by Ryan and Gross in 1943 ; perhaps again bearing out the effectiveness of the joint governmental-commercial approach.

The process from awareness to acceptance involves a temporal sequence. Graphed (figure 11), the data collected in this Quebec study provided a skew distribution. Innovators were determined by the break in slope evident at 1965. This identification of innovators was then used to examine the relationship between the group and information sources.

The information sources as used by the innovators (figure 10b), varied considerably from that of the average, as shown in figure 10a, with an increase in the significance of both journals and commercial contacts. The significance of both *agronomes* and personal contact with other farmers declined. The latter is explicable and predictable, given the situation presented. Without exception, the innovators relied on the same initial information source throughout the change process, several noting a reliance on 'trial and error' methods in the first years of production.

Figure 11



Within the innovator group, farmers using the *agronomes* and commercial agents as an information source were generally selected by these bodies on some specific criteria. 'Leaders', identified by their progressiveness, willingness to bear risk, and range of influence, were chosen. The commercial organizations were guided in their choice by the *agronomes*. Size was not noted as a specific factor, but more land and associated higher incomes, does perhaps reflect a greater willingness and ability to bear risk. As far as the industrial market is concerned, scale of grain-corn production has been noted as significant. While the mean farm size for all sample farms was 68.4 hectares (169 acres) improved land, that of the innovators' farms was 93.1 hectares (230 acres) improved land. Within the innovator group, the English speaking farmers had an average of 124 hectares (306 acres) improved land. Further, for the one dominant industrial concern from which details were available, the ratio of English to French speaking farmers contacted during the first three years of a 'corn program' (1963-65), was at a 1:2 level. This was due at least in part to a communications problem, a shortage of suitable bi-lingual staff, but does much to explain the 1:2 English/French ratio found among 'innovators' in contrast to the 1:5 ratio expected on the basis of sample size.

The Role of the Free Sample

Farmers who received free seed samples from a commercial market source (a distillery company) benefited by obtaining the full sequence of information necessary for the change process, with no time lag between stages. Further, the new producers received full market knowledge from the beginning. Such farmers progressed from initial awareness to production with a zero time lag; all grew corn during that initial contact year.

The free samples encouraged rapid adoption. Moreover, the supply agents' conscious choice of farmers at an increasing distance from the established production areas aided rapid diffusion. However, the establishment of an information flow between a distant producer and a sophisticated

market, was not paralleled by a physical linkage. The company concerned has attempted to encourage grain-corn production in Quebec, but is not willing to buy grain directly from the new producers, either with a loose marketing agreement, or under tight contract control, preferring to maintain its established market links with Ontario dealers. The farmers that entered hybrid grain corn production under the initial impetus of this company thus followed the market choice pattern of all the sample farmers.

The value of the seed samples was weakened by the fact that they were not supplied to encourage grain-corn production alone, although this is suggested in the publicity material issued. Seed types offered varied annually, and their use supplied test results for the company's benefit. Consequently, seed samples were offered to producers of several years experience in grain-corn, as well as to new producers. Only the more experienced producers, it seems, were in a position to benefit from the comparative study of the different seed types. Most of the farmers that obtained samples found them 'interesting', but of no other value. Several producers were encountered that had refused samples. These farmers believed that they were merely being asked to provide free experimental plots for the company.

While the policy of free samples did provide a measurable impetus to grain-corn production, it did in part indirectly discourage further close farm-industry linkages. This disillusionment is principally due to the apparent lack of market opportunity offered by the company, but is also due to the joint purpose of the seed sample itself.

Contract Farming

As is increasingly apparent, the function of the market as an information network is of limited value without the physical structures necessary for transportation, processing, and storage. Similarly, the provision of physical plant does not alone ensure an efficient supply of the necessary raw material. This receives maximum expression in contract farming. The use of contracts with firm advanced prices between mills and distilleries has been noted, and their value as a means of co-ordinating amount and quality of grain supplied has already been considered. Direct contract linkages between individual farms and market outlets were also found.

As suggested, contract farming may be seen as a consequence of the increased sophistication of market demand, and the failure of conventional means of co-ordination, notably price, to ensure adequately balanced supply-demand schedules. Contract farming ensures some degree of stability for the producer, at least on an annual basis and security rather than price is commonly the farmer's prime consideration. Moreover, the precise demands of the consumer may be easily conveyed to the producer via the contract itself, or through the other integrated communications linkages thus established.

In the earlier consideration of market choice, 'convenience' was seen as a dominant factor, both in terms of distance, and in terms of market structure. Distance was similarly significant in the development of contract relationships. The structural convenience of contract farming in the stability it provides for the producer was particularly evident in land use change. Where a contract was obtained, the area of grain-corn then produced increased by an average of over 360% during the first contract year. All these contract farms had at least 50% of their improved land in hybrid corn.

With one company in particular, contract farming also provided access to a farm machinery pool, and thus lowered the capital investment required of each individual farmer. This latter relationship was seen by certain non-contract farmers as a form of exploitation by industry of agricultural producers due to the 'excessive' hire costs they believed were charged. However, this argument was not accepted by those farmers directly involved.

In effect, these industrial markets for grain-corn have accepted their dual function, and using a contract relationship, have established an integrated communications system, and provided the physical facilities necessary for successful production.

CONCLUSIONS

Lacking any valid theoretical base within the existing geographical literature, a fairly loosely structured approach was followed in this work. The study was designed to generate hypotheses for further testing elsewhere, rather than for any rigorous analysis of established theoretical ideas.

Several significant relationships between market functions and land use change were found. As shown, the lack of an effective market structure may limit the scale of production by individual farmers to that necessary for auto-consumption. Consequently, the development of large scale commercial production is dependent on the availability of specific physical facilities, while the location, volume, stability and quality of market demand may offer material constraints on market choice at the individual producer/supply level.

The role of the market as an information system was confirmed through an examination of the impact of direct market intervention on information diffusion. Such intervention was found to influence positively both the rate and direction of change. The problem of effective communication by the market system has encouraged the development of linkages between the producer and his market on a contract basis. The stability and convenience offered by contract farming is reflected in specialisation of production.

In the light of the findings summarised above, one may conclude that the importance of industry-farm linkages in determining land use patterns

has been underemphasised in the past literature, and that this aspect of agricultural geography deserves much greater attention. In a modern farming system, integrated closely with urban and national markets one may go so far as to suggest that these linkages are a primary factor in the evolution of land use patterns, and that these patterns reflect the strength or weakness of such linkages in a very direct manner. Although the evidence presented in this paper is demonstrably limited, there is no reason to suppose that this finding might not be replicated elsewhere, since the processes of information, decision and action that have been examined are almost universal in such economic environments. Analysis of the functional and spatial relationships between individual farm units and the processing and supply industries would seem on *prima facie* grounds to be an important road to understanding agricultural patterns, and the demonstration of their significance in this case study may therefore have wider significance.

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ABSTRACT

**SMITH, William : Farm-Market Linkages and Land Use Change :
A Quebec Case Study**

The paper presents the results of research into the function of farm-market linkages in the evolution of hybrid grain-corn production in Southern Quebec. The evolution of the physical structure of the market, the nature of market demand, and the farmers' perception of the market, are all identified as significant variables in the location pattern of grain-corn production. The direct role of the market as an information source is examined and found to influence positively both the rate and direction of change. The use of free seed samples and the establishment of contract marketing further confirm these findings.

KEY WORDS : Farm Market Linkages, Hybrid Grain-Corn, Market Structure, Demand, Perception, Location, Information Diffusion.
Quebec Province, St. Lawrence Lowlands.

RÉSUMÉ

**SMITH, William : Les liaisons ferme-marché et l'évolution des productions
agricoles : un cas québécois**

Nous présentons ici les résultats d'une recherche sur le rôle des rapports entre les producteurs et le marché, dans l'évolution de la production du maïs-hybride dans le sud du Québec. Nous avons trouvé que ce sont les variables suivantes qui déterminent le plus le schéma de la localisation de la production du maïs-hybride : l'évolution de la structure du marché, la nature de la demande et la perception du marché par les producteurs. De plus, il semble que la connaissance qu'ont les producteurs du marché, influence directement et de façon positive la tendance et la vitesse du changement de la production. L'utilisation d'échantillons fournis par l'acheteur, et la conclusion assurée de contrats de vente, confirment nos observations.

MOTS-CLÉS : Liaisons ferme-marché, maïs-hybride, structure du marché, demande, perception, localisation, diffusion de l'information.
Province de Québec, Basses terres du Saint-Laurent.