Agriculture
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Research Branch
Direction générale de la recherche

Technical Bulletin 1988-2E

Agricultural land use systems of the Regional Municipality of Haldimand-Norfolk

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Technical Bulletin 1988-2E
LRRC Contribution No. 85-32

Research Branch
Agriculture Canada
1988

Copies of this publication are available from
Land Resource Research Centre
Research Branch, Agriculture Canada
Ottawa, Ontario
K1A 0C6

Produced by Research Program Service

Cat. No.: A54-8/1988-2E
ISBN: 0-662-15776-1

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The dots on the map represent Agriculture Canada research establishments.

SUMMARY

As part of the Land Resource Research Institute's program in land use and evaluation, an inventory of Agricultural Land Use Systems in Haldimand-Norfolk was conducted in 1982. In the land use systems approach, classification is oriented toward the identification of different levels of land use intensity, categorization is based on the mix and proportion of different crops within individual properties, and systems are characterized in terms of socio-economic parameters. Mapping was conducted through interpretation of 1980 aerial photos and complete field survey in 1982, while characterization data was collected through landowner interviews and from the 1981 Census of Agriculture.

The Regional Municipality of Haldimand-Norfolk is comprised of two basically different agricultural zones: the tobacco and vegetable area, consisting of the (old) townships of Houghton, Middleton, North and South Walsingham, Windham, Charlotteville, Townsend, Woodhouse and parts of Moulton and Sherbrooke; and the field crop area, consisting of Walpole, Oneida, Seneca, Rainham, North and South Cayuga, Canborough, Dunn and parts of Moulton and Sherbrooke. Four cropping systems with tobacco in association with rye, wheat, corn or vegetables; one system of vegetables and berries; six specialty crops such as orchards and nurseries and seven field crop systems, ranging in intensity from monoculture row-crops to mixed corn-wheat-forage to pasture were mapped. In addition, land use types such as built-up, extraction, idle agricultural and forest and site descriptions such as hog and poultry barns and farm machinery dealers are indicated on the maps. The land use maps were produced at a scale of 1:50,000 in three sheets: 1) Norfolk, 2) Delhi - Nanticoke and 3) Haldimand-Dunnville.

Landowner interviews were conducted following the mapping phase, and information pertaining to physical characteristics, cropping practices and enterprise types was collected for approximately 100 farms. This information was used to identify farm types from the Census, in order to characterize each category in socio-economic terms. The results of the characterization process are presented in the form of histograms and tables. Generally, the high intensity systems are characterized by relatively large farms with high proportions of rented land and high quality soils, high total but low per-hectare capitalization levels, positive financial returns, high hired labour use and relatively young operators. A description of a "typical" operation for each system is provided in the report.

A 1:100,000 scale generalized land use map showing combinations of the predominant systems by local area is included.

RÉSUMÉ

Dans le cadre du programme de l'Institut de recherches sur les terres portant sur l'utilisation et l'évaluation des terres, un inventaire des systèmes d'utilisation des terres agricoles de la Municipalité régionale d'Haldimand-Norfolk a été effectué en 1982. Dans cette perspective, la classification est orientée vers l'identification des différents niveaux d'intensité d'utilisation des terres, la catégorisation est basée sur la composition et la proportion des différentes cultures dans chaque exploitation et les systèmes sont caractérisés selon des paramètres socio-économiques. Les cartes ont été préparées à partir de l'interprétation des photographies aériennes prises en 1980 et d'une étude complète sur le terrain effectuée en 1982, alors que les données de caractérisation ont été recueillies lors d'entrevues avec des propriétaires et du recensement de l'agriculture de 1981.

La Municipalité régionale d'Haldimand-Norfolk est composée de deux zones agricoles fondamentalement différentes: la zone à tabac et à légumes, comprenant les (vieux) cantons de Houghton, Middleton, North et South Walsingham, Windham, Charlotteville, Townsend, Woodhouse et des parties de Moulton et de Sherbrooke; et la zone de grandes cultures, comprenant les cantons de Walpole, Oneida, Seneca, Rainham, North et South Cayuga, Canborough, Dunn et des parties de Moulton et de Sherbrooke. Quatre systèmes culturaux du tabac en combination avec le seigle, le blé, le maïs ou les légumes; un système des légumes et les petits fruits; six catégories de cultures spéciales comme les fruits de verger et les pépinières et sept systèmes des grandes cultures, par ordre décroissant d'intensité des cultures en ligne à les cultures mixtes de maïs-blé-foin à le pâturage sont indiqués sur les cartes. En outre, les cartes indiquent également les types d'utilisation des terres comme bâtiments, extraction, friches et forêt, et les descriptions des emplacements comme les étables à cochons et à volaille et les marchands de machinerie agricole. Les cartes d'utilisation des terres ont été produit à l'échelle 1:50,000 en trois feuillets: 1) Norfolk, 2) Delhi-Nanticoke et 3) Haldimand-Dunnville.

Les entrevues avec les propriétaires ont été effectuées après la mise en carte et les renseignements relatif au caractéristiques physiques, aux systèmes de culture et au type de production ont été recueillis auprès de 100 fermes. Ces renseignements ont été utilisées pour identifier les types de ferme du recensement afin qu'elles peuvent être caractérisés en termes socio-économiques. Les résultats du procès de caractérisation sont présentés sous la forme d'histogrammes et de tableaux. Dans l'ensemble, les systèmes de culture intensive sont caractérisés par des fermes étendues, à forte proportion de terres louées, des terres de haute qualité, des niveaux de dépenses importants pour l'ensemble de l'exploitation, mais faibles par hectare, un bilan positif d'exploitation, une forte utilisation de main-d'oeuvre salariée et des exploitants relativement jeunes. Le rapport contient une description d'une exploitation typique pour chaque système cultural.

Une carte générale de l'utilisation des terres au 1:100,000^{e}, indiquant les combinaisons des systèmes prédominants par région, est également incluse.

ACKNOWLEDGEMENTS

The report and accompanying maps are the result of cooperative efforts by a number of individuals and agencies. The Ontario Institute of Pedology (particularly C.J. Acton and T. Presant) provided support and suggestions for the mapping phase, OMAF agricultural representatives and staff at Cayuga and Simcoe assisted with the classification scheme, data and office space, and personnel at the Delhi Tobacco Research Station provided comments and work space.

Special appreciation is extended to the mapping crew, consisting of R. Difelice (Party Leader), E. Dykstra, S. Marshall, D. Van Houtte, M. Snyder and K. Rockefeller. Ernesto Ojeda, a visiting scientist from Mexico also spent time in the field and contributed to the map preparation.

Map production and report preparation were expertly carried out by members of the Cartographic Section of the Land Resource Research Centre, Agriculture Canada, and special thanks go to J. Dumanski of the LRRC for his support, comments and direction.

As usual in a project of this type, much of the credit must go to all of the farmers and landowners who freely provided insight, advice and data.

NOTE: The social and economic data in this report is based on the 1981 Census of Agriculture and landowner interviews conducted in 1983 and 1984. Because of considerable changes in farm input costs and crop prices since then, these values may not reflect current conditions, particularly in the case of tobacco and vegetable systems. However, comparisons of intensity and relative economic positions should remain relevant.

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INTRODUCTION

The procedure for mapping "Agricultural Land Use Systems" as outlined in this report was developed to address the growing demand for pertinent and detailed information on the nature and location of different agricultural activities within a region. The inventory techniques and data analysis are based on the concept of land use as an economic activity rather than as land cover. Thus emphasis is placed not so much on the location of specific crops at one point in time, but on the combinations, proportions and successions of crops within farm-level management units or 'land parcels'. This allows a realistic application of socio-economic parameters of farm enterprises to their land use activities, as well as providing a means of comparing land use intensity (the level of recurrent agronomic inputs) from property to property. In addition, the emphasis on crop proportions and rotations means that maps and data remain relevant over a considerable time period.

This report uses three approaches in presenting information. First, spatial variation in land use intensity is depicted on maps (folded in pocket) of cropping systems at two levels of detail. The three 1:50,000 scale map sheets, prepared from field survey and air photo interpretation, show the type of cropping scheme practised within each parcel in the Region. The 1:100,000 generalized map was prepared from the more detailed sheets and provides a Regional overview of cropping system distribution and association. The second approach, presented under the heading "Description of Cropping Systems", focusses on each mapped category and outlines the socio-economic conditions of farms representing that cropping system. Each cropping system, described by a number of physical, economic and social variables, constitutes an Agricultural Land Use System. This socio-economic evaluation, which is based on analysis of 1981 Census of Agriculture data, also provides the orientation for the third approach as covered in the section "Characterization of Cropping Systems". Here the focus is on selected social and economic variables and the presentation relies on bar charts and a summary table to depict the variation between systems.

OVERVIEW OF AGRICULTURE IN THE STUDY AREA

The Regional Municipality of Haldimand-Norfolk, which encompasses 291,229 ha, is a study in agricultural contrasts. The area is well known for its tobacco and vegetable production, but it also supports extensive and modern cash crop, dairy, hog, poultry and nursery operations. In addition, the influence of industrial, commercial and tourist activities can be observed in the numerous built-up areas, hobby farms and recreational properties.

In 1981 there were 3899 farms, with a mean farm size of 58 ha (Table 1, General Statistics). The farmland area of 225,603 ha covered 77 percent of the total land area and consisted of 31,514 ha of specialty crops (tobacco, vegetables, nursery and fruit), 132,625 ha of field crops (corn, cereal grains, soybeans and hay), 9,067 ha of improved pasture, 6,137 ha of summerfallow, 10,012 ha of other improved land and 36,248 ha of unimproved land. Seventy-one percent of all farmland was owned by the operator and twenty-nine percent was rented. Distribution of land use is not homogeneous over the study area; the Region can be divided into a specialty crop area and a field crop area.

Specialty Area - The 'specialty' area generally includes the Townships of Norfolk and Delhi, the Town of Simcoe and the western part of the City of Nanticoke (Houghton, Middleton, North and South Walsingham, Windham, Charlotteville, Townsend and Woodhouse). There is as well some vegetable concentration in the Town of Dunnville (Moulton and Sherbrooke). The area within these municipalities constitutes 45 percent of the Region's total, and it supported 47 percent (1,832) of the Census farms in 1981. Average farm size was 53 ha, and the farmland area of 96,425 ha consisted of approximately 25 percent tobacco, vegetables and nursery crops, 45 percent field crops, 2 percent improved pasture, 2 percent summerfallow, 5 percent other improved land, and 21 percent unimproved land.

The principal reason for the concentration of specialty crops in this area is the abundance of well-drained sandy and sandy loam soils, as 50 percent* of the 'specialty area's' 120,204 ha is rated as Special Crop Suitability Classes 'good' or 'fair to good' for crops such as asparagus, tobacco, melons and berries (Presant and Acton, 1984). Some restrictions such as wet subsoils and summer droughtiness may be encountered on these soils but artificial drainage and irrigation is generally feasible for high value horticultural crops. Forty-six percent of the area is rated as 'fair' or 'poor to fair', and 4 percent is rated as 'poor' or 'unsuitable'.

The 'specialty area' lies within the 2900-3100 Corn Heat Unit area, the frost free period averages 155 days, and the average annual precipitation is 773 mm (Presant and Acton, 1984).

Field Crop Area - The 'field crop area' is comprised of the remainder of the Region, namely the Towns of Haldimand and Dunnville and the City of Nanticoke (Walpole, Oneida, Seneca, Rainham, North and South Cayuga, Canborough, Dunn, Moulton and Sherbrooke). This area constitutes 55 percent of the total area of the Region and supported 53 percent (2067) of the Census farms in 1981. Average farm size was 62 ha, with a total farmland area of 129,178 ha. This was made up of 68 percent field crops (corn, wheat, oats, barley, soybeans and hay), 6 percent vegetables, tobacco, fruit and nursery crops, 6 percent improved pasture, 3 percent summerfallow, 4 percent other improved land and 13 percent unimproved land.

Canada Land Inventory Class 1, 2 and 3 soils constitute approximately 89 percent**of the total of 159,810 ha in the 'field crop area', with significant problems of adverse soil structure and topography. Class 4 and 5 soils, with problems of excess water, account for 9 percent of the area while shallow Class 6 soils cover 2 percent (Presant and Acton, 1984).

This portion of the Region is within the 2900-3100 Corn Heat Unit area, the frost free period is 150 days on average, and precipitation averages 728 mm per year.

* Based on analysis of approximately 500 randomly selected point locations.

** Based on analysis of approximately 600 randomly selected point locations.

TABLE 1. General Agricultural Statistics, 1981[A] (Area in hectares).

	Region	Specialty Area	Field Crop Area
Number of Farms	3,899	1,832	2,067
Average Farm Size	58	53	62
Total Area	291,229	131,053	160,176
Farmland Area	225,603	96,425	129,178
Specialty Crops[B]	31,514	26,347	5,167
Field Crops[C]	132,625	45,043	87,582
Improved Pasture	9,067	1,316	7,751
Summerfallow	6,137	2,262	3,875
Other improved	10,012	4,845	5,167
Unimproved	36,248	34,698	1,550

A. Source: Statistics Canada, 1982. Compiled for this report.
B. Includes tobacco, vegetables, nursery and fruit.
C. Includes wheat, oats, barley, mixed grain, hay, grain corn, fodder corn, soybeans, rye and buckwheat.

INVENTORY METHODOLOGY

Development of the mapping legend involved determination of common crop rotations and crop combinations through a study of published agricultural statistics, farm practice bulletins, socio-economic reviews and discussion with extension personnel and farmers. Seven field crop 'systems', four tobacco 'systems', seven specialty crop categories, 9 land use types and 16 site descriptions were incorporated. For the 'cropping system' map units land parcel boundaries correspond to property boundaries as derived from current land ownership maps. For the land use types (including 'Grazing') land parcel boundaries were not necessarily a function of ownership boundaries. For example, the 'forest' land use type was primarily identified and delineated from air photo interpretation without reference to ownership.

The mapping phase of the inventory was carried out during the summer of 1982 and consisted of pretyping air photos to identify land use types (forest, built-up etc.), followed by field mapping to categorize the remaining area of each property. Comparison of the crop mix of 1982 with that interpreted from 1980 air photos, plus visual analysis of farming activities, provided the information needed to categorize each land parcel according to the legend. Minimum land parcel size for mapping purposes was 2.5 ha.

In order to verify the mapping and system identification criteria, a number of landowner interviews were conducted in late 1983 and early 1984. These served primarily to establish more precisely the crop proportions for each of the cropping systems mapped. Socio-economic characterization of each category was then performed through Census of Agriculture data by assigning each Census farm to the appropriate category based on the crop proportions of the individual farm. Standard data summary procedures were then applied to each category for the variables outlined in the following 'descriptive' sections.

USING THE INFORMATION

Information presented in this report and accompanying maps can be used at two levels of study. The detailed scale of publication (1:50 000) is intended for local concerns, while the reduced scale (1:100 000) is for regional or provincial considerations.

For proper interpretation of the detailed map, it is important to understand the manner in which land use is portrayed. The principle on which the map is based is that cropping systems reflect crop rotations and/or crop combinations, which are not necessarily farms or farming systems. Map polygons indicate parcels of land within which the intensity of use is fairly consistent, without direct reference to ownership. Any one map polygon may consist of a portion of a farm, an entire farm, or portions of several farms. On the other hand, any one farm may be represented by several map polygons, depending on soil type, ownership, or distance between properties. However, for socio-economic characterization purposes, each census farm was assigned to a single cropping system on the basis of crop proportions within the farm, without reference to the location of that farm or to its map designation. There is an assumption, therefore, that the socio-economic characteristics of any land parcel are similar to those of a farm having the same combination and proportion of crops.

With an understanding of the methodology, the map and report can be used for a variety of land related assessments. Decisions in establishing planning zones, service installations, corridor and regional site locations, drainage improvements, and resource protection schemes can all be improved through a study of the existing social and economic characteristics of an area. In conjunction with soil survey, forest inventory and wildlife habitat maps and reports, land use systems information can provide a basis for non-point pollution and erosion studies, for land use change assessment, for compensation evaluations, and for agricultural extension efforts.

The Agricultural Land Use Systems map can also be used in assessing underuse, misuse, and potential use of the land base, as well as in predicting and monitoring land use change. Underutilization of natural capability is often indicated by a parcel of low intensity land use in an area of predominantly higher intensity use, as the surrounding systems of land use are usually good indicators of the physical potential of any parcel. For example, a low intensity use on the same soil type as one of higher intensity indicates where a change in management could effect a dramatic increase in production, and in fact defines a parcel which is likely to undergo a change in land use in the near future. Similarly, a relatively high intensity use surrounded by parcels of low land use intensity (such as in an area dominated by hobby farms) may be subject to pressures of decreasing intensity.

The 1:100,000 generalized map is not suitable for assessments of individual properties, but is intended instead to give a regional perspective of the spatial variation in agricultural land use intensity. The combination of symbols indicates the predominant cropping systems within a given area. This type of presentation can be particularly suitable for defining broad zoning categories, identifying general route and site locations, determining agricultural service facility requirements, establishing extension program priorities and formulating policy.

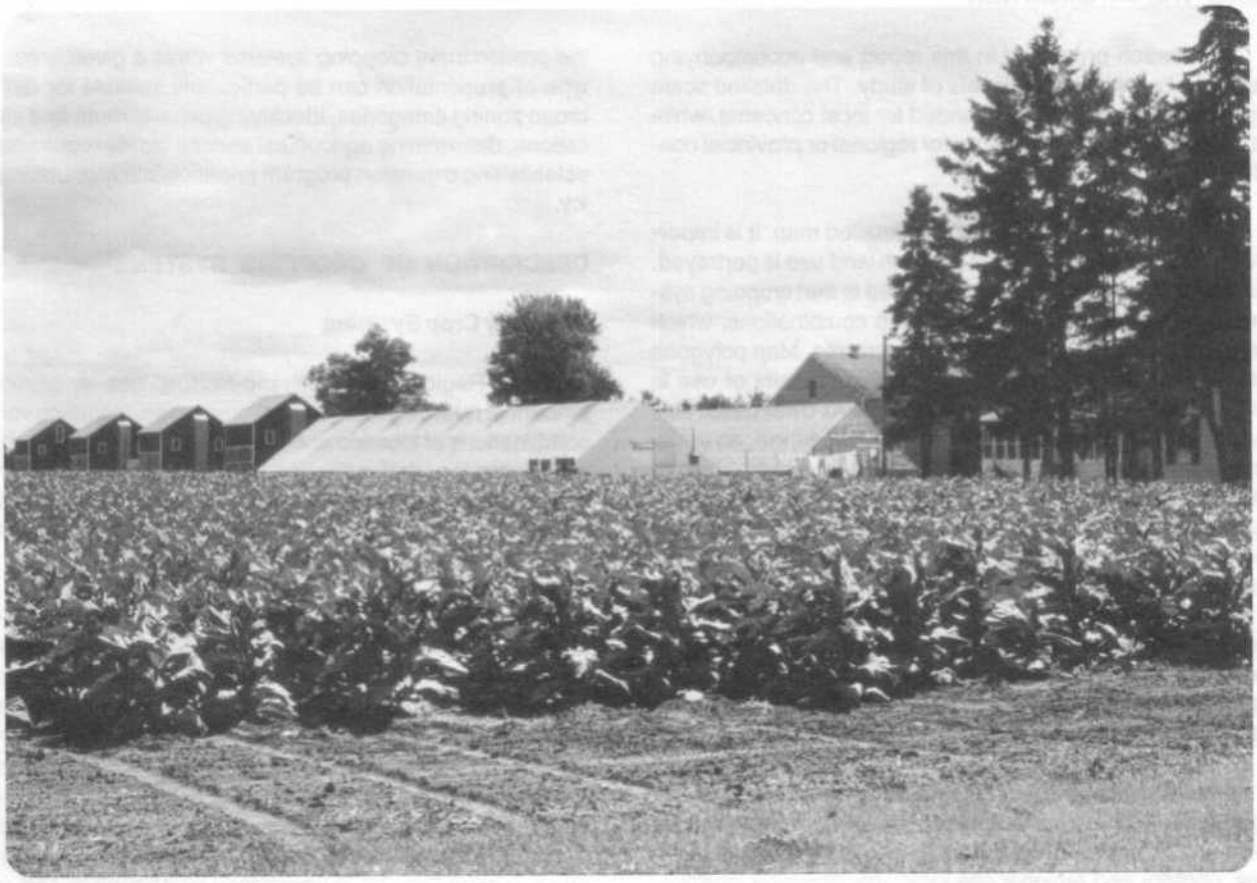
DESCRIPTION OF CROPPING SYSTEMS

Specialty Crop Systems

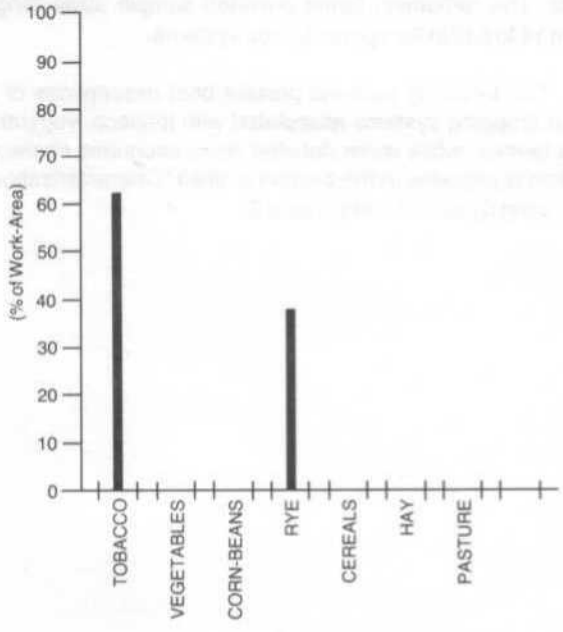
The Region of Haldimand-Norfolk has a significant amount of relatively intense crop production, including various combinations of tobacco and other crops, vegetables and berries, nurseries, orchards, peanuts, sod and ginseng. These crops are grown primarily in that portion of the Region identified as the 'Specialty Area' (p 7), but there are some instances of specialty crops in other locations as well.

Calculation of socio-economic parameters from Census data required special manipulation of farm records in order to create categories as close as possible to cropping system definitions used in the mapping phase. For example, all farms less than 8 ha (20 ac.) in size were eliminated from the analysis for all systems except 'Vegetable - Berries', as rural properties smaller than that and with no vegetables or berries were mapped as 'rural residential' rather than as a cropping system. Similarly, census farms reporting mushroom houses, nursery crops or more than 1% in uncommon crops such as sod, millet or sorghum were excluded on the basis of confidentiality, low dependence on the land base or possible distortion of the results. The remaining farms provided sample sizes ranging from 14 to 642 in the specialty crop systems.

The following sections present brief descriptions of the main cropping systems associated with tobacco, vegetables and berries, while more detailed socio-economic characterization is provided in the section entitled "Characterization of Cropping Systems" and in Table 2.

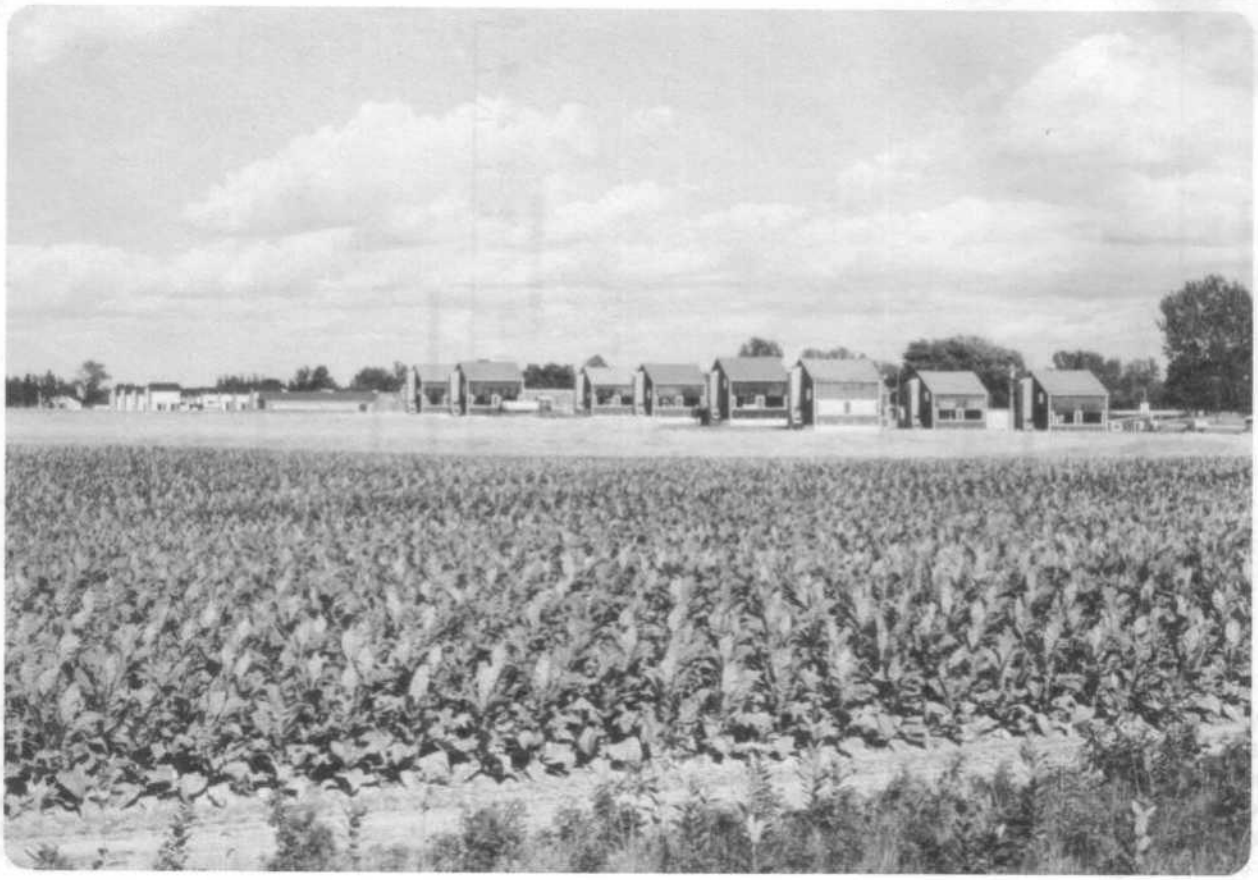


Tobacco System (Map Symbol 'T')

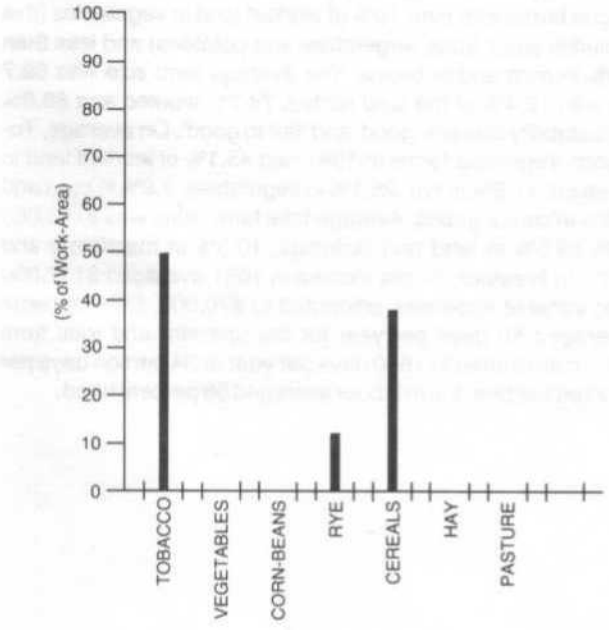


This cropping system represents the conventional scheme of alternating tobacco with rye from year to year, and it was mapped wherever tobacco and/or rye covered essentially 100% of a land parcel. Although the theoretical crop distribution for this system is 50% tobacco and 50% rye, in practice the ratio is closer to 60-40 due to a certain amount of tobacco following tobacco and small areas of other crops. As well, the rotation dictates that either crop may constitute 100 percent of a land parcel in any one year. The Tobacco System is concentrated on well drained sandy soils in the Townships of Norfolk and Delhi.

For statistical analysis of census data, this system was defined as consisting of those farms with greater than 90% of worked land (cropland + summerfallow + improved pasture) in tobacco and rye. In 1981, Tobacco System farms had an average of 62.4% of their cultivated land area in tobacco, 36.9% in rye and under 1% in any other crop. Very few had livestock and only a few had poultry. Tobacco Systems were characterized by an average farm size of 47.5 ha, with 31.0% of the land rented, 77.0% worked and 56.9% in Special Crop Suitability classes 'good' and 'fair to good'. Average total farm value was approximately $752,800, with 89.6% in land and buildings. Gross income in 1981 averaged about $117,000 and variable expenses amounted to approximately $60,000. Most farms in this group were family businesses with one or more full time operators, who worked off the farm an average of 27 days per year. Total farm averaged 669 person days per year per farm or 31 person days per worked hectare , of which 59 percent was hired.



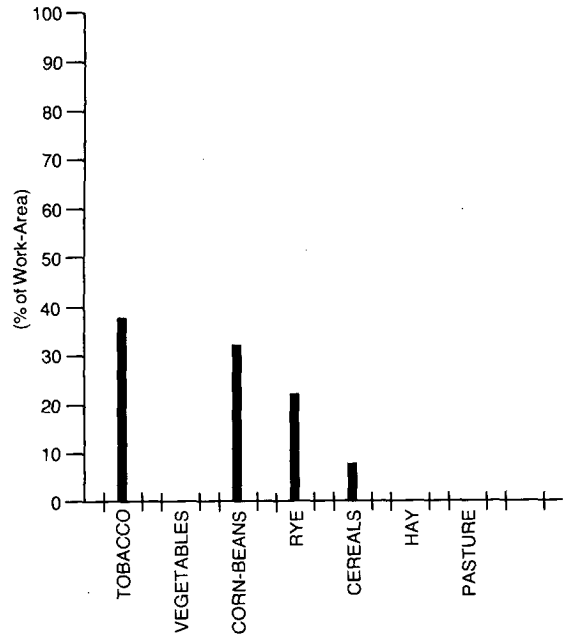
Tobacco-Wheat System (Map Symbol 'TW')



The 'Tobacco-Wheat' cropping system is similar to the Tobacco System, but with a significant amount of wheat. It was mapped wherever tobacco, rye and wheat covered essentially 100% of the land parcel and wheat constituted greater than 10% of the area. As in the Tobacco System, the Tobacco-Wheat System centers on a 2 year rotation of tobacco and wheat or rye, but small quantities of other crops and some double cropping of tobacco may alter that somewhat. This system is also concentrated on well-drained sandy sites in the western parts of the Region.

Analysis of farms in this system is based on a census farm with greater than 10% of the worked land area in wheat and greater than 90% in tobacco, wheat and rye. Farm operations so classified on the basis of 1981 data averaged 55.1 ha in size, with 17.0% of the land rented, 73.3% worked and 44.4% in suitability classes 'good' and 'fair to good'. Typically, 50.0% of the cultivated land was in tobacco, 37.7% was in wheat, 10.7% was in rye and the remainder was in various other crops. Average total farm value was approximately $698,000, with 88.9% in land and buildings, 11.0% in machinery and 0.1% in livestock. Gross income in 1981 was about $108,000 and average variable expenses amounted to $58,000. Operator off-farm work averaged 40 days per year and total farm labour amounted to 883 days per year or 24 person days per worked hectare per year. Hired labour amounted to 55 percent of the total.

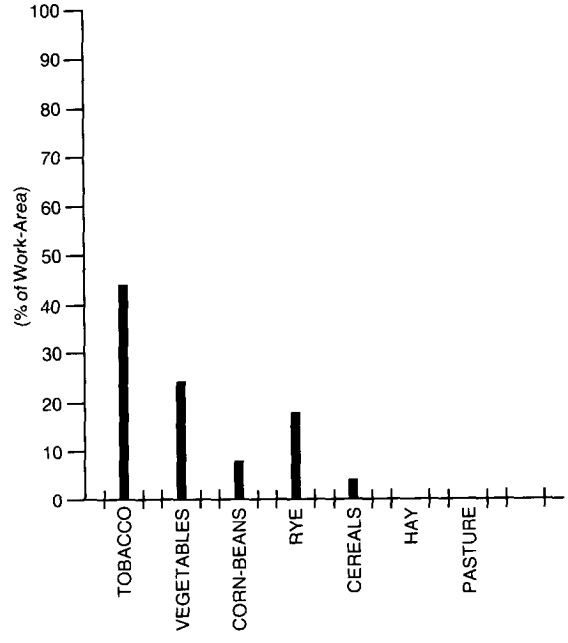
Tobacco-Corn System (Map Symbol 'TC')



This system relates to a situation in which corn and/or soybeans are grown in combination with tobacco and cereal grains. Land parcels in which tobacco, rye, wheat, corn and beans covered essentially the entire area and corn/beans covered more than 10% were mapped as 'TC'. This seldom occured as corn or beans in rotation with tobacco, but rather as corn/beans grown on land not needed or unsuited to the accompanying tobacco-grain rotation. Such a system is typically found in areas of varying terrain, where the heavier and/or wetter soils are poorly suited to tobacco.

For statistical analysis, this system was comprised of those census farms that had only tobacco, rye, wheat, corn and beans and in which corn and beans constituted greater than 10% of cultivated land. An average farm in this system in 1981 was relatively large (88.2 ha), with 16.9% of the land rented, 73.7% worked and 57.9% in Suitability classes 'good' and 'fair to good'. Farms generally had 38.0% of their worked land in tobacco, 31.1% in corn/beans, 21.9% in rye and 9.0% in other cereal grains. Average total farm value was near $894,000, with 88.6% in land and buildings, 11.2% in machinery and 0.2% in livestock. Gross income in 1981 averaged $131,000 and average variable expenses amounted to $67,000. Off-farm work for the operator averaged 26.5 days per year, total farm labour amounted to 976 days per year or 19 person-days per worked hectare and hired labour constituted 54 percent of the total.

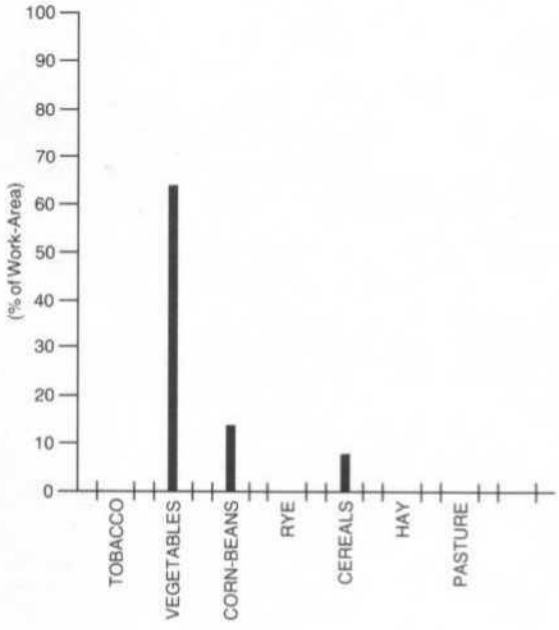
Tobacco-Vegetable System (Map Symbol 'TK')



This cropping system is a combination of tobacco and vegetables, often with rye, corn and wheat. It was mapped wherever tobacco, rye and/or wheat and vegetables constituted essentially all of the land parcel area and vegetables covered at least 10%. The most common vegetable in this combination was asparagus, and the system was typically mapped on well drained sandy sites in the Township of Norfolk.

Analysis of 'Tobacco-Vegetable' farms included those tobacco farms with over 10% of worked land in vegetables (this includes small fruits, vegetables and potatoes) and less than 70% in corn and/or beans. The average farm size was 59.7 ha with 12.4% of the land rented, 74.7% worked and 60.0% in Suitability classes 'good' and 'fair to good'. On average, Tobacco-Vegetable farms in 1981 had 45.1% of worked land in tobacco, 17.8% in rye, 25.1% in vegetables, 7.2% in corn and 3.9% in cereal grains. Average total farm value was $743,000 with 89.5% in land and buildings, 10.5% in machinery and 0.0% in livestock. Gross income in 1981 averaged $117,000 and variable expenses amounted to $70,000. Off-farm work averaged 59 days per year for the operator and total farm labour amounted to 1650 days per year or 34 person days per worked hectare. Farm labour averaged 58 percent hired.

Vegetable - Berry System (Map Symbol 'K').



The 'Vegetable-Berry' category is an intensive land use related primarily to the production of vegetables, sweet corn and strawberries. This category was mapped wherever vegetables and berries and associated fallow and ploughdown crops constituted essentially the entire land parcel area. It was not used in cases where vegetable crops were interplanted with fruit trees. The Vegetable-Berry category is found throughout the region, with concentrations around Waterford and Dunnville.

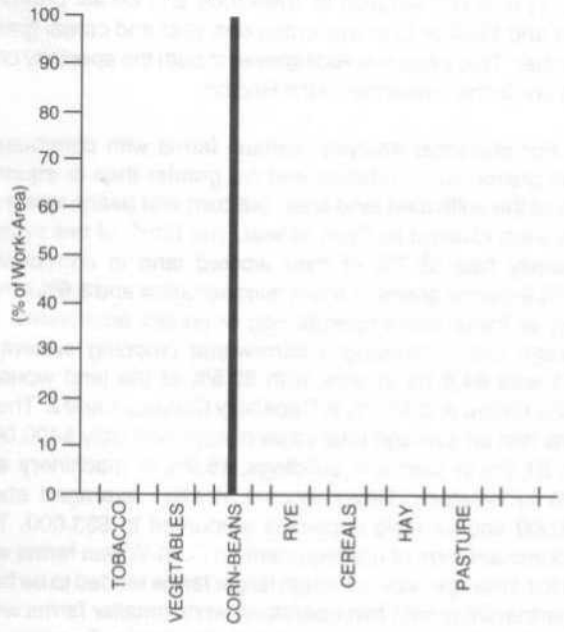
Data to describe an average Vegetable-Berry type farm operation came from census farms with a minimum size of 0.8 ha, greater than 10% of worked land in vegetables and no tobacco crop. These farms are characterized by an average farm size of 30.6 ha, with 17.8% of land rented, 70.4% worked and 80.0% in Suitability classes 'good' and 'fair to good'. According to 1981 figures, Vegetable-Berry farms had 63.2% of their worked land in vegetables, 13.8% in corn and 5.8% in cereal grains. Average total farm value was approximately $263,000, with 84.8% in land and buildings, 14.2% in machinery and 1.0% in livestock. Gross income in 1981 averaged about $42,000 and variable expenses amounted to $26,000. Most farms that carry on market gardening are family businesses with at least one full time operator. Operator off-farm work averaged 76.7 days per year, farm labour totalled 561 days per year (75 person days per worked hectare) and hired labour averaged 26 percent of total.

Field Crop Systems

The common field crops in the Region, in general order of intensity, are: corn and soybeans, cereal grains (wheat, barley, oats, buckwheat, mixed grains), legume hay (alfalfa and clover), grass hay (timothy, brome, orchard), improved pasture and unimproved pasture. The intensity of a cropping scheme which incorporates several of these crops is reflected by the proportion of area and the frequency of occurrence of the crop receiving the highest level of agronomic input. Thus a cropping system consisting of a high proportion of corn or soybeans every year is a very high intensity land use, while one employing only grass hay and pasture is a low intensity scheme.

In the following six sub-sections, field crop systems are characterized through census farms with a minimum size of 8 ha, no more than 1% in specialty (eg. tobacco, vegetables) or unusual crops (eg. sod) and no mushroom houses, nursery crops or greenhouses. Grazing systems were not analysed as they exist primarily as adjuncts to other cropping systems.

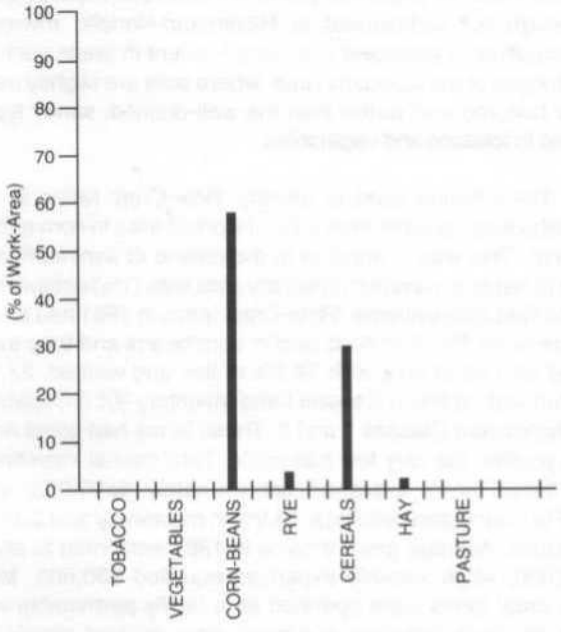
Row Crop System (Map Symbol 'J')



Corn and soybeans are demanding crops in terms of both physical resources and management inputs, and a cropping system that entails cultivation of corn and/or soybeans every year is a high intensity land use. This system was mapped wherever greater than 90% of a land parcel was in row-crops in both 1980 (air photo interpretation) and 1982 (field survey). Although not widespread in Haldimand-Norfolk, row-crop monoculture is practised to a certain extent in areas such as the fringes of the Specialty Area, where soils are slightly more finer textured and wetter than the well-drained, sandy types suited to tobacco and vegetables.

The criterion used to identify 'Row-Crop' farms in the Census was: "greater than 90% of worked area in corn and/or beans". This was in addition to the criteria of minimum farm size (8 ha) and maximum specialty crop area (1%) established for all field crop systems. 'Row-Crop' farms in 1981 had an average of 98.7% of worked land in corn/beans and they averaged 49.3 ha in size, with 78.5% of the land worked, 22.7% rented and 38.9% in Canada Land Inventory (CLI) Capability for Agriculture Classes 1 and 2. These farms had some hogs and poultry, but very few had cattle. Total capital investment on these farms averaged approximately $289,000, with 82.7% in land and buildings, 14.9% in machinery and 2.4% in livestock. Average gross income in 1981 amounted to about $50,000, while variable expenses equalled $30,000. Most 'row-crop' farms were operated as a family partnership with one or more principal operators who worked significant periods off the farm. Off-farm work for the operator averaged 98.1 days per year while total farm labour averaged 323 days per year or 16 person-days per worked hectare per year. Hired labour made up 7 percent of the total.

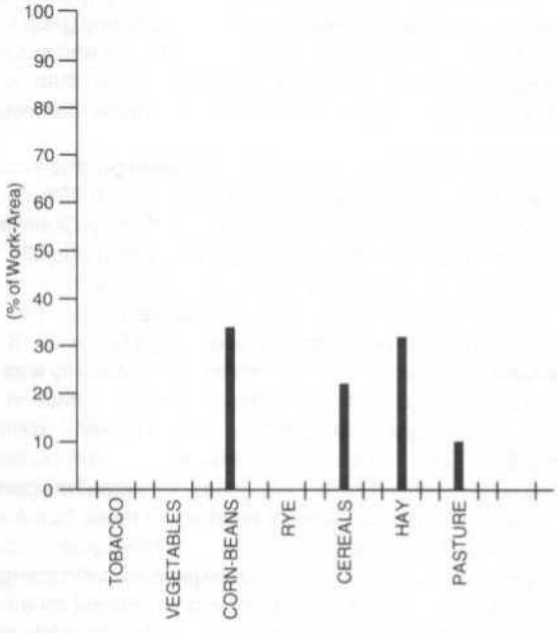
Corn-Wheat System (Map Symbol 'CW')



This cropping system is slightly less intensive than continuous row-crops in that cereal grains (wheat, barley, oats) are grown in a rotation with corn and/or soybeans. It was mapped on land parcels where greater than 90% of the land area was: 1) in a combination of row-crops and cereal grains in 1980 and 1982 or 2) in row-crops one year and cereal grains the other. This system is widespread in both the specialty crop area and in the remainder of the Region.

For statistical analysis, census farms with corn/beans, small grains, summerfallow and rye greater than or equal to 90% of the cultivated land area, but corn and beans less than 90% were classed as Corn-Wheat. The farms of this system generally had 58.7% of their worked land in corn/beans, 29.6% in cereal grains, 5.9% in summerfallow and 3.9% in rye. Many of these farms operate hog or poultry enterprises. An average farm practicing a corn-wheat cropping system in 1981 was 84.9 ha in size, with 82.5% of the land worked, 30.3% rented and 45.0% in Capability Classes 1 and 2. These farms had an average total value of approximately $400,000, with 81.0% in land and buildings, 15.9% in machinery and 3.1% in livestock. Gross income in 1981 averaged about $53,000 and variable expenses amounted to $33,000. The predominant form of management on Corn-Wheat farms was one full-time operator, although larger farms tended to be family partnerships with two operators, while smaller farms were more likely to be operated on a part-time basis. Operator off-farm work averaged 84.6 days per year, on-farm labour totalled 355 days per year (9 person days per worked hectare per year) and hired labour averaged 11 percent of the total.

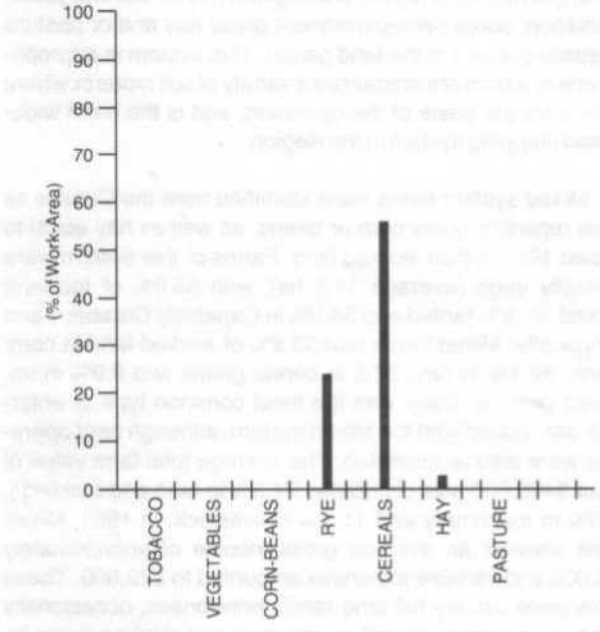
Mixed System (Map Symbol 'M')



The 'Mixed' system is a moderately high intensity cropping program that incorporates corn and/or soybeans, cereal grain(s), hay (legume and grass) and pasture. A common rotation entails row-crops for one to three years, followed by cereal grain(s) for one year and legume hay for several years. In addition, some semi-permanent grass hay and/or pasture is usually present in the land parcel. This system is appropriate where a farm encompasses a variety of soil types or where cattle form the basis of the operation, and is the most widespread cropping system in the Region.

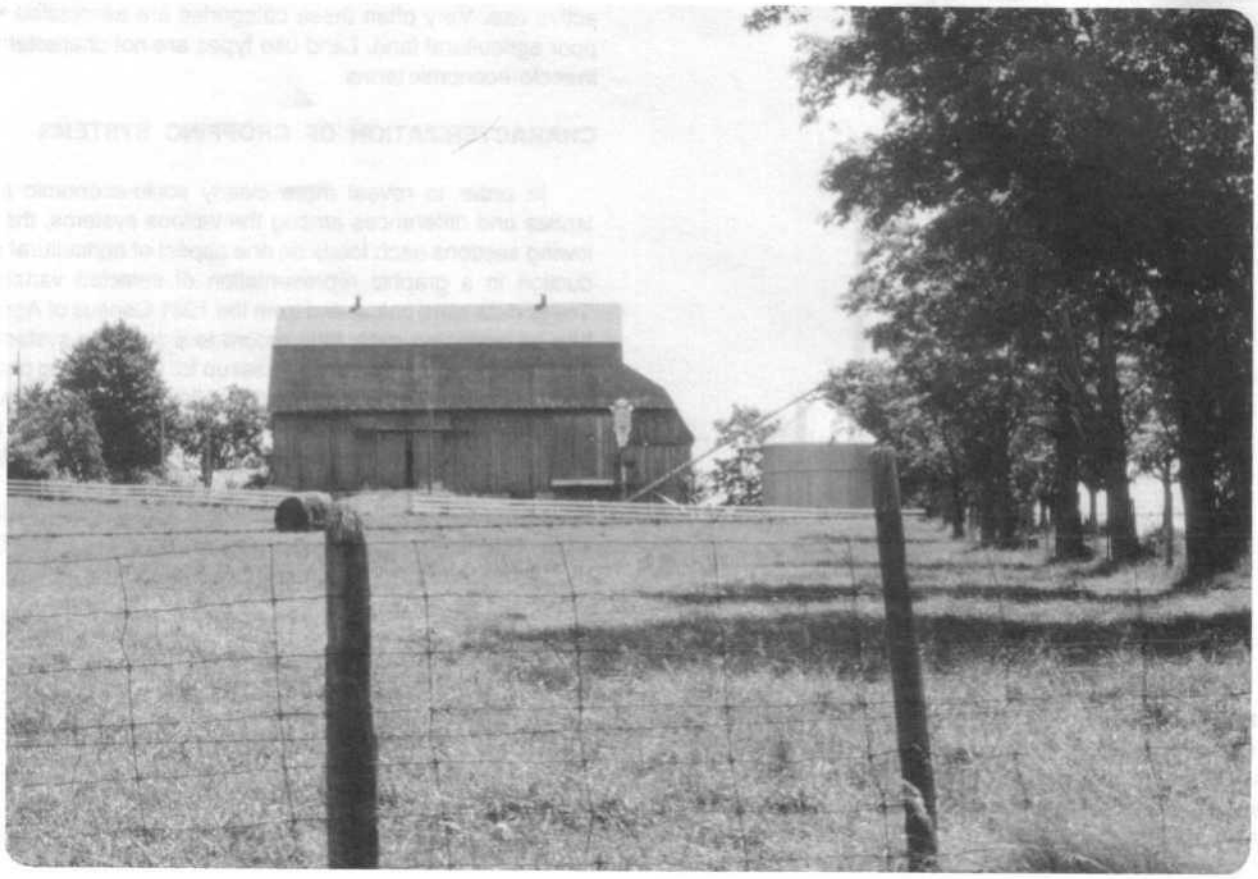
Mixed system farms were identified from the Census as those reporting some corn or beans, as well as hay equal to at least 10% of their worked land. Farms of this system were generally large (average 91.2 ha), with 85.0% of the land worked, 27.6% rented and 33.0% in Capability Classes 1 and 2. Typically, Mixed farms had 33.9% of worked land in corn/beans, 32.1% in hay, 22.5 in cereal grains and 9.0% in improved pasture. Dairy was the most common type of enterprise associated with the Mixed system, although beef operations were also represented. The average total farm value of about $409,000 was distributed 74.3% to land and buildings, 14.6% to machinery and 11.1% to livestock. In 1981, Mixed farms showed an average gross income of approximately $55,000 and variable expenses amounted to $29,000. These farms were usually full-time family enterprises, occasionally with two operators as well as spouses and children being involved in the daily routines. Off-farm work averaged 66.2 operator days per year and total farm labour averaged 385 days per year or 8 person days per worked hectare. Hired labour constituted 13 percent of the total.

Cereal Grain System (Map Symbol 'SW')

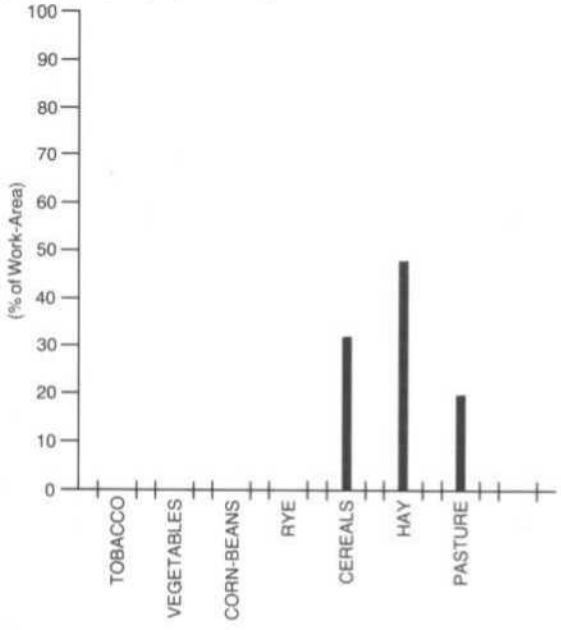


The 'Cereal Grain' cropping system, which represents continuous cultivation of oats, wheat and/or barley, is somewhat less intensive than those systems which incorporate corn and soybeans. This system was mapped wherever greater than 80% of a land parcel was in cereal grain(s) and no corn or beans were present. Continuous cereal grain cultivation is not a widespread practice in the Region and this system occurs only in scattered locations rather than as a localized pattern corresponding to specific natural features.

Identification of census farms representing this system involved the same criteria as for mapping: at least 80% cereal grains and no corn or beans. An average Cereal Grain farm had 55.6% of its worked land in oats, wheat and barley, 24.5% in rye, 17.9% in fallow and 1.7% in hay. These farms showed little tendency for any livestock enterprise except poultry. Cereal Grain farms are relatively small (35.8 ha), with 78.4% of the land cultivated and 12.6% rented. Soil capability was not analysed for this system due to the limited occurence in the Region. Total capital investment in 1981 averaged approximately $281,000, most of which was in land and buildings (85.6%) and machinery (12.7%), while a very small proportion (1.7%) was in livestock. Annual finances of these farms was generally low due to the small size and in 1981 gross income averaged $27,000, with variable expenses amounting to $16,000. Many Cereal-Grain farms were operated on a part-time basis with one principal operator. Off-farm work averaged 102.6 days per operator per year, while total farm labour averaged 301 days per year or 18 person days per worked hectare. Approximately 5 percent of the labour applied on the farm was hired.



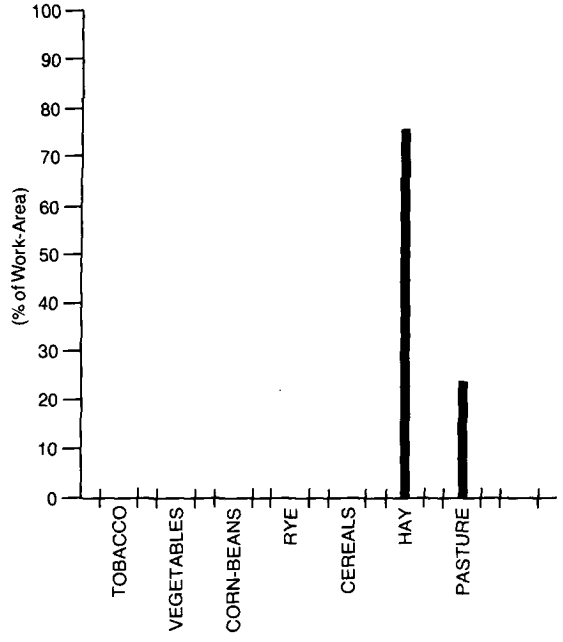
Hay System (Map Symbol 'H')



The 'Hay' system is another moderately intensive cropping scheme which relies mainly on legume or good quality grass hay and improved pasture. A typical rotation involves one year of cereal grain followed by several years of hay and then back to grain. This is usually complemented by a considerable amount of pasture, either older hay fields in the rotation or permanent grazing land. It was mapped on land parcels with mostly hay (at least some legume hay, grain or fallow) and no corn or beans. The Hay system is typically found in areas of poorer quality soil or in an urban fringe.

Census farms for this system were defined as those with no corn or beans and greater than 10% in alfalfa, cereal grains or summerfallow, but with less than 80% in cereal grains and summerfallow. These farms had an average of 47.2% of worked land in hay, 31.8% in cereal grains, 13.4% in improved pasture and 6.8% in unimproved pasture. They were primarily dairy and beef operations. Hay farms were of moderate size, averaging 46.3 ha, with 80.3% of the land worked, 16.4% rented and 20.0% in Capability Classes 1 and 2. The average total value was around $175,000, of which 80.6% was devoted to land and buildings, 12.5% to machinery and 6.9% to livestock. The financial situation of farms associated with a Hay cropping system was precarious; in 1981 average gross income amounted to approximately $17,000 and variable expenses to $7,000. These farms were typically operated as a family endeavour in addition to fulltime off-farm employment of the principal operator, although a number represented the chief interest of older 'retired' operators as well. Off-farm work averaged 102.6 days per year, total farm labour averaged 283 days per year or 11 person days per hectare per year and hired labour averaged 5 percent of total.

Pasture System (Map Symbol 'HG')



On the basis of the amount of agronomic inputs applied to land, the 'Pasture' system, which relies on annual harvesting of perennial grass species, is a very low intensity production scheme. It is a system of essentially grass hay and pasture, and was mapped wherever greater than 50% of a land parcel was in grass hay and/or pasture, and summerfallow and grain were absent. This system does not cover a large area in the Region.

Census farms representing this system have hay but no corn/beans, cereal grain, summerfallow or rye. 'Pasture' farms generally had 76.8% of their worked area (cropland + summerfallow + improved pasture + unimproved pasture) in hay, 22.8% in improved pasture and 10.6% in other unimproved land. Beef cattle were prevalent on farms of this system. The Pasture system was characterized by relatively small farms, averaging 27.1 ha in size, with 86.2% of the land worked and 6.6% rented. This system is too limited in extent to make reasonable estimates of soil capability. Total farm value was low (average about $119,000) with the proportion in land and buildings equal to 80.8%, machinery 10.0%, and 9.2% in livestock. The average gross income in 1981 was around $11,000 and variable expenses amounted to $7,000. The financial situation of these farms indicates that they are essentially large hobby farms and are generally operated in conjunction with significant off-farm work. Operator off-farm work amounted to 143.1 days per year and farm labour averaged 226 days per year or 14 person days per worked hectare per year. Hired labour amounted to only 2 percent of the total.

Idle Land and Forest

Land Use Types such as Idle Agricultural (A1), Scrubland (A2), Forest (Z), Reforestation (Zr) and Swamps (X) are not true system categories, although some use (or non-use) is implied. They are more properly land cover types and represent those portions of an agricultural area that are not presently in active use. Very often these categories are associated with poor agricultural land. Land use types are not characterized in socio-economic terms.

CHARACTERIZATION OF CROPPING SYSTEMS

In order to reveal more clearly socio-economic similarities and differences among the various systems, the following sections each focus on one aspect of agricultural production in a graphic representation of selected variables. These data were calculated from the 1981 Census of Agriculture by assigning each farm record to a cropping system on the basis of crop proportions as set up for the mapping phase. The histograms depict simple arithmetic means for each variable and should be used only for general comparative purposes. For more specific purposes actual values for both mean and standard deviation are presented in Table 2. The number of farms used in the statistical analysis ranges from 14 in 'Tobacco-Vegetable' category to 700 in the Mixed System. Sample sizes for all systems are presented in Table 2.

FIGURE 1. FARM SIZE

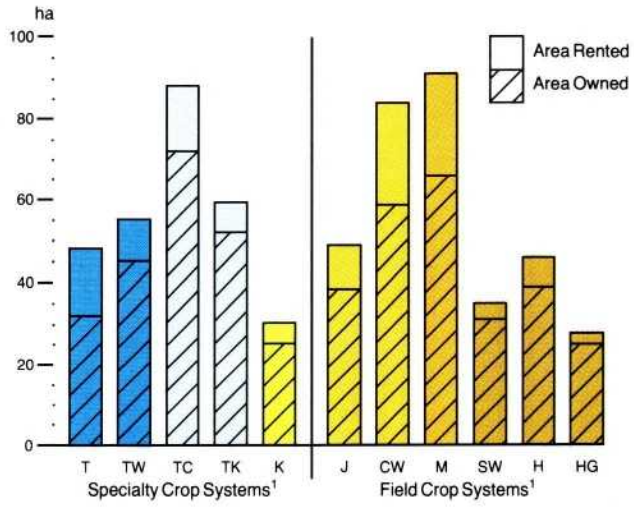


FIGURE 2. WORK AREA[2]

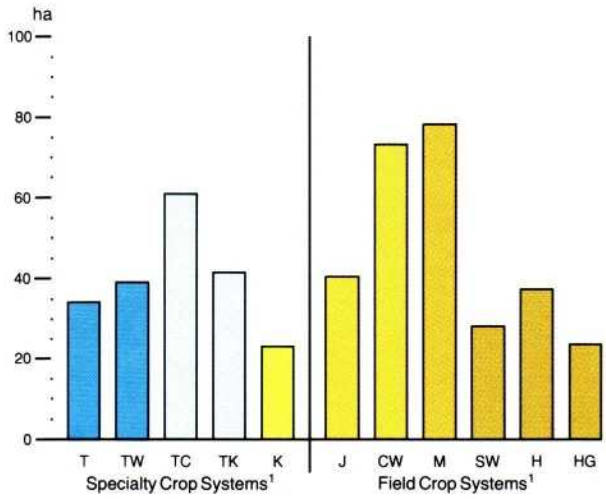
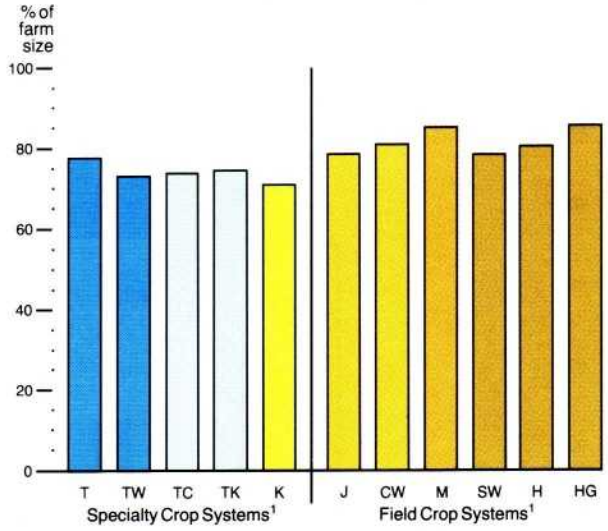


FIGURE 3. WORK AREA[2]



Note 1) T = Tobacco, TW = Tobacco-Wheat, TC = Tobacco-Corn, TK = Tobacco-Vegetable, K = Vegetable-Berries, J = Row Crops, CW = Corn-Wheat, M = Mixed, SW = Cereal Grains, H = Hay, HG = Pasture.

Note 2) In all systems except 'Pasture', WORK AREA equals cropland plus fallow plus improved pasture. In 'Pasture' WORK AREA equals cropland plus fallow plus improved pasture plus unimproved pasture.

FIGURE 4. CATTLE DENSITY

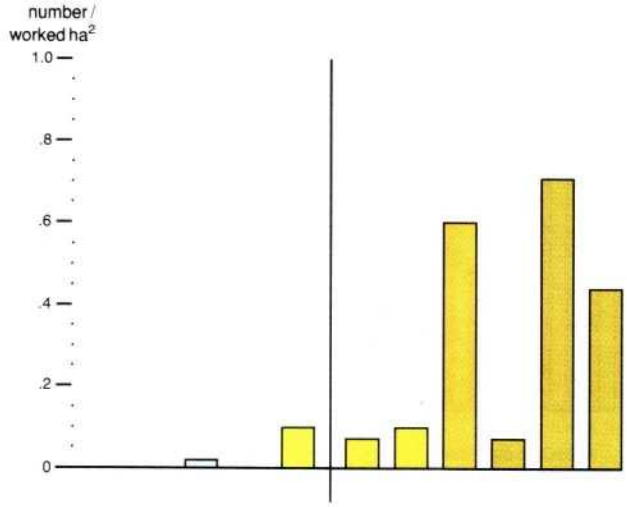


FIGURE 5. PIG DENSITY

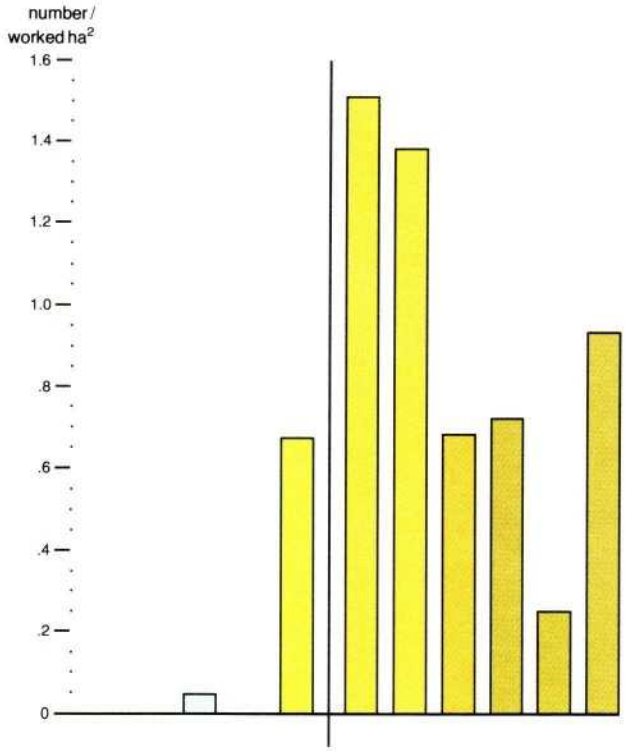


FIGURE 6. CHICKEN DENSITY

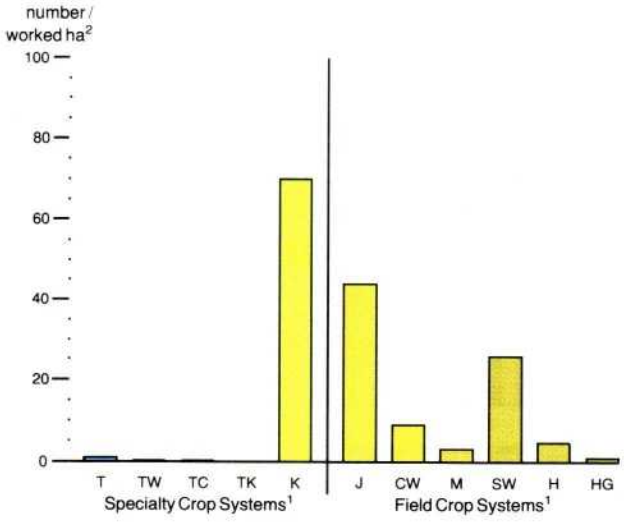
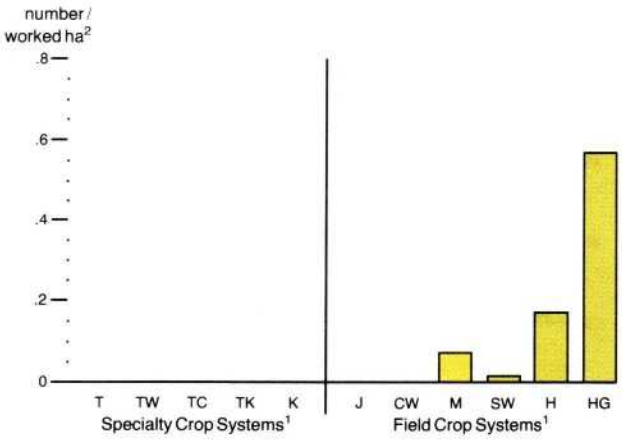


FIGURE 7. SHEEP DENSITY



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Note 2) In all systems except 'Pasture', WORK AREA equals cropland plus fallow plus improved pasture. In 'Pasture' WORK AREA equals cropland plus fallow plus improved pasture plus unimproved pasture.

FIGURE 8. HERBICIDE APPLIED

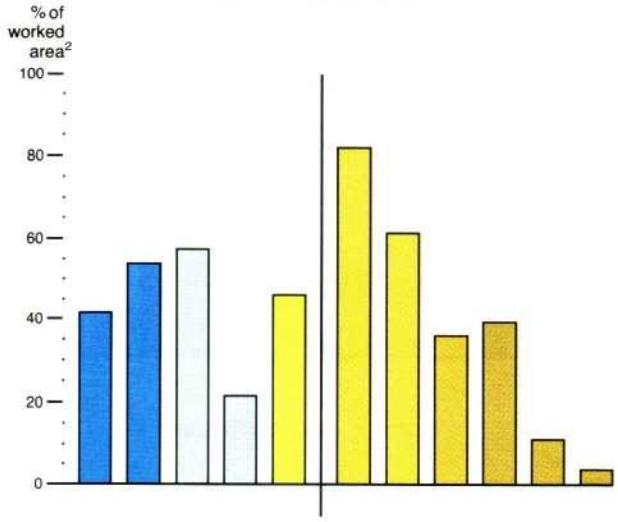


FIGURE 9. INSECTICIDE APPLIED

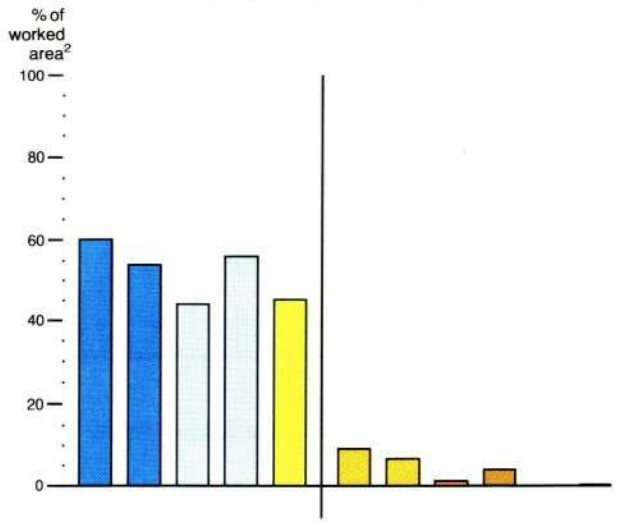


FIGURE 10. FERTILIZER APPLIED

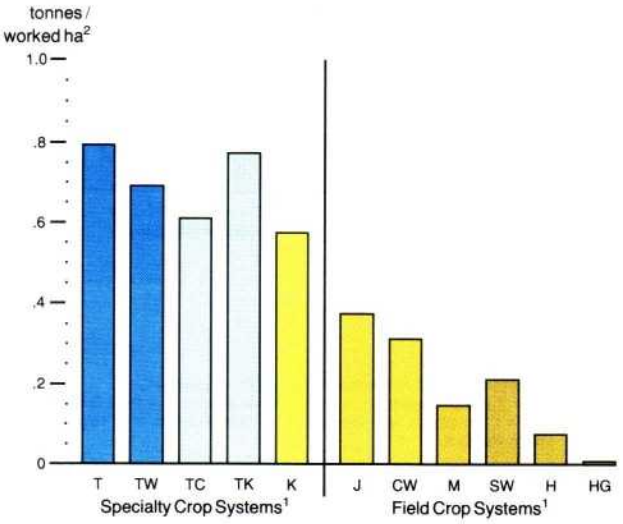
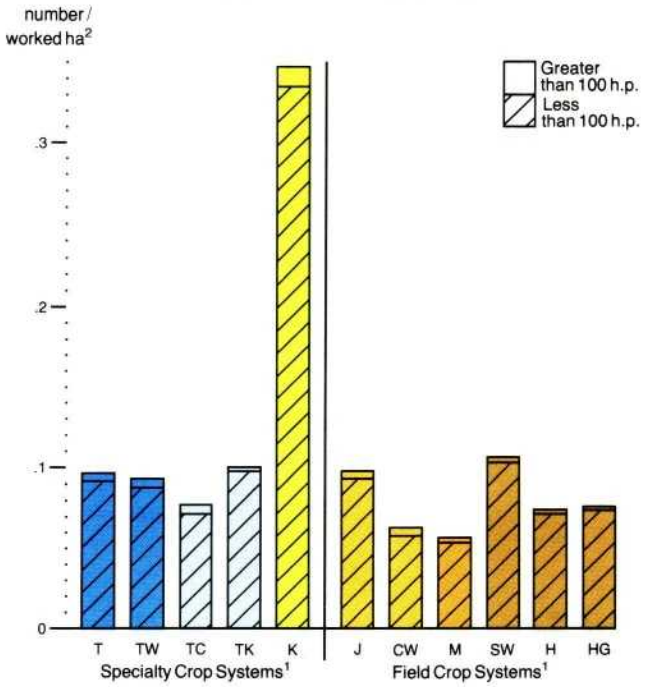


FIGURE 11. TRACTORS OWNED



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Note 2) In all systems except 'Pasture', WORK AREA equals cropland plus fallow plus improved pasture. In 'Pasture' WORK AREA equals cropland plus fallow plus improved pasture plus unimproved pasture.

ECONOMIC CHARACTERISTICS

FIGURE 12. TOTAL CAPITAL INVESTMENT[3]

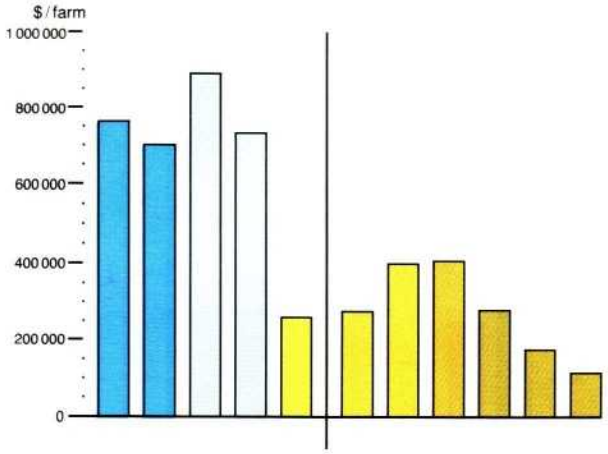


FIGURE 13. TOTAL CAPITAL INVESTMENT[3]

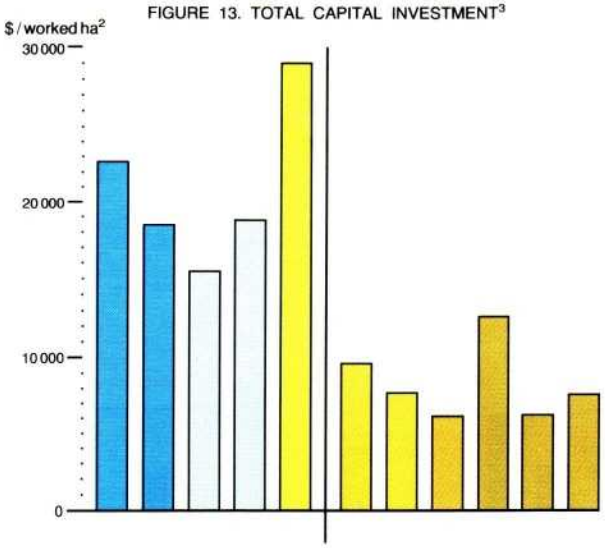


FIGURE 14. LAND AND BUILDING VALUE

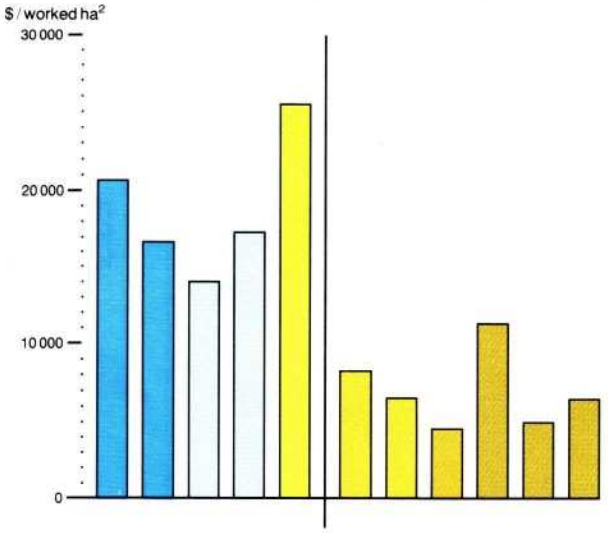


FIGURE 15. LIVESTOCK VALUE

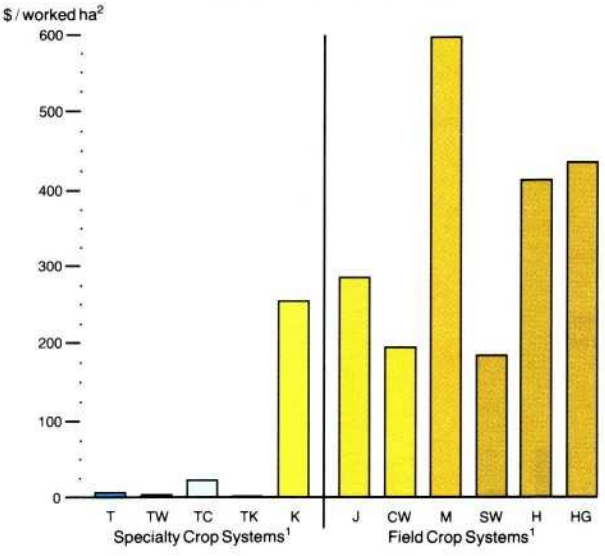
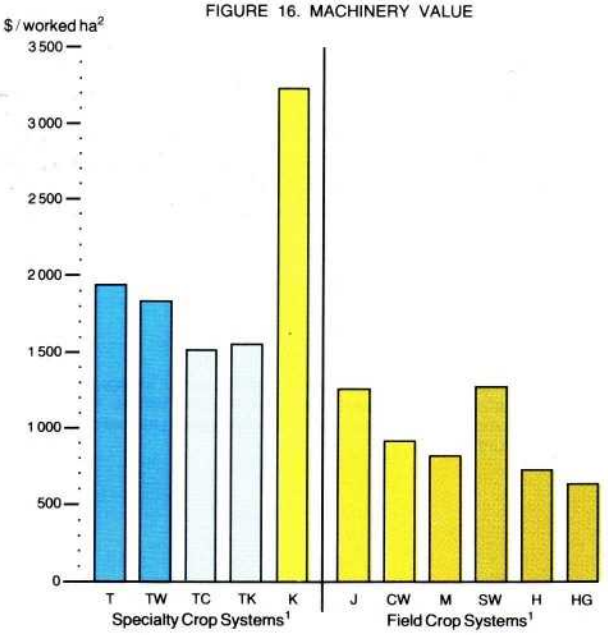


FIGURE 16. MACHINERY VALUE



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Note 2) In all systems except 'Pasture', WORK AREA equals cropland plus fallow plus improved pasture. In 'Pasture' WORK AREA equals cropland plus fallow plus improved pasture plus unimproved pasture.

Note 3) Total Capital Investment includes the 1981 market value (from Census) of land, buildings, machinery and livestock.

FIGURE 17. FARM INCOME (1981)

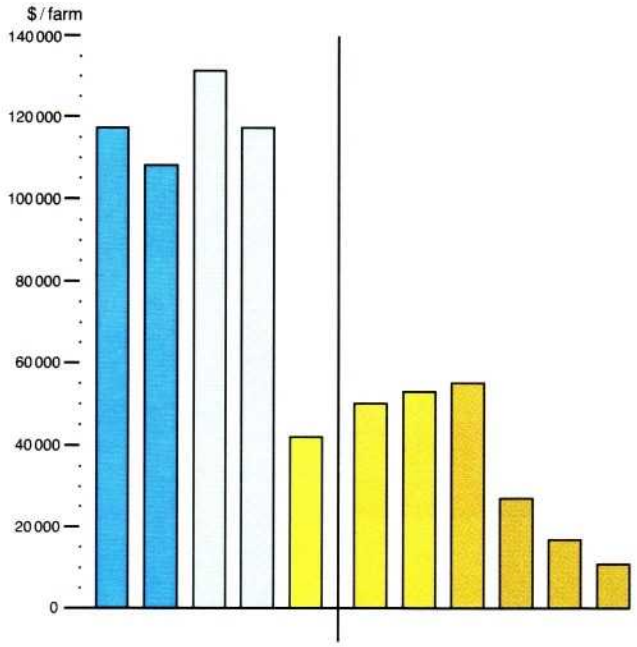


FIGURE 18. FARM INCOME (1981)

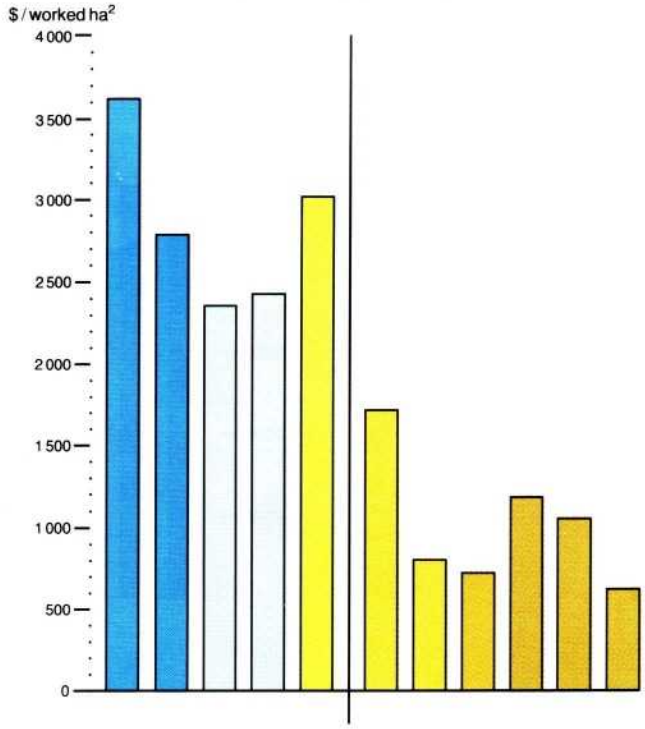


FIGURE 19. OPERATING EXPENSES[3]

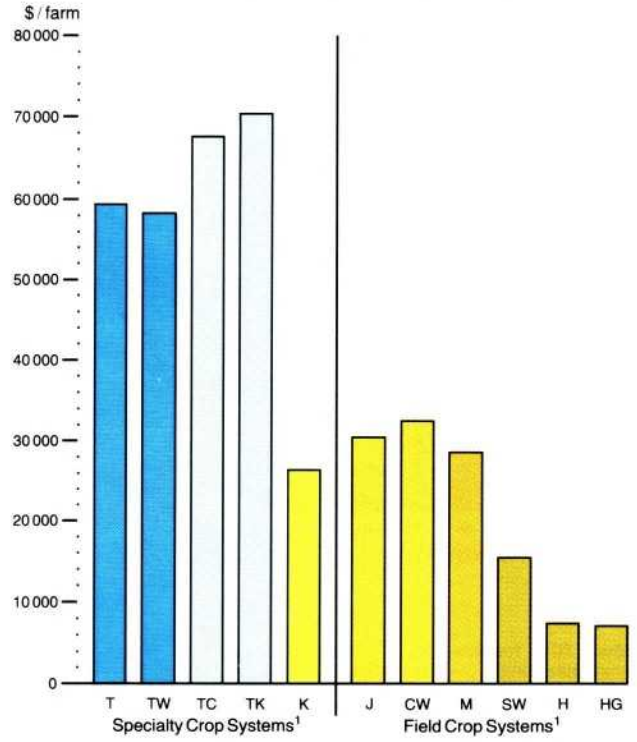
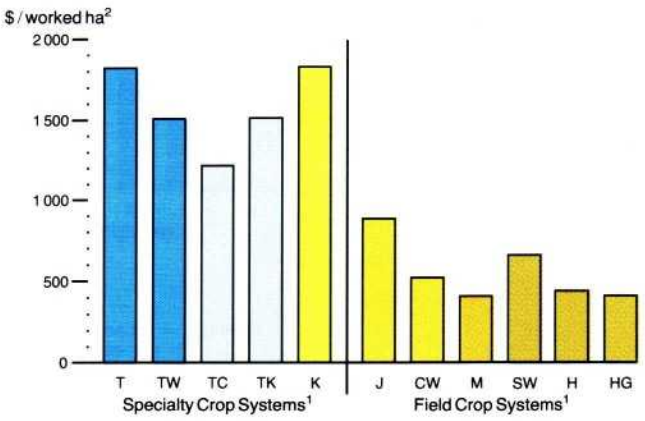


FIGURE 20. OPERATING EXPENSES



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Note 2) In all systems except 'Pasture', WORK AREA equals cropland plus fallow plus improved pasture. In 'Pasture' WORK AREA equals cropland plus fallow plus improved pasture plus unimproved pasture.

Note 3) Operating Expenses include land, building and machinery rental costs, wages (hired labour), feed supplements, seed, fertilizer, chemicals, custom work, fuel, lubricants, repairs and electricity.

FIGURE 21. GROSS MARGIN[3]

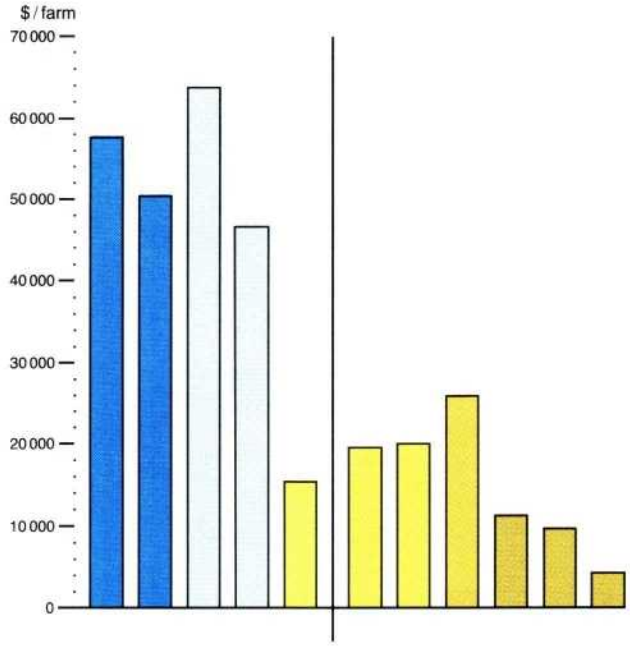
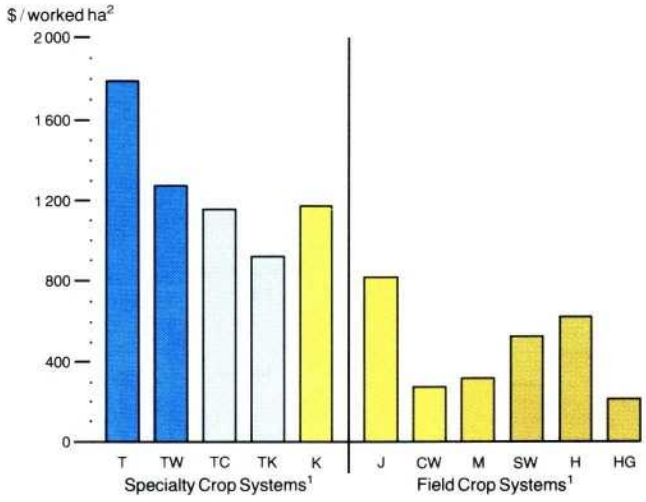


FIGURE 22. GROSS MARGIN[3]



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Note 2) In all systems except 'Pasture', WORK AREA equals cropland plus fallow plus improved pasture. In 'Pasture' WORK AREA equals cropland plus fallow plus improved pasture plus unimproved pasture.

Note 3) Gross Margin = Gross Income minus Operating Expenses.

FIGURE 23. FARM LABOUR INPUTS[3]

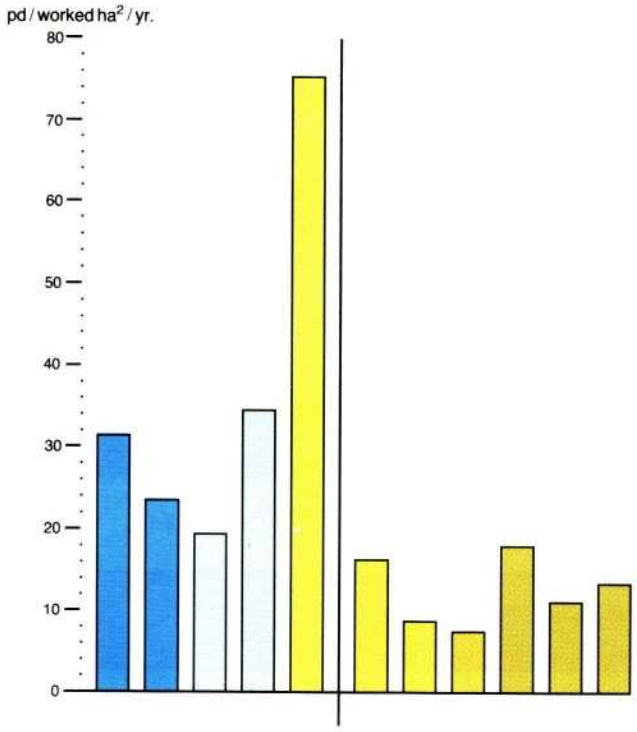


FIGURE 24. GROSS FARM RETURN PER LABOUR UNIT[3]

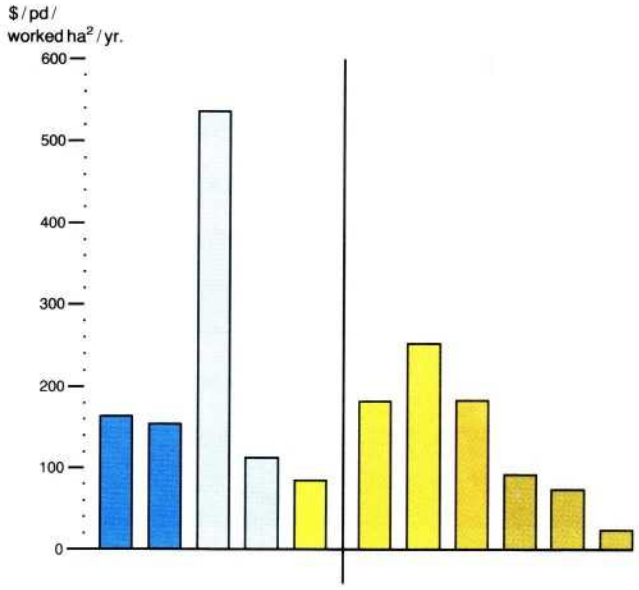


FIGURE 25. AGE OF FARM OPERATOR

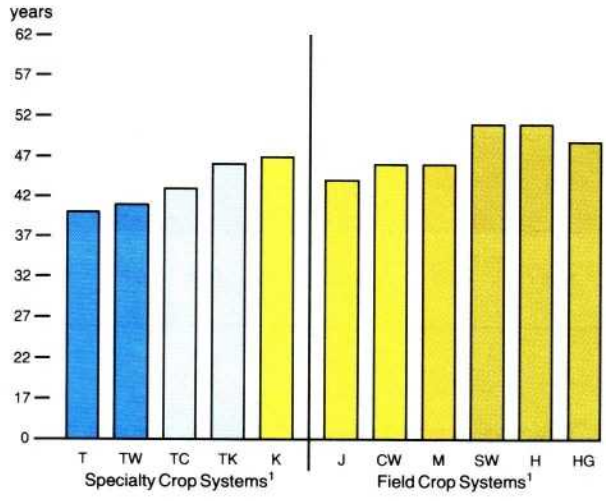
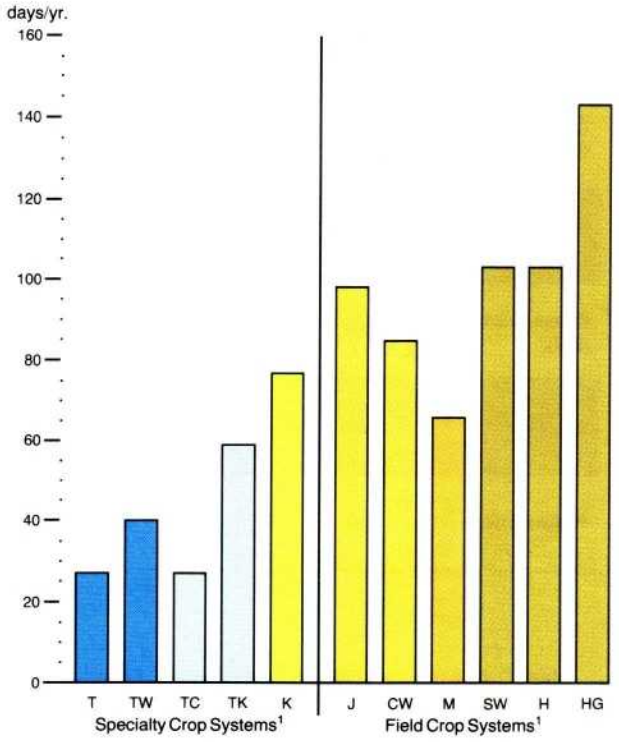


FIGURE 26. OPERATOR OFF-FARM WORK



Note 1) T = Tobacco, TW = Tobacco-Wheat, TC = Tobacco-Corn, TK = Tobacco-Vegetable, K = Vegetable-Berries, J = Row Crops, CW = Corn-Wheat, M = Mixed, SW = Cereal Grains, H = Hay, HG = Pasture.

Note 2) In all systems except 'Pasture', WORK AREA equals cropland plus fallow plus improved pasture. In 'Pasture' WORK AREA equals cropland plus fallow plus improved pasture plus unimproved pasture.

Note 3) Labour Inputs include hired and operator labour only. Operator labour was calculated as 365 minus off-farm work.

TABLE 2. SUMMARY STATISTICS, CHARACTERIZATION OF CROPPING SYSTEMS, HALDIMAND-NORFOLK, 1980-81.

Agricultural Land Use System (Map Symbol)	N (Farms)	PHYSICAL CHARACTERISTICS						CAPITAL INVESTMENT							
		Farm Size (ha)		Rented Land (% of Farm Size)		Work Area[1] (% of Farm Size)		Total Value ($/ha)[1]	Land and Buildings		Machinery		Livestock		
									(% of Total Value)						
		MEAN	STD. DEV.	MEAN	STD. DEV.	MEAN	STD. DEV.	T = 1.00[2]	MEAN	STD. DEV.	MEAN	STD. DEV.	MEAN	STD. DEV.	
Tobacco (T)	642	47.5	23.4	31.0	44.5	77.0	18.0	1.00	89.6	9.8	10.4	9.8	0.0	0.5	
Tobacco-Wheat (TW)	123	55.1	22.6	17.0	36.2	73.3	17.0	0.81	88.9	7.4	11.0	7.4	0.1	0.4	
Tobacco-Corn (TC)	218	88.2	81.0	16.9	32.1	73.7	15.6	0.68	88.6	9.0	11.2	9.0	0.2	0.9	
Tobacco-Vegetable (TK)	14	59.7	34.6	12.4	19.1	74.7	24.2	0.83	89.5	6.6	10.5	6.6	0.0	0.0	
Vegetable-Berry (K)	272	30.6	42.0	17.8	33.4	70.4	25.4	1.27	84.8	11.9	14.2	11.7	1.0	3.2	
Row-Crop (J)	257	49.3	53.7	22.7	36.3	78.5	20.4	0.43	82.7	13.8	14.9	13.5	2.4	5.5	
Corn-Wheat (CW)	289	84.9	90.4	30.3	37.5	82.5	16.4	0.34	81.0	13.0	15.9	11.1	3.1	7.2	
Mixed (M)	700	91.2	77.3	27.6	33.1	85.0	13.2	0.27	74.3	13.5	14.6	8.9	11.1	8.9	
Cereal-Grains (SW)	136	35.8	27.6	12.6	29.8	78.4	21.7	0.56	85.6	10.5	12.7	9.8	1.7	4.0	
Hay (H)	366	46.3	31.1	16.4	31.7	80.3	17.4	0.27	80.6	12.4	12.5	10.4	6.9	7.7	
Pasture (HG)	56	27.1	17.4	6.6	20.9	86.2	16.3	0.33	80.8	17.5	10.0	8.7	9.2	12.5	

Note 1) Data were calculated per 'worked hectare', defined for all systems except 'Pasture' as consisting of cropland plus summer fallow plus improved pasture. Because of the small area of tilled land in 'Pasture' systems, unimproved pasture is included as 'Work Area'.

Note 2) Values in 1980 dollars for 'Tobacco' are: Total Value $22,786/ha, ±10,223; Gross Income $3,621/ha, ±1,584; Gross Margin $1,794/ha, ±1,325; Gross Margin per Labor Unit $67/pd, ±76.

ANNUAL INCOME AND EXPENSES				ANNUAL FARM LABOR					OPERATIONAL CHARACTERISTICS		
Gross Income ($/ha)[1]	Operating Expenses[3] (% of Income)		Gross Margin ($/ha)[1]	Total Labor Inputs (pd/ha)[1]		Hired Labour (% of Total)		Gross Margin per Labor Unit ($/pd)	Off-farm Work (Operator days)		Predominant Farm Enterprise
T = 1.00[2]	MEAN	STD. DEV.	T = 1.00[2]	MEAN	STD. DEV.	MEAN	STD. DEV.	T = 1.00[2]	MEAN	STD. DEV.	
1.00	83.9	328.1	1.00	31.4	17.4	58.9	20.5	1.00	27.4	74.9	Cash crop
0.77	88.2	288.8	0.72	23.7	9.8	55.2	24.6	0.94	39.6	90.1	Cash crop
0.66	65.1	130.4	0.65	19.5	10.7	54.5	26.7	3.25	26.5	74.0	Cash crop
0.67	65.9	26.6	0.52	34.3	26.2	58.0	29.7	0.68	58.9	106.9	Cash crop
0.83	117.8	321.6	0.66	75.4	127.9	26.2	29.7	0.52	76.7	111.9	Cash crop, poultry, hogs
0.47	97.9	185.9	0.46	16.4	21.2	6.8	17.1	1.10	98.1	113.9	Cash crop, hogs, poultry
0.22	136.2	406.8	0.16	8.8	9.0	11.5	22.1	1.52	84.6	117.3	Cash crop, hogs, dairy
0.20	113.9	412.3	0.18	7.6	7.9	13.3	21.3	1.11	66.2	109.0	Dairy, beef hogs
0.33	117.1	145.9	0.30	18.0	25.1	5.1	16.6	0.55	102.6	124.8	Cash crop, hogs, poultry
0.29	126.5	297.1	0.35	11.2	16.2	5.2	14.4	0.45	102.6	121.0	Beef, dairy, hobby
0.17	161.2	203.9	0.12	13.6	12.4	2.0	5.8	0.14	143.1	128.3	Beef, sheep, hobby

Note 3) Operating Expenses include feed and supplements, seed, fertilizer, chemicals, fuel, land, building and machinery rentals and maintenance, hired wages, custom work and electricity.

Note 4) Total labor includes operator and hired labor.

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